

LETTERS

PUBLIC HEALTH PRACTICE VS PUBLIC HEALTH RESEARCH: THE ROLE OF THE INSTITUTIONAL REVIEW BOARD

The Journal is to be commended for presenting another Health Policy and Ethics Forum (June 2004) just 2 years after grappling with similar controversies in July 2002. It is, however, disappointing to see that the public health community continues its special pleading to circumvent the protection of human research subjects required by federal regulation.¹ The assertion that “primary intent” exempts public health research from institutional review board (IRB) oversight is arbitrary and unjustified.² Intent to publish the results of innovative public health efforts is sufficient (if not necessary) to meet the regulatory definition of human subjects research. Attempts to evade the protection of federal regulations in the belief that the ends justify the means are worrisome indeed. While the loss of publishable data because of delays in the review process is unfortunate, it is not too high a price to pay for meaningful oversight and consistency.

The increased scrutiny given to therapeutic maneuvers in the research context is not yet applied to therapeutic innovation not destined

to be used for generalizable knowledge. IRB oversight might, in fact, provide needed protection in some instances of creative but risky unpublished clinical innovation. In any case, the dilemma of distinguishing public health practice from public health research would be eliminated if all such undertakings were reviewed by an IRB to determine whether IRB jurisdiction is appropriate. Any policies promulgated to simplify the review process, particularly for minimally risky research, would be equally welcome for clinical investigations not performed as public health endeavors.

The Nazi doctors, too, were motivated by public health concerns when they exposed unconsenting prisoners to trauma, infections, fatal low air pressure, and freezing temperatures, simulating disasters in war. If we reject the “end justifies the means” rationale for medical research, it is to be hoped that the slippery slope will be left to history. ■

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MACQUEEN AND BUEHLER RESPOND

In our article we addressed a number of questions regarding the boundary between human subjects research, as defined by federal regulations, and public health practice, as defined by state and federal public health policy and law. The vast majority of work

done by public health agencies is not research, and this boundary is usually clear. For example, a randomized controlled trial to evaluate an experimental tuberculosis therapy is human subjects research, despite the public health mission driving the work, and should be reviewed by an institutional review board (IRB). Conversely, a state mandate that physicians report cases of tuberculosis to public health authorities represents public health practice, despite the potential richness of the resulting data for research, and allows health departments to monitor tuberculosis trends and direct prevention and care services. Mechanisms exist to protect the confidentiality of those reported to public health surveillance systems or receiving public health services.

There are, however, areas of practice where oversight may be inadequate or lacking. In contemplating new approaches to ensuring ethical public health practice, oversight by a group familiar with public health law and human rights would be more meaningful than review by an IRB familiar mainly with research ethics and procedures.

We share Wedeen's interest in ethical public health. We made no arguments justifying ends over means, and Wedeen's assertion that we have taken such a position represents a serious misreading of our article. We explicitly argued for the creation of oversight or guidance mechanisms that are meaningful and appropriate for public health. Our intent was to promote thoughtful discussion and informed action in resolving the challenges faced by public health practitioners and researchers who strive to meet their obligations ethically.

The National Bioethics Advisory Commission called for innovative solutions to correct the limitations of current procedures for distinguishing research from practice and for ensuring the ethical conduct of investigations in which the risks primarily involve stigmatization or potential threats to privacy and confidentiality.¹ The engagement of community advisory boards by public health agencies is

one approach to addressing these concerns,^{2,3} reflecting parallel interest in such boards for research projects.⁴ Another approach would be to more clearly inform and engage the public concerning the objectives, methods, and procedures of public health practice, in turn improving the oversight of public health agencies already provided by the political process of governance.⁵ ■

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have less educational attainment have the worst caries outcomes. Commonly listed reasons relate to access to care and include inability to afford preventive and therapeutic care, a shortage of minority dentists, ineffective insurance coverage, and poor diet.

In their editorial “Strengthening the Oral Health Safety Net: Delivery Models That Improve Access to Oral Health Care for Uninsured and Underserved Populations,” Formicola and colleagues state that “reducing disparities in oral health requires both institutional and health policy changes.”^{1(p704)} One institutional shift that could serve to improve oral health can be found in Finland—use of xylitol for caries prevention.

Xylitol, a sugar substitute that is not fermentable by oral microflora, is considered an anticariogenic agent.² It is a 5-carbon-sugar alcohol (pentitol) approved by the US Food and Drug Administration as a food sweetener.³ Multiple clinical and field trials have demonstrated that the addition of xylitol to the diet dramatically reduces the incidence of dental caries,⁴⁻⁷ and this reduction seems to continue long after use of xylitol is terminated.⁷ One study in Finland demonstrated that a school-based xylitol program was equal in caries prevention to a pit and fissure sealant program.⁸ Xylitol-based chewing gum is a mainstay for prevention in Finland, where in 1998 45% of boys and 63% of girls in a nationally representative survey of 11-, 13-, and 15-year-olds used xylitol gum daily.⁹

Caries prevention strategies employed in the United States, such as cleanings and application of sealants, are performed in clinical settings. Healthy People 2010 specifically calls for measures that would target oral health preventative procedures to poor inner-city children in school-based or school-linked programs.¹⁰ Distributing gum or candy to children is inherently low-tech. The xylitol research is significant because a low-cost, quickly implementable caries prevention strategy that can circumvent barriers could lessen oral health disparities in the United States. ■

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WHAT CAN ORAL PUBLIC HEALTH LEARN FROM FINLAND?

Dental caries are the most prevalent chronic childhood disease in the United States, and the burden of this condition falls heavily on socially disadvantaged children. Findings from numerous reports have demonstrated that there is an oral health gap in the United States—ethnic minorities, children of low-income families, and children whose parents

FORMICOLA RESPONDS

In her letter regarding our article on strengthening the oral health safety net, Widome proposes the widespread use of xylitol gum as an effective measure to prevent dental caries in children. Our purpose was not to specify individual or communitywide preventive strategies. We described 3 operational programs to improve access to oral health care for children and adults. Improving access for the millions of Americans who are uninsured or underserved is a great challenge. In describing successful models to open access to

care, our hope was that others might employ similar programs and strategies for low-income populations.

Experience has taught us that preventive programs should not operate in isolation but should coexist with treatment systems for existing disease. In northern Manhattan, the Columbia Community DentCare program in the public schools uses proven preventive interventions such as screening the children, providing oral hygiene education, providing cleanings, and applying dental sealants. However, the existing disease burden in children is high in northern Manhattan and in many communities where access to care is limited. In the northern Manhattan example, the prevalence of untreated dental caries in the school children was 36%, with 13% of children having at least one severely carious tooth requiring endodontic therapy or extraction.¹ Thus, improving access to treatment was as important as implementing preventive measures. The 3 programs we described—the northern Manhattan Columbia Community DentCare program, the New Mexico Health Commons Model, and the FirstHealth Model in North Carolina—all provide both treatment and preventive services.

Water fluoridation, oral hygiene measures, and dental sealants are widely accepted cornerstones of preventive programs in the United States. Xylitol chewing gum, as pointed out by Widome, appears to be a promising caries prevention method.² In the United States, large-scale studies may be necessary before the general use of xylitol is recommended.³ ■

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BREASTFEEDING AND ASTHMA IN ADOLESCENTS

Da Costa Lima et al.¹ examined factors related to childhood infection in relation to adolescent asthma in Brazil and highlighted a weak increased risk for breastfeeding as being of particular interest. We note that there are several factors that might contribute to a spurious positive association.

One issue is confounding. Of the large number of early-life factors examined, the authors found the strongest association with number of people sharing a bedroom, but the authors did not adjust the breastfeeding associations presented in Table 3 for this variable. Although they report a lack of confounding of the breastfeeding associations by “crowding” in the text, they do not specify which crowding variable, nor their criteria for determining confounding. It would be useful for the reader to see the breastfeeding associations adjusted for both crowding variables along with the other potential confounders.

Selection bias may have occurred. Five percent of the original cohort had died before the follow-up in 2000. If, as has been reported in Brazil,² breastfeeding reduced mortality from respiratory infection (a risk factor for future asthma), the selective loss of asthma-prone children with less breastfeeding could introduce a spurious positive association. The lower follow-up rate among the poorest children could produce the same effect, because low income was protective for asthma in these data and longer duration of breastfeeding was recently reported to be more common among low-income women in this cohort.³ Showing the relevant data on subjects without follow-up would be useful.

Differential exposure misclassification may also have occurred, because higher-income women in this cohort have been reported to overestimate breastfeeding duration and their children have a higher prevalence of asthma.⁴ Looking at income as an effect modifier would help.

Some mothers may delay weaning because of early respiratory infection, a risk factor for later asthma. The authors could present data to address this possible bias away from the null, because the original questionnaire included information on early asthma/wheeze.

The message that breastfeeding may cause asthma later in life could discourage the practice in some women, despite disclaimers that the breast is still best. Given the potential public health impact of these results, we would like to see more information that would allow evaluation of the likelihood and possible magnitude of bias. ■

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DA COSTA LIMA ET AL. RESPOND

We would like to thank London and Promislow for their thoughtful review of our article. They raise the possibility that our results might have been affected by confounding, selection bias, and misclassification.

Regarding confounding, we investigated all variables for which we had information in early life and which, according to the literature, might affect either asthma or respiratory illnesses in general. These variables included family income, maternal education, assets

TABLE 1—Prevalence Ratios (PRs) and 95% Confidence Intervals (CIs) for Asthma, by Breastfeeding Status: Pelotas, Brazil

Breastfeeding Status, 1983–1986	Crude PR (95%CI)	Adjusted PR ^a (95%CI)	Adjusted PR ^b (95%CI)
Feeding pattern at age 3 mo			
Exclusive	1.26 (1.02, 1.54)	1.22 (0.99, 1.51)	1.27 (0.97, 1.66)
Partial	1.20 (0.97, 1.48)	1.18 (0.95, 1.47)	1.27 (0.97, 1.66)
Not breastfed	1.00	1.00	1.00
<i>P</i> ^c	.06	.13	.12
Type of milk received at age 3 mo			
Breast	1.25 (1.03, 1.53)	1.22 (1.00, 1.50)	1.28 (0.99, 1.65)
Mixed	1.19 (0.94, 1.49)	1.17 (0.93, 1.47)	1.25 (0.93, 1.66)
Non-breast	1.00	1.00	1.00
<i>P</i> ^c	.06	.13	.13
Type of milk received at age 6 mo			
Breast	1.27 (1.02, 1.58)	1.26 (1.00, 1.58)	1.29 (0.98, 1.71)
Mixed	1.20 (0.92, 1.55)	1.19 (0.91, 1.54)	1.33 (0.96, 1.83)
Non-breast	1.00	1.00	1.00
<i>P</i> ^c	.07	.09	.08
Type of milk received at age 9 mo			
Breast	1.30 (0.99, 1.71)	1.34 (1.02, 1.75)	1.43 (1.04, 1.97)
Mixed	1.41 (1.08, 1.83)	1.41 (1.08, 1.83)	1.42 (1.01, 2.00)
Non-breast	1.00	1.00	1.00
<i>P</i> ^c	.01	.009	.02
Type of milk received at age 12 mo			
Breast	1.18 (0.84, 1.65)	1.26 (0.90, 1.77)	1.35 (0.90, 2.03)
Mixed	1.36 (1.04, 1.79)	1.39 (1.06, 1.82)	1.44 (1.01, 2.03)
Non-breast	1.00	1.00	1.00
<i>P</i> ^c	.06	.03	.05

^a Adjusted for family income, maternal education, and assets index.

^b Adjusted for family income, maternal education, assets index, number of persons sharing a bedroom, number of other children in the home, maternal age, parental smoking, birthweight, gestational age, intrauterine growth retardation, parity, and type of delivery.

^c χ^2 test for trend.

index, number of persons sharing a bedroom, number of other children in the home, maternal age, parental smoking, birthweight, gestational age, intrauterine growth retardation, parity, and type of delivery.

London and Promislow rightly point out that the number of persons sharing a bedroom was not included as a possible covariate in the results presented in Table 3 of our article. In this table, we adjusted only for socioeconomic variables; however—as stated in the text (p1859)—after further adjustment for the other potential confounders listed above, including both variables related to crowding (number of persons per bedroom and number of children in the home), there were no further changes in the results (Table 1). Thus, lack of adjustment for variables related to crowding does not explain our results.

The writers mention the possibility of selective loss of asthma-prone children (e.g., those with childhood lung diseases) and ask us to show follow-up rates for different subgroups of children. In Table 2 here, we show the follow-up rates at age 18 years according to family income at birth and reported history of asthma/bronchitis or pneumonia in the first 2 years of life (this information was collected in 1984). The table also shows follow-up rates according to hospital admissions in the first 4 years of life. There is no evidence that morbidity in early life was associated with follow-up rates. For a general discussion of follow-up rates in the study we refer to Victora et al.¹ More than 70% of subjects in each socioeconomic category were traced in 2000.

As suggested, we investigated effect modification by income, after adjustment for the

confounding variables listed in Table 1. For low-income families (up to 3 times minimum wage per month), mixed feeding at 9 months was associated with a prevalence ratio (PR) for asthma of 1.48 (95% confidence interval [CI]=0.95, 2.31) and breastfeeding was associated with a PR of 1.22 (95% CI=0.74, 2.02), relative to children who did not receive any breast milk (Table 3). For upper-income families the corresponding PRs were 1.41 (95% CI=1.08, 1.83) and 1.34 (95% CI=1.02, 1.75). Therefore there was no apparent effect modification.

London and Promislow suggest that some mothers may delay weaning because of early respiratory infection, and they ask that we present information on early wheezing and asthma according to feeding patterns. In fact, our data suggest the opposite. Infants who at 9 months of age received breastfeeding (PR=0.80; 95% CI=0.53, 1.23) or mixed feeding (PR=0.55; 95% CI=0.35, 0.87) were less likely to have reported asthma or wheezing at the age of 2 years than those who did not receive any breast milk. It should be noted, however, that reported wheezing or asthma at this age is often due to infectious rather than atopic conditions. The literature, as reviewed by Sears,² shows that breastfeeding tends to protect against wheezing conditions in early life, but not later on.

Finally, we share the concern expressed by the writers about the public health message of an article suggesting that breastfeeding may have some detrimental effects, despite the wealth of literature showing its benefits. However, our article was not the first to show such an association. Studies of the 1958 and 1970 United Kingdom birth cohorts^{3,4} and studies in Arizona,⁵ Italy,⁶ and, more recently, New Zealand² all show increased risk of atopy, asthma, or both among breastfed children. ■

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TABLE 2—Characteristics of the Original Cohort (n = 3037) and Percentage Located in 2000: Pelotas, Brazil

	Original Cohort, No.	Deceased, No.	Interviewed, No.	Located in 2000, % ^a
Family income, \$/mo (1982)				
<50	666	63	420	72.5
50–149	1463	65	1105	80.0
150–299	544	8	448	83.8
≥300	351	5	269	78.1
Asthma or bronchitis (1984)				
No	2041	38	1656	83.0
Yes	513	11	414	82.8
Pneumonia (1984)				
No	2084	34	1701	83.3
Yes	467	14	369	82.0
Hospital admissions (1982–1986)				
No	1791	21	1466	83.0
Yes	910	40	699	81.2

^aIncludes subjects interviewed as well as those known to have died.

TABLE 3—Prevalence Ratios (PRs) and 95% Confidence Intervals (CIs) for Asthma, by Breastfeeding Status and Monthly Family Income in 1982: Pelotas, Brazil

Breastfeeding Status, 1983–1986	Adjusted PR (95%CI) ^b		
	Income <\$150	Income ≥\$150	Overall
Feeding pattern at age 3 mo			
Exclusive	1.26 (0.86, 1.85)	1.25 (0.99, 1.51)	1.27 (0.97, 1.66)
Partial	1.46 (1.02, 2.09)	1.18 (0.95, 1.47)	1.27 (0.97, 1.66)
Not Breastfed	1.00	1.00	1.00
<i>p</i> ^a	.11	.13	.12
Type of milk received at age 3 mo			
Breast	1.37 (0.97, 1.95)	1.22 (1.00, 1.50)	1.28 (0.99, 1.65)
Mixed	1.33 (0.89, 1.99)	1.17 (0.93, 1.47)	1.25 (0.93, 1.66)
Non-breast	1.00	1.00	1.00
<i>p</i> ^a	.16	.13	.13
Type of milk received at age 6 mo			
Breast	1.21 (0.78, 1.87)	1.26 (1.00, 1.58)	1.29 (0.98, 1.71)
Mixed	1.60 (1.08, 2.37)	1.19 (0.91, 1.54)	1.33 (0.96, 1.83)
Non-breast	1.00	1.00	1.00
<i>p</i> ^a	.06	.09	.08
Type of milk received at age 9 mo			
Breast	1.22 (0.74, 2.02)	1.34 (1.02, 1.75)	1.43 (1.04, 1.97)
Mixed	1.48 (0.95, 2.31)	1.41 (1.08, 1.83)	1.42 (1.01, 2.00)
Non-breast	1.00	1.00	1.00
<i>p</i> ^a	.20	.009	.02
Type of milk received at age 12 mo			
Breast	1.19 (0.67, 2.12)	1.26 (0.90, 1.77)	1.35 (0.90, 2.03)
Mixed	1.28 (0.79, 2.09)	1.39 (1.06, 1.82)	1.44 (1.01, 2.03)
Non-breast	1.00	1.00	1.00
<i>p</i> ^a	.55	.03	.05

^a χ^2 test for trend.

^bAdjusted for family income, maternal education, assets index, number of persons sharing a bedroom, number of other children in the home, maternal age, parental smoking, birthweight, gestational age, intrauterine growth retardation, parity, and type of delivery.

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**HIV TOPICAL MICROBICIDES:
THE CURRENT DEVELOPMENT
STRATEGY IS FULLY JUSTIFIED**

In his critique of current microbicide trials, Michael Gross states: “People may die because research delays defer answers that could have spared them. People also may die because research proceeds down a blind alley or stalls progress in more promising avenues of investigation.”^{1(p1088)} Let us be quite clear. People *will* die—*are* dying—in very large numbers because of delays in developing microbicides. It would be unconscionable and indeed unethical to tolerate further delays if they are avoidable. We must therefore look carefully at Gross’s twin contentions that the current strategy will come to nothing and that it will hinder work on the next generation of microbicides.

The trials referred to were scrutinized in April 2004 by the International Working Group on Microbicides and subsequently at the consultation mentioned by Gross. It was affirmed that they should all go ahead, with the recommendations that they be organized to ensure integrated assessment of findings and that, where necessary, protocols be

strengthened to improve safety monitoring. Mechanisms are being established to facilitate implementation of these recommendations.

Gross argues for evaluating multiple products head-to-head in a single study. The difficulties of mounting such a large and complex trial, achieving multistakeholder consensus on design, and obtaining approvals mean that a delay of several years would be inevitable, with no guarantee of success. Gross also indicates that the pharmaceutical industry's approach would be to evaluate only the most promising of the 4 different polyanion microbicides among the current products. However, while product selection in conventional drug development can draw on well-tested surrogate markers of safety and efficacy, with microbicides we will have no validated surrogate markers of either until we are able to correlate the clinical findings from these phase 3 trials with putative markers. This applies equally to in vitro indicators, animal models, and early clinical findings.

As Gross says, there are some promising new microbicides in the pipeline, but important questions must be answered about their safety, efficacy, and cost before their phase 3 evaluation would be justified. And it is so far only an assumption that they will be superior to current products. Far from posing a threat, the present work will pave the way for trials of future entities by creating site infrastructure and local expertise and by testing trial designs. It cannot fail to move the microbicide field substantially forward and may give us a product that can begin to save lives. ■

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Acknowledgments

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I would like to acknowledge helpful discussions over many years with numerous colleagues in the United Kingdom and elsewhere.

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GROSS RESPONDS

The viewpoint of an expert as renowned as Stone—he received a lifetime achievement award at the international Microbicides 2004 conference for his leadership in the field—deserves careful consideration. As in his letter here, last spring Stone expressed a sense of urgency about proceeding forthwith to implement planned large-scale trials, irrespective of their impact on testing of new microbicide concepts: “Every day we’re not doing something, people are getting infected and dying . . . we’ve just got to get these products out there.”^{1(p1043)}

Indeed we must, provided they do more good than harm. Stone knows that the notable outcome to date from microbicide efficacy trials of previous nonoxynol-9–based products was an excess of HIV infections among women who received the experimental products compared with women who received a placebo.² He recognizes that preclinical and early clinical safety studies used to qualify products for entry into large-scale trials failed to detect problems that imperiled women volunteers and that the techniques have not improved since then.

Stone believes that “optimal trial design in terms of having the highest chance of giving reliable answers to the questions we are asking must be tempered by other considerations, especially the need to minimize harms—physical, social, emotional—to trial participants and others involved.”³ The best way to minimize harm is to expose the fewest volunteers to experimental products, because experience tells us that danger may not be detected until a disproportionate number of women assigned to the experimental product become infected. The best way to do that is to conduct either a single, robust trial of the strongest candidate, based on available preclinical assays, or a hypothesis-driven comparative trial, if there is a scientific justification for testing more than one.

Robin Shattock—who has been applying his pioneering laboratory models for screening

candidate microbicides both to the current generation of products and to newer candidates, some of which represent novel concepts of protection—drew the opposite conclusion from that of Stone. Shattock estimated that 5 million new infections might result from proceeding with all impending trials, instead of ensuring capacity for rapid entry of new candidates or combination products into large-scale trials.⁴ The precedent set by trials of all candidates in a class, instead of screening for best-in-class, will only exacerbate congestion at the critical stage of efficacy testing. Even if one or more of the current products displays efficacy, there is no reason to expect that we would learn of a correlate of protection relevant to future candidates based on other modes of action.

In addition to chairing one of the groups he cited as endorsing current plans, the International Working Group on Microbicides, Stone has been working with a media consultant to “develop [his] contacts with UK journalists and position [him] as an independent scientific resource that they can utilize.”⁵ How independent is Stone? He serves on the Management Board of the Medical Research Council (MRC)/Department for International Development Microbicides Development Programme, sponsor and donor for 1 of the 6 current trials. This trial tests a product that requires 10 times more active agent than the best-performing product to achieve equal potency against the predominant HIV subtype associated with sexual transmission. In preclinical efficacy studies, Emmelle (ML Laboratories, St. Albans, England) protected only 2 of 4 monkeys; in comparison, the best-performing product protected 7 of 7.⁴ While Stone continued to defend Emmelle, a product he championed when he directed MRC’s microbicides program, the MRC was deciding to discontinue support for this candidate.⁶ The second product in the proposed MRC trial is the better-performing one, but, in the inexplicable matrix of trials and products contemplated by current plans, this candidate is being investigated in at least one other large-scale trial.

I share Stone’s recognition that achieving multistakeholder consensus on a rational trial design strategy would be arduous and pro-

tracted. His letter sheds light on why it would be so difficult. ■

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ERRATUM

In: Macalino GE, Vlahov D, Sanford-Colby S, Patel S, Sabin K, Salas C, Rich JD. Prevalence and incidence of HIV, Hepatitis B virus, and Hepatitis C virus infections among males in Rhode Island prisons. *Am J Public Health.* 2004;94:1218–1223.

Data were incorrectly presented in a table. In **TABLE 3: Incidence of Hepatitis B Virus and Hepatitis C Virus Infection Among Male Prisoners, Stratified by Intake Characteristics: Rhode Island, 1998–2000** on page 1222, the number of prisoners that reported injection drug use and the number that didn't report injection drug use were reversed. The corrected rows are (corrected numbers in boldface type):

Variable	n	No. Positive	Person-Years	Incidence Rate ^a (95% Confidence Interval)	Rate Ratio (95% Confidence Interval)
Hepatitis C virus infection					
Injection drug use ^b					
Yes	11	1	18.2	5.5 (0.14, 30.65)	18.3 (3.13, 119.81)
No	217	1	352.7	0.3 (0.01, 1.67)	1.0

^aIncidence rate per 100 person-years.

^bValues do not add up to total owing to missing data.

EDITOR'S CHOICE



You Can't Have One Without the Other: Environmental Health Is Urban Health

Population health results from the intersection between people and their environment. For the first time in history, most of the world's population is predominantly urban. Any effort to meaningfully improve population health via environmental interventions must acknowledge that environmental health is increasingly synonymous with urban health.

Virtually all of the world's population growth over the coming decades will take place in the poorest cities, within the poorest countries. This demographic reality will have enormous environmental repercussions. Urbanization is largely a process of migratory push and pull. Over the past 2 centuries, much of the push came from increased agricultural productivity, which rendered many rural workers redundant. At the same time, industrialization became a magnet pulling surplus rural populations to the cities. This transformation of society from rural to urban was brutal. Nonetheless, though urban life was rife with rising rates of disease and death in the early years, it was also a source of new hope. For the majority of early migrants to the cities, this move meant a far better life for their children and grandchildren.

While the city continues to attract migrants, the push and pull have changed. Now the push from rural areas is caused by falling, rather than rising, agricultural productivity—there are too many mouths to feed in places with depleted soils and droughts. Many of the cities to which contemporary migrants flee are impoverished places in impoverished countries. These cities lack dynamic economic activity; at best, they offer the barest subsistence in an informal economy. Picking over trash is a common “job.” Even in cases where migrants make their way to booming economic centers, their reception is harsh. The newcomers are typically offered wages that are inadequate to cover a minimal standard of living, and they often find themselves living in makeshift quarters at the margins of the formal city.

This is the urban context of the new global environmental challenge—a challenge that is daunting, but not insurmountable. The response requires radical rethinking. In many of the poorest cities, some of the most exciting urban environmental projects are now under way. These promising projects share an underlying method: the poor are meaningfully involved in the process of improving the slum conditions in which they live. To bring participatory approaches up to a scale where they can measurably improve the urban environment and population health, it is necessary to institutionalize them in the establishment of democratic government at the local level. After 2 decades of “privatization” and disengagement of government, it is time to change direction and engage in the process of supporting democratic governments at the local level that can work with the urban poor and that can absorb and use sorely needed outside aid wisely.

Such a change is especially crucial at this juncture. The epidemics of HIV/AIDS and malaria are on the upswing in the developing world's rapidly growing and desperately poor cities. While antiretroviral drugs and antimalarial treatments are necessary, they are effective only if they are provided in the context of robust, accessible medical care systems and strong public health infrastructures capable of delivering core public health necessities, such as safe drinking water and effective sanitation. This simply will not happen unless we invest in building civic and public institutions in which the world's poor can participate in planning urban environments where they can live healthier lives. ■

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Environment and Health: Capacity Building for the Future

In October 2002, the World Health Organization (WHO) sponsored a workshop in Geneva, Switzerland, to address the problems faced by medical journals in the developing world regarding their efforts to provide critical, timely health information to local health practitioners and research scientists. Of major concern is the unavailability of the results of medical research from developing nations, which is published in international journals, to those who are living and working in developing nations. If scientific knowledge is to be used to improve public health and the environment, then it must be accessible to the local health professionals who need it most. A specific outcome of this workshop was the creation of the Forum for African Medical Editors (FAME) with 12 inaugural African medical editors, both anglophone and francophone. While the WHO is a major sponsor of FAME, other participating organizations, institutions, journals, and associations offer various forms of assistance.

In September 2003, the US National Institutes of Health (NIH)—specifically, the National Library of Medicine (NLM), the Fogarty International Center, and the National Institute of Environmental Health Sciences—sponsored a meeting in London at the offices of *BMJ* (*British Medical Journal*). The primary objective was to discuss the partnership of 4 sub-Saharan African medical journals with 5 Northern Hemisphere medical journals as a mechanism to enhance the quality and credibility of the African journals and thereby attract high-level research.

Identified steps needed to enhance the *quality* of the African journals included providing training for editors in improving sustainability and publishing regularly, improving the peer review process by identifying experienced reviewers willing to serve and mentoring new reviewers, and offering local researchers guidance in preparing research papers for publication. Ideas for improving the *credibility* of the African journals included having respected scientists from multiple countries serve on the journals' editorial boards, earning inclusion in major indexing databases such as the NLM's MEDLINE, and exploring ways to share journal content, for example, by co-publishing peer-reviewed research articles of high importance to the people in the area served by regional journals. This latter approach would have the added benefit for researchers and health practitioners in developed countries of making important regional research results more available in the international literature.

In May 2004, a contract was awarded to the Council of Science Editors to manage the funds for a pilot project intended to build the capacity of the 4 sub-Saharan African journals as per the thoughts generated at the London meeting. The African journals were selected because all of their editors are founding members of FAME and thus are committed to enhancing the capacities of their journals as well as other sub-Saharan medical journals. In addition, the African journals are published in countries that have active NIH-sponsored

research and are also part of the communication network developed by the NLM for the Multilateral Initiative on Malaria. The Northern Hemisphere journals were selected on the basis of their missions and commitment to advancing public health and the environment in developing regions of the world. The following 4 journal partnerships have been established: (1) *African Health Sciences* with *BMJ*; (2) *Ghana Medical Journal* with *The Lancet*; (3) *Malawi Medical Journal* with the *Journal of the American Medical Association*; and (4) *Mali Medical* with *Environmental Health Perspectives* and the *American Journal of Public Health*. The last partnership—ours—is the only one involving 2 Northern Hemisphere journals and the only one involving a francophone journal.

In September 2004, the 3 of us met in Research Triangle Park, NC, to begin working toward the successful completion of our contract tasks, which were as follows:

1. To identify the equipment and facility needs of the *Mali Medical* and then provide computer hardware and software to the publishing offices, along with initial training to editorial office personnel.
2. To identify the editorial needs of the *Mali Medical* through mutual site visits by the partnering editors-in-chief to observe editorial and publishing practices.
3. To provide author/reviewer training via workshops, emphasizing international standards for writing and systematic approaches for reviewers, open to all FAME members at sched-

uled scientific/medical meetings in Africa.

4. To provide training and support for a managing editor/business manager in establishing business plans for effective, sustainable publishing operations through technical consultation and through a workshop in Africa open to all FAME members.
5. To develop and maintain a Web site that would permit online publication of the *Mali Medical*.
6. To establish internships for representatives of the *Mali Medical* at the editorial offices of *Environmental Health Perspectives* and the *American Journal of Public Health*.
7. To commission 4 systematic reviews on topics relevant to sub-Saharan Africa to be published in partnering African journals in both English and French.

Over the next several years, we plan to evaluate the success of our capacity-building initiative, using the following indicators: progress toward indexing the *Mali Medical* in MEDLINE, numbers of articles submitted and published, numbers and effectiveness of local peer reviewers, and timeliness of publication. If our journals and sponsoring organizations are to fulfill our common missions of working to improve the public's health and achieving equity in health status for all, then our nascent partnership is a viable means toward this end. Our collective hope is that all 3 journals will better realize their potential to serve as vehicles for progressive change through increased understanding, collaboration, insight, and connections between the environment and health in the developed and developing world. Look for regular updates from us published simultaneously in all 3 journals in both English

and French. We aim to hold one another accountable in fulfilling our assigned tasks and enlisting other partners in our rewarding struggle to find creative and practical solutions that eliminate past and present health inequalities and protect the environment for future generations. ■

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Environnement et Santé: Augmenter le Potentiel Pour le Futur

En octobre 2002, l'Organisation Mondiale de la Santé (OMS) a parrainé un atelier à Genève, en Suisse, s'attaquant aux problèmes rencontrés par les revues médicales dans les pays en développe-

ment dans leurs efforts pour fournir une information médicale importante en temps voulu aux chercheurs et praticiens locaux. Le problème le plus inquiétant est le manque d'accès pour ceux qui vivent et travaillent dans les pays en développement aux résultats de la recherche médicale provenant des mêmes pays en développement et publiés dans des revues internationales. Si le but de la science est l'amélioration de la santé publique et de l'environnement, alors elle doit être accessible aux professionnels de la santé locaux qui en ont le plus besoin. A l'issue de cet atelier fut créé le FAME (Forum des Rédacteurs en Chef Médicaux Africains), qui comptait 12 rédacteurs en chef africains à son inauguration, anglophones et francophones. Bien que l'OMS soit le principal sponsor du FAME, d'autres organisations, institutions, revues et associations participantes apportent leur assistance sous différentes formes.

En septembre 2003, les Instituts nationaux américains de la santé (NIH)—à savoir, la Bibliothèque nationale de médecine (NLM), le Centre international Fogarty et l'Institut national des sciences de l'hygiène du milieu (NIEHS)— ont organisé un meeting à Londres, dans les bureaux du BMJ (*British Medical Journal*). L'objectif premier était de discuter d'une collaboration entre quatre revues médicales d'Afrique sub-saharienne et cinq revues médicales de l'hémisphère Nord comme moyen d'améliorer la qualité et la crédibilité des revues africaines, et d'attirer ainsi une recherche de haut niveau.

Les étapes définies comme nécessaires à une plus grande qualité des revues africaines comprenaient : former les rédacteurs en chef à améliorer la

rentabilité et à régulariser leur publication ; améliorer le procédé de relecture en trouvant des re-lecteurs expérimentés désireux de former et de suivre de nouveaux re-lecteurs ; proposer aux chercheurs locaux des conseils pour la préparation à la publication de dossiers de recherche. Les idées pour l'amélioration de la crédibilité des revues africaines incluaient la participation aux éditoriaux de scientifiques reconnus originaires de différents pays, être plus inclus dans les grandes bases de données telles que Medline de la NLM, et chercher le moyen de partager le contenu des revues, c'est à dire co-publier, après relecture, des articles de recherche de haute importance pour les populations des régions concernées par les revues. Cette dernière approche bénéficierait également aux chercheurs et praticiens des pays développés, en rendant les résultats importants de la recherche régionale plus accessibles dans la littérature étrangère.

En mai 2004, un contrat fut concédé au CSE (Council of Scientific Editors) pour gérance de fonds pour un projet pilote visant à augmenter le potentiel de quatre revues d'Afrique sub-saharienne selon les idées émises lors du meeting de Londres. Les revues africaines sélectionnées furent celles dont les rédacteurs en chef étaient membres fondateurs du FAME, et s'étaient donc engagés à améliorer la qualité de leurs revues ainsi que d'autres revues médicales sub-sahariennes. De plus, les revues africaines sont publiées dans des pays qui ont une recherche active sponsorisée par des NIH, et qui font également partie du réseau de communication mis en place par la NLM pour le *Multilateral Initia-*

tive on Malaria. Les revues de l'hémisphère Nord furent sélectionnées en fonction de leurs missions et engagement dans l'avancée de la santé publique et de l'environnement dans les régions en développement. Les quatre collaborations établies entre revues sont les suivantes: (1) *African Health Sciences* et le *BMJ*; (2) *Ghana Medical Journal* et *The Lancet*; (3) *Malawi Medical Journal* et le *Journal of the American Medical Association*; (4) *Mali Medical, Environmental Health Perspectives* et l' *American Journal of Public Health*. La dernière collaboration—la nôtre—est la seule qui inclut 2 revues de l'hémisphère Nord, et la seule incluant une revue francophone.

En juillet 2004, nous nous sommes réunis au Research Triangle Park, en Caroline du nord, aux Etats-Unis pour commencer à travailler au succès de l'accomplissement de nos tâches contractuelles, qui sont:

1. Identifier les besoins en équipement du *Mali Medical*, puis fournir du matériel informatique et des logiciels aux ré-

- dactions, ainsi qu'une formation de base au personnel de la rédaction.

2. Identifier les besoins éditoriaux du *Mali Medical* au moyen des visites mutuelles de la part des rédacteurs en chef associés, afin d'observer les méthodes de rédaction et d'édition.

3. Offrir une formation d'auteur/re-lecteur au moyen d'ateliers, en mettant l'accent sur les normes internationales d'écriture et les approches systématiques de relecture, ouverte à tous les membres du FAME lors de sommets médico-scientifiques en Afrique.

4. Offrir une formation et un support au rédacteur en chef et au directeur du service commercial en établissant des plans pour des opérations d'édition efficaces et viables grâce à une consultation technique et un atelier en Afrique ouvert à tous les membres du FAME.

5. Développer et entretenir un site Internet qui permettrait la publication en ligne du *Mali Medical*.

6. Organiser des stages pour les représentants du *Mali Medical* au

- sein des rédactions de l'*Environmental Health Perspectives* et de l'*American Journal of Public Health*

7. Mettre au point quatre compte-rendus systématiques sur des sujets importants en Afrique sub-saharienne qui seront publiés dans les revues africaines partenaires à la fois en anglais et en français.

Au cours des années à venir, nous évaluerons le succès de notre initiative d'amélioration de potentiel au moyen des indicateurs suivants : augmentation des références au *Mali Medical* dans Medline, nombre d'articles soumis et publiés, nombre et efficacité des re-lecteurs locaux, et ponctualité de publication. Si nos revues et organisations partenaires accomplissent nos missions communes que sont travailler à l'amélioration de la santé publique et parvenir à l'égalité dans la santé pour tous, alors notre collaboration naissante est un moyen efficace pour atteindre ces buts. Notre espoir commun est que les trois revues exploitent mieux leur potentiel d'acteurs

d'un changement progressif, et ce à travers une plus grande compréhension, la collaboration, la perspicacité et les relations entre l'environnement et la santé dans les pays développés et en développement. Nous mettrons à jour régulièrement et simultanément nos trois revues, en anglais et en français. Nous souhaitons être chacun tenu responsable pour l'accomplissement des tâches qui nous sont assignées et l'engagement d'autres partenaires dans ce combat digne d'être mené : trouver des solutions pratiques et innovantes pour éliminer les inégalités médicales passées et présentes et protéger l'environnement pour les générations futures. ■

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Les auteurs remercient nos organisations partenaires—l'American Public Health Association, le Mali Medical Association, et particulièrement le US National Institute of Environmental Health Sciences—pour leur soutien primordial dans cette entreprise de collaboration.

A Role for Public Health History

Mixed in with the rich and varied articles on global health themes in this issue of the Journal are 6 articles based on historical research. Five of the articles originated in the History Working Group of the Joint Learning Initiative (JLI) “Human Resources for Health and Development,” a major international policy and planning initiative undertaken by the Rockefeller Foundation and several partners.¹ The sixth, by Didier Fassin and Anne-Jeanne Naudé, was submitted independently but fits here nicely along with the other historical articles.²

The purpose of the History Working Group was to contribute to the JLI’s overall objectives by critically reviewing international public health initiatives during the 20th century and uncovering new insights into their successes and failures. Members were urged to illuminate through historical study the motives, context, and local complexity of these international programs. Elizabeth Fee and Marcos Cueto served as cochairs of the group, and Theodore M. Brown was senior advisor. From March 2003 to May 2004 the

group held 2 meetings in Bellagio, Italy, planned and prepared papers, and helped to develop the recommendations of the final JLI report.

The 5 JLI contributions in this issue represent current concerns in the historical study of international health. For many years, scholarship in the field focused on the role played by colonial and postcolonial medicine, US philanthropies, and the first international health agencies during the early decades of the 20th century.^{3–8} Few studies examined developments in international

health in the second half of the century. This has begun to change, and the later period is now drawing increased attention from historians, especially because recent decades have been marked by the tense encounter of cultures in the context of international public health, a changing political climate reflecting the vicissitudes of the Cold War, the emergence of neoliberalism, and the boom of economic “globalization.”^{9–12}

Marcos Cueto, in “The Origins of Primary Health Care and Selective Primary Health Care,” underscores the dynamics of the Cold War in the 1970s as the major contextual source for the World Health Organization’s (WHO’s) 1978 Alma-Ata declaration on primary health care.¹³ Cueto suggests that shifts in the international power balance between the United States and the Soviet Union, the new assertiveness of recently decolonized developing nations, and the ascent of China as a geopolitical player explain the relative decline of Western technologically based approaches and the rise of comprehensive, grassroots, and socio-political alternatives. The location of the famous meeting at Alma-Ata in Soviet Kazakhstan was itself reflective of the Cold War context and Soviet versus Chinese maneuvering. Given the circumstances, it was no surprise that “selective primary care,” the alternative to primary health care promoted by UNICEF, USAID, and other backers, was perceived by some as a staged “counterrevolution.”

Socrates Litsios explores other dimensions of the emergence of primary health care as WHO policy in the 1970s. In “The Christian Medical Commission and the Development of WHO’s

Primary Health Care Approach,”¹⁴ he traces 2 streams of thinking that converged in 1974, when a critical meeting took place in Geneva, Switzerland, between the staff of the Christian Medical Commission (CMC) and senior WHO staff. A few years before, the CMC had begun to refocus on preventive services for communities at large. Working from principles of human rights and distributive justice, CMC leaders deemphasized technical care and gave priority to comprehensive health care as one part of a general plan for the development of society.

Within WHO, Kenneth Newell and Halfdan T. Mahler began to shift attention toward plans for the integration of preventive and curative care. The World Health Assembly in May 1973 adopted a resolution confirming that countries must develop health services suited to their needs and socioeconomic conditions and use an appropriate level of technology. This resolution provided the basis for a close collaboration between the CMC and WHO, cemented by Mahler’s election as director general of WHO and leading ultimately to Alma-Ata.

Sanjoy Bhattacharya turns from intra- and interorganizational dynamics to issues of bureaucratic complexity and resistance in his article, “Uncertain Advances: A Review of the Final Phases of the Smallpox Eradication Program in India, 1960–1980.”¹⁵ He explores unpublished correspondence to show that varying levels of programmatic commitment and belief, jurisdictional conflicts, and just plain local sabotage often undermined the supposedly smoothly run, carefully orchestrated, and centrally directed

campaign. Bhattacharya documents the ways in which WHO headquarters in Geneva, the South East Asia Regional Office in New Delhi, the Indian central government, and local Indian state governments often got in one another’s way and could be brought into efficient operating relationships—for limited periods—only by concerted diplomacy, financial blandishments, and threats of political embarrassment. Bhattacharya thus offers a nuanced account of the final stages of one of the major international health programs in the later 20th century and reminds us that things are rarely as simple as they are sometimes portrayed and that politics and public health are inextricably interwoven.

Stephen J. Kunitz also highlights the inextricable interweaving of politics and public health. In “The Making and Breaking of Federated Yugoslavia, and Its Impact on Health,”¹⁶ he traces the formation and fragmentation of the Yugoslav nation, emphasizing the roles of deep-seated ethnic tensions, regional economic disparities, and the devastating inflationary consequences of a calculated turn to the West. According to Kunitz, the eruption of a bloody civil war in 1991 was inevitable, as were the health consequences of the downward economic spiral that led up to it. He shows that in the 1980s, as inflation exploded, the postwar decline in infant mortality stagnated while mortality in the elderly and mortality due to cardiovascular disease increased. Global economics, more than local ethnic conflict, was the real villain in the piece, because the policies of the International Monetary Fund led to forced under-spending on social services and failed to curb inflation, thus lead-

ing to deteriorating health and intensifying ethnic antagonisms.

William Muraskin’s article “The Global Alliance for Vaccines and Immunization (GAVI): Is It a New Model for Effective Public Private Cooperation in International Public Health?”¹⁷ completes the set of JLI contributions in this issue. Muraskin strongly argues the case that GAVI, created in late 1999, is riddled with substantial and quite possibly fatal flaws that will undermine the success it has thus far enjoyed. He contends that GAVI is an enterprise built on “top-down globalism” and that its promoters in the Gates Foundation, the International Federation of Pharmaceutical Manufacturers Association, the World Bank, and elsewhere push immunization as a nonnegotiable goal. The allies recruited into GAVI by financial inducements are weak allies at best. They have their own priorities and they realize the full extent of the enormously complex problems “on the ground,” not least of them the “human capacity problem,” which makes it difficult to implement GAVI initiatives in recipient nations. Because of the top-down imposition of the “policy of the month,” Muraskin argues, it is difficult to respond to new initiatives without seriously disrupting existing programs and priorities. He suggests that a little humility and a lot more consultation would go a very long way.

What are the take-home lessons of these 5 contributions? First, that international public health efforts are deeply influenced and critically shaped by their political context. Programs cannot be created in a vacuum or applied in isolation. They are of this world and, like it, they constantly change and thus need

to be frequently renegotiated. Second, the culture of international health organizations must be acknowledged in order to understand what priorities will emerge at any particular time and which will survive intra- and interagency competition. Programmatic ideas are always contested and rise and fall with shifting political alliances.

Third, ideas are applied in a world governed by administrative and bureaucratic realities. The translation of plans into actual programs requires a great deal of persistence and negotiating skill to make them real and keep them functioning. Fourth, international health initiatives must reckon with deep-seated historical and cultural traditions, local realities, and global forces. All play roles in the success and failure of public health activities, and no success is likely to last forever, especially when the world changes in dramatic ways. Fifth, top-down initiatives cannot expect to succeed without real bottom-up support. Because people at the local level understand how programs need to function to address their particular needs, there can be no simple formula for international public health success. A single agenda or set of priorities cannot suit all circumstances.

Clearly, there is an important role for history in global public health. Studying history carefully and generalizing from its particulars may not necessarily help us avoid repeating the mistakes of the past, but by distilling the lessons of history, we can certainly learn more clearly where we have been and, as a consequence, become more aware of where we are. ■

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PLUMBISM REINVENTED

Childhood Lead Poisoning in France, 1985–1990

Didier Fassin, MD, PhD, MPH, and Anne-Jeanne Naudé, MA

Although the history of childhood lead poisoning started a century ago in the United States, the first French cases were identified in 1985. Instead of merely adopting knowledge accumulated for decades, the public health professionals and activists involved had to reestablish, against incredulity from medical authorities and resistance from policymakers, all the evidence: that children were the main group concerned; that cases were not isolated but part of an epidemic; that wall paint in old, dilapidated apartments was the source of contamination; and that poor housing conditions, and not cultural practices, were responsible for the high incidence in African families.

This “reinvention” illustrates more general sociological phenomena: discontinuities in medical history, strength of culturalist prejudices toward immigrants, resistance to socioeconomic interpretations of disease, and struggles between different perspectives in public health. The history shows that public health is the product of intellectual and political struggles to impose visions of the world.

This, my dear Friend, is all I can at present recollect on the Subject. You will see by it, that the Opinion of this mischievous Effect from Lead is at least above Sixty Years old; and you will observe with Concern how long a useful Truth may be known and exist, before it is generally receiv'd and practis'd upon.

Benjamin Franklin, 1786¹

A COMPLETE HISTORY OF plumbism, or lead poisoning, would begin with the first testimonies of adverse health effects from the lead industry in Greece and Rome and would continue with the medical treatises written by Paracelsus on “miner’s sickness” in the 16th century and by Ramazzini on the effects of lead poisoning on “white lead makers” in the 18th century.² A more contemporary historiography of lead poisoning begins in Australia in the 1890s with the works of J. Lockhart Gibson, a Queensland pediatrician, or, perhaps more significantly, in the United States in the 1910s with the medical observations of a Baltimore physician, Kenneth D. Blackfan; it continues through the epidemiological studies and policy guidelines of the Centers

for Disease Control and Prevention (CDC) in the 1980s.³

A reader of the history of lead poisoning gets the impression that, for nearly a century, the physiopathology and epidemiology of lead poisoning have become increasingly understood, giving rise to a large amount of medical literature as well as spurring health professionals and agencies into action.⁴ Actually, things have never been so simple or straightforward, even in the United States, where most pioneering public health research and policies have been conducted, but where there has also been much resistance and inertia.⁵

Nevertheless, as data and experience have accumulated, one would expect that in Europe, where old housing is an impor-

tant historical issue, public health would have benefited from a transatlantic transfer of knowledge and long since assessed the seriousness of the problem and prevented its consequences. Such an optimistic view of scientific progress would be naïve,⁶ as the history of lead poisoning in France shows. Not only did the “discovery” of the first signs of the French epidemic not begin until 1985, but it also took at least another 5 years to go through all the stages of the construction of a public health problem, from the identification of the disease and its cause to the experimentation and evaluation of prevention measures, including an assessment of the severity and extent of the problem.⁷ Instead of merely adopting existing knowledge on lead poisoning,

French pioneers rewrote the history of plumbism, albeit at an accelerated pace and with a few original pages. By not taking on board the considerable experience of international public health, particularly that of the United States, the French discoverers of the first cases of lead poisoning among children in the 1980s were forced to start from scratch, similar to what had happened when the first Australian cases were ignored by European and North American authors at the beginning of the 20th century.⁸

Thus, the story of the fight against plumbism is rather discontinuous, not in the Kuhnian sense of scientific revolutions⁹ but in the commonsense meaning of unlearned lessons. From one side of the Atlantic Ocean to the other, the narrative thread was cut, with the actors in this drama doing little more than tying the broken ends together again. Their role consisted first of learning about an epidemic they had little knowledge of and then of winning the support of skeptical public authorities. It is this staggered chapter in the saga of world plumbism that we relate, basing our account on ethnographical research carried out over a period of 5 years in the Paris metropolitan region, where the French epidemic of the 1980s began. It is presented in parallel with the North American experience, which offers, in distinct historical and sociological contexts, interesting similarities a few decades apart.

A NEW DISEASE FROM ANCIENT TIMES

In August 1913, a comatose 5-year-old boy was admitted to Johns Hopkins Hospital in Balti-

more.¹⁰ He had limb spasms and body convulsions. Meningitis with encephalopathy was diagnosed. For 4 weeks, all known infectious etiologies were investigated, from tuberculosis to syphilis, but in vain. After 4 spinal taps, intracranial pressure was lowered and the child's clinical condition improved. He was returned to the Home for the Friendless where he lived. A few months later, he was readmitted with headaches and vomiting. This time, someone noticed a discoloration of the gum, soon identified as a "lead line." The source of the contamination was discovered when the boy was found gnawing the paint of his hospital crib. A visit to the home revealed deterioration of the painted wood of his bed. A month later, he seemed to have recovered and was again released, but he died a few weeks later.

In March 1986, a comatose 2-year-old girl was admitted to Necker Enfants Malades Hospital in Paris.¹¹ After a few hours, she was transferred from the pediatric ward to the intensive care unit in a convulsive state. A diagnosis of viral encephalitis was posited, and various infectious etiologies were investigated, in particular through lumbar punctures. Two weeks later, plumbism was considered, among other hypotheses. The child's blood lead level was found to be 2630 $\mu\text{g/L}$ (the present CDC norm is $<100 \mu\text{g/L}$). The father, a Malian immigrant, explained that his daughter regularly ingested paint at home. After 2 chelation treatments, the child's medical condition partially improved. The social investigation in the apartment where the family lived showed that the paint on the bedroom wall above the crib was completely scratched off to a

height of 1 m. Months later, the child continued to suffer severe neuropsychic sequelae with behavioral disorders.

Baltimore and Paris—2 quite similar medical stories on opposite sides of the Atlantic 73 years apart. They each represented a dramatic case that initiated the deployment of a cognitive and institutional plan of action confronting a new public health problem. Both clinical pictures took a long time to diagnose be-



Photo by Mariano Garate

A dilapidated building with white lead paint on the outskirts of Paris.

cause, in both situations, lead poisoning was not yet a clinical reflex for doctors little aware of environmental issues. And both pathological situations led to investigations at the children's homes, where paint-eating pathogenic behavior was discovered. Obviously, in both situations, doctors were still thinking in terms of symptoms, individual cases, and chelation treatment, not in terms of screening, population studies, and housing improvement.¹² To paraphrase Michel Foucault,¹³ the birth of public health had not yet occurred.

Of course, there are also differences between the 2 cases. First, diagnostic procedures that used to rely on clinical observation were completed by system-

atic tests in the 1980s. The routine of x-ray and biological checkups practiced in the later period provided wide screening of etiologies and therefore better diagnosis of plumbism, as well as other medical problems. Furthermore, as far as the history of lead industry is concerned, the contexts are quite different. Although in the United States at the beginning of the 20th century white lead pigment in paint was not seen as dangerous and was still commonly used, the situation had changed 7 decades later in France. White lead pigment in paint had been recognized as toxic and restricted since 1915; it had been banned from professional use since 1926 and from craft work since 1948. Consequently, it remained only in ancient, often dilapidated housing. Thus, in the first case, lead paint was not yet thought of as a potential hazard, while in the second case it was no longer considered a problem.

In fact, the young African child at the Necker hospital was not the first case of the French epidemic. Six months earlier, in August 1985, a clinical observation had been reported in Trousseau Pediatric Hospital.¹⁴ This patient was also a 2-year-old girl whose parents were from Mali. Rather than dramatic symptoms, the girl displayed chronic anemia, abdominal pain, and slow physical development. There were elevated levels of blood lead, and abdomen radiographies showed opacities. The diagnosis of lead poisoning was later called lucky¹⁵; at that time, a pediatrician would not ordinarily consider lead poisoning, since it was mentioned as a rare disease in French medical publications, and only systematic blood

testing definitively established the diagnosis. The parents, questioned by the doctors, seemed to confirm that their daughter ate flaking paint. The young doctor in charge asked the hospital unit's social worker to intervene to take the child away from the dangerous environment. An investigation at the family's house revealed it to be severely run down and suggested that there might be other cases in the same building. Further testing among the inhabitants confirmed this suspicion.

The social worker then informed the City of Paris Mother and Child Health Care services. However, the consulted public health physician admitted her ignorance on 2 counts: first, on the pathology itself, which she only remembered from hygiene courses as due to contaminated water; second, on how to solve the problem, since finding new accommodation for a family was not part of her professional responsibility. Moreover, she seemed unconvinced that she was facing a serious sanitary issue. In fact, it was the clinicians at the Trousseau hospital who, thanks to the screening of other children in the building where the child lived, found 6 other serious cases and pinpointed the problem.¹⁶ During the next 12 months, 20 children were diagnosed with abnormal blood lead levels, which at the time meant more than 250 µg/L; 2 of the children died from encephalopathy. In contrast, between 1956 and 1981, only 10 clinical cases had been reported in the French medical literature.¹⁷ It therefore seemed unlikely that these first few cases were isolated. When lead poisoning was looked for, it was found.

Consequently, in pediatrician circles beginning in 1986, the pathology began to be talked about as an ailment that was “certainly underestimated in France.”¹⁸ Faced with this evidence provided by clinical medicine, public health professionals slowly moved into action. Because they failed to consult the international literature, however, which would have made clear the source of the poisoning, the whole course of demonstrable evidence had to be uncovered during the following years.

HISTORY AS A PROCESS OF CONSTANT RENEWAL

Stage One: Identifying the Source

The first step toward defining the problem of plumbism consisted of demonstrating that lead poisoning essentially concerns children, and old paint is the cause of contamination. Although these basic notions of plumbism had been known for decades, French doctors and epidemiologists would have to establish them anew.

In Chicago in 1953, 21 cases of lead poisoning in children were discovered in a single hospital, 5 of them fatal. The diagnosis had not been easy: an epidemic of viral encephalitis had been initially suspected, and scientific support had been sought from epidemiologists of the US Public Health Service Communicable Disease Center. Nevertheless, this error had unexpected consequences: “Although the epidemic proved not to result from a communicable disease, the epidemiological approach was of great aid not only in determining the true nature of these 21 cases of lead poisoning, but also in ac-

quiring valuable information concerning the disease.” Two conclusions were drawn from the statistical data on clinical cases and home visits: “The ages of the patients clustered between 1 and 4 years, a period when the risks of accidental poisoning are greatest,” and “Painted walls, woodwork and window sills were the chief sources of lead; except for dried paint, other sources of lead to which these children might have been exposed were not found.”¹⁹

In Paris in 1986, the pediatrician in charge of the Mother and Child Health Care service asked her toxicologist colleague from the City of Paris Hygiene Laboratory to identify the features of the population affected as well as the source of contamination. The investigation concerned the inhabitants of 2 Parisian buildings where cases had just been discovered. Among 52 people screened, only 1 adult (out of 45) and 4 children (out of 7) had lead poisoning (blood levels above 250µg/L). As the pediatrician recalled, “We tested lead in the blood of all people living in the two buildings, adults and children. At the time we had no idea [of what we would find], but there [in the buildings] we found something we did not quite expect: that virtually no adults were poisoned, just one pregnant woman with a blood lead level of 350µg/L; however, we found poisoned children. So this investigation showed us that the pathology primarily affected children.”²⁰

Contrary to what the 2 medical colleagues were familiar with (i.e., adult lead poisoning, known essentially in occupational medicine), the form of the disease they were faced with

was a specific infantile form. The first hypothesis was that lead-contaminated water was the source of the poisoning, in accordance with the then-prevailing etiological model.²¹ Water from taps was therefore analyzed for lead content, which was normal. It was only later that paint on the walls and woodwork of dilapidated homes was considered as a possible source of lead. Old paint samples were then taken in the apartments for chemical analysis. As the toxicologist explained:

It is the parents that drew our attention to the children's habit of scratching off paint below windowsills, so we took paint scrapings and I asked my colleagues to analyze them. They came to see me afterward saying they did not understand, they had found large amounts of lead and wanted to check the results. So we went back to the apartments, we took paint samples again, and then we demonstrated the existence of high levels of lead.²²

The pediatrician and the toxicologist were then convinced: lead poisoning existed, and its cause was old lead paint. Nonetheless, it would take them several years to convince the Parisian and national health authorities of this truth. But before that, they had to face another test.

Stage 2: Demonstrating the Severity

The second step toward defining the problem of plumbism consisted of showing that the prevalence and seriousness of plumbism makes it a public health issue. Indeed, the difficult recognition of a few cases of child lead poisoning and the laborious identification of the source of contamination were not

sufficient to make it a matter of policy; the potential epidemic dimension of the disease had yet to be demonstrated.

In Baltimore in 1956, an epidemiological survey among 333 children living in a congested low-income area showed that 44% had lead blood levels in excess of 500 µg/dL, which at the time was considered the upper limit of normality.²³ Although most of these children were asymptomatic, several were eventually admitted to the hospital with lead encephalopathy. Similar observations were made in Philadelphia, Penn; New York, NY; Washington, DC; and New Haven, Conn. Each time, lower-class families, mostly Black, living

“The pediatrician and toxicologist were then convinced: lead poisoning existed, and its cause was old lead paint. Nonetheless, it would take them several years to convince the Parisian and national health authorities of this truth.”

in poorly maintained old housing, were involved. The first established evidence of this social epidemiology of plumbism came as far back as the early 1930s, again in Baltimore. Through these tragically iterative surveys, it became obvious that one only needed to search for child plumbism to find it wherever certain environmental and social conditions were present. Still, several decades would pass before there was wide recognition of the magnitude of the problem and effective measures to fight it were implemented. The repetition of calls for action in the medical literature until recently

indicate how slow the process has been.

In Paris in 1987, the 2 Parisian medical colleagues, encouraged by the results of the first inquiry, launched another investigation on a larger sample that included 122 children. This time, the objective was to prove that implementation of a systematic program for screening the blood lead levels of children at risk would show that the problem was common in slum areas. As the public health pediatrician explained:

In the first period, from 1985 to 1990, the child lead poisoning issue was considered exclusively a Parisian problem. I remember that our director had written to the Ministry of Health to report about the first lead poisoning cases identified and to get more information about the disease. The official response of the ministry was that it was rather unbelievable and that the problem only existed in Paris—surely lead poisoning was not to be found elsewhere in France. The fact that it was considered to be a Parisian problem allowed a certain inertia on behalf of the national health public authorities that left the issue in the hands of the mayor of Paris.²⁴

To establish the extent of the problem, a simple procedure of cross-sectional study was devised, comparing 2 groups of children living in different environmental and social contexts. Of 82 children seen in 3 Mother and Child Health Care services in a working-class area of Paris, all of whom lived in insalubrious housing, 9% had blood lead levels that exceeded 250 µg/L, whereas none of the 40 children who were included in a Social Security health checkup but lived in recently built habitations had high blood lead levels.

It was at last possible to affirm that “populations at greatest risk are young children between 1 and 6 years old, living in dilapidated housing and of low socioeconomic background” and that “any physician practicing in an urban area should be able to detect the disease more readily.”²⁵ Still, it would be another few years before the Ministry of Health set up the national survey the Parisian professionals had called for. At the beginning of the 1990s, an investigation conducted in several French towns would show that the epidemic extended far beyond the capital: within the at-risk population tested for blood lead, 26% of 1- to 6-year-old children had levels exceeding 150 µg/L, the recently established standard for lead poisoning.²⁶ In the meantime, however, the question of why lead poisoning affected mostly young immigrant children from sub-Saharan Africa still had to be answered.

CULTURALISM AS A COMMON THEORY OF KNOWLEDGE

In a 1927 poster advertising Dutch Boy paint, a blond child leaves fingerprints on a wall freshly painted with white lead paint; however, “there is no cause for worry,” reads the text, since “a little soap and water will remove them easily without harming the paint or marring the beauty of the finish: painted walls are sanitary, cheerful and bright.” At that time, it was still possible to have “white lead promotion campaigns,” since knowledge of the toxicity of this paint was restricted to industrial sectors and a few medical professionals. Awareness would enter

the public sphere in 1943 with an article in *Time* magazine reporting on a study conducted by 2 pediatricians, Randolph Byers and Elisabeth Lord.²⁷ Despite the advertisement’s reassurance, however, children in the 1980s living in deteriorated old housing in Paris and its suburbs, where white lead paint was still present, had much to worry about. Nobody there would think of their painted walls as sanitary, cheerful, or bright; they lived in dilapidated housing in which they were often squatters. The floors of the insalubrious rooms were contaminated with paint dust and fragments.

But there was another difference between the image on the American poster and the reality in French inner cities: in the latter scene, the children were Black. This fact did not go unnoticed among those who discovered the epidemic, as 85% of the severe cases in Paris during the 1980s were children from sub-Saharan African families. However, this finding was masked in 2 ways. First, it was suggested that there were possible biases in the population samples, since screening tests were carried out in preventive health centers where immigrants had better access because they offered free care. Second, the overrepresentation of the immigrant population could probably be attributed to their socioeconomic living conditions.²⁸ Nevertheless, in some cases, not only geographic but also racial features were mentioned: “In the Paris area, most children treated for plumbism are of African origin and Black race.”²⁹

In any case, the much higher incidence of lead poisoning among Black African children

puzzled the physicians and gave rise to some original hypotheses.³⁰ In fact, before wall and woodwork paints were definitely regarded as the sole source of lead, several other potential sources were considered: “potions” that African people drink for treatments, ink used by the “marabouts” (or dervishes) to prepare amulets, and even kohl used in the mothers’ makeup.³¹ Investigations of the lead content of the suspected substances were, however, inconclusive.

The eventual recognition of lead paint as the source of poisoning did not put an end to these cultural interpretations. During the 1980s, the dominant worldwide thesis still maintained that the main mode of contamination was the ingestion of paint flakes.³² Studies showing the role of paint dust, which explains the poisoning in terms of passive intoxication through simple inhalation, were few.³³ In fact, specialists were starting to think that both ways of contamination coexisted, inhalation being particularly common in low-level poisoning and ingestion mainly being related to severe cases.³⁴ But for a long time, pica behavior, defined as a taste for mineral substances, was used to account for the intake of paint fragments; this was sometimes related to geophagy practices, reported to be common in Africa.³⁵ In the United States, the pica syndrome was generally described as a pathological behavior related to mental disorders or relationship problems; some authors considered “mental retardation” to be a predisposing factor, but most incriminated “disturbed mother–child relationships.”³⁶ This interpretation was, however, sometimes

mixed with racial considerations, as most cases occurred among Blacks, whose alleged bad habits could thus be blamed.

In France, the high proportion of African immigrants among children with lead poisoning led social workers and health professionals to view the problem as one of “cultural attitudes,” as one of them put it in an interview.³⁷ One particular cultural aspect was a matter of concern: the geophagy encountered among West African women, who were said to eat clay when pregnant, and the supposed impact of this practice on their offspring who imitated them.³⁸ This explanation, although dominant, did not exclude the role of psychopathological factors. Nevertheless, it seems that whereas the Americans had a tendency to “psychologize” their explanatory models, adding moral judgments that amounted to blaming the victims (“The mothers give their children too little attention”), the French were more inclined to “culturalize” the interpretative framework, often with the more or less conscious intention of avoiding stigmatization (“It is not their fault, it is because of their culture”). Both models, however, left aside all social aspects of the housing and poverty problem.

In Paris, this search for cultural causes went so far as to call on ethnologists for assistance to study African family cultural practices. The 2 researchers sent to the premises wondered, “Do the culture and way of life of sub-Saharan Africans resettled in France particularly expose them to lead salts contained in the paints of their domestic environment?” They concluded that minerals, clay in particular, can be “at the same time a delicacy, a

medicine and a nutriment for these people, as well as a trading item, subject to gift and counter-gift.” Therefore, “the active ingestion of paint fragments in Paris should not be related to the European biomedical or cultural norms, but rather more to autochthonous norms that approve and value geophagy.”³⁹ This interpretation suggested that African families were not to blame but rather that their cultural differences needed to be understood. However, it downplayed the fact that because these families had arrived when all other opportunities for accommodation were closed, they were forced to live in dilapidated buildings where old paint was common and where children had a high risk of lead poisoning. It led many public health and housing agents to encourage the implementation of educational programs stressing behavior change, rather than considering the insalubrious housing, the extreme poverty, and the illegal status of immigrants as priorities for taking public action.

Practical culturalism can be defined as a common sense theory that essentializes culture and overemphasizes the understanding of social reality by its cultural aspects. Practical culturalism is socially efficacious, particularly in the field of health and medicine, first, because it gives an acceptable form to prejudices against others (shifting the blame from individuals to the abstract concepts of origins and traditions), and second, because it avoids putting a political perspective on social problems (transforming inequality issues into educational questions). This attitude was precisely what humanitarian associations campaigning against lead

A destruction permit for insalubrious housing on the outskirts of Paris.



Photo by Mariano Garate

“Against learned but erroneous evidence, as well as against institutional resistance, these activists asserted that plumbism was a disease of living conditions and not a disease of culture.”

poisoning were striving to denounce in the late 1980s. As proclaimed by one of the most committed members of these nongovernmental agencies, later in charge of defining the national program for the Ministry of Health:

The recurrent argument about the specific cultural features of the population affected has to be discussed. In France, the great majority of contaminated children are African, but evidence elsewhere in the world shows that in Great Britain, Indian children are the most affected by the disease, and in the United States, [children with lead poisoning] belong to African American and South East Asian communities. Yet, the common factor between these populations of different origins cannot be cultural but is, first and foremost, the derelict housing conditions they live in. The use of this cultural argument leads one to focus attention on the pica issue, instead of focusing attention on the lead risk exposure. Indeed, the main cause of lead poisoning was not the pica behavior, but the lead.⁴⁰

Against learned but erroneous evidence, as well as against insti-

tutional resistance, these activists asserted that plumbism was a disease of living conditions and not a disease of culture.

The pathology affected mainly Africans because they represented the vast majority of the latest waves of immigration and because, among the immigrant population, they lived in the most dire situations. Several reasons can explain this precarious situation. First, Africans arrived after the borders were closed to immigration and so they often lacked residence permits. Second, because of discriminatory practices on the labor market, they had difficulty in finding jobs. Finally, they rarely had access to social housing owing to restrictive policy measures affecting immigrants.⁴¹ While insisting on this social explanation of lead poisoning, some health professionals nonetheless remained sensitive to explanations based on cultural singularity: “When 60% to 70% of Black Africans are found with lead poisoning,” declared the public health pediatrician who carried out the first Parisian in-

vestigations, “one can actually think that there are overdetermining factors. Indeed, there are a whole series of factors like socioeconomic factors, the quality of dwellings, and probably also confounding factors such as behavior and tolerance.”⁴² Culturalism bred in the bone comes out in the flesh.

THE ULTIMATE AMERICAN LESSON

In Paris in October 1990, the first conference on lead poisoning in children was held under the patronage of the Ministry of Health.⁴³ It was organized by the Department of Health and Social Affairs of the Paris Region and 2 nongovernmental organizations, Médecins Sans Frontières and Migrations-Santé. For 2 days, 360 physicians, nurses, town planners, social workers, and health public servants discussed child lead poisoning in all its aspects, including strategies to ensure its prevention. This conference was a turning point in the French history of the epidemic. The attendance of public health representatives testified to the recognition of lead poisoning as a national priority and the state’s commitment to fight it. While the regional director of health opened the conference by suggesting that lead poisoning “could be caused by the ingestion of paint flakes containing lead salts,” in his closing remarks, the national director of health backed up the urgent need to put the problem on the ministry’s agenda and, in particular, to address the issue of insalubrious housing.

In this effort to establish epidemiological evidence of plumbism, the way North American public health experience was

used as evidence is noteworthy. In their introductory speech, the 2 doctors from the humanitarian nongovernmental organizations that helped organize the conference referred to a series of epidemiological studies conducted in the United States to challenge psychological and culturalist interpretations of pica. Moreover, 2 major American experts were invited to the conference to present their state's and city's experiences: the head of the Department of Lead Poisoning Prevention at the Kennedy Institute in Baltimore and the director of the Program on Plumbism at the Health Department of Rhode Island. For the organizers, their authority would bring them a decisive victory:

We decided that we definitely had to invite American specialists to the conference. It was not possible to hold such a meeting without showing the foreign experience. Two American experts presented their work. For French participants, it was very useful to see what had been done elsewhere in concrete terms. Many of them were local health professionals, some came from the provinces. It was very important that the Americans tell a story where, first, lead intoxication affected different kinds of populations—this allowed the argument of the disease's cultural cause to be put into perspective—and second, show that housing rehabilitation programs had long been implemented.⁴⁴

Clearly, the US history of plumbism had to be presented as a persuasive example of the fight against lead poisoning, one in which convincing evidence counted more than factual truth.⁴⁵ The US example, however idealized it was, served as a political icon. Indeed, in a scientific controversy, it is not enough to be right; one must also be able to rely on

efficient networks.⁴⁶ The key point is to establish alliances of support with influential partners.

This process of capitalizing on North American experience and legitimacy had started 2 years before. After rebuilding the entire body of knowledge on child lead poisoning through piecemeal investigations far from the scientific gold standard, the activists soon realized that to go further they would need to learn what had been done elsewhere. They had to substitute the exacting requirements of science for what had been almost amateurish epidemiology. A few of them, who would later become the organizers of the conference, decided in 1989 to make an exploratory mission to the United States. They visited the CDC in Atlanta and the public health services in Massachusetts, Maryland, New York, and Rhode Island. Back in France, they wrote a report that presented the main lessons of their trip, covering the risk evaluation aspects as much as the legislation designed for prevention.⁴⁷ In the preface, the head of the Public Health Department at the Faculty of Medicine Bichat wrote enthusiastically: "A 'gang of four' is at the origin of this document. They tell us the story of the conquest of the West." He added: "Why reinvent the past when experience exists? The conclusion of the report draws the lessons from the American experience." The cycle was now complete. Everything about the pathology of plumbism had to be reinvented, and ultimately everything was to be rediscovered.

Why such an arduous path—that of reinvention—had to be followed is an important remaining question. Yet this is less exceptional that one might think. The history of child lead poisoning,

like the history of numerous other pathologies, rarely progresses in a smooth linear manner.⁴⁸ Even in the United States, given as an example by French activists, the road to the recognition of plumbism was long, with industrial resistance, institutional hesitations, scientific wrong tracks, and public health inertia leading to delays in implementing effective policies.⁴⁹ In the French case, one simple and partially accurate explanation would be to attribute these time gaps to ignorance of the scientific literature. Parisian health professionals often upheld this explanation: they simply hadn't read it. However, there is more to it, and it is probably necessary to understand this appropriation of new knowledge as a complex and differentiated phenomenon.

Pediatricians, who were the ones confronted with poisoned children, were prevented from seeing beyond the clinical cases because of the strength of biomedical habits associated with a lack of epidemiological culture. Since they were mainly restricted to neurological complications, in which the poisoning was severe, they considered lead poisoning to be a rare disease; they would never use their authority to send social workers to investigate the children's homes. For local authorities, in particular those in charge of housing policies, the political and economic issues were sensitive; the populations at risk were immigrants, sometimes illegal ones at that. Besides, the cost of housing measures, whether the rehabilitation of apartments or accommodation for families, was dissuasive. Finally, they had few connections with public health specialists. Regarding national

institutions, especially the Ministry of Health, several elements converged: the objectives of the decisionmakers tended toward medicine and hospitals rather than social and environmental issues; very few administrators had been trained in public health or were prepared to deal with new problems; in the High Committee for Public Health, which was the main consultative institution, the toxicology expert was closely linked to the painting industry.

In the French context, 2 other more historical factors must be taken into account. First, public health as a professional and institutional organization remained extremely weak, both locally and nationally, as was shown in the same period by the failure of the state when confronted with the AIDS epidemic.⁵⁰ Second, the image of plumbism, with its dilapidated buildings and poor families, harkened back to a distant past, that of the 19th century with its insalubrious housing.⁵¹ Thus, denial of lead poisoning resulted from a mixture of lack of competence and conflicts of interests, an absence of public health culture and structures, and practical considerations as well as symbolic effects, sometimes reinforced by incredulity or bad faith.⁵² No wonder it took a few years to conceive of plumbism as a public health problem.

Indeed, 5 years to recognize a new environmental issue could be considered a relatively short time, compared with what happened in the United States. This period was actually longer, however, since cases of severe lead poisoning had been diagnosed for several decades before the first public health response was

decided in 1985 (as indicated by home visits, notification of authorities, and further epidemiological investigation) and since effective legislation was not enacted until 1998 (when the law against social exclusion was passed).

But whatever chronological criterion is used or normative evaluation is given, the interesting fact is that, in spite of all available knowledge, it was necessary in France in the 1980s to demonstrate again the nature of lead poisoning in children. French public health actors repeatedly attempted to cast doubt on the transferability to France of North American results in the field of lead poisoning. France is not America, they explained. In France, cases of plumbism were few, the children affected were mainly Africans, and contamination was a matter of behavior. It was therefore necessary to establish that one dealt with an epidemic, that the children belonged to an urban proletariat, and that poisoning came from insalubrious housing, as was the case in the rest of the world. Against the skepticism of some and the bad will of others, against ordinary prejudices and professional responses, the social reality of child lead poisoning had to be reinvented before it could be rediscovered. The history of plumbism therefore reminds us that public health is always the product of intellectual as well as political struggles aimed at imposing a certain vision of the world. ■

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Contributors

D. Fassin prepared the design of the research, contributed to interviews of key actors and analysis of data, and wrote most of the article. A.-J. Naudé participated in the design and analysis of the research, did most of the bibliographical and empirical investigation, and contributed to the writing.

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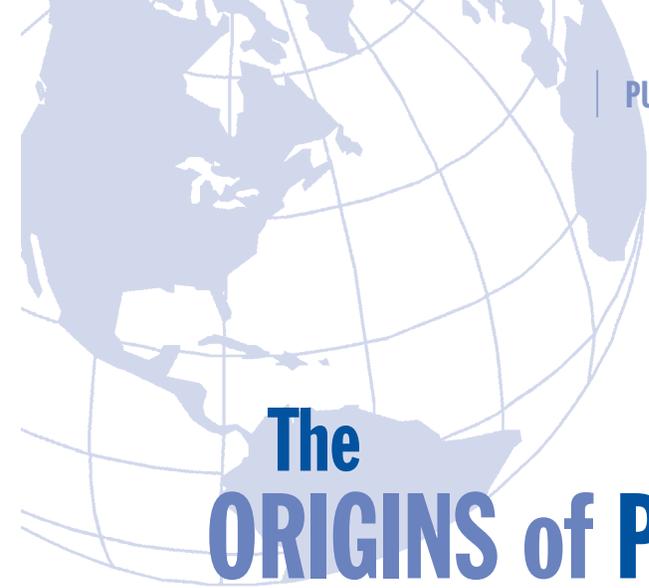
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The ORIGINS of Primary Health Care and SELECTIVE Primary Health Care

| Marcos Cueto, PhD

I present a historical study of the role played by the World Health Organization and UNICEF in the emergence and diffusion of the concept of primary health care during the late 1970s and early 1980s. I have analyzed these organizations' political context, their leaders, the methodologies and technologies associated with the primary health care perspective, and the debates on the meaning of primary health care.

These debates led to the development of an alternative, more restricted approach, known as selective primary health care. My study examined library and archival sources; I cite examples from Latin America.

DURING THE PAST FEW

decades, the concept of primary health care has had a significant influence on health workers in many less-developed countries. However, there is little understanding of the origins of the term. Even less is known of the transition to another version of primary health care, best known as selective primary health care. In this article, I trace these origins and the interaction between 4 crucial factors for international health programs: the context in which they appeared, the actors (personal and institutional leaders), the targets that were set, and the techniques proposed. I use contemporary publications, archival information, and a few interviews to locate the beginnings of these concepts. I emphasize the role played by the World Health Organization (WHO) and UNICEF in primary health care and selective primary health care. The examples are mainly drawn from Latin America. The work is complementary to recent studies on the origin of primary health care.¹

BACKGROUND AND CONTEXT

During the final decades of the Cold War (the late 1960s and early 1970s) the US was embroiled in a crisis of its own world hegemony—it was in this political context that the concept of primary health care emerged. By then, the so-called vertical health approach used in malaria eradication by US agencies and the WHO since the late 1950s were being criticized. New proposals for health and development appeared, such as John Bryant's book *Health and the Developing World* (also published in Mexico in 1971), in which he questioned the transplantation of the hospital-based health care system to developing countries and the lack of emphasis on prevention. According to Bryant, "Large numbers of the world's people, perhaps more than half, have no access to health care at all, and for many of the rest, the care they receive does not answer the problems they have . . . the most serious health needs cannot be met by teams with

spray guns and vaccinating syringes."²

In a similar perspective, Carl Taylor, founder and chairman of the Department of International Health at Johns Hopkins University, edited a book that offered Indian rural medicine as a general model for poor countries.³ Another influential work was by Kenneth W. Newell, a WHO staff member from 1967, who collected and examined the experiences of medical auxiliaries in developing countries. In *Health by the People*, he argued that "a strict health sectorial approach is ineffective."⁴ In addition, the 1974 Canadian Lalonde Report (named after the minister of health) deemphasized the importance attributed to the quantity of medical institutions and proposed 4 determinants of health: biology, health services, environment, and lifestyles.⁵

Other studies, written from outside the public health community, were also influential in challenging the assumption that health resulted from the transfer of technology or more doctors and more services. The

British historian Thomas McKeown argued that the overall health of the population was less related to medical advances than to standards of living and nutrition.⁶ More aggressively, Ivan Illich's *Medical Nemesis* contended that medicine was not only irrelevant but even detrimental, because medical doctors expropriated health from the public. This book became a bestseller and was translated into several languages, including Spanish.⁷

Another important influence for primary health care came from the experience of missionaries. The Christian Medical Commission, a specialized organization of the World Council of Churches and the Lutheran World Federation, was created in the late 1960s by medical missionaries working in developing countries.⁸ The new organization emphasized the training of village workers at the grassroots level, equipped with essential drugs and simple methods. In 1970, it created the journal *Contact*, which used the term primary health care, probably for the first time. By the mid-1970s, French and Spanish versions of the journal appeared and its circulation reached 10 000.

It is worth noting that John Bryant and Carl Taylor were members of the Christian Medical Commission and that in 1974 collaboration between the commission and the WHO was formalized. In addition, in Newell's *Health by the People*, some of the examples cited were Christian Medical Commission programs while others were brought to the attention of the WHO by commission members. A close collaboration between these organizations was also possible because the WHO headquarters in Geneva were situated close to the main

office of the World Council of Churches (and 50 WHO staff received *Contact*).⁹

Another important inspiration for primary health care was the global popularity that the massive expansion of rural medical services in Communist China experienced, especially the "barefoot doctors." This visibility coincided with China's entrance into the United Nations (UN) system (including the WHO). The "barefoot doctors," whose numbers increased dramatically between the early 1960s and the Cultural Revolution (1964–1976), were a diverse array of village health workers who lived in the community they served, stressed rural rather than urban health care and preventive rather than curative services, and combined Western and traditional medicines.¹⁰

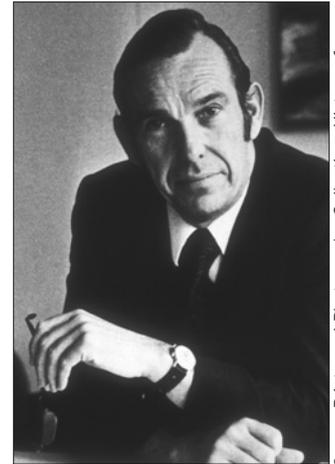
Primary health care was also favored by a new political context characterized by the emergence of decolonized African nations and the spread of national, anti-imperialist, and leftist movements in many less-developed nations. These changes led to new proposals on development made by some industrialized countries. Modernization was no longer seen as the replication of the model of development followed by the United States or Western Europe. For example, Prime Minister Lester B. Pearson of Canada and Chancellor Willy Brandt of West Germany chaired major commissions on international development emphasizing long-term socioeconomic changes instead of specific technical interventions.¹¹ In a corollary decision, in 1974 the UN General Assembly adopted a resolution on the "Establishment of a New International Economic Order" to uplift less-developed countries.¹²

NEW ACTORS AND NEW HEALTH INTERVENTIONS

New leaders and institutions embodied the new academic and political influences. Prominent among them was Halfdan T. Mahler of Denmark. He was elected the WHO's director general in 1973 and was later re-elected for 2 successive 5-year terms, remaining at its head until 1988. Mahler's background was not related to malariology, the discipline that dominated international health during the 1950s. His first international activities were in tuberculosis and community work in less-developed countries. Between 1950 and 1951, he directed a Red Cross antituberculosis campaign in Ecuador and later spent several years (1951–1960) in India as the WHO officer at the National Tuberculosis Program. In 1962, he was appointed chief of the Tuberculosis Unit at the WHO headquarters.¹³ In Geneva, Mahler also directed the WHO Project on Systems Analysis, a program that implied improving national capabilities in health planning.

More importantly, Mahler was a charismatic figure with a missionary zeal. His father, a Baptist preacher, helped shape his personality. Many years after his retirement from the WHO, he explained that for him, "social justice" was a "holy word."¹⁴ The strong impression he produced in some people is well illustrated by a religious activist who met Mahler in the 1970s: "I felt like a church mouse in front of an archbishop."¹⁵

Mahler had excellent relations with older WHO officers. The Brazilian malariologist Marcolino Candau, the WHO director general before Mahler, appointed the



Halfdan T. Mahler, director general of the World Health Organization, 1973–1988.

Source: Prints and Photographs Collection, History of Medicine Division, National Library of Medicine, Bethesda, Md.



“From the late 1960s, there was an increase in WHO projects related to the development of “basic health services” (from 85 in 1965 to 156 in 1971). These projects were the institutional predecessors of the primary health care programs that would later appear.”

Dane as an assistant director general in 1970. Thanks to his close relationship with the WHO's old guard, Mahler could ease the transition experienced by this agency under his command. Some of these changes occurred before Mahler assumed the post of director general. From the late 1960s, there was an increase in WHO projects related to the development of “basic health services” (from 85 in 1965 to 156 in 1971).¹⁶ These projects were institutional predecessors of the primary health care programs that would later appear. Another early expression of change was the creation in 1972 of a WHO Division of Strengthening of Health Services. Newell, a strong academic and public health voice for primary health care, was appointed director of this division (Newell's career with the WHO started in 1967 as director of the Division of Research in Epidemiology and Communications Science).

In 1973, the year of Mahler's appointment as the WHO director general, the Executive Board of WHO issued the report *Organizational Study on Methods of Promoting the Development of Basic Health Services*.¹⁷ This report was the basis for a redefinition of the collaboration between the WHO and UNICEF (which could be traced to the years immediately following World War II). Mahler established a close rapport with Henry Labouisse, UNICEF's executive director be-

tween 1965 and 1979, who had his own rich experience with community-based initiatives in health and education. The agreement produced in 1975 a joint WHO–UNICEF report, *Alternative Approaches to Meeting Basic Health Needs in Developing Countries*, that was widely discussed by these agencies. The term “alternative” underlined the shortcomings of traditional vertical programs concentrating on specific diseases. In addition, the assumption that the expansion of “Western” medical systems would meet the needs of the common people was again highly criticized. According to the document, the principal causes of morbidity in developing countries were malnutrition and vector-borne, respiratory, and diarrheal diseases, which were “themselves the results of poverty, squalor and ignorance.”¹⁸ The report also examined successful primary health care experiences in Bangladesh, China, Cuba, India, Niger, Nigeria, Tanzania, Venezuela, and Yugoslavia to identify the key factors in their success.

This report shaped WHO ideas on primary health care. The 28th World Health Assembly in 1975 reinforced the trend, declaring the construction of “National Programs in primary health care” a matter “of urgent priority.” The report *Alternative Approaches* became the basis for a worldwide debate. In the 1976

World Health Assembly, Mahler proposed the goal of “Health for All by the Year 2000.” The slogan became an integral part of primary health care. According to Mahler, this target required a radical change. In a moving speech that he delivered at the 1976 assembly, he said that “Many social evolutions and revolutions have taken place because the social structures were crumbling. There are signs that the scientific and technical structures of public health are also crumbling.”¹⁹ These ideas would be confirmed at a conference that took place in the Soviet Union.

ALMA-ATA

The landmark event for primary health care was the International Conference on Primary Health Care that took place at Alma-Ata from September 6 to 12, 1978. Alma-Ata was the capital of the Soviet Republic of Kazakhstan, located in the Asiatic region of the Soviet Union. According to one of its organizers, the meeting would transcend the “provenance of a group of health agencies” and “exert moral pressure” for primary health care.²⁰ A Russian co-organizer claimed that “never before [have] so many countries prepared so intensively for an international conference.”²¹

The then-current tension among communist countries played an important role in the selection of the site. The Chinese delegation to the WHO originated the idea of an international conference on primary health care. Initially, the Soviet Union opposed the proposal and defended a more medically oriented approach for backward countries.

However, after noticing that the primary health care movement was growing, the Soviet delegate to the WHO declared in 1974 that his country was eager to hold the meeting. The offer also resulted from the growing competition between the traditional communist parties and the new pro-Chinese organizations that emerged in several developing countries. However, the proposal of the Soviet Union had one condition: the conference should take place on Soviet soil. The Soviet Union was willing to fund a great part of the meeting, offering \$US 2 million.²²

For a while, the WHO searched for an alternative site. The governments of Iran, Egypt, and Costa Rica entertained the idea but finally declined. Nobody could match the economic offer of the Soviet Union, and in the case of Iran there was fear of political instability. Finally, the WHO accepted the Soviet offer but asked for a different location than Moscow, suggesting a provincial city. After some negotiations Alma-Ata was selected, partly because of the remarkable health improvements experienced in what was a backward area during Tsarist Russia. The event was a small Soviet victory in the Cold War.

The conference was attended by 3000 delegates from 134 governments and 67 international organizations from all over the world. Details were carefully orchestrated by the Peruvian David Tejada-de-Rivero, the WHO assistant director general who was responsible for the event.²³ Most of the delegates came from the public sector, specifically from ministries of health; of 70 Latin American participants, 97% were from offi-

cial public health institutions. It was expected that many of the delegates would be planning officers and education experts, who would be able to implement an effective intersectorial approach, but few of them were. The meeting was also attended by UN and international agencies such as the International Labor Organization, the Food and Agriculture Organization, and the Agency for International Development. Non-governmental organizations, religious movements (including the Christian Medical Commission), the Red Cross, *Medicus Mundi*, and political movements such as the Palestine Liberation Organization and the South West Africa People's Organization were also present. However, for political reasons—the Sino-Soviet conflict had been worsening since the 1960s—China was absent.

At the opening ceremony, Mahler challenged the delegates with 8 compelling questions that called for immediate action. Two of the most audacious were as follows:

- Are you ready to introduce, if necessary, radical changes in the existing health delivery system so that it properly supports [primary health care] as the overriding health priority?
- Are you ready to fight the political and technical battles required to overcome any social and economic obstacles and professional resistance to the universal introduction of [primary health care]?²⁴

When the conference took place, primary health care was to some degree already “sold” to many participants. From 1976 to 1978, the WHO and UNICEF organized a series of regional meetings to discuss “alternative

approaches.” The conference’s main document, the Declaration of Alma-Ata, which was already known by many participants, was approved by acclamation. The term “declaration” suggested high importance, like other great declarations of independence and human rights. The intention was to create a universal and bold statement. This was certainly unusual for a health agency used to compromising resolutions. The slogan “Health for All by the Year 2000” was included as a prospective view.

Three key ideas permeate the declaration: “appropriate technology,” opposition to medical elitism, and the concept of health as a tool for socioeconomic development. Regarding the first issue, there was criticism of the negative role of “disease-oriented technology.”²⁵ The term referred to technology, such as body scanners or heart-lung machines, that were too sophisticated or expensive or were irrelevant to the common needs of the poor. Moreover, the term criticized the creation of urban hospitals in developing countries. These institutions were perceived as promoting a dependent consumer culture, benefiting a minority, and drawing a substantial share of scarce funds and manpower. Mahler’s used the story of the sorcerer’s apprentice to illustrate how health technology was out of “social” control.²⁶ In contrast, “appropriate” medical technology was relevant to the needs of the people, scientifically sound, and financially feasible. In addition, the construction of health posts in rural areas and shantytowns, instead of hospital construction, was emphasized.

The declaration’s second key idea, criticism of elitism, meant a

disapproval of the overspecialization of health personnel in developing countries and of top-down health campaigns. Instead, training of lay health personnel and community participation were stressed. In addition, the need for working with traditional healers such as shamans and midwives was emphasized. Finally, the declaration linked health and development. Health work was perceived not as an isolated and short-lived intervention but as part of a process of improving living conditions. Primary health care was designed as the new center of the public health system. This required an intersectorial approach—several public and private institutions working together on health issues (e.g., on health education, adequate housing, safe water, and basic sanitation). Moreover, the link between health and development had political implications. According to Mahler, health should be an instrument for development and not merely a byproduct of economic progress: “we could . . . become the *avant garde* of an international conscience for social development.”²⁷

The 32nd World Health Assembly that took place in Geneva in 1979 endorsed the conference’s declaration. The assembly approved a resolution stating that primary health care was “the key to attaining an acceptable level of health for all.” In the following years, Mahler himself became an advocate of primary health care, writing papers and giving speeches with strong titles such as “Health and Justice” (1978), “The Political Struggle for Health” (1978), “The Meaning of Health for All by the Year 2000” (1981), and “Eighteen Years to Go to Health

for All” (1982).²⁸ However, despite the initial enthusiasm, it was difficult to implement primary health care after Alma-Ata. About a year after the conference took place, a different interpretation of primary health care appeared.

SELECTIVE PRIMARY HEALTH CARE

The Alma-Ata Declaration was criticized for being too broad and idealistic and having an unrealistic timetable. A common criticism was that the slogan “Health for All by 2000” was not feasible. Concerned about the identification of the most cost-effective health strategies, the Rockefeller Foundation sponsored in 1979 a small conference entitled “Health and Population in Development” at its Bellagio Conference Center in Italy. The goal of the meeting was to examine the status and interrelations of health and population programs when the organizers felt “disturbing signs of declining interest in population issues.”²⁹ It is noteworthy that since the 1950s, international agencies had been active in population control and family planning in less-developed countries.

The inspiration and initial framework for the meeting came from the physician John H. Knowles, president of the Rockefeller Foundation and editor of *Doing Better and Feeling Worse*, who strongly believed in the need for more primary care practitioners in the United States.³⁰ (Knowles died a few months before the meeting took place.) The heads of important agencies were involved in the organization of the meeting: Robert S. McNamara, former secretary of de-

fense in the Kennedy and Johnson administrations and, since 1968, president of the World Bank; Maurice Strong, chairman of the Canadian International Development and Research Center; David Bell, vice president of the Ford Foundation; and John J. Gillian, administrator of the US Agency for International Development, among others. The influential McNamara was trying to overcome the criticism that the World Bank had ignored social poverty and the fatigue of donor agencies working in developing countries. He promoted business management methods and clear sets of goals, and he moved the World Bank from supporting large growth projects aimed at generating economic growth to advocating poverty reduction approaches.³¹

The conference was based on a published paper by Julia Walsh and Kenneth S. Warren entitled “Selective Primary Health Care, an Interim Strategy for Disease Control in Developing Countries.”³² The paper sought specific causes of death, paying special attention to the most common diseases of infants in developing countries such as diarrhea and diseases produced by lack of immunization. The authors did not openly criticize the Alma-Ata Declaration. They presented an “interim” strategy or entry points through which basic health services could be developed. They also emphasized attainable goals and cost-effective planning. In the paper, and at the meeting, selective primary health care was introduced as the name of a new perspective. The term meant a package of low-cost technical interventions to tackle the main disease problems of poor countries.

At first, the content of the package was not completely clear. For example, in the original paper, a number of different interventions were recommended, including the administration of antimalarial drugs for children (something that later disappeared from all proposals). However, in the following years, these interventions were reduced to 4 and were best known as GOBI, which stood for growth monitoring, oral rehydration techniques, breast-feeding, and immunization.

The first intervention, growth monitoring of infants, aimed to identify, at an early stage, children who were not growing as they should. It was thought that the solution was proper nutrition. The second intervention, oral rehydration, sought to control infant diarrheal diseases with ready-made packets known as oral rehydration solutions.³³ The third intervention emphasized the protective, psychological, and nutritional value of giving breastmilk alone to infants for the first 6 months of their lives.³⁴ Breastfeeding also was considered a means for prolonging birth intervals. The final intervention, immunization, supported vaccination, especially in early childhood.³⁵

These 4 interventions appeared easy to monitor and evaluate. Moreover, they were measurable and had clear targets. Funding appeared easier to obtain because indicators of success and reporting could be produced more rapidly. In the next few years, some agencies added FFF (food supplementation, female literacy, and family planning) to the acronym GOBI, creating GOBI-FFF (the educational level of young women and mothers being considered crucial to

many health programs). Interestingly, acute respiratory infections, a major cause of infant mortality in poor countries, were not included. These were thought to require the administration of antibiotics that non-medical practitioners in many of the affected countries were not allowed to use.

Selective primary health care attracted the support of some donors, scholars, and agencies. According to some experts, it created the right balance between scarcity and choice.³⁶ One participant of the Bellagio meeting that was greatly influenced by the new proposal was UNICEF. James Grant, a Harvard-trained economist and lawyer, was appointed executive director of UNICEF in January 1980 and served until January 1995.³⁷ Under his dynamic leadership, UNICEF began to back away from a holistic approach to primary health care. The son of a Rockefeller Foundation medical doctor who worked in China, Grant believed that international agencies had to do their best with finite resources and short-lived local political opportunities. This meant translating general goals into time-bound specific actions. Like Mahler, he was a charismatic leader who had an easy way with both heads of state and common people. A few years later, Grant organized a UNICEF book that proposed a “children’s revolution” and explained the 4 inexpensive interventions contained in GOBI.³⁸

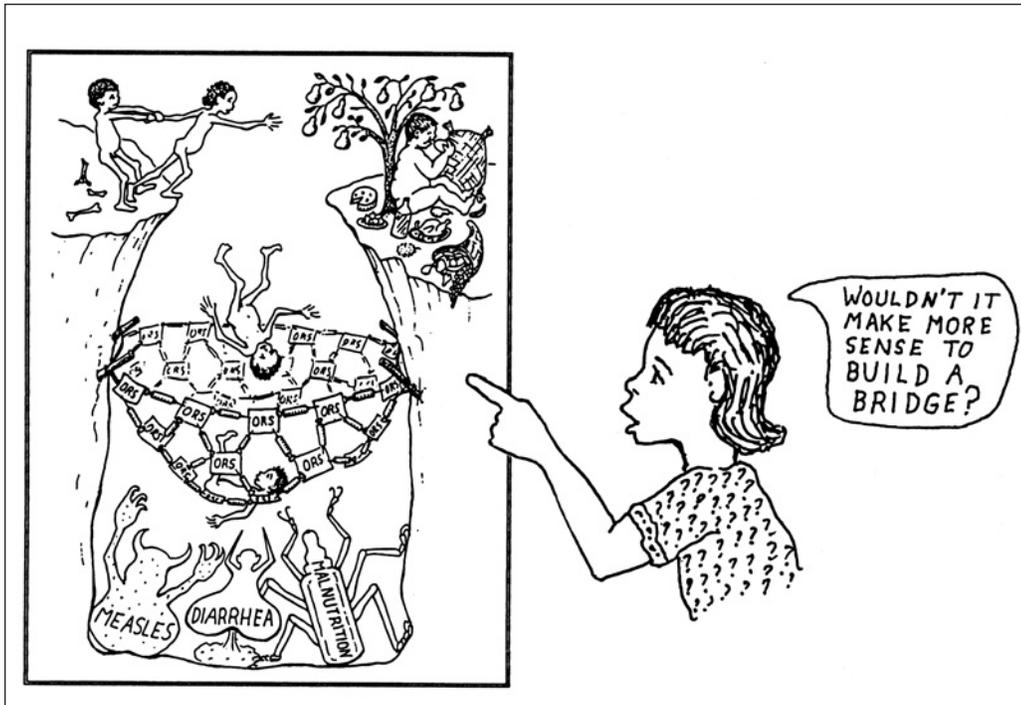
Mahler never directly confronted this different approach to primary health care. After some doubts, Mahler himself attended the Bellagio Conference, and although there is evidence that he did not get along with

the new director of UNICEF, he asked a WHO assistant director to nourish a good relationship between the 2 organizations. However, a debate between the 2 versions on primary health care was inevitable.³⁹ Some supporters of comprehensive primary health care, as the holistic or original idea of primary health care began to be called, considered selective primary health care to be complementary to the Alma-Ata Declaration, while others thought it contradicted the declaration. Some members of the WHO tried to respond to the accusation that they had no clear targets. For



“Some supporters of comprehensive primary health care, as the holistic or original idea of primary health care began to be called, considered selective primary health care to be complementary to the Alma-Ata Declaration, while others thought it contradicted the declaration.”

example, a WHO paper entitled “Indicators for Monitoring Progress Towards Health for All” was prepared at the “urgent request” of the Executive Board.⁴⁰ Another publication provided specific “Health for All” goals: 5% of gross national product devoted to health; more than 90% of newborn infants weighing 2500 g; an infant mortality rate of less than 50 per 1000 live births; a life expectancy over 60 years; local health care units with at least 20 essential drugs.⁴¹ However, most of the supporters of primary health care avoided these indicators,



Oral rehydration salts promoted by selective primary health care were criticized in this drawing as a “Band-Aid.” (Drawing by Alicia Brelsford, reprinted with permission from David Werner. David Werner and David Sanders, with Jason Weston, Steve Babb, and Bill Rodriguez, *Questioning the Solution: the Politics of Primary Health Care and Child Survival, with an In-Depth Critique of Oral Rehydration Therapy* [Palo Alto, CA : HealthWrights, 1997].)

arguing that they were unreliable and failed to demonstrate the inequities inside poor countries.⁴² The debate between the 2 versions of primary health care continued.

THE DEBATE

The supporters of comprehensive primary health care accused selective primary health care of being a narrow technocentric approach that diverted attention away from basic health and socioeconomic development, did not address the social causes of disease, and resembled vertical programs.⁴³ In addition, critics said that growth monitoring was difficult since it required the use of charts by illiterate mothers (recording data was not an easy operation, weighing scales were frequently deficient, and charts were subject to misinterpretation). Breastfeeding confronted powerful food industries. In 1979, it was estimated that global sales of

artificial infant formula were \$2 billion a year (Third World nations accounted for 50% of the total).⁴⁴ Companies argued—incorrectly—that infant formulas had to be used in developing countries because undernourished mothers could not provide proper nourishment and prolonged lactation would aggravate their health.⁴⁵ In contrast, for health advocates, who launched a boycott against the Swiss multinational Nestlé, one of the main problems was the use of unsafe water for bottle-feeding in shantytowns. This fascinating controversy helped to change maternal practices in several countries but did little to excite the enthusiasm of donor agencies.⁴⁶

To supporters of comprehensive primary health care, oral rehydration solutions were a Band-Aid in places where safe water and sewage systems did not exist. However, this intervention, together with immunization, became popular with agencies

working in developing countries,⁴⁷ partly thanks to an important achievement: the global eradication of smallpox in 1980. Beginning in 1974, the WHO’s Expanded Program on Immunization fought against 6 communicable diseases: tuberculosis, measles, diphtheria, pertussis, tetanus, and polio, setting a target of 80% coverage of infants or “universal childhood immunization” by 1990. This program contributed to the establishment of cold-chain equipment, adequate sterilization practices, celebration of National Vaccination Days, and expanded systems of surveillance.⁴⁸

Immunization campaigns accelerated in the developing world after the mid-1980s. They also gained the important support of Rotary International.⁴⁹ Colombia, for example, made immunization a national crusade. Starting in 1984, it was strongly supported by the government and by hundreds of teachers, priests, policemen, journalists, and Red Cross volunteers.⁵⁰ In 1975, only 9% of Colombian children aged younger than 1 year were covered with DPT (a vaccine that protects against diphtheria, pertussis, and tetanus, given to children younger than 7 years old). By 1989, the figure had risen to 75% and in 1990 to 87%.⁵¹ In a corollary development, the infant mortality rate decreased. These experiences were instrumental in overcoming popular misperceptions such as that vaccination had negative side effects, was not necessary for healthy children, and was not safe for pregnant women.

However, the achievements of immunization did not lessen the debate over primary health

care.⁵² Newell, one of the architects of primary health care, made a harsh criticism: “[selective primary health care] is a threat and can be thought of as a counter-revolution. Rather than an alternative, it . . . can be destructive. . . . Its attractions to the professionals and to funding agencies and governments looking for short-term goals are very apparent. It has to be rejected.”⁵³ US agencies, the World Bank, and UNICEF began to prioritize some aspects of GOBI, such as immunization and oral rehydration solutions. As a result, increasing tension and acrimony developed between the WHO and UNICEF, the 2 founding institutions of primary health care, during the early 1980s.⁵⁴

The debate between these 2 perspectives evolved around 3 questions: What was the meaning of primary health care? How was primary health care to be financed? How was it to be implemented? The different meanings, especially of comprehensive primary health care, undermined its power. In its more radical version, primary health care was an adjunct to social revolution. For some, this was undesirable, and Mahler was to be blamed for transforming the WHO from a technical into a politicized organization.⁵⁵

For others, however, it was naïve to expect such changes from the conservative bureaucracies of developing countries. According to their view, it was simplistic to assume that enlightened experts and bottom-up community health efforts had a revolutionary potential, and the political power of the rural poor was underestimated. They also thought that the view of “communities” as single pyramidal

structures willing to participate in health programs after their leaders received the necessary information was idealistic. In fact, they said, these communities and their learning process were usually diverse and complex.⁵⁶

In its mildest version, primary health care was an addition to preexisting medical services, a first medical contact, an extension of health services to rural areas, or a package of selective primary health care interventions. However, none of these features could avoid being considered second-quality care, simplified technology, or poor health care for the poor.⁵⁷ Two corollary criticisms from Latin American leftist scholars were that “primary” really meant “primitive” health care and that it was a means of social control of the poor, a debasement of the gold standard established in Alma-Ata. A related question not answered was, Is primary health care cheaper than traditional health interventions or does it demand a greater investment?⁵⁸

It was not clear just after the Alma-Ata meeting how primary health care was going to be financed.⁵⁹ In contrast to other international campaigns, such as the global malaria eradication program of the 1950s, where UNICEF and US bilateral assistance provided funding, there were no significant resources in the WHO for training auxiliary personnel, improving nutrition and drinking water, or creating new health centers. It was difficult to convince developing countries to change their already committed health budgets. A 1986 study examined several estimates of primary health care in developing countries (around US\$1 billion) and concluded that

“the wide range of costs . . . is indicative of how little is known about this area.”⁶⁰

As a result, most international agencies were interested in short-term technical programs with clear budgets rather than broadly defined health programs.⁶¹ In addition, during the 1980s many developing countries confronted inflation, recession, economic adjustment policies, and suffocating foreign debts that began to take their toll on public health resources. A new political context created by the emergence of conservative neo-liberal regimes in the main industrialized countries meant drastic restrictions in funds for health care in developing countries. According to Mahler, during the 1980s, “Too many countries, too many bilateral and multilateral agencies, too many individuals had become too disillusioned with the prospects for genuine human development.”⁶²

The changing political context was also favorable for deeply ingrained conservative attitudes among health professionals. For example, most Latin American physicians were trained in medical schools that resembled US universities, were based in hospitals, lived in cities, received a high income by local standards, and belonged to the upper and upper-middle classes.⁶³ They perceived primary health care as anti-intellectual, promoting pragmatic nonscientific solutions and demanding too many self-sacrifices (few would consider moving to the rural areas or shantytowns). A minority of medical doctors who embraced primary health care thought that it should be conducted under the close supervision of qualified professional personnel. Frequently,

they distrusted lay personnel working as medical auxiliaries.

In a 1980 speech, Mahler had already complained about the “medical emperors” and their negativism toward primary health care because of false “pompous grandeur.”⁶⁴ The confrontation made matters worse. The resistance of medical professionals became more acute since they feared losing privileges, prestige, and power. Confrontation continued since there was no steady effort to reorganize medical education around primary health care or to enhance the prestige of lay personnel. However, for a generation of Latin American medical students, primary health care became an introduction to public health and Mahler a sort of icon.

Another problem of primary health care implementation was real political commitment. Some Latin American authoritarian regimes, such as the military regime in Argentina, formally endorsed the Alma-Ata Declaration but did not implement any tangible reform. Because most international agencies favored selective primary health care, many Latin American ministries of health created an underfunded primary health care program in their fragmented structures and concentrated on 1 or 2 of the GOBI interventions. As a result, the tension between those who advocated vertical, disease-oriented programs and those who advocated community-oriented programs was accepted as a normal state of affairs.

During the mid-1980s, Mahler continued his crusade for a more holistic primary health care in different forums. However, he was frequently alone, since he did not have the full

support of the WHO’s bureaucracy, and his allies outside WHO were not always available. For example, from 1984 to 1987, an important US scholar for primary health care, Carl Taylor, left Johns Hopkins and was a UNICEF representative in China. In 1985, Tejada-de-Rivero, one of Mahler’s main assistants at Geneva, moved permanently to Peru, where he became minister of health. In 1988, Mahler ended a 3-term period as director general of the WHO. Although he never officially launched a reelection campaign, no one appeared who was second-in-command or had sufficient energy to keep promoting primary health care against all odds. In a confusing election and an unexpected turn of events, the Japanese physician Hiroshi Nakajima was elected as the new director general.

Nakajima lacked the communication skills and charismatic personality of his predecessor. His election can be considered to mark the end of the first period of primary health care. The WHO seemed to trim primary health care, and most importantly, the WHO lost its political profile. In a corollary development, a 1997 Pan American Health Organization document proposed a new target, or a new deadline, entitled “Health for All in the 21st Century.”⁶⁵ Supporters of a holistic primary health care believed that the original proposal largely remained on the drawing board,⁶⁶ a claim still made today.

CONCLUSION

The history of the origins of primary health care and selective primary health care analyzed in

this article illustrate 2 diverse assumptions in international health in the 20th century. First, there was a recognition that diseases in less-developed nations were socially and economically sustained and needed a political response. Second, there was an assumption that the main diseases in poor countries were a natural reality that needed adequate technological solutions. These 2 ideas were taken—even before primary health care—as representing a dilemma, and one path or the other had to be chosen.

I have illustrated the crucial interaction between the context, the actors, the targets, and the techniques in international health. Primary health care and selective primary health care represent different arrangements of these 4 factors. In the case of primary health care, the combination can be summarized as the crisis of the Cold War, the prominence of Mahler at the WHO, the utopian goal of “Health for All,” and an unspecific methodology. The combination in the case of selective primary health care was neo-liberalism, the leadership of Grant as head of UNICEF, the more modest goal of a “children’s revolution,” and GOBI interventions.

A lesson of this story is that the divorce between goals and techniques and the lack of articulation between different aspects of health work need to be addressed. A holistic approach, idealism, technical expertise, and finance should—must—go together. There are still problems of territoriality, lack of flexibility, and fragmentation in international agencies and health programs in developing countries. Primary and vertical programs coexist. One way to enhance the integra-

tion of sound technical interventions, socioeconomic development programs, and the training of human resources for health is the study of history. ■

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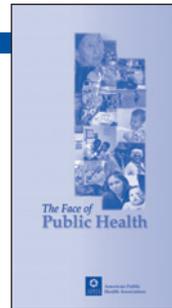
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Uncertain Advances

A Review of the Final Phases of the Smallpox Eradication Program in India, 1960–1980

| Sanjoy Bhattacharya, PhD

In this article, I describe the complex nature of the final phases of the Indian smallpox eradication program. I examine the unfolding of policies at different levels of administration and the roles played by a wide range of national and international actors. A careful examination of unpublished official correspondence, on which this article is largely based, shows that the program's managers were divided and that this division determined the timing of the achievement of eradication. This material also reveals that Indian health workers and bureaucrats were far more capable of reshaping policies in specific localities, often in response to local infrastructural and political concerns, than has been acknowledged in the historiography.

THE ERADICATION OF SMALLPOX

in India would not have been possible but for the contributions of many actors. The headquarters of the World Health Organization (WHO) in Geneva, Switzerland, and its South East Asia Regional Office, based in New Delhi, India, played a prominent role. So did the health ministries of the Indian central and state governments. All of these agencies set up a series of special “eradication units,” which deployed several energetic medical and public health personnel all over the subcontinent. The Soviet Union, the United States, Sweden, and a host of other Asian and European countries provided generous doses of aid, often bilaterally (without involving intermediary non-governmental agencies), in

the form of field operatives, vaccine, operating kits, and money. Indian and international charitable institutions made significant contributions at crucial junctures as well.¹

The involvement of such a great variety of workers is not surprising considering how complicated the organization of the final stages of the Indian smallpox eradication campaign turned out to be. The country was huge, with stretches of very difficult terrain, often with no access to transportation links. The topography was varied, and specific campaign methods had to be organized for each territorial context. Language and culture were equally varied. More than 20 major languages and several local dialects were spoken, and there was a wide variety of religious traditions and class configurations in the localities of each Indian state. The administrative challenges did not end there. Many sections of the Indian population were often not only uncooperative but also openly hostile to the quest for smallpox eradication.

Even though commentaries about smallpox eradication in India have frequently disagreed

about the value of the contributions of particular players, a uniformly celebratory element is particularly noticeable in publicity documents, official histories, and memoirs. These generally also present a simplified picture of a unified campaign workforce, supposedly confident about its goals and consistently effective in the field owing to its educational and technical expertise. A prime example of this is provided in the foreword written by Donald Henderson, the inspirational chief of the special Smallpox Eradication Unit set up within WHO headquarters in Geneva, in the organization's official history of the eradication program. As Henderson writes,

One of the most gratifying features of this programme is the unified and effective way in which the Government of India and the World Health Organization have collaborated. At every level national and WHO staff worked shoulder to shoulder, pursuing their goal with technical competence, dedication and enthusiasm.²

Perhaps unsurprisingly, unpublished WHO and Government of India correspondence reveals a far more complex pic-

ture. Agencies sponsored by WHO and the Indian government were often at loggerheads on matters of strategy in particular situations, which shows that neither administrative organization was monolithic in nature. Moreover, many officials, of different nationalities and ranks, remained skeptical about the possibility of expunging variola from the subcontinent. This group even included some of the campaign's staunchest supporters within WHO, who often privately questioned many of the successes claimed regarding the dramatic reduction of the disease's incidence in the early 1970s.

“The WHO Health Assembly's repeated calls in the 1950s for smallpox eradication caused international attention to be focused at India, as it was a major reservoir of the disease.”

Despite their ability to provide a more nuanced understanding of the final chapters of one of the most important international health programs of the 20th century, these administrative complexities are often ignored.³ In this article, I attempt to show why it would be profitable not to do so.

CREATION OF THE INFRASTRUCTURE FOR ERADICATION

The WHO Health Assembly's repeated calls in the 1950s for smallpox eradication caused international attention to be focused at India, as it was a major reservoir of the disease (Table 1). This critical gaze made several senior members of India's central government, including Jawaharlal Nehru, the prime

minister, uneasy. The widespread incidence of variola was considered by this modernizing crusader, with his keen sense of how India was perceived on the international stage, as a stigma; it was a sign that his regime's agenda of rapid reform and development was unfolding less effectively than planned.⁴ Since the prime minister was the chief executive authority in the country (the Indian president, who was elected by the 2 houses of parliament, was merely a figurehead), Nehru's views ensured action from the federal Ministry of Health. A so-called “Central Expert Committee” was appointed in May 1958; it was

asked to put forward proposals about the best means of eradicating variola.

In many ways, however, this was a limited exercise—setting up a committee was one thing, getting policies enacted and bureaucratic and civilian support was quite another. Prime ministerial authority was relatively slight at this time, when state-level politicians and bureaucrats were allowed significant levels of autonomy. In addition, there was political hostility to the proposal for an organized smallpox eradication program. Even Nehru, widely regarded as a charming negotiator with a knack for rallying wide-ranging political support on the domestic front, found it difficult to get rid of opposition from senior bureaucrats within the federal and state-level health ministries, which were reported

as being deeply divided about the issue.⁵

Senior WHO officials in Geneva were well aware of these administrative divisions at each level of Indian government. Nevertheless, they developed plans for smallpox eradication in India, assuming that bureaucratic and political opposition in the country would ultimately be overcome with the support of senior members of the central government. This assessment was powerfully underlined by the presentation of a Smallpox Eradication Criterion in August 1961.⁶ Strikingly, this prescription proved unpopular within the headquarters of the WHO's South East Asia Regional Office, based in New Delhi, the Indian capital. These WHO workers, therefore, demanded changes in the statement released from Geneva, arguing that this was necessary in view of the local administrative and political situation.⁷ Although this reminder of organizational disunity irritated the WHO headquarters, its officials were forced, nevertheless, to provide a written reassurance to New Delhi that local epidemiological and infrastructural factors would be considered during the planning and running of an Indian eradication program.⁸

The wisdom of developing regionally relevant policy was underlined quickly. Even as pilot smallpox eradication schemes were started in 1 district of each of the 22 Indian states in 1960, the damaging effects of local infrastructural constraints and bureaucratic lack of interest became obvious. The deployment of all the pilot projects, which were intended to introduce a 100% vaccinal coverage, was delayed

everywhere, causing much-publicized WHO and central targets to be missed. Worryingly for the Federal Health Ministry, these setbacks appeared as other disease eradication and control programs began to hit stormy waters and their managers started demanding greater chunks of central government allocations (the flagging national malaria eradication program was a good case in point, as was the troubled drive for tuberculosis control).⁹

These difficulties ensured that the structures supporting the national smallpox eradication program developed far more slowly than many WHO officials had hoped. The initial burst of growth was limited to the development of a new central nodal organization based in New Delhi, which was accompanied by a round of reform of local administrative rules seeking to make state-level public health officials more answerable to their superiors in New Delhi.¹⁰ Nevertheless, smallpox eradication work in the states was dogged by delays, and this situation was justified by persistent references to financial difficulties.¹¹

While central government financial assistance allowed the completion of most of the state-level pilot schemes, several senior central government observers were disheartened by the administrative difficulties that had been thrown up in almost every context. Indeed, unpublished correspondence from the second half of the 1960s shows that many powerful administrators considered these difficulties to be proof that expunging variola was impossible, and they began to develop plans for cutting back the national smallpox eradication program budget.

News of these developments set alarm bells ringing throughout WHO, causing Donald Henderson to personally approach the director general of Indian Health Services in February 1967. His aim, which seems to have had widespread support in Geneva, was to ensure that the Indian government continued to back the eradication goal, albeit on a new basis. Henderson suggested that all aspects of the subcontinental campaign be thoroughly reformed. These changes were not only to involve governmental structures but also to include the relevant departments of WHO's South East Asia Regional Office; senior WHO representatives seemed to consider it politic to accept part of the blame for the problems that were continuing to hound smallpox immunization work in India.¹²

Henderson's intervention was apparently timely, even though he appears to have been uncertain initially about the effectiveness of his efforts and of WHO headquarters' public declarations of support for the Indian government.¹³ One of his letters to the American Embassy in New Delhi reported, for instance, that the Indian administrators were giving mixed messages and that Geneva had no clear idea whether the subcontinental campaign would survive the year.¹⁴ He need not have worried. The promises of additional aid caused the Indian federal authorities to reconsider their plans of scaling back their antismallpox measures and led to what was widely regarded as a helpful reshuffle of bureaucrats within the central health ministry department charged with responsibility for coordinating the eradication program.¹⁵

PROGRAM EXPANSION, REORGANIZATION, AND REDEPLOYMENT

The developments of 1967 brought about a major shift in the organization of the subcontinental smallpox eradication program. This shift was not, however, just a result of the WHO decision to embark on a worldwide campaign of mass immunization. The changes initiated in Geneva and New Delhi from April onward were a direct response to the Indian govern-

Table 1—Smallpox Cases in India and the World, 1950–1977

Year	India	World	India/World,%
1950	157 487	332 224	47.4
1951	253 332	485 942	52.1
1952	74 836	155 609	48.1
1953	37 311	90 768	41.1
1954	46 619	97 731	47.7
1955	41 887	87 743	47.7
1956	45 109	92 164	48.9
1957	78 666	156 404	50.3
1958	168 216	278 922	60.3
1959	47 109	94 603	50.4
1960	31 091	65 737	47.3
1961	45 380	88 730	51.3
1962	55 595	98 700	56.3
1963	83 423	133 003	62.7
1964	41 160	75 910	54.2
1965	33 402	112 703	29.8
1966	32 616	92 620	35.2
1967	83 943	131 418	63.9
1968	30 925	80 213	37.8
1969	19 139	52 204	35.3
1970	12 341	33 663	36.7
1971	16 166	52 794	30.6
1972	20 407	65 153	31.3
1973	88 109	135 851	64.9
1974	188 003	218 364	86.1
1975	1 436	19 278	7.5
1976	0	953	...
1977	0	3 234	...

Source. R. N. Basu, Z. Jezek, and N. A. Ward, *The Eradication of Smallpox From India* (New Delhi: World Health Organization/South East Asia Regional Office, 1979), 36.

ment's threat to withdraw support. These changes brought heightened levels of WHO assistance. The organization's willingness to commit extra resources did, of course, have certain advantages for the managers of its smallpox eradication units—they were able to extract the Indian prime minister's permission to launch a mass immunization drive in the subcontinent, with both sides agreeing that this work would be conducted in collaboration with Federal Health Ministry officials. The new plans of action were, therefore, a result of the coming together of the strategic needs of both parties.

The WHO headquarters attempted to kick-start the goal of achieving countrywide mass vaccination by employing large numbers of foreign workers; by agreement with the Indian central government, they were expected to work with the local bureaucrats. Geneva also arranged for the reorganization of the smallpox eradication unit attached to the South East Asia Regional Office. Once again, this was achieved by the involvement of numerous foreign workers, on a variety of short-term contracts, who had experience in managing public health projects. However, a variety of problems cropped up. It was difficult to find sufficient numbers of foreign staff; Henderson found it hard to convince the US government and universities to provide experienced consultants at this time.¹⁶ Additionally, the WHO offices in Geneva and New Delhi had to get the international workers cleared by the Indian authorities, which was not easily achieved. Reports frequently referred to friction between short-term WHO consult-

ants, officials working on long-term contracts for the South East Asia Regional Office, and Indian bureaucrats.¹⁷

All these problems combined to reduce the effectiveness of the mass vaccination drives launched in 1968; the continuing shortages of efficacious freeze-dried vaccine and operating gear did not help either. As a result, despite what the Indian government described as "gigantic and concentrated" efforts to reformulate immunization policy between 1968 and 1970, the incidence of smallpox remained high. These circumstances exacerbated tensions between the eradication units run by WHO and the Indian Health Ministry, as officials blamed each other's tactics. Henderson, for instance, referred to the problems existing between the "various warring factions within the Ministry and between the Ministry and the States."¹⁸

At another level, though, the high incidence of variola encouraged the formation of new alliances. This process involved workers and bureaucrats who supported a shift from the goal of mass vaccination to a new strategy of "surveillance–containment," based on the isolation of infected people and selective vaccination of smallpox-stricken communities and "rings" of contacts (immediate contacts targeted first, after which the scope of vaccination increased to cover a broader range of potential contacts).¹⁹ These views did not go unchallenged. Reports frequently mentioned how variola outbreaks in the districts could throw carefully laid plans for surveillance–containment out of gear in a situation where local bureaucrats frequently reverted to the strategy of mass vaccination.²⁰

In the light of such administrative challenges, the managers of WHO's smallpox eradication units in Geneva and Delhi made concerted efforts to gain the Indian central government's help in bringing hostile members of the federal and state health ministries and local bureaucrats into line. While published reports and official accounts of the eradication campaign are mostly silent about this tactical shift, unpublished correspondence reveals how important it was considered by a range of senior WHO officials. It was not enough to have the stated support of the central authorities; it was now recognized that it was important formally to involve the federal government in mobilizing local political and bureaucratic support.

This strategy of using central government assistance to bring state employees into line was neither easy nor always successful. Such high-level political support was inconsistent and needed periodic renewal. The genius of Henderson and of Nicole Grasset—an inspirational French official employed by the WHO South East Asia Regional Office headquarters—lay in their ability to make this support possible through lobbying exercises, which were at times based on the unconventional tactic of approaching Indira Gandhi, the powerful Indian prime minister, directly, sometimes in violation of diplomatic protocols. Gandhi's support was significant, as she was actively involved in centralizing power and was in a position to force relatively compliant state chief ministers to support, at least publicly, specific immunization campaigns.²¹

A good instance of this strategy occurred in 1972, a year considered crucial by WHO and

the federal government, which believed that a concerted search of certain states was then necessary if eradication was to be achieved in India.²² Central government cooperation, stoked by support from the prime minister's office, caused so-called "smallpox endemic states" such as Jammu and Kashmir and Bihar to be searched intensively.²³ As a direct result, thorough surveillance-containment efforts, more rigorous than at any time in the past, were launched. Work was often conducted on a systematic, door-to-door basis, particularly in areas where smallpox outbreaks were confirmed. The policy was effective, and even the most demanding assessments accepted that by late 1972, smallpox was endemic only in the 4 contiguous states of Bihar, Uttar Pradesh, West Bengal, and Madhya Pradesh.²⁴

REORGANIZATION AND REDEPLOYMENT

This success in limiting the scope of variola in India surprised many within both WHO and the Indian government, and questions were raised by those hostile to the eradication program about the reliability of the data being presented. Nevertheless, this reduction in the area of smallpox endemicity was seen as a major advance, so much so that WHO began negotiations for the launch of an even more concentrated program of action, targeted primarily at the remaining pockets of variola. On the basis of an offer of even greater levels of financial and infrastructural assistance, these deliberations were successful, and the so-called intensified smallpox eradication program was launched in 1973.

Grasset and Henderson played an important role in negotiations with international financial donors; special funds were, for instance, made available by the Swedish International Development Agency after considerable efforts on their part.²⁵

Despite the deployment of unprecedented levels of financial and technical resources, difficulties in running the intensified program began to show up almost immediately. Reports of numerous cases of bureaucratic opposition in the states, districts, and subdivisions threatened to sour the spirit of cooperation that appears to have developed among at least some senior WHO and

Federal Health Ministry's smallpox eradication department.²⁸

Yet this aim was not easily achieved in a situation in which the Indian prime minister's support fluctuated over time for reasons that are impossible to identify definitively. The important point, though, is that her commitment to the eradication goal varied, which kept senior WHO and Indian government officials supportive of smallpox eradication on the defensive. Indira Gandhi would sometimes fully endorse the aims of campaign, release statements to that effect, and allow the WHO officials to distribute copies of these during their tours in the states.²⁹ She

“Despite the deployment of unprecedented levels of financial and technical resources, difficulties in running the intensified program began to show up almost immediately.”

Indian government officials. Faced with recurrent smallpox outbreaks across eastern India, accusations of inefficiency, impropriety, and lack of commitment began to be traded in meetings and correspondence.²⁶ Grasset felt, for example, that problems were being created by officials at the level of state governments. She accused their officials of playing a double game, publicly promising help to the smallpox eradication departments of the Federal Health Ministry and WHO but remaining noncommittal in private.²⁷ Senior WHO officials, therefore, began to push the Indian government, from 1974 onward, to convert the intensified program into a centrally controlled campaign, one that was politically supported by the prime minister's office and run by the

would also sometimes force senior state officials—the chief ministers and health ministers—to show similar levels of support.³⁰

On other occasions, however, this encouragement appeared to all but evaporate. At one point, for instance, the federal health minister was permitted, almost at a whim, to freeze the number of international staff members WHO could deploy. The pressures imposed on state-level workers to cooperate with WHO teams were often relaxed at such times; the hostility of several senior health ministry officials to colleagues working within the smallpox eradication department, which had close links with Grasset's and Henderson's offices, also contributed to these trends. Such patterns of inaction and hostility could prove

to be administratively problematic. Apart from allowing the underreporting of variola cases, it created a situation in which surveillance–containment operations were mishandled—local workers would often carry out mass vaccinations over an area of only a 5-mile radius, without any attention given to people at high risk of infection. Workers often failed to detect people who were away from home and possibly carrying smallpox between villages. And district officials seeking to justify their inability to meet vaccination targets frequently exaggerated vaccination refusal rates.³¹

Thus, when around the middle of 1974 the Indian government accepted the proposal that the running of the intensified program be fully centralized, the move was widely celebrated within the WHO offices in Geneva and New Delhi, not the least because it formally offered their smallpox eradication units the option of working in an organized manner with the Federal Health Ministry. The officials attached to these agencies were now going to be allowed access to a centralized fund, built up with contributions from a range of donors and held in Geneva. These developments also allowed the creation of a new, well-organized program bureaucracy that was distinct from the workforce attached to other disease control programs run by the federal and state health ministries. This bureaucracy was to be varied in composition, based not only on workers from the United States, western and eastern Europe, and Asia (the US Centers for Disease Control [CDC] and the Soviet Academy of Sciences con-

tributed several consultants to WHO) but also on the employment of local bureaucrats, Indian private medical practitioners, and medical students from subcontinent colleges, who were placed on a variety of short-term contracts.³²

Increased financial and infrastructural input did not automatically translate into success. The centrally controlled intensified smallpox eradication program was not always able to attract the support of local administrative networks and operate without impediment. The special status accorded to the campaign and its workforce often made it deeply unpopular among sections of the Indian central and state governments. This antipathy even included elements within the Federal Health Ministry, who continued to undermine the intensified program. A dramatic example was Dr J. B. Shrivastav, the director general of health services and the senior-most bureaucrat within the Federal Health Ministry. Dr Mahendra Dutta, a senior member of the ministry's smallpox eradication department, noted that Shrivastav began to question the surveillance–containment policy at a time that it was considered crucial. Presenting himself as a supporter of the policy of 100% vaccinal coverage, he began distributing warnings about the dangers arising from the development of a “vaccination backlog.” This created doubts among more junior state- and district-level officials, who began to worry about what would happen to their career prospects if they were found to be ignoring the views of Shrivastav and his allies. As a result, they often tended to be

less than cooperative with the smallpox eradication teams.³³

The problems did not end there. At the same time, certain state administrators began to demand that workers attached to other vertical public health programs and health centers return to their original duties, rather than buttress the intensified program. Indeed, WHO officials soon found themselves competing for resources with family planning schemes launched by the central and state health ministries owing to pressures imposed by Sanjay Gandhi, the prime minister's politically powerful son.³⁴ Senior WHO officials such as Grasset and Henderson tried to lighten the impact of these developments by directing diplomatic initiatives at the prime ministers office, the state chief ministers, and the federal and state health ministries. However, only some of these efforts proved successful; the intensified eradication program moved ahead in fits and starts during the course of 1974.³⁵

Nevertheless, efforts at strengthening the program continued apace right through 1975. These took several forms: more foreign consultants were brought in from a variety of countries, greater numbers of local workers were contracted on a temporary basis with funds held at WHO headquarters, and the support of senior politicians and bureaucrats was lobbied continuously. These efforts paid off; eastern India was systematically and intensively searched for variola pockets, leading to the discovery of several cases in January of that year. While the month had started off well, with less than 100 outbreaks being reported throughout the country

in the first 2 weeks, a search carried out by a team led by Dr R. B. Arnold, a CDC epidemiologist posted in Nalanda, in the state of Bihar, revealed a large cluster of new cases at Pawa Puri village. The situation was complicated by the fact that several hundred Jain pilgrims—a religious community averse to vaccination—were visiting the village on a daily basis.³⁶

A USEFUL EPIDEMIC

Ironically, however, this outbreak proved useful to the program managers. Reference to the crisis allowed them to reinvigorate support for eradication, as several senior politicians and bureaucrats were reminded that the battle against variola was far from won. This event also allowed Grasset and Henderson, and their allies within the Federal Health Ministry, to get the prime minister's ear: Gandhi did not want her regime to be identified with the failure of a global program. Her office began involving itself in bringing into line the state ministries run by the ruling Congress Party.

The benefits of such trends were clearly visible in the weeks following the Bihar outbreak. Even though several ministerial employees and civil servants doubted that variola could be expunged in the subcontinent, Gandhi's firm intervention ensured that they were forced to support efforts to contain the outbreak and carry out detailed searches of surrounding areas. In this regard, the role played by Sharan Singh, Bihar's chief secretary, was important. He kept pressuring branches of the state administration and the chief minister and helped ensure the

deployment of governmental resources for special epidemiological teams, which were set up in association with the smallpox eradication unit in New Delhi. Singh also negotiated a political arrangement whereby Dr Larry Brilliant, an American consultant employed by WHO's South East Asia Regional Office, was allowed to take over responsibility for coordinating activity in Pawa Puri. The central government even cleared the Bihar Military Police to assist these special epidemiological teams; military personnel helped cordon off affected villages and provided protection to program staff.³⁷

Notably, the managers of the intensified program kept reminding the central and state governments, as well as national and international funding agencies, about the possibility of another serious smallpox outbreak if their work slackened. The dangers arising from such potential crises were also underlined; India, it was frequently pointed out, could very well end up bearing the stigma of causing the failure of a high-profile global eradication campaign. By all indications, these tactics were effective. Funding bodies, such as the Tata Industrial Group and the Swedish International Development Agency, renewed their financial commitment. Surveillance—containment measures elsewhere were retained as well, generally with active assistance from the Government of India, which allowed its antimalaria and family planning units to be used frequently by the managers of the smallpox eradication program, most notably to strengthen search activities in eastern and northeastern parts of the country.³⁸

Announcement of the so-called "smallpox zero status" followed soon after; the last indigenous case was reported on May 17, 1975, from the Katihar district of Bihar.³⁹ The news was announced officially by Dr Karan Singh, the federal minister of health, on June 30, 1975, and was then widely publicized. The achievement was also celebrated through a variety of public functions, some coinciding with the country's independence day celebrations on August 15, 1975. Even though the managers of the intensified program participated in these celebrations, privately they were uncertain about the wisdom of announcing such a "victory."⁴⁰ Henderson and Grasset highlighted the need to push through the message that the eradication of smallpox in India could by no means be taken as guaranteed.⁴¹ A great deal of effort was therefore expended by WHO and the smallpox eradication department of the Federal Health Ministry, which advertised the importance of continuing detailed country-wide searches through 1976 and 1977.

These efforts paid off, but despite Indira Gandhi's enthusiasm for this final drive, the Indian administrative services were by no means united in their support for the retention of an intensified program. Even at this late stage, when a victory against variola in India had been confidently announced by the federal authorities, many officials in New Delhi and the states believed that variola's disappearance was temporary and that it would inevitably reappear, after being reintroduced from Bangladesh or Africa.⁴² Program workers of all ranks worried incessantly about

unearthing a large pocket of smallpox. This anxiety caused generous monetary rewards to be offered for the notification of variola cases, with detailed investigation of all resultant reports.⁴³

As it transpired, these fears proved misplaced. Managers of the intensified program were able to start preparing the documentation that was to certify the eradication of smallpox in India by September 1976.⁴⁴ This evidence was cross-checked by an independent team of international workers over the course of several months, and India was certified smallpox free on April 23, 1977.

CONCLUSION

The successful outcome of the smallpox eradication program demanded persistent hard work by a range of Indian and international officials. The personal sacrifices were often great: program officials were forced to spend protracted periods of time away from their families in unfamiliar contexts and experienced demanding shifts in the field that often led to physical exhaustion and ill health. This work was frequently a thankless task, as workers encountered the hostility not only of those they were seeking to protect from a dreadful disease but also of politicians and officials. As a result, their experience was often bittersweet: sometimes extremely frustrating but also greatly gratifying, especially when certification of eradication was achieved against overwhelming odds.⁴⁵

A detailed examination of the experiences of these workers and of their interactions with different governmental departments and officials thus presents

a nuanced picture of the multifaceted smallpox eradication program. This program is sometimes simplistically presented as a vertically organized campaign that was imposed on India by powerful industrialized nations. If anything, Indian administrators accepted the launch of an organized effort aimed at eradicating variola on their own terms; the campaign was also run on their terms over several years, despite the best efforts of certain WHO officials to dictate the design and unfolding of policy in the subcontinent.

These trends were visible at all levels of administration. The prime minister, the Federal Health Ministry, and the central government bureaucracy reminded WHO representatives of their autonomy at every available opportunity. As a result, WHO was forced to change its strategic plans for smallpox eradication in the subcontinent and agreed to contribute generously to the setting up of a special bureaucracy for the purpose. And yet, this administrative flexibility did not solve all their problems. State- and district-level administrators, keen to demonstrate their unwillingness to be ordered about by international and New Delhi-based officers, also provided differing levels of cooperation to the plans put forward by the smallpox eradication units. As a result, senior WHO officials remained acutely aware that none of their goals would be met without political and bureaucratic assistance from the highest levels of the Indian government. It was recognized that such support was most likely to arise from supplicatory requests made through diplomatic initiatives.

It is also noteworthy that the smallpox eradication program had variable effects on the running of the health delivery systems based at the different levels of the Indian administration. While it is undeniable that some dispensary facilities were affected adversely by the eradication drive, as health personnel were drawn away from their daily responsibilities, this situation was by no means common. In fact, accusations that the smallpox eradication program harmed the provision of local health care facilities were frequently exaggerated and politically motivated. Apart from representing the annoyance of bureaucrats and politicians doubting the possibility of eradicating variola, these criticisms were often used to obscure the fact that many subdivisional health care facilities were not as comprehensive as state government officials had claimed in their reports, publicity materials, and election speeches.

The smallpox eradication program thus appears to have competed far more vigorously for financial resources than other centrally administered vertical health schemes, such as family planning campaigns. It is also worth noting that the managers of the smallpox eradication program considered it useful to employ members of local communities on short-term contracts for special antiepidemic measures and state-level intensive surveillance–containment campaigns. These short-term employees were seen as an invaluable source of locally pertinent information, as well as being useful for introducing teams of touring officials to the rural communities being targeted. They were also asked to report

on the effective working of local medical and public health officials, who were expected to report all rash and fever cases they encountered during the course of their routine duties for further investigation.

To conclude, it is impossible to tell the complete story of a complex public health program like the smallpox eradication campaign through published WHO and Indian government reports and through the celebratory official histories and memoirs of field workers. Such commentaries usually tend to present an oversimplified sense of unity of purpose, overemphasize the contributions of certain organizations and individuals, and downplay many of the serious problems bedeviling the campaign. A careful analysis of unpublished correspondence, conversely, shows us how policies developed at the level of the WHO headquarters and the Indian central government had to be readapted continuously to meet local conditions. It also reveals that a range of workers, of different nationalities and with widely varying professional qualifications, were responsible for a monumental triumph that many had thought impossible. ■

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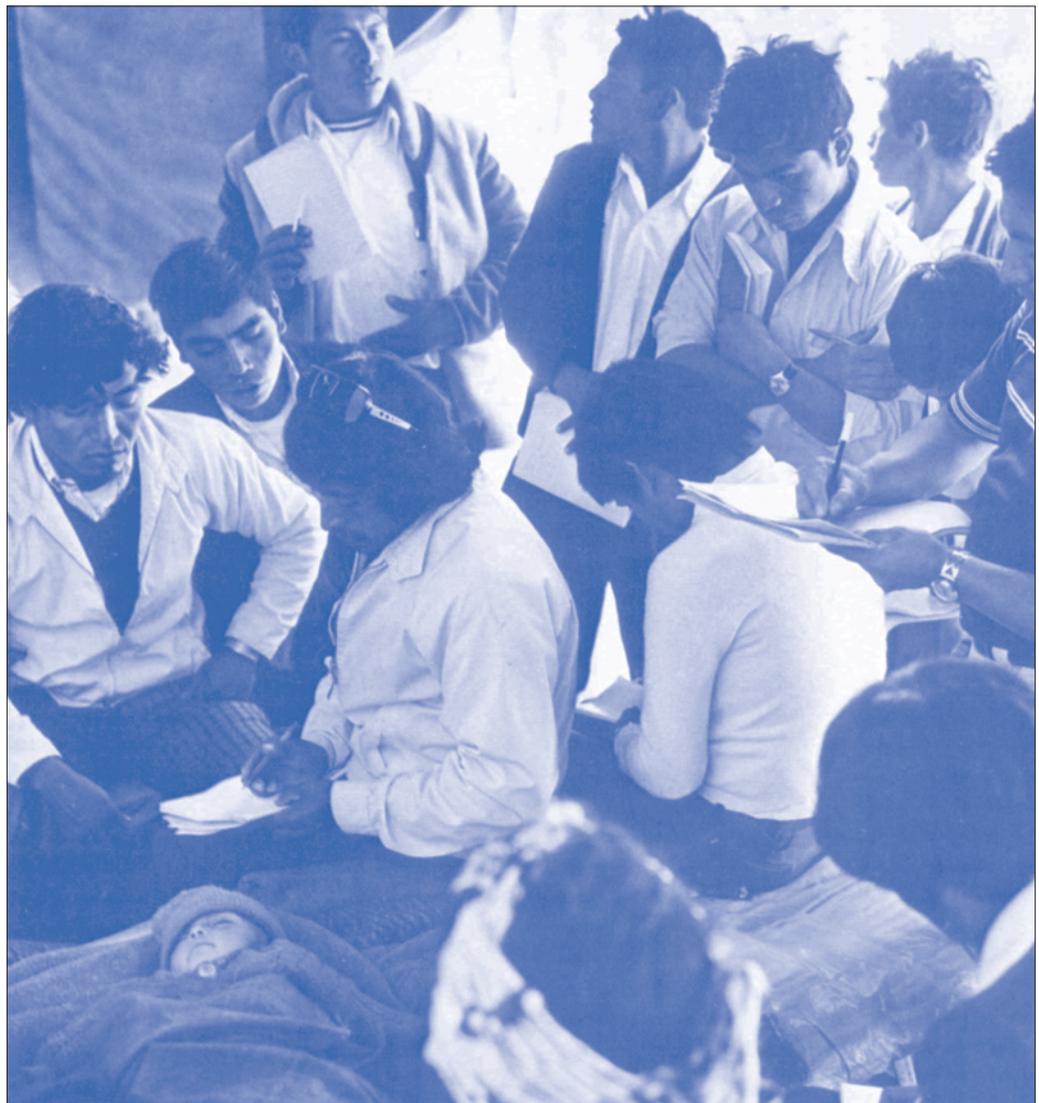
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The Christian Medical Commission and the Development of the World Health Organization's Primary Health Care Approach

| Socrates Litsios, ScD

The primary health care approach was introduced to the World Health Organization (WHO) Executive Board in January 1975. In this article, I describe the changes that occurred within WHO leading up to the executive board meeting that made it possible for such a radical approach to health services to emerge when it did. I also describe the lesser-known developments that were taking place in the Christian Medical Commission at the same time, developments that greatly enhanced the case for primary health care within WHO and its subsequent support by nongovernmental organizations concerned with community health.



Health promoters at the bedside of a sick child, Chimaltenango Hospital.

Phot by Ulli Steltzer

THE PERIOD 1968 TO 1975

saw dramatic changes in the priorities that governed the work program of the World Health Organization (WHO). For more than a decade, the global malaria eradication campaign had been WHO's leading program. Initiated in the mid-1950s, it was a strictly vertical program based on the insecticidal power of DDT. Only in the early 1960s was it acknowledged that a health infrastructure was a prerequisite for the success of the program, especially in Africa.

Independent of the malaria campaign's needs, UNICEF, wishing to increase available funding to help governments develop health services, sought technical guidance from WHO for planning such services. In response, WHO prepared in 1964 a short paper outlining broad principles for the development of basic health services. The model, which followed an outline developed in the early 1950s,¹ called for a hierarchical arrangement of health facilities staffed by a wide range of public health disciplines.

As it became evident that malaria eradication would not be achieved, greater priority was given to the development of basic health services. The then-director general of WHO, Dr Marcolino Candau, in 1967 noted that "the success of practically all the Organization's activities depends upon the effectiveness of these very services."² In 1968, Candau again highlighted their importance and called for a comprehensive health plan, within which an integrated approach to preventive and curative services could be developed.³

I begin this article with a description of 2 WHO programs, one initiated in 1967 and the

other in 1969, that became deeply involved in questions concerning what countries should do to improve their health services. I then turn to the history of the Christian Medical Commission (CMC), which was addressing similar questions, but for totally different reasons.

The parallel paths of WHO and the CMC came together only after Dr Halfdan T. Mahler became director general of WHO in July 1973. I conclude the article by describing how cooperation between these 2 organiza-

these were part of the "systems analysis" approach that was very much in vogue at the time.

In 1969, a new program called Project Systems Analysis was established in WHO. Its director, Dr Halfdan T. Mahler, a tuberculosis specialist, had been chief of the Tuberculosis Unit from 1962 to 1969. Although both programs had many points in common, Mahler's program was created as an instrument to change the way WHO worked with countries, an orientation that was outside Newell's mandate.

"As it became evident that malaria eradication would not be achieved, greater priority was given to the development of basic health services. The then-director of WHO, Dr. Marcolino Candau, in 1967 noted that 'the success of practically all the Organization's activities depends upon the effectiveness of these very services.'"

tions developed and how it influenced the formulation of the primary health care approach.

WHO—SEEDS OF CHANGE

In 1967, a new division was created in WHO: Research in Epidemiology and Communications Science. Its director, Dr Kenneth N. Newell, was an infectious disease epidemiologist. Among the research projects developed, one addressed research in the organization and strategy of health services. Its purpose was "the development and demonstration of methods to show that a rational approach to the formulation of health strategies is desirable, possible and effective."⁴ By "rational approach" was meant the incorporation of epidemiological, ecological, and behavioral perspectives into the health services planning process, while "methods" included standard statistical methods plus mathematical and simulation modeling;

Candau appointed Mahler assistant director general in September 1970, assigning him responsibility for both programs as well as the divisions concerned with health care (Organization of Health Services and Health Manpower Development). He was 1 of 5 assistant director generals who shared responsibility for around 15 technical programs. Although the programs worked for common goals, each pursued their objectives following somewhat independent paths, thereby contributing to a highly fragmented situation that Mahler's program hoped to overcome through improved project and program planning methodologies.

In January 1971, the executive board chose the subject of methods of promoting the development of basic health services for its next organizational study.⁵ To facilitate this study, the WHO secretariat prepared a background document for the board's

deliberations in January 1972. It provided an excellent historical overview of the subject and identified different ways that WHO might assist countries—for example, “organize a planning and evaluation section in their ministry of health,” “train health planners in the establishment and implementation of national training programmes,” and “prepare plans for the organization and development of the public health services.”⁶ No reference was made to community participation.

In introducing this document, Mahler noted that “there were sufficient financial and intellectual resources available in the world to meet the basic health

the criteria whereby national health services should be judged and the role that WHO might play in assisting member states to improve their health delivery systems. These criteria were as follows: health status, in terms that included “fertility, the opportunity for proper growth and development, morbidity, disability and mortality”; operational factors, such as coverage and use of health service facilities; accepted technology; cost; and consumer approval.⁸

The report concluded that no single or best pattern existed for developing a health services structure capable of providing wide coverage and meeting the

In May 1973, the 26th World Health Assembly adopted resolution WHA26.35, entitled “Organizational Study on Methods of Promoting the Development of Basic Health Services.” Among other things, this resolution confirmed the high priority to be given to the development of health services that were “both accessible and acceptable to the total population, suited to its needs and to the socioeconomic conditions of the country, and at the level of health technology considered necessary to meet the problems of that country at a given time.”¹² This wording reflects the impact of the executive board’s study. Countries were again being reminded that there was no universal model for the health services that they could or should aim to develop. They had to adapt available technologies to fit the conditions that were unique to each situation. The assembly also confirmed the election of Mahler as the next director general of WHO, the functions of which he assumed on July 21, 1973.

Shortly after Mahler became director general, a WHO/UNICEF intersecretariat discussion decided to seek out “promising approaches to meeting basic health needs”; among possible characteristics to be considered were “community involvement in financing and controlling health services, in projects to solve local health problems, in health-related development work, or other relevant ways.”¹³

The search for new approaches led to 2 important WHO publications in early 1975: *Alternative Approaches to Meeting Basic Health Needs of Populations in Developing Countries*, edited by V. Djukanovic and E. P. Mach (staff members under Newell), and

aspirations of all peoples,” and suggested that “there was a need for an aggressive plan for worldwide action to improve this unsatisfactory situation.”⁷

In 1972, Mahler oversaw the amalgamation of Newell’s research division with the Organization of Health Services to create a new division, Strengthening of Health Services, with Newell as director. Newell inherited the job of secretary to the executive board’s working group responsible for the organizational study. He worked closely with its members and was deeply involved in drafting the group’s final report on basic health services, which was presented to the full executive board in January 1973.

Avoiding the question of what was meant by basic health services, the working group identified

varying needs of the population being served: “Each country will have to possess the national ability to consider its own position (problems and resources), assess the alternatives available to it, decide upon its resource allocation and priorities, and implement its own decisions.”⁹

WHO, the report said, should serve as a “world health conscience,” thereby providing a forum where new ideas could be discussed as well as a “mechanism which can point to directions in which Member States should go.”¹⁰ To fulfill this role, WHO needed to make better use of the resources available to it by concentrating on those projects that were likely to “show major returns and . . . result in a long-term national capability for dealing with primary problems.”¹¹

“WHO, the report said, should serve as a ‘world health conscience,’ thereby providing a forum where new ideas could be discussed as well as a ‘mechanism which can point to directions in which Member States should go.’”

Health by the People, edited by Newell.¹⁴ During the first 18 months that Mahler was director general, the WHO and the CMC greatly intensified their cooperation. It is therefore necessary to backtrack and learn how the CMC came into being and how its activities became so important for WHO in the years that followed.

ESTABLISHMENT AND EARLY WORK PROGRAM OF THE CMC

The CMC was established in 1968 as a semiautonomous body to assist the World Council of Churches in its evaluation of and assistance with church-related medical programs in the developing world. The decision to create the CMC did not take place overnight. It evolved from much field work and a series of consultations. The field work, which started in late 1963, showed that churches had concentrated on hospital and curative services and that these “had a limited impact” in meeting the health needs of the people they were meant to be serving. It was found that “95% of church-related work was curative” and “at least half of the hospital admissions were for preventable conditions!”¹⁵

Of particular concern to the World Council of Churches was the fact that many of the more than 1200 hospitals that were run by affiliated associations were rapidly becoming obsolete and their operating costs were increasing dramatically. What was needed were “some criteria for evaluating these programmes” that would help reorient the direction for their future development.¹⁶

The CMC had very limited resources. It was composed of 25 members and was served by an executive staff consisting of a director and “not more than three others.”¹⁷ It was to engage in surveys, data collection, and “research into the most appropriate ways of delivering health services which could be relevant to local needs and the mission and resources of the Church.” It was concerned with determining “what specific or unique contribution to health and medical services can be offered by the Church.”¹⁸

Two major consultations, called Tübingen I (May 1964) and Tübingen II (September 1967) had set the stage for the work of the CMC. Tübingen I reviewed the nature of the church’s involvement in healing and the theological roots of such work. In contrast to the response of medical missions in the early part of the 19th century to the overwhelming need at that time, which was “instinctive without any conscious concern about its theological justification,” the justification for current activities, both medically and theologically, was still weakly developed.¹⁹ The church’s medical staff was trained in medical care and had little interest in disease prevention, which was considered to be the government’s responsibility.

The report resulting from Tübingen I, *The Healing Church*, confirmed that the church did have a specific task in the field of healing. The medicalization of the healing art had led to a rift between the work of “those with specialized medical training and the life of the congregation.” The entire congregation had a part to play in healing.²⁰

James C. McGilvray, the CMC’s first director, found the contribution of Dr Robert A. Lambourne to be “the most significant” one in the preparatory stages of Tübingen II. McGilvray had been involved in hospital and health services administration since 1940, first when he was superintendent of the Vellore Medical College Hospital in India and then in various health administration positions in Southeast Asia and the United States.

From Lambourne’s reports, a disturbing picture emerged of the manner in which modern care was at odds with the quest for health and wholeness. The hospital had become a “factory for repair,” in which the patient had been broken down into “pathological parts.” The “results of a battery of tests” were more important “than the relationship of persons in a therapeutic encounter.”²¹

Lambourne’s concept of wholeness and health had strong implications for the congregation, a position that had emerged from Tübingen I. It is only “when the Christian community serves the sick person in its midst [that] it becomes itself healed and whole.”²² Going further, he argued that the healing congregation accepts the fact “that any one individual group or nation may not be entitled to an unlimited use of the resources of healing when such unlimited use will mean less available resources of healing for others.”²³ Thus, Lambourne’s argument suggested a moral basis for individuals and communities to be involved in any consideration of how resources are to be used to promote their health.

The theological basis for health and healing work continued as important points of discussion during the CMC's first annual meetings. These were critical in helping the commission advise the World Council of Churches how to help church-funded services to move from the provision of medical care to individuals to the development of curative and preventive services to communities at large.

The discussions took the form of a "dialogue" between Dr John H. Bryant, the commission's chairman and a professor of public health, and David E. Jenkins, a commission member and a theologian. The last dialogue, which took place in 1973, demonstrates well to what degree, even though there were important differences of opinion between them, both were committed to a distribution of resources that improved the lot of those worst off.

Bryant addressed the question of "health care and justice."²⁴ In doing so, he applied the notions of entitlement, natural rights, positive rights, and distributive justice to the question of human health, and developed a series of tentative principles:

- Whatever health care and health services are available should be equally available to all. Departure from that equality of distribution is permissible only if those worst off are made better off.
- There should be a floor or minimum of health services for all.
- Resources above this floor should be distributed according to need.
- In those instances in which health care resources are nondivisible or necessarily uneven, their distribution should be of advantage to the least favored.²⁵

Jenkins approached the question differently. He did not believe, for example, that "the notion of human rights is biblical." The Bible is concerned about "human possibilities, about divine activities, and about human response to divine activities," and with "obstacles to becoming human," and consequently is much more concerned with "attacking exploitations, attacking oppressions, attacking inequalities, attacking deprivation than laying down rights."²⁶

The reflections of both Bryant and Jenkins supported the involvement of Christians in fighting inequities. To do so, the CMC from its inception gave priority to what it termed comprehensive health care—"a planned effort for delivering health and medical care attempting to meet as many of the defined needs as possible with available resources and according to carefully established priorities." Such a program "should not be developed in isolation but as the health dimension of general development of the whole society."²⁷

Given the fragmented and often competing nature of most church-related programs, the CMC identified planning as "the most important new dimension in the field of health care today" as a means of exercising "stewardship with their resources." Stewardship was required "not only to achieve the optimum health care within our resources, but equally to see that the results are economically viable in the local context."²⁸

CMC staff actively worked with various church groups and voluntary organizations to encourage them to undertake joint planning and action with the aim of promoting a more effective use

of resources. At the same time, they searched for field situations that lent themselves "to experimentation in broad-based community health programmes."²⁹ Along with members of the commission, they also searched for community-based experiences around the world that would shed light on how best to develop programs that were comprehensive (i.e., would offer a spectrum of services ranging from treatment and rehabilitation to prevention and health promotion), were part of a network of services ranging from the home to specialized institutions, and would incorporate human resources ranging from involved church members to specialist professionals, including auxiliary and midlevel health workers.³⁰

Many of the community-based experiences uncovered were discussed at various CMC meetings and were written up in the publication *Contact*, whose first issue appeared in November 1970.

Contact was not a regular publication. For the first few years, around 6 issues were published annually. The first issue was a summary of a lecture given by Lambourne entitled "Secular and Christian Models of Health and Salvation." Issue 4, published in July 1971, contained the Bryant–Jenkins dialogue held during the third annual meeting in June of that year.

Three community-based experiences presented to the CMC between 1971 and 1973 proved critical in WHO's conceptualization of primary health care.

CRITICAL COMMUNITY-BASED EXPERIENCES

McGilvray "discovered" the first project during a survey un-

dertaken in Indonesia in 1967.³¹ The project, located in central Java, was run by Dr Gunawan Nugroho. Begun in 1963, it featured such innovations as goat and chicken farming to increase the income available to the poorest members of the community and the creation of a health fund that aimed at “providing inexpensive treatment so that anyone who was sick could afford to seek medical care.”³² Educational activities were stressed to provide individuals with the information they needed to learn for themselves what they could do to improve their health and that of the community.

Although Nugroho presented his project to the CMC’s annual meeting in 1971, and Newell had met him in the early 1960s when he was working in Indonesia, Newell only learned about Nugroho’s project in late 1973. Dr Joe Wray, who was then with the Rockefeller Foundation in Bangkok, ran into Newell in the “middle of nowhere” in India and told him about the project when he learned that Newell was looking for “people who were doing interesting things in rural health care.”³³ Subsequently, Newell visited Nugroho and invited him to Geneva in July 1974 to prepare a chapter on his project for *Health by the People*.³⁴

The second project was also run by a husband–wife medical team, Rajanikant and Maybelle Arole. Their project was developed in Jamkhed, India. The Aroles sought financial help from the CMC in 1970, at which time they described how their initial attempts at providing curative services “had done little for the general health of the community around us.”³⁵

When on their return they found the project area facing a severe drought, they helped organize a community kitchen and found funding for introducing tractors in areas where farmers had lost their cows and for installing deep tube wells. To extend services to nearby villages, they contacted indigenous practitioners and health workers in the area, helping to shape them into health teams and to extend the services offered by introducing village health workers.

The Jamkhed project aimed to establish a viable and effective health care system that involved the “community in decisionmaking,” was “planned at grass roots,” used local resources “to solve local health problems,” and provided “total health care not fragmented care.”³⁶

Rajanikant Arole presented their project to the 1972 annual meeting of the CMC, and it was written up in *Contact*. The WHO regional office in New Delhi had not recommended this project because “it wasn’t an Indian government project.” However, it came to the attention of Dr Ed Brown, who was working for Djukanovic (the WHO officer responsible for the alternative approaches study) while on sabbatical leave from the Indiana University Medical Center. Brown gathered the project files from the CMC (which was just down the road from the WHO office) to show Djukanovic, who then visited the project and made arrangements for its inclusion in his study.³⁷

In the third critical community-based experience, Carroll Behrhorst directed the Chimaltenango development project in Guatemala. The use of community health promoters was one of the



Source. Gunawan Nugroho

Thanks to a mini-dam built by the community with village labor and the help of a small loan from the health center, Sirkandi village in central Java, Indonesia, increased its rice production by 25% in 1 year.

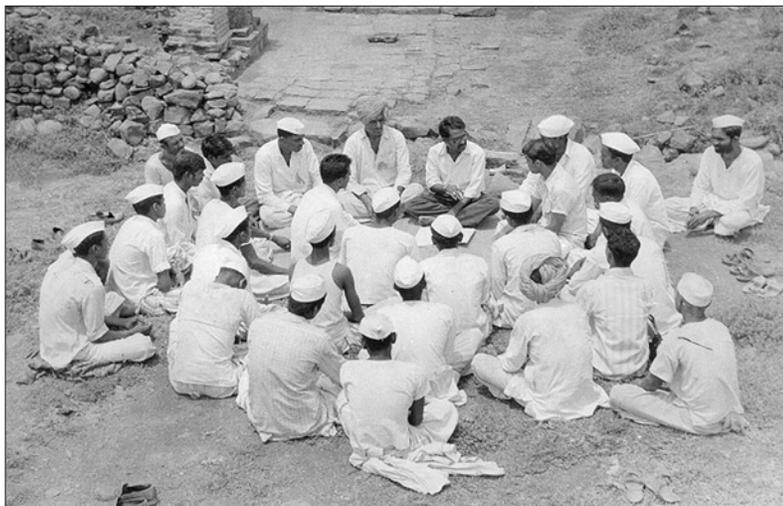
“Educational activities were stressed to provide individuals with the information they needed to learn for themselves what they could do to improve their health and that of the community.”

major features of this project. Initially selected on the basis of recommendations from local priests or Peace Corps volunteers, this approach quickly gave way to the formation of community health committees who took over this responsibility.

The training of community health promoters was a continuous activity. They were trained in groups, attending sessions once weekly for a year before they were allowed to dispense medicines or give injections. They could enter the program at any time; “nearly all of them, even those who began their training more than 8 years ago, still come every week to learn new techniques or treatments.”³⁸

Promoters were also trained as community catalysts, working in areas other than curative medicine (e.g., literacy programs; fam-

Source: Connie Gates



A farmers' club gathering in Jamkhed, India.

ily planning; the organization of men's and women's clubs; agricultural extension; the introduction of new fertilizers, new crops, and better seeds; chicken projects; and improving animal husbandry).³⁹

Behrhorst presented his project at the CMC's 1973 annual meeting, and it was written up in *Contact* the following year.⁴⁰

There is no doubt that other experiences, either then ongoing or publicized earlier, had an influence on Newell's conceptualization of primary health care. As an active member of the UK social medicine community in the 1950s, he would have been exposed to related concepts and projects early in his career. He was a contemporary of John Cassel, whom Newell knew well and admired; Cassel frequently visited Geneva, where he presented his latest social epidemiological research results. These were actively followed and discussed by the epidemiologists working in Newell's research division.

Cassel's early career was "closely intertwined with [Sidney] Kark's."⁴¹ It is therefore highly probable that it was he who introduced Newell to Kark, who

was Newell's dinner guest on at least one occasion before 1973.⁴² Given Newell's interest in social medicine and epidemiology, it is difficult to imagine that he did not learn, first from Cassel and then from Kark, of their earlier community-oriented primary care experience in South Africa.⁴³ Many similarities between primary health care and Kark's work in Africa are evident.

WHO AND CMC JOIN FORCES

By the summer of 1973, the CMC had brought to the world's attention many projects that offered innovative ways to improve the health of populations in developing countries. WHO, under its new leadership, intensified efforts to seek alternative approaches to meeting the basic needs of those same populations. New leadership was required to bring about a closer working relationship between the CMC and WHO.⁴⁴ "In the Candau-Dorolle era [of WHO] there was a basically hesitant if not negative relation to religious bodies," said Dr Hakan Hellberg of the CMC,

speculating that WHO might have felt pressure from the Catholic Church on sexual issues.⁴⁵ Even before taking over as director general from Candau, Mahler was advising WHO staff to read the February 1973 issue of *Contact* (issue 13), which was on rural health.⁴⁶

The first official sign of efforts to bring WHO staff together with CMC staff was a letter from McGilvray to the commission members. Dated November 7, 1973, it said that Dr Tom Lambo, the new deputy director general of WHO, "is arranging a meeting between our staff and several officers of that organization to explore more effective ways of working together." That meeting did not take place until March 22, 1974, at which time the small professional staff of the CMC met with some 10 senior WHO staff, including Newell. Newell reacted enthusiastically to the discussion that took place.⁴⁷ To what degree he was already aware of the CMC before the meeting is not easy to judge. His father had been a minister who worked for the World Council of Churches in Geneva in the late 1940s or early 1950s, suggesting that he might have had an even deeper knowledge of their health-related activities than those who worked with him realized at the time.⁴⁸ In any case, he seized the opportunity offered to work with individuals who clearly shared his values concerning human and health development.

Immediately after this meeting, Newell met with McGilvray and Nita Barrow, deputy director of the CMC, to decide on how to explore "possible collaboration and the mechanisms of action."⁴⁹ A joint working group was established, with Barrow and Newell

designated as representatives from the CMC and WHO, respectively. The working group prepared a 6-page statement that was subsequently approved by both organizations.⁵⁰

It was envisaged that a working relationship could best be achieved by “joint involvement in common endeavours” in the domain of “policy and research, or research and development endeavours with particular emphasis upon health delivery systems at the peripheral level.”⁵¹

Newell attended the CMC annual meeting in July 1974, where the joint statement was discussed. Following the meeting, McGilvray wrote Mahler that it was “enthusiastically welcomed by our membership.”⁵² In his annual report, McGilvray noted that “cooperation has already begun at a very practical level.” Referring to the inclusion of the 3 projects discussed earlier in the reports being prepared by WHO, he expressed his delight “by this development, not so much because of the credibility it confers upon us, as because it significantly enhances our mutual efforts to ensure health services for those who are now deprived of them.”⁵³

The 3 community-based projects were incorporated into Newell’s *Health by the People*, a publication that he viewed as “an extension” of the alternative approaches study.⁵⁴ Only the Jamkhed project had been included in the publication edited by Djukanovic and Mach.

Newell classified the case studies from China, Cuba, and Tanzania included in *Health by the People* as examples of changes introduced at the national level, while those from Iran, Niger, and Venezuela represented examples

of changes introduced through an extension of services provided by the existing health services system. He classified the 3 community-based experiences discussed in the previous section as local community development. Each example offered something different—China, for example, trained large numbers of part-time health workers (barefoot doctors), while Venezuela introduced what it called “simplified medicine” and Tanzania mobilized its rural population into “Ujamaa villages” that were socialistic in structure and designed to encourage popular participation in development planning.

While Newell expressed excitement at what had been demonstrated in all of the programs, he was particularly enthusiastic about the 3 community development projects. He contrasted issues such as improving the productivity of resources to enable people to eat and be educated—and the sense of community responsibility,

pride, and dignity obtained by such action—with the more traditional public health activities of malaria control and the provision of water supplies. The challenge for people in the health field was to accept these wider developmental goals as legitimate ones for them to pursue; Newell even said that “without them there must be failure.”⁵⁵

PRIMARY HEALTH CARE: WHO’S NEW APPROACH TO HEALTH DEVELOPMENT

Resolution WHA27.44, adopted by the 27th World Health Assembly in July 1974, called on WHO to report to the 55th session of the Executive Board in January 1975 on steps undertaken by WHO “to assist governments to direct their health service programmes toward their major health objectives, with priority being given to the rapid and effective development of the health delivery system.”⁵⁶ This provided Mahler and Newell with the opportunity

Magdalena Mucia de Cuex at the clinic in an informal gathering of patients, talking about nutrition for pregnant women.



Photo by Ulli Steltzer

to introduce primary health care in a comprehensive manner, drawing on the work of the previous 2 years.

The paper presented to the board, known as document EB55/9, argued that the “resources available to the community” needed to be brought into harmony with “the resources available to the health services.” For this to happen, “a radical departure from conventional health services approach is required,” one that builds new services “out of a series of peripheral structures that are designed for the context they are to serve.” Such design efforts should (1) shape primary health care “around the life patterns of the population”; (2) involve the local population; (3) place a “maximum reliance on available community resources” while remaining within cost limitations; (4) provide for an “integrated approach of preventive, curative and promotive services for both the community and the individual”; (5) provide for all interventions to be undertaken “at the most peripheral practicable level of the health services by the worker most simply trained for this activity”; (6) provide for other echelons of services to be designed in support of the needs of the peripheral level; and (7) be “fully integrated with the services of the other sectors involved in community development.”⁵⁷

Four general courses of national action were outlined, with the expectation that each country would respond to its need in a unique manner:

1. the development of a new tier of primary health care;
2. the rapid expansion of existing health services, with priority

being given to primary health care;

3. the reorientation of existing health services so as to establish a unified approach to primary health care;

4. the maximum use of ongoing community activities, especially developmental ones, for the promotion of primary health care.⁵⁸

Invited to speak on this occasion, McGilvray observed, “What the Commission had learnt from its mistakes was reflected in the principles set forth in document EB55/9.” He went on to urge the board to give its enthusiastic support for the policy statement constituted by that document, and pledged the resources of the commission in implementing it.⁵⁹

CONCLUSION

How dramatic a change primary health care was for WHO can be seen in the contrast between it and the ideas and approaches being promoted several years earlier concerning how best to develop national health systems. Instead of the “top-down” perspective of health planning and systems analysis, priority was now being given to the “bottom-up” approaches of community involvement and development, but without losing sight of the importance of planning and informed decisionmaking. This article documents how and when this shift took place, but it does not capture the courage that it took for Mahler to challenge the organization to rethink its approach to health services development or for Newell to respond to that challenge in the way he did.

Once Mahler took command, he moved quickly to make known his thinking on how

health services should be developed. In March 1974, for example, he discussed with Newell’s senior staff how he envisioned their objectives. He especially stressed the objective of “pursu[ing] the idea of community participation (and its logical bottoms-up orientation) to the maximum degree possible.”⁶⁰

In January 1975, Newell formally created the Primary Health Care program area, whose members included those who had drafted the report to the executive board. While there was mixed reaction within WHO to this new priority, a wide range of nongovernmental organizations (NGOs) joined forces in what soon became the NGO Committee on Primary Health Care. This group of organizations prepared for the International Conference on Primary Health Care held at Alma-Ata in September 1978 in an independent manner, thus helping to keep WHO on track.

For those of us in WHO committed to the primary health care approach, working with members of this committee was of prime importance. At the psychological level, the constant positive feedback helped us “keep the faith.” At the professional level, new opportunities opened up that led to projects that would have been difficult, if not impossible, to pursue in earlier years.

That primary health care in time was forced to take second billing to “selective” primary health care in no way detracts from its importance. The same reasons that led to it emerging as a force in public health in the 1970s apply equally, if not more so, today. Under new leadership, WHO has recently reintroduced primary health care onto the agenda of the governing bodies,

and nongovernmental voices are again pressuring WHO to make primary health care its priority for the coming decades.⁶¹ It is too soon to judge whether this will happen. Sadly, however, the CMC will no longer be involved with whatever emerges, as it was effectively disestablished in the 1990s. ■

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The Making and Breaking of Yugoslavia and Its Impact on Health

| Stephen J. Kunitz, MD, PhD

The creation of nation-states in Europe has generally been assumed to be intrinsic to modernization and to be irreversible. The disintegration of Czechoslovakia, the Soviet Union, and Yugoslavia demonstrates that the process is not irreversible. I argue that in the case of Yugoslavia, (1) disintegration was caused by the interaction between domestic policies with regard to nationalities and integration into the global economy and (2) the impact of the disintegration of the federation on health care and public health systems has been profound. Improving and converging measures of mortality before the collapse gave way to increasing disparities afterward.

The lesson is that processes of individual and social modernization do not result in improvements in health and well-being that are necessarily irreversible or shared equally.

SINCE THE LATE 1980S, THE world has witnessed a phenomenon unique in modern European history. For the past several centuries, nation-states in Europe have grown stronger while incorporating large numbers of different peoples within their boundaries. The process has never been entirely successful, of course, as conflicts with incompletely assimilated peoples in the United Kingdom, Belgium, and Spain attest. Nonetheless, most scholars assumed that the building of nation-states was inevitable, irreversible, and part of the very

fabric of the process of modernization. And modernization meant secularization, the creation of national identities out of separate ethnic identities, rising living standards, and improvements in health.

This version of the growth of the nation-state is based on the western European experience, in which “the nation is a territorially bounded and self-governing collectivity, a collectivity shaped, indeed *constituted* by its territorial and political frame. Nationhood, on this view, is both conceptually and causally dependent on political territory.”¹ This was not the experience in central and eastern Europe, particularly “in the great multinational empires of the Ottomans, Hapsburgs, and Romanovs.” There, the nation was not territorially based. It was an ethnocultural community, “typically a community of language.”² Members of the same ethnocultural community, or nationality, often lived scattered among other ethnocultural communities. In the states that emerged from the ruins of

the Ottoman, Hapsburg, and Romanov empires, nationalities continued to refer to such communities. This conception shaped the policies toward nationalities of the communist successor regimes of the Soviet Union and Yugoslavia and ultimately contributed to the collapse of both countries, thus demonstrating that the process of nation-state creation is not irreversible.

In this article, I suggest some of the reasons for the breakup of the Yugoslav federation and describe some of the health-related consequences. The association between political institutions and health care and public health institutions is inextricable, and the collapse of the former has profound consequences on the latter and on the health of the population. I argue that it was the economic crisis of the 1980s that let slip the dogs of war that tore apart the country. Nationalism, while real enough during all of Yugoslavia’s brief history, became truly toxic only when economic collapse threatened.

A BRIEF HISTORY OF THE FORMER YUGOSLAVIA

Throughout the 19th century, Croatia and Slovenia had been part of the Austro-Hungarian Empire. Serbia had gradually achieved independence from the Ottomans over the course of the 19th century. Bosnia, which had also been an Ottoman possession, was turned over to the Austro-Hungarian Empire as a result of the Treaty of Berlin in 1878.

The Ottoman Empire had by the end of the 19th century withdrawn from most of the Balkan Peninsula, retaining control of only Thrace and Macedonia. In the First Balkan War in 1912, the Serbs, Bulgarians, Montenegrins, and Greeks joined in a largely successful effort to drive the Turks from those remaining lands. Soon the victors fell to quarreling among themselves, and in 1913 the Second Balkan War erupted. This time, the major fighting occurred between the Serbs and the Bulgarians, with the Serbs emerging as the victors. The brutality, slaughter of civilians, and widespread destruction in each of the 2 wars horrified observers.³ The nationalist enthusiasms of which these wars were a manifestation were rife throughout the Balkans; a year later, in June 1914, they led to the assassination of the Hapsburg Archduke Franz Ferdinand and his wife in Sarajevo by Bosnian Serbs seeking the union of Bosnia with Serbia. The Austro-Hungarians held Serbia responsible and war erupted, which for the Serbs became a war to liberate all their South Slav brethren—Croats, Slovenes, and Serbs still under the domination of the Austro-Hungarian Empire.⁴ The result, after horrific bloodshed, was the

creation by the victorious allies of the Kingdom of the Serbs, Croats, and Slovenes, later to be renamed Yugoslavia.

All the regions that composed the new nation were for the most part agricultural. What industrial and commercial development had occurred was mainly in Croatia and Slovenia, which had long been part of the Austro-Hungarian Empire. When the new country was created by the Treaty of Versailles in 1918, Croatia and Slovenia went from being among the least developed parts of the empire to the most developed part of an undeveloped country. Rather than being able to trade in a large area without customs restrictions, they were now the commercial centers of a small, poor country

health leader, and the government was ineffective in providing preventive and curative health services as well as needed infrastructure. High taxes and declining agricultural prices during the depression years of the 1930s may have contributed to the peasants' hostility to the government and to their support for the Partisans during World War II, which was as much a civil war as a war against the German invaders.

That the Yugoslavs had fought their own war of liberation and had had their own communist revolution gave them a certain degree of independence in dealing with the Soviet Union and other communist nations. In particular, the Yugoslav leadership wished to develop Yugoslav industry rather than be entirely dependent on the

“The association between political institutions and health care and public health institutions is inextricable, and the collapse of the former has profound consequences on the latter and on the health of the population.”

whose political center was located in Belgrade and dominated by Serbs.⁵ It is to the restriction of Croatian and Slovenian trading and commercial possibilities and to autarchic Serbian policies that much of the hostility between these republics right up to 1991 may be attributed.

The country remained largely undeveloped throughout the interwar years. Seventy-seven percent of the population were peasants. Illiteracy rates of those older than 10 ranged between 83.8% in Macedonia and 8.8% in Slovenia, with the national figure being 51.5% in 1921.⁶ Mortality and fertility were both high, epidemics were common despite innovative programs created by Andrija Stampar, the Croatian public

Soviet Union for manufactured goods. Conflict with the Soviet Union over this and other issues resulted in Yugoslavia's expulsion from the Comintern in 1947 and increasing economic and political isolation.⁷

As a result, Yugoslavs became increasingly critical first of Soviet foreign policy and then of its domestic policy, which they called “etatism,” that is, centralized, bureaucratized government planning and control. In response to the threat of invasion by the Soviet Union, and to maintain the allegiance of the people, most of whom were noncommunists, a new form of socialism, called self-management, was developed. Self-management involved both decentralization and the inclu-

sion of workers in decisionmaking in the enterprises in which they worked.⁸ There was growing openness toward, and dependence on, the West as trade with the Eastern Bloc declined. This took several forms, including foreign aid, foreign investment in Yugoslav enterprises, an increasingly market-oriented economy, and, increasingly through the 1970s, loans from commercial lenders.

The benefits of international integration were real, but also dangerous. Real incomes increased substantially from the early 1950s to the late 1970s but then began to fall precipitously as inflation destroyed the economy.⁹ The economic decline was attributable to severe deficits in the balance of payments, the result of increases in the price of oil and other imported goods beginning in the early 1970s; declining competitiveness of Yugoslav exports in the world market; and increasing resort to short-term commercial loans at high interest rates. Despite the establishment in 1979 of an economic stabilization program supported by the International Monetary Fund, inflation accelerated throughout the 1980s.¹⁰ From 1970 to 1980, inflation had averaged 18.4% per year. It was between 85% and 105% annually in the early 1980s and reached 800% to 900% by the end of the decade; for the period 1979 to 1989, inflation averaged 123% annually.¹¹

Complicating and exacerbating the economic crisis was the policy toward nationalities pursued by the Yugoslav government, one similar in many respects to, but less coercive and arbitrary than, the one pursued by the Soviet government.¹² Nationalities were

recognized as having cultural rights (to be educated in their own language, for instance). This was seen as a necessary but transitional phase—necessary to gain the loyalty of the many different nationalities, transitional because it was believed they would ultimately become one people. In both the Soviet Union and Yugoslavia, nationalities were territorially based in the different republics of the federation, but significant minorities were found in other republics—for instance, Serbs in Bosnia, Croatia, and the autonomous province of Kosovo (part of Serbia and the poorest region of Yugoslavia); Croats in Bosnia; Albanians in Macedonia; and Hungarians in Vojvodina (also an autonomous province of Serbia and among the richest regions in the country). The notion that nationalities were ethnocultural communities was thus encouraged by government policy. Among other things, it meant that Serbia had an interest in the treatment of Serbs outside of Serbia, and that Croatia had an interest in the treatment of Croats in other republics.

The policy regarding nationalities also meant equalization across the republics; that is, a transfer of wealth from the rich to the poor republics.

“As in the Soviet Union, the equalization policy was most successful in culture,” Vugacic and Zaslavsky write.

The promotion of local languages, the establishment of republican cultural institutions, and a general improvement in social services such as schooling and public health . . . contributed to the growth of an indigenous class of experts. As long as extensive economic growth and foreign credits could sustain such a policy, it helped co-opt ethnic middle

classes. One of the more harmful unintended consequences, however, has been the overproduction of experts whom the more market-oriented Yugoslav economy could not absorb.¹³

The overproduction of experts, particularly health workers, does not mean there were no health care needs left unmet but rather that the condition of the economy did not allow for their full employment. The result was a class of well-educated people dissatisfied with the limited opportunities afforded them.

It was in this context that first Slovenia and then Croatia seceded from Yugoslavia in 1991, for these were the 2 wealthiest republics. Their citizens had supported decentralization and liberalization and had long resented what they perceived to be the confiscatory taxes levied by the central government to pay for equalization, including development projects and services in the poor republics and in the autonomous province of Kosovo. While the taxes and redistributive policies they supported may have been tolerable when real incomes were rising, they became intolerable when the economy had fallen apart.

However, in addition to tension between republics there was the problem that Yugoslavia, like the Soviet Union, was a single-party state. There was no organized opposition party that crossed republic lines and could unite people once the dominant party had been discredited. Indeed, the policy with regard to nationalities had created local elites in every republic ready to assert their claims to independent nationhood. In both Serbia and Croatia, demagogic leaders arose whose ap-

peal to their constituents was based on religious and ethnic loyalties that, once unleashed, could not be controlled.¹⁴

Thus, the history of Yugoslavia since 1945 embraces a period of rapid economic, political, and social modernization reflected in urban and industrial growth, improvements in literacy and economic well-being, changes in the traditional patriarchal family structure (the *zadruga*), moderation of ethnic hostilities, and integration into the international economy. However, in dialectical fashion, it also embraces a period of economic decline and intense ethnic reaction. In a very real sense, the route to the collapse of the Yugoslav federation, like the collapse of the Soviet federation, was paved by the policy toward nationalities that each had pursued, but it was precipitated by involvement in the global economy.

MORTALITY IN THE POST-WORLD WAR II ERA

The redistributive policies pursued by the central government in Belgrade were partially effective: disparities in a variety of indicators of well-being persisted but diminished right into the 1980s. For example, school attendance and literacy increased all across the country, but by 1981 there were still major differences, with illiteracy ranging from 0.8% in Slovenia to 17.6% in Kosovo.¹⁵ Similarly, there continued to be significant regional differences in income, in per capita expenditures on health and welfare, and in the distribution of physicians and hospital beds.¹⁶

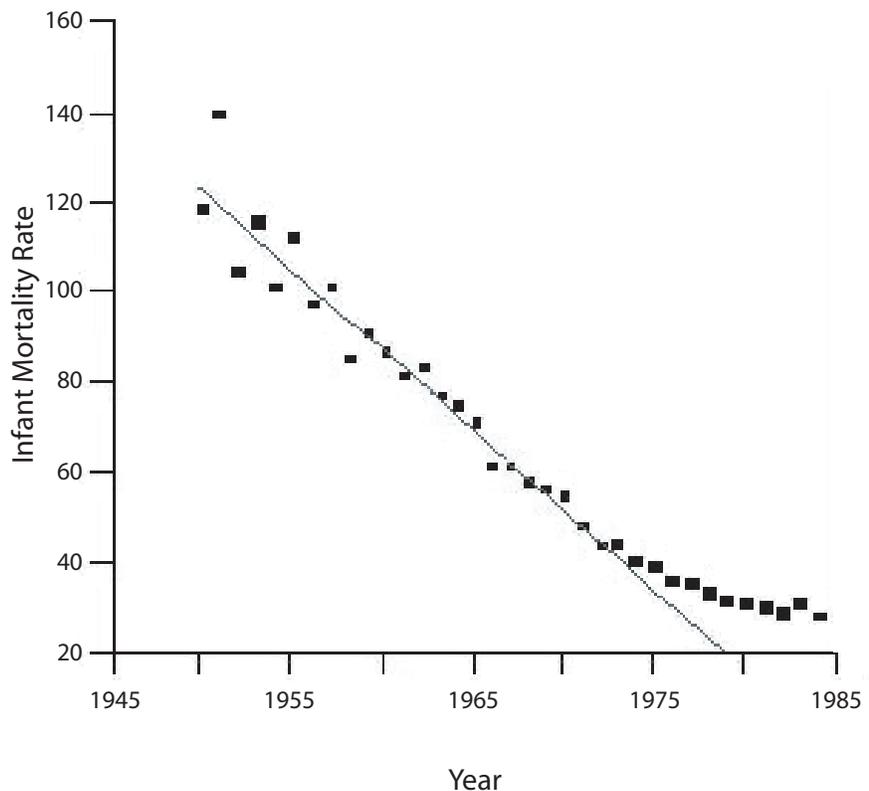
There was also a substantial drop in infant mortality over most of the period from the early

1950s into the 1980s. Figure 1 displays the rates from 1955 through 1984 for the entire Yugoslav population. However, just as striking as the decline, is the stagnation that began some time in the early 1970s and became worse in the early 1980s.¹⁷ The slowing rate of decline occurred at the same time that inflation was increasing and rates of improvement of real income were slowing and then reversing. A similar pattern was observed in each of the republics and autonomous provinces (data not shown).

In addition to infants and children, the elderly were especially susceptible to the ill effects of economic decline and environmental hazards. Mortality rates of

women aged 80 to 84 years increased from 129.1 per 1000 in 1977 to 132.5 per 1000 in 1981, while rates for men of the same age increased from 153.1 per 1000 to 162.9 per 1000 over the same period. For women and men aged 85 years and older, the increases were from 191.8 to 229.1 per 1000 and from 210.8 to 242.7 per 1000, respectively.¹⁸

Finally, a study in central Serbia showed that the rate of decline in deaths resulting from infectious diseases diminished significantly in the period 1987 to 1990 compared with the decline in previous years, attributable to the economic crisis of the 1980s.¹⁹ And a study in Bel-



Source. *Statistical Yearbook of Yugoslavia* (Belgrade: Savezni Zavod za Statistiku, various years).

FIGURE 1—Infant mortality rate (per 1000 live births) by year, Yugoslavia, 1950–1984.

grade showed an increase in all-cause and cardiovascular disease mortality among both women and men from 1975 to 1989.²⁰

However, even with inflation and declining real incomes, there was convergence among the republics, although improvements did not necessarily occur at the same rate. For example, infant mortality rates improved more rapidly in wealthy than poor regions, whereas the reverse was true of productive years of life lost.²¹ Nonetheless, these analyses suggest that the decade before 1991, when Croatia and Slovenia seceded from the Yugoslav federation, was one of deteriorating health, just as was occurring in the Soviet Union before it collapsed.

This deterioration was attributable to the increasing inflation that began in the early 1970s and accelerated during the 1980s, to the erosion of real incomes, to the increased cost of imported pharmaceuticals and medical technologies, and to the withdrawal of government support from the health and social services sector, a condition imposed both by the economic crisis and by the International Monetary Fund when it rescheduled the nation's debt repayment. Nonetheless, no economic or political intervention was able to dampen the secessionist nationalist passions, which by the end of the 1980s had become so inflamed that war was inevitable.

HEALTH DURING THE THIRD BALKAN WAR

So far, I have discussed the small but real health consequences of the political and economic changes that resulted in the secession of Croatia, Slovenia, Macedonia, and Bosnia-Herzegovina from the Yugoslav federation. Those secessions resulted in a war that matches in brutality the 2 previous Balkan wars of 1912 and 1913. What made these wars so brutal was that, like World War II, they were waged against civilians.

Clearly, even civilians in the noncombat zones suffered. In a series of studies, Serbian investigators in Belgrade described the consequences of United Nations (UN) sanctions on the health of the population of Serbia, and particularly of Belgrade.²² Their data also measure the continuing collapse of the Yugoslav dinar, which had made imports of all sorts prohibitively expensive, as indeed they were even before the war. The hardships imposed by further economic collapse, as well, perhaps, as sanctions, has had an increased effect since the late 1980s, as the data in Table 1 illustrate.²³

The top part of Table 1 shows that hospitalization rates declined significantly, particularly for people aged 60 years and older. At the same time, mortality rates of hospitalized patients increased, suggesting that only the very sick were being admitted, that health care worsened as a result of the inability to import needed medications, or both. The bottom part of Table 1 shows that for the total population of Serbia and Montenegro, and particularly for the elderly, mortality rates increased substantially from the

TABLE 1—Hospital Use and Mortality in Serbia and Montenegro, 1985–1992

	1985	1988	1989	1990	1991	1992
Hospital use and hospitalized mortality in Belgrade						
Hospitalization rate per 1000	111.9		104.0	103.5	107.3	96.9
Hospitalization rate per 1000 aged ≥ 60 y	246.5		192.4	189.5	186.1	166.8
Mortality rate per 1000 hospitalized patients	28.3		25.8	29.9	31.7	36.4
Mortality rate per 1000 patients aged ≥ 60 y	74.0		71.5	78.9	86.3	96.6
Mortality from all causes, per 100 000 population						
Belgrade						
All ages		816.3	826.8	889.7	925.2	1026.9
≥ 65 y		5329.7	5349.3	5665.1	5828.3	6571.7
Serbia and Montenegro						
All ages		953.8	963.2	942.9	975.8	1012.2
≥ 65 y		6162.8	6289.7	6187.2	6336.9	6621.6
Serbia						
All ages		972.9	984.2	961.9	996.7	1031.3
≥ 65 y		6247.2	6367.0	6264.2	6415.6	6695.7
Montenegro						
All ages		603.3	628.4	641.9	644.8	709.0
≥ 65 y		4558.5	4810.7	4706.7	4815.2	5180.2

late 1980s through 1992. Again, it is not obvious from the data what the precise reasons are—sanctions, the collapse of the dinar and the inability to purchase needed medications and vaccines, or a combination of both plus a variety of other factors. Another study, of 2 regions in Serbia in late 1993 and early 1994, showed that there had been a reduction in the use of a variety of preventive and curative services owing to an absence of supplies and an inability to pay for services that had previously been provided without charge.²⁴

The economic collapse of the rump state of Yugoslavia had other health-related effects, for as the economy deteriorated, criminal activity increased. In the city of Belgrade, there was a 100% increase in homicides since the prewar period.²⁵ Thus, even far from the combat zone, the mortality of noncombatants increased. But of course it was in the combat zone that the dangers were greatest, particularly when civilians were targeted by the warring parties.

Unlike contemporary civil wars in poorly developed nations, in which infectious diseases have been the leading cause of civilian death, in Bosnia, war-related trauma was the leading cause. Between April 1992 and March 1993, 57% of all mortality in Sarajevo was caused by war injuries compared with 4% to 11% in Somalia between April 1992 and January 1993.²⁶ In Sarajevo in April 1993, the crude monthly mortality rate was 2.9 per 1000, compared with 0.8 per 1000 in 1991. The incidence of infectious diseases, of course, increased in Bosnia owing to an inability to maintain water supplies and sewerage sys-

tems. Perinatal mortality and spontaneous abortions increased, and average birthweight decreased as a result of the inability to maintain prenatal services. Immunization levels declined among children, but no epidemics or evidence of mass starvation occurred.

Despite the deterioration of public health, trauma rather than infectious diseases remained the major cause of death,²⁷ a direct consequence of the policy of ethnic cleansing that justified gang rapes by soldiers,²⁸ the killing of noncombatants, and their forced transfer from one area to another. While all the warring parties engaged in such behavior, UN observers agreed that Bosnian Serbs caused the vast majority of deaths, as well as most of the forced movement of populations, rapes, and destruction of homes and cultural monuments.²⁹

What evidence exists from previous European wars indicates that as a proportion of *all* war-related deaths, civilian deaths (defined as caused by wounds resulting from military equipment) have increased dramatically since the beginning of the 20th century. It is believed that occurrences of such deaths were low in 18th- and 19th-century European wars. In World War I, civilians accounted for 19% of all deaths; in the Spanish Civil War, 50%; in World War II, 48%; in the Korean War, 34%; in the Vietnam War, 48%.³⁰ In the Third Balkan War, the contribution of civilian deaths to the total may have been substantially more than 50%, as the data from Sarajevo suggest. Indeed, in Croatia in 1991 and 1992, the proportion was 64%.³¹ Such high and increasing rates are associated both with the increasing

“Unlike contemporary civil wars in poorly developed nations, in which infectious diseases have been the leading cause of civilian death, in Bosnia, war-related trauma was the leading cause.”

lethality of weapons and with a change in the morality of warfare, which became especially obvious during World War II. Civilians have increasingly been the targets of warfare to both terrorize and demoralize the population and to obliterate the enemy (whether combatant or noncombatant) from the face of the earth.

Thus, the available evidence indicates that the health of certain segments of the Yugoslav population had begun to worsen in the decade and a half before the war as the economy declined and that the deterioration of health continued during the war. There also have been measurable postwar health consequences of the terror and suffering visited upon noncombatants and combatants.³² These, significant in their own right, represent a continuing burden on, and challenge to, health care and public health systems. I turn, however, to some of the consequences that are not the direct result of war trauma to individuals.

THE AFTERMATH OF WAR

Until the late 1980s, measures of well-being were converging among the republics and regions of Yugoslavia. The breakup of the country changed all that. In what is now the rump state of Yugoslavia, known as Serbia and Montenegro, income dropped by more than

50% from 1981 to 1999. In constant 1994 dinars, per capita income was 4820 dinars in 1981, 3894 dinars in 1991, and 1887 dinars in 1999.³³

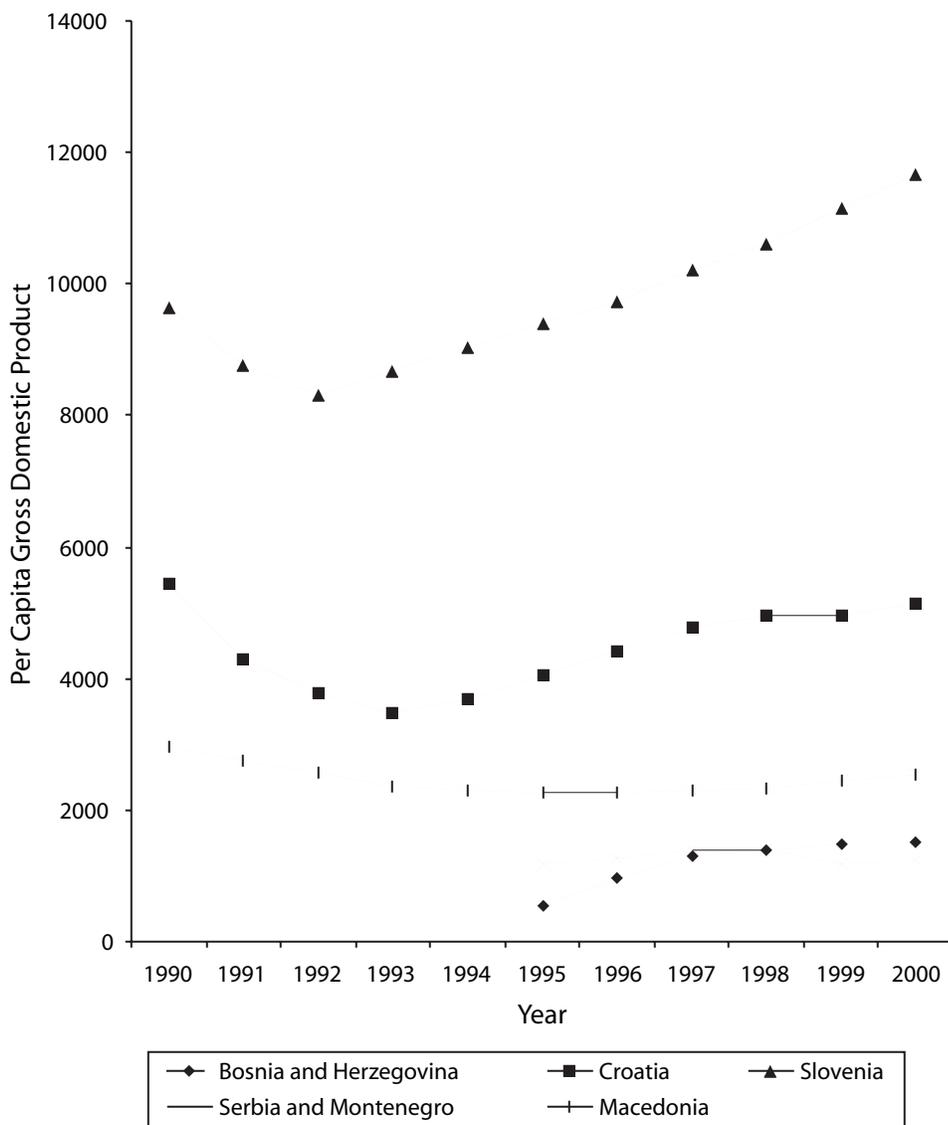
Figure 2 tells an equally dramatic story. Income declined or stagnated in Macedonia, Serbia and Montenegro, and Bosnia. In Croatia and Slovenia, where income was high to begin with,

it improved substantially after a decline in 1991 and 1992. Indeed, the improvement in Slovenia has been extraordinary. As a consequence of secession, war, and sanctions, there was dramatic divergence among the countries that composed the former Yugoslavia. Some got poorer, some stagnated, and others got richer.

Although life expectancy data from the 1990s are highly suspect owing to the turmoil of war and the vagaries of various reporting systems,³⁴ Figure 3 tells roughly the same story as Figure 2. There was rapid convergence of life expectancy through the 1970s, equality and stagnation in the 1980s, and then substantial divergence in the 1990s, with Slovenia moving well ahead of the others.

The conflicts in the early 1990s did not occur on the territory of Serbia and Montenegro, having been limited to Slovenia, Croatia, and Bosnia-Herzegovina. However, in the late 1990s, fighting broke out in Kosovo, leading to the NATO bombing of Serbia. Thus, throughout the decade of the 1990s, Serbia and Montenegro experienced first economic collapse, exacerbated by UN and US sanctions, and then bombing. Only when President Slobodan Milosevic was removed from office in 2000 were the sanctions lifted, although the public health infrastructure remained underfunded and in disarray. It is estimated that sanctions had caused about 20% of the decline in the economy of Serbia and Montenegro.³⁵

The crisis in Bosnia-Herzegovina was different. Fighting had been savage, with the loss of many civilian lives and the purposeful destruction of hospitals and other infrastructure. The Dayton Accords ended the fighting in 1995 and led to the creation of a state with 2 ethnic entities, the Bosnian-Croat Federation and the Republika Srpska (Serbian Republic), each governed separately. There are 13 different jurisdictions, each with its own constitution and with no coordination among them,³⁶ an exam-



Source. World Bank. World Development Indicators [CD-ROM]. Washington, DC: World Bank; 2002.

FIGURE 2—Per capita gross domestic product in 1995 US dollars in countries of the former Yugoslavia, 1990–2000.

ple of balkanization if ever there was one.

After minimal fighting early in the war, Slovenia was left to its own devices. In Croatia, however, Serbs had held about a quarter of the territory and caused horrific damage and loss of life until expelled by Croatian troops in 1995. The Serbs fled to Serbia while hundreds of thousands of Croatian refugees from Bosnia-Herzegovina fled to Croatia. Hundreds of thousands of Kosovars also fled to Macedonia and Albania in 1999,³⁷ and many Serbs living in Kosovo fled to central Serbia. Thus, compounding the death and destruction caused by the fighting were large population movements. All of this caused severe disruption throughout the former Yugoslavia, with the exception of Slovenia.

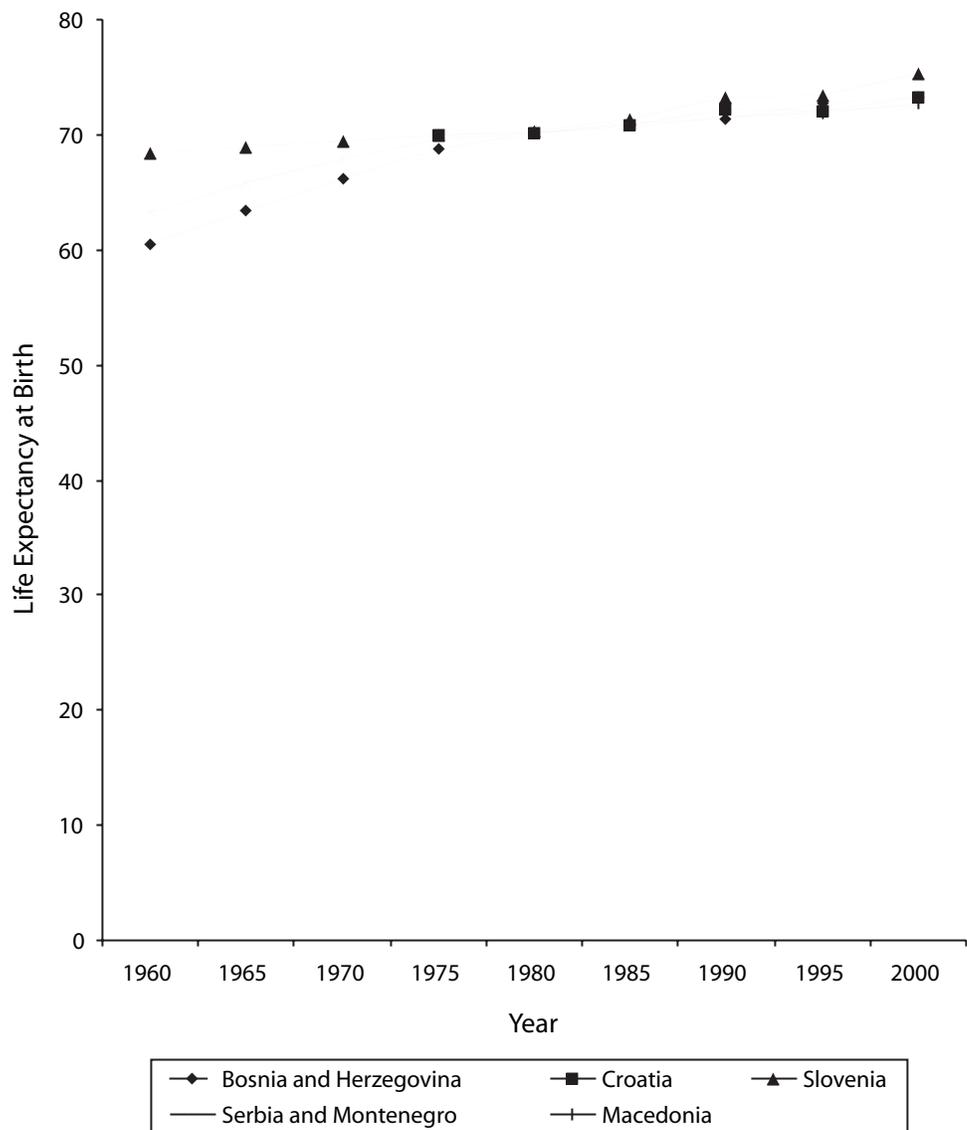
In all the former republics except Slovenia, economic decline, large movements of refugees, and the destruction of much of the health-related infrastructure have put great pressure on the health services, so much so that in every case user fees are being instituted or increased. But economic pressure is not all that accounts for the change. The collapse of socialism has meant that privatization of all varieties of enterprises, including health care, has proceeded more or less rapidly in all the former republics.³⁸ Undoubtedly, the fact that loans from the World Bank are being used to underwrite health system reform is also important, but the extent of the influence is not clear. What is clear is that the plans for reform, their rationale, and the criticisms of the previous system sound remarkably alike across all the republics.

HEALTH CARE SINCE THE BREAKUP OF YUGOSLAVIA

When Yugoslavia split from the other Communist Bloc countries, it developed its own form of what was called self-managing socialism. This was meant to decentralize and democratize decisionmaking in both productive

enterprises and service institutions such as hospitals and health centers. Money for health care came from payroll taxes and was managed by social insurance institutions at the local level. Originally, agricultural workers were excluded, but gradually coverage became universal.

Before the breakup of the country, the effectiveness of the



Source. World Bank. World Development Indicators [CD-ROM]. Washington, DC: World Bank; 2002.

FIGURE 3—Life expectancy at birth in countries of the former Yugoslavia, 1960–2000.

system had been debated. One view was that decentralization had led to inefficient and wasteful use of resources, perpetuated inequalities among regions, and required greater central planning and control to be effective. Another view was that the dysfunctions of the system were the result of too much continuing control by the state, not too little.³⁹ In general, however, the consensus appeared to be that the health care system did provide services, even if inefficiently, to people who would

covered by the state, “regardless of extent.” “The greatest problem was the communist manner of financial management, which lasted for decades. Health services had no fixed prices and were available to everybody, without any financial control. The system was separated from other financial systems, especially financial inspections. Health care was a gift of communism to the people. It was forbidden to ask about its cost, although it was obvious that a very high price would have to be paid for it some day.”⁴⁰

sulted in worsening of the health of the poor.⁴²

LESSONS

The story of Yugoslavia is at odds with the optimistic assumptions that are the legacy of the 19th-century ideas of nationalism, convergent modernization, and demographic and epidemiological progress of which we are the inheritors. Regarding mortality, since the late 18th century there clearly has been convergence between the less devel-

increasingly well integrated into the Western economy, so much so that shortly before the collapse of the country, membership in the European Community was under serious consideration. But that integration was also one of the sources of the collapse, for it was rising oil prices, unwise borrowing from commercial banks, and the failure of Yugoslav products to compete in the world markets that led to the balance of payments crisis. And it was the internal weaknesses of the federation, notably a single-party system of government and the pursuit of a policy that encouraged ethnocultural autonomy within the republics of the federation, that made it unable to withstand and survive the crisis. Indeed, it was the crisis that made those weaknesses at once obvious and fatal.

I have said that divergence in the well-being of people in the new countries that were once Yugoslavia is a distinct possibility. The fact that these newly independent nations are relatively small is not by itself significant, as the low mortality rates of small nations such as the Scandinavian countries and The Netherlands demonstrate. The more significant issue has to do with the great economic and health inequalities that characterized the republics when Yugoslavia was a federation and that will characterize the independent nations into which the federation has fragmented.

Federations are in part a response to the problems encountered by small, weak countries with common borders across which trade and populations move only with great difficulty and to the problems of defense that can be more effectively

“The reforms that have been widely instituted generally mandate a basic level of health services for everyone, with varying levels of co-payments, supplemented by private insurance for services that are not part of the compulsory scheme.”

have otherwise been unable to afford them. Of course, many people who could afford to do so were able to manipulate the system to their advantage, often by paying additional fees to health care providers.

Since the breakup, commentators have been more nearly unanimous in their judgment of the previous system: it was, they assert, wasteful and corrupt. Services were essentially free and were abused by the populace. General practitioners had no inducements to treat most problems themselves, instead referring large numbers of patients to specialists whose services were invariably costly. There were no financial controls on the purchase of medications. “Salaries were fixed independently by workers of each health institution,” leading to inequality among institutions but also to high levels of debt, which were

Those comments were made by the Croatian minister of health in 1994, but many others wrote similarly of the system as it existed before the breakup of the country.⁴¹

The reforms that have been widely instituted generally mandate a basic level of health services for everyone, with varying levels of co-payments, supplemented by private insurance for services that are not part of the compulsory scheme. The result in Croatia, where the consequences of the reforms have been studied most thoroughly, is dissatisfaction on the part of large segments of the public and high proportions of the incomes of poor and middle-class people being spent on health care that used to be free. This spending contributes to growing income inequality, but it is not yet clear whether the increasing cost of care has re-

opened and more developed regions of the world, even though in the 1970s and 1980s the rate of convergence diminished.⁴³

However, divergence in the future is a real possibility, and the story of Yugoslavia, like that of the Soviet Union, illustrates some of the reasons why. They have to do with the deteriorating situation that led up to secession and war and its consequences. In Yugoslavia, as in the Soviet Union and Czechoslovakia, the centripetal forces of political, economic, and military integration were counterbalanced by the centrifugal forces of devolution, nationalism, and ethnocultural self-determination, even in the presence of both institutional and individual “modernization.”

As a federation, Yugoslavia after World War II worked well for more than 4 decades. It worked largely because it was

solved in common than separately. Federations are not all the same, of course, but there are some problems with which they all must cope. Inevitably, there is not perfect equality among the constituent members of any federation, and just as inevitably there will be some redistribution of resources among them—what has been termed horizontal equalization. Along with the problem of vertical equalization (the imbalance between expenditures and revenues at the state and federal levels), this is a major issue they all face, and the rock upon which the Yugoslav federation foundered.

Horizontal equalization poses enormous challenges. On the one hand, federations generally are based on some sort of agreement about the minimum standards beneath which no province or state should fall, implying that some will be taxed more than is returned to them by the federal government and that those in need will receive more than they pay in taxes. On the other hand, if citizens in the relatively well-to-do provinces or states believe they are being unfairly taxed, they will attempt to redress the balance, in the most extreme case by secession.

The economic problem is exacerbated when great cultural differences separate the constituent states or republics. This separation is what happened in Yugoslavia and the Soviet Union. The irony is that the ethnocultural differences that characterized each of them were not the product of deep-seated hatreds that had never disappeared and never would. While national differences clearly existed within each federation, they were exacerbated by policies that each had

pursued as a means of keeping the state intact.

Secession may solve the problem for the well-to-do, although there is no assurance of that. It is likely to prove catastrophic for the poor states, republics, or provinces that are now poor countries without a reasonably assured source of foreign aid equivalent to the domestic aid they received when they were part of a federation. The result regarding health and welfare may very well be worsening conditions for the poor new nations and increasing disparities with the well-to-do nations where once there was increasing similarity.

The lesson of this story is that the convergence of health status is not inevitable. Much depends on the continued existence of states that are able to redistribute resources from wealthy to poor regions and populations. That in turn depends on economic stability at a minimum and preferably growth as well as egalitarian policies to which the vast majority of citizens subscribe. To the degree that ethnic and cultural differences influence resistance to such policies, fragmentation as in Yugoslavia and the Soviet Union is a distinct possibility and with it increasing disparities between the relatively well-off and the poor. ■

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Kenneth Olden, *Master Fencer*

| Valerie J. Brown, MS

When Dr Kenneth Olden steps down this year from his position as director of the National Institute of Environmental Health Sciences (NIEHS) and the National Toxicology Program, he will leave institutions far different from the ones with which he started. He has transformed both of these components of the National Institutes of Health (NIH) from relatively obscure, basic science-oriented organizations into diversified sources not only of basic science but also of an interdisciplinary research agenda, community involvement, and international outreach in environmental health. In his 12 years at the helm, Olden has negotiated the often politically fraught national health infrastructure with the grace and agility of a fencer, pushing his vision not by force but by inspiring and enlisting the support of researchers, patient advocacy groups, and politicians. Although leaving the directorship, he will continue as an NIEHS investigator and has no intention of leaving public service. In fact, his name is in the ring as the next administrator of the Environmental Protection Agency, a job he makes no bones about wanting.

The expansion and diversification of NIEHS were largely attributable to a threefold increase in funding during Olden's tenure.

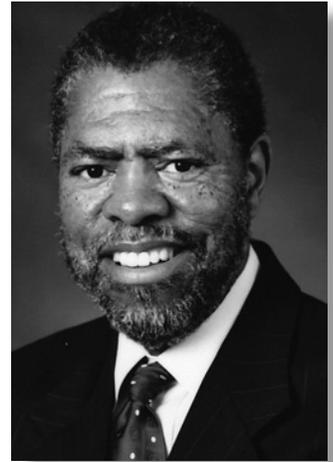
"He has brought about the effective integration of basic research, population-based research, and community outreach and education," as well as new initiatives in toxicogenomics, proteomics, and integrated systems biology, says Raymond Novak, director of the Institute of Environmental Health Sciences at Wayne State University, whose Center in Molecular and Cellular Toxicology with Human Applications is funded by NIEHS.

Olden has also expanded the scope of the NIEHS journal *Environmental Health Perspectives* beyond its role as a peer-reviewed journal. Under Olden, *Environmental Health Perspectives* has become "much more of a people-oriented journal" that disseminates information "to a much broader audience," says Tom Goehl, its editor-in-chief. *Environmental Health Perspectives* now delivers free print copies to developing countries; 40 000 copies are distributed in China, where, Goehl says, they "become rabbit-eared, they're used so much." A Spanish-language edition will be available soon, and *Environmental Health Perspectives* is now an open-access online journal.

Much of Olden's success rests on his ability to bring the best out of those who work for him and to build a constituency

outside the agency. He listens to everybody, from citizens in the Rust Belt who are worried about chemicals in their water supply to intra- and extramural scientists investigating the arcana of endocrine disruption. "He listens to ideas," says Goehl. "He doesn't shut down when a new idea is produced, he asks how we can get that done."

Olden is the first African American to head a division of



“Environmental health is not this discipline or that one. It is an interdisciplinary science. That’s something I’ve brought to the field, to make sure the right people are talking to each other to get these complex issues addressed. That’s what the NIEHS is doing in its road map to get rid of these stovepipe disciplines.”

Kenneth Olden

the NIH. He says his early life is the source of much of his approach to and his success at administration. In the small southern town of Parrottsville, Tenn, it was poverty as much as race that limited both Black and White residents' lives. But, Olden says, "Most of the qualities that have made me a success are the direct consequence of growing up where I grew up. The things that really count for leadership I learned as a kid and I didn't forget them."

When Olden became head of NIEHS in 1991, he immediately started a series of brown bag lunches with scientists and staff. He also began conducting town meetings with everyday citizens around the country and built relationships with patient advocacy groups such as the Children's Health Environmental Coalition. Elizabeth Sword, the coalition's

“During the 6 years that I’ve known him, I have seen a passion for what he does that has arisen, I believe, from all these town meetings. I think it has made him infinitely more effective and a very approachable leader.”

**Elizabeth Sword, executive director,
Children's Health Environmental Coalition**

executive director, says, “Early on, he had made a commitment to raising children’s environmental health on the radar screen and putting some muscle and research dollars behind it.” Theo Colborn, a professor in the Zoology Department at the University of Florida at Gainesville and coauthor of *Our Stolen Future*, a popular-press book on endocrine disruption, says that—unlike many leaders of federal agencies—Olden “always wanted to know what I thought about things.”

Olden remembers the epiphany that sent him down the road to scientific research. It hit him while he was a senior at Knoxville College. As a participant in an interuniversity research program at the University of Tennessee on the other side of town, he visited a laboratory for the first time. “I was thrilled by research,” he says. “I am now 65 years old, and that was the best decision I’ve ever made.”

He earned a bachelor’s degree in biology at Knoxville College, a

master’s in genetics at the University of Michigan, and a doctorate in cell biology and biochemistry at Temple University (with research conducted in absentia at the University of Rochester). He did postdoctoral work and instructed at the Harvard Medical School (while running a dormitory at Radcliffe College with his wife for 4 years) before conducting research at the National Cancer Institute. From 1982 to 1991, he worked at Howard University in several roles, ultimately as director of the Howard University Cancer Center. In 1991, Olden moved to the directorship of NIEHS and the National Toxicology Program, with a concurrent scientific post as chief of the Metastasis Section of the NIEHS Environmental Carcinogenesis Program.

Olden has maintained his research interests throughout his administrative career. Among his many publications are a 1978 paper on glycoproteins in *Cell* that has become one of the 100 most-cited scientific research reports¹ and a 1985 paper in the *Journal of Biological Chemistry* that reversed the 15-year conventional wisdom that secretory proteins are transported via a “conveyor belt.”²

Olden’s early cancer research led him to study the role of glycoproteins in cancer. Working with Ken Yamada and others at the National Cancer Institute, Olden became fascinated with fibronectin, a glycoprotein that promotes the attachment of cells to the extracellular matrix. Because fibronectin disappears from cancer cells, which then metastasize, fibronectin might hold the key to metastasis prevention, thus saving patients’ lives. The team got as far as preventing metastasis in mice but

was unable to do the same thing in humans.³

“We now know the protein is so big it spans the bilayer,” he says. “The tail part is inside [the cell], and when you add something outside, a signal is transferred through the molecule into the tail, and it activates a lot of things inside the cell.” This transmembrane signaling is the focus of his current research, which also includes further investigation into the anticancer potential of swainsonine, an alkaloid (the “loco” component of locoweed) known to be an inhibitor of metastasis and tumor growth.^{4,5} “I’m excited about getting back in the lab,” he says, “and I hold out hope that [blocking signals critical to cancer metastasis] is going to be done some day.”

Olden entered college in the late 1950s, before the civil rights movement and affirmative action. “I’ve not had African American mentoring,” Olden says. “There were so few African Americans in science when I came through.” As a student, Olden himself did not view his African American professors as role models, and it was not until he entered the laboratory at the University of Tennessee that he saw university research as an attractive career. But because he had excellent mentoring throughout his career, he has long made a point of mentoring students of all races and backgrounds, from high schoolers to postdocs.

“He has been a patron, a godfather—he’s been wonderful,” says Freeman Hrabowski, an African American mathematician and president of the University of Maryland, Baltimore County. Charles Wells, director of Environmental Justice/Health Disparities and Public Health Activities at NIEHS, says of Olden, “He’s

one of the few institute directors that would take his lunch period to talk to postdocs and to young people about his career as a scientist. I've seen him go without lunch to mentor not just African Americans but any young people that seek his advice."

In 2000, Olden's name was suggested as the Bush Administration's new director of the Environmental Protection Agency. He didn't survive the cut, but the post may yet be in Olden's future, according to former Republican Representative John Porter of Illinois. Olden testified before Porter on numerous occasions when the latter was chair of the House Appropriations Committee's Subcommittee on Labor, Health and Human Services, Education and Related Agencies.

"There's always the possibility, especially if the president were to be reelected," Porter says. "There's often a large changeover and I think Olden would be high on the list." Porter adds that Olden is "extremely able, very forthcoming, and an excellent director in all respects." Olden is unabashedly enthusiastic about the job, saying the Environmental Protection Agency would benefit from having a scientist at the top. "I'd love to have it," he says. "I can interpret the science correctly and not go beyond what it says and stretch it."

A few years ago at a NIEHS center directors' meeting, the directors gave Olden a "Fencing for Funds" award that recognized his expansion of the NIEHS budget, unaware until the day of the award ceremony that Olden had actually fenced in college. Novak, who helped organize the meeting, says that even Olden's body language while delivering a speech brings fencing to mind, and that "knowing when to jab

and when to duck may be the underlying basis for his ability" to dance through the often cooperative but sometimes competing interests that make up the environmental health community.

The "Fencing for Funding" award is only one of many honors Olden has received; they include election to the Institute of Medicine of the National Academy of Sciences and to the Academy of Toxicological Sciences. "Whatever he does," says Bernard Goldstein, dean of the University of Pittsburgh's Graduate School of Public Health, "we hope that he will remain a spokesperson for the environ-

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"He wasn't the type of leader who just did things to impress people. He did things because they were right and they would change things for all aspects of society, not just those who had clout or influence."

Charles Wells, director, Environmental Justice/Health Disparities and Public Health Activities at NIEHS

ment and for a public health and scientific approach to environmental protection. We're going to miss him, there's no question about it." ■

About the Author

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Ethics in Public Health Research

Human Testing of Pesticides: Ethical and Scientific Considerations

| Alan H. Lockwood, MD

I reviewed ethical and scientific aspects of 6 human pesticide-dosing studies submitted to the Environmental Protection Agency (EPA) for consideration during the pesticide reregistration process. All had serious ethical or scientific deficiencies—or both—including unacceptable informed consent procedures, unmanaged financial conflicts of interest, inadequate statistical power, inappropriate test methods and endpoints, and distorted results.

Given today's knowledge of the effects of pesticides, there is no assurance that any such study can be completely free of short-term risks, long-term risks, or both. Therefore, there is no basis for allowing pesticide studies to continue or for using them during the pesticide reregistration process. An EPA committee that is free from political and financial conflicts of interest should review this practice. (*Am J Public Health*. 2004;94:1908–1916)

PESTICIDES ARE DEFINED BY the Environmental Protection Agency (EPA) as “substances used to prevent, destroy, repel or mitigate any pest. . . .”¹ Their

widespread use has both improved crop yields and helped control insects and other pests, which has subsequently led to improvements in health. However, they are inherently toxic and have been linked to a broad range of human health problems, including cancer, damage to the central and peripheral nervous system, and interference with neurodevelopment and the endocrine system.

The federal government regulates pesticide use with 2 major pieces of legislation: the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) and the Federal Food, Drug, and Cosmetic Act (FFDCA). Because of concerns that children may be particularly vulnerable to the effects of pesticides, the US Congress requested the National Academy of Sciences (NAS) to study policy and scientific issues related to pesticides in the diets of infants and children.² The result led to unanimous Congressional action that amended FIFRA with the Food Quality Protection Act of 1996 (FQPA). Among its provisions, FQPA added a children's safety factor to existing pesticide tolerances, where tolerance is defined as the

maximum concentration of a pesticide residue permitted in food, and a requirement that all pesticides be reregistered.

This move led to experiments that may affect tolerances set during reregistration, including controversial experiments in which human volunteers were given pesticides to determine a “no observable effect level” (NOEL) or a “no observable adverse effect level” (NOAEL). Before FQPA was enacted, tolerances were set by dividing the NOEL by an uncertainty factor that had 2 elements: an interspecies factor of 10 to account for the possibility that humans are more sensitive than the test animal and an intraspecies uncertainty factor of 10 to account for intraspecies variations. With FQPA, the provision of a children's safety factor added another factor of 10 to the uncertainty factor, which yields a total uncertainty factor of 1000 for children and 100 for the general population. By establishing a NOEL for humans, the interspecies uncertainty factor would become unnecessary and would change the total uncertainty factor to 100 for children and 10 for the general population, with

a concomitant effect on tolerances.

The controversies triggered by human testing have resulted in at least 3 major reports. However, close reading of these reports strongly suggests that the authors did not have access to the detailed protocols and reports that described the human studies submitted to the EPA by the pesticide manufacturers and the contract research organizations they employed to conduct the tests. The most recent of these was commissioned by the EPA and was conducted by a committee appointed by the National Research Council of the NAS.³ The committee concluded that intentional-dosing studies among humans can be conducted and can be used for EPA regulatory purposes if stringent conditions are met. Although it could not envision a circumstance in which the deliberate dosing of children would be permissible, the committee failed to recommend prohibiting this practice. Two other groups have examined the ethical aspects of these experiments. In 2000, an EPA subcommittee reported it “in general would not support human experimentation prima-



rily to determine a NOAEL.^{4(p11)} The terms *in general* and *primarily* were seen as loopholes that would permit testing. A minority report stated that the final report was a “distorted and diluted” version of their deliberations that “minimiz[ed] the risks to humans from intentional experimental dosing, and de-emphasiz[ed] the salient issue: that no limited human study will provide information about safe levels of intake of pesticides by humans, especially children.”^{4(pC1)} In another report, Oleskey et al. wrote an emphatic rejection: “NOEL studies inherently violate various ethical guidelines.”^{5(p919)} They recommended that “no results obtained from any NOEL studies can be considered in the formulation of exposure guidelines by EPA.”^{5(p919)}

To better understand issues related to human testing, I obtained reports about testing from the EPA under the Freedom of Information Act; 6 reports from 1992 to 1999 were provided by the agency.^{6–11} A synopsis is shown in Tables 1 and 2. I evaluated the reports to determine compliance with the ethical principles contained in whichever version of the Declaration of Helsinki¹² was in effect at the time of each study and to evaluate the adequacy of the experimental design and the interpretation of the results. Because all the studies claimed use of the Declaration of Helsinki as the ethical standard, and because none of these studies claimed use of the Common Rule, the latter was not used as an evaluation criterion.

RESULTS

Adherence to the Declaration(s) of Helsinki

Study purpose. Ethical studies begin with a defined statement of purpose. The declaration states that “research . . . must . . . improve diagnostic, therapeutic and prophylactic procedures and the understanding of . . . disease” and “the interests of science and society should never take precedence over the . . . well-being of the subject.”¹²

Two of the investigations I reviewed were designed to determine the NOEL,^{9,10} and 3 of them claim to have determined a NOEL.^{6–8} The sixth investigation was designed to establish “safety and tolerability” of the pesticide tested.¹¹ Because none of these reports have appeared in the scientific literature, they were apparently not intended to advance generalizable scientific knowledge (a MEDLINE search on April 16, 2004, of the name of first author on each of the 6 reports retrieved 35 references; however, none were related to the reports submitted to the EPA).

Protocol review and approval. The declaration states that protocols must be approved by committees that are “independent of the investigator, the sponsor or any other kind of undue influence.”¹² All 6 of the protocols were reviewed and were approved by an ethics committee, usually after minor revisions. However, all of the ethics committees were part of the contract research organization that was paid by the sponsor to perform the study. Poten-

tial conflicts of interest were not addressed.

The informed consent process.

Three protocols included an informed consent document. Of these, the aldicarb consent was the least satisfactory. For example, it refers to aldicarb only as “the compound under test.”^{11(p26)} Although the consent states that “I have been given a full explanation of . . . any reasonably foreseeable untoward effects,”^{11(p65)} the nature of the study, the participant’s role, and the risks were not listed.

The azinphos methyl study also refers to the pesticide as “the compound under test.” Risks and requirements are listed in an “information document given to me” that states “large increases of acetylcholine in the nervous system can cause increased salivation, sweating, reduced blood pressure, nausea, vomiting and stomach cramps.” It fails to mention weakness, respiratory failure, and death. Although the subject was “free to withdraw from the study at any time without needing to justify my decision,” it goes on to say that if a participant withdraws for nonmedical reasons, “the payment to be made [£1500], *if any*, shall be at the discretion of the supervising doctor” (emphasis added).^{9(Appendix A)} The declaration prohibits coercion.

The chlorpyrifos consent is marred by the first sentences in the side effects statement: “Cholinesterase inhibitors are a widely study [*sic*] class of chemicals. Low doses of these agents have been shown to improve performance on numerous tests of mental function.”^{9(p128)} Several drugs that treat Alzheimer

disease are acetylcholinesterase (AChE) inhibitors. However, none are organophosphates. It is misleading to imply participation might improve intellectual function.

Evaluation of risk–benefit considerations. According to the declaration, human studies “should be based on adequately performed laboratory and animal experimentation and on . . . knowledge of the scientific literature.”¹² Investigators must supply this information to enable the institutional review board to make an informed decision. While all 6 studies contained detailed information about the *mechanics* of their performance, information that justifies the studies and that allows an institutional review board to evaluate the risk–benefit considerations varies substantially. The 3 dichlorvos reports do not include this information. The aldicarb study mentioned exposures that have “given rise to alleged intoxication,” several animal studies, and a previous human study. It concluded with the statement, “In the 17 years of registered use of TEMIK [aldicarb], 193 cases of alleged overexposure have been reported. All . . . resulted from misuse of the product . . .”^{11(p50)} This ignored a report of more than 1000 cases that resulted in 17 hospitalizations and stillbirths by 2 of the 47 pregnant women.¹³ The azinphos methyl study mentions toxicological studies in animals and several unpublished human studies. The chlorpyrifos study mentioned animal studies without summarizing the data, and 1 published and 1 unpub-



TABLE 1—Design, Statistical Methods, and Ethical Standards

Pesticide, Class, Location of Study	Design	Doses Administered (all orally), Number Dosed, Gender	Sample Interval	Analytical Method	Ethical Standard Claimed	Written Informed Consent Available
Aldicarb, carbamate, Inveresk Clinical Research, Edinburgh, Scotland	Double-blind, placebo-controlled, single dose	Placebo, 16M, 6F 0.01 mg/kg, 8M 0.025 mg/kg, 8M, 4F 0.05 mg/kg, 8M, 4F 0.075 mg/kg, 4M	(Hours) -16, -3, 0 predose 1, 2, 4, 6, 8, 21 postdose	Mean of 3 predose vs postdose ANOVA (treatment, time, treatment-time interaction)	Declaration of Helsinki, 1989	Yes
Dichlorvos, organophosphate, Medval Ltd, University of Manchester, UK	Open label, single dose	70 mg, 6M	(Days) 0, 1, 5 or 6, 7, 14	Within group: pre vs each time, paired <i>t</i> test within subject: permutation	Declaration of Helsinki, 1989	No, but protocol states “volunteers completed a consent form.” ^{8(p12)}
Dichlorvos organophosphate, Medval Ltd, University of Manchester, UK	Single-blind, placebo-controlled, randomized	Placebo, 3M OR 7 mg daily for 21 days, 6M	(Days) 0, 1, 2, 4, 7, 9, 11, 14, 16, 18, 25, 28, 29, or 30	Group means at each time by repeated measures ANOVA; pre vs post at each time by paired <i>t</i> test; within-subject, permutation	Declaration of Helsinki, 1989	No, but protocol states “volunteers completed a consent form.” ^{7(p12)}
Dichlorvos, organophosphate, Medval Ltd, University of Manchester, UK	2-phase, open label, placebo-controlled	Phase 1: day 1, 35 mg 4M day 8, placebo, 4M, day 14, 35 mg, 6M Phase 2: 2 week hiatus followed by 21 mg daily up to 15 days, 6M	(Days) pre-dose 3 measures in 7 days prior to dose 1 Phase 1: 1, 3, 5, 7 or 8 days after dose or placebo Phase 2: 3, 5, 8, 10, 12, 15, 17, 19, 22, 24, 26, 29, 33, 40, 47, 54 days after initial dose	Between-group, pre vs post dose group means by paired <i>t</i> test within-subject, permutation test	Declaration of Helsinki, 1989	No, but protocol states “volunteers completed a consent form.” ^{6(p14)}
Azinphos methyl organophosphate, Inveresk Research, Tranent, Scotland	Randomized, double-blind, placebo-controlled, repeat dose Declaration of Helsinki, 1996	Placebo, 4 M 0.25 mg/kg daily for 28 days, 8M	Pre-dose, 8 determinations over 2 weeks; before dose on each day and 4 hours post dose on days 1, 2, 3, 4, 5, 7, 10, 14, 17, 21, 28	Repeated measures ANOVA (treatment, time, treatment time interaction) pesticide vs placebo, pairwise at each time (error variance from ANOVA)	Declaration of Helsinki, 1996	Yes
Chlorpyrifos organophosphate, MDS Harris, Lincoln, Nebraska	2-phase, single dose randomized, double-blind, placebo-controlled	Phase 1: placebo, 6M, 6F 0.5 mg/kg, 6M, 6F 1.0 mg/kg, 6M, 6F Phase 2: placebo, 6M, 6F 2.0 mg/kg, 6M, 6F	(Hours) Phase 1 and 2: -10, 0, pretreatment and 2, 4, 8, 12, 24, 36, 48, 72, 96, 120, 144, 168 posttreatment	Truncated at 96 h for phase 1 and 48 h for phase 2 and analyzed separately by univariate repeated measures ANOVA and fixed effects modeling	Declaration of Helsinki, 1996, 21 CFR parts 50, 56, 321 [sic]	Yes

Note. ANOVA = analysis of variance; M = males; F = females.

In phase 2 of the 2-phase dichlorvos study, boldface numbers in sample interval column denote days on which subjects were dosed.



TABLE 2—Human Testing of Pesticides, Study Objectives, and Additional Design Considerations

Pesticide	Study Objectives	Variables Measured (including data not specified in study objectives)	Statistical Test Applied to Variable	Findings, Conclusion(s)
Aldicarb	Determine general tolerance to various doses	Vital signs, pulmonary function, salivation, pupil size , ECG, clinical signs (nausea, vomiting, sweating, diarrhea, abdominal cramps, slurred speech)	ANCOVA for bolded items at left, none specified for others	45% reduction in AChE at highest dose, "clinical no effect level . . . is . . . 0.05 mg/kg" ^{11(p8)}
	Determine effect on plasma and RBC AChE	Plasma and RBC AChE	ANCOVA	
Dichlorvos, single dose	Assess effect on RBC AChE	RBC AChE	Paired <i>t</i> test pre vs post dose means	Significant effect at day 5,6, and 14 in group analysis. Five of 6 had significant effect on individual analysis NOEL established at 70 mg (approximately 1 mg/kg).
Dichlorvos, 7 mg daily for 21 days	Assess effect on RBC AChE	Symptoms reported by volunteers	None specified	Significant reduction on all dates after 10 days of dosing. "Results from this study can unequivocally establish a NOEL at 7 mg dichlorvos per day . . . following repeat administration for 21 days." ^{6(p19)}
		RBC AChE	Repeated measures ANOVA	
Dichlorvos, 2 phase	Assess effect on RBC AChE after single and multiple doses	Symptoms reported by volunteers	None specified	2 of 6 subjects withdrawn because of AChE depressions, 2 more met withdrawal criteria on last day. Significant reductions in AChE from day 5–33 after 15 days of dosing. "NOEL established at or close to 21 mg . . . approximately 0.3 mg/kg . . ." ^{5(p24)}
		RBC AChE	Paired <i>t</i> test pre vs post dose means	
		Symptom form completed by volunteer	None specified	
Azinphos methyl	Establish recommended daily intake for chronic dietary exposure	None	None specified	
	Determine NOEL for plasma and RBC AChE	Plasma and RBC AChE	Repeated measures ANOVA, paired <i>t</i> placebo vs agent at each time	Significant increase in inhibition (paired <i>t</i>) at 4 of 24 time points for plasma AChE and 2 of 24 time points for RBC AChE. ^a
	Conduct risk assessment and obtain information for biological monitoring	Adverse events coded using World Health Organization terminology	None specified	Repeat doses of 0.25 mg/kg were safe
Chlorpyrifos	Determine NOEL for RBC AChE	RBC AChE	ANOVA	NOEL for signs and symptoms was 2.0 mg/kg body weight
		Signs and symptoms coded using <i>COSTART Adverse Event Dictionary</i> , 5th Edition	None specified	

Note. ANCOVA = analysis of covariance; ANOVA = analysis of variance; NOEL = no observable effect level; RBC = red blood cell; AChE = acetylcholinesterase; ECG = electrocardiogram.

^aFor each of the 22 time points, the azinphos methyl group had greater inhibition of plasma AChE than placebo; data not analyzed or commented on by investigators. For RBC AChE, 6 of the 12 values were higher.



lished human study. There is no indication that institutional review boards requested additional information before approving the studies.

Scientific Considerations

Experimental design and accurate reporting of results. Because it is unethical to perform studies of poor scientific quality, this area of inquiry bridges the closely related elements of ethics and science. Information about methods, variables measured, statistical tests, and conclusions is shown in Table 2.

A power analysis to define the proper size of study group(s) is an essential part of the design. If too many participants are enrolled, the excess will be subjected to unnecessary risk. If too few are enrolled, the investigator risks erroneous acceptance of the null hypothesis. Underpowered studies are inconclusive, and all participants in an underpowered study will have been exposed to risk unnecessarily. All of these studies were underpowered.⁴

All 6 investigations studied young healthy adults, the population least likely to be affected by pesticides. None performed preenrollment pesticide exposure studies, and only 1, the chlorpyrifos study, measured paroxonase levels. Low paroxonase levels increase the sensitivity to some organophosphates, including chlorpyrifos.¹⁴ There is no evidence that paroxonase activity was a selection criterion or affected the analysis or interpretation of the results. These data cannot be generalized to children, the focus of FQPA, and

probably cannot be generalized to the general population.

The declaration states, “The physician is obliged to preserve the accuracy of the results.”¹² Although this generally refers to publication in biomedical literature,¹⁵ it also should apply to these reports. In each study, the investigators focused their statistical evaluations on red cell and plasma AChE activity. They then treated this as a biological marker of exposure devoid of clinical relevance. After detecting significant AChE effects, they concluded that they had established a NOEL. However, as shown in Table 2, few protocols used rigorous methods to collect and evaluate any data other than AChE activity. Thus, it is not clear how they justified the NOEL conclusion.

The aldicarb study has the most appropriate statement: “Due to the multiplicity and investigational nature of these analyses, the observed p-values should be used for descriptive purposes rather than formal hypothesis testing.”^{11(p24)} This minimizes the investigators’ AChE findings. However, they then proceeded to claim that “the NOEL for clinical signs is . . . 0.05 mg/kg”^{11(p36)} because they observed “definite” evidence of toxicity in 1 subject who was given 0.06 mg/kg. This assertion was made in the absence of a prospective strategy for collecting and applying statistical analyses to relevant data.

The most egregious distortion was found in the 2-phase 21-mg/day dichlorvos study in which AChE activity reached the with-

drawal criterion in 2 participants on day 12 and 2 more on day 15. Yet, the investigators concluded that a NOEL level was established “at or close to 21 mg dichlorvos following repeated daily oral administration.”^{6(p11)} They do not justify reaching this conclusion.

Adherence to other laws and regulations. None of the 6 protocols provided evidence of compliance with regulations that govern the administration of chemicals or drugs to human participants. Although the chlorpyrifos study, which was conducted in Nebraska, claims compliance with “21 CFR [Code of Federal Regulations] parts 50, 56 and 321 [sic],”^{9(p6)} it fails to reference an investigative new drug application (an application to the Food and Drug Administration requesting permission to administer a drug, chemical, or test compound to a research participant) made to the Food and Drug Administration (FDA). The chlorpyrifos used in this study and the insecticides used in the other studies appear to be shelf chemicals—chemicals that can be purchased “off the shelf” from a commercial supplier versus chemicals that must be synthesized de novo by a small custom synthesis process. Five of the studies were conducted outside the United States and failed to reference adherence to the regulations of federal FDA-equivalent agencies.

DISCUSSION

I have provided evidence for departures from the ethical standards in effect at the time studies

were conducted. The studies reviewed also had inadequate designs, and there were biases in the interpretation of data. The EPA must decide whether or how to use these submissions. This article is designed to inform the discussion and the debate that will occur during that process and to assist any associated rulemaking.

Voluntary informed consent is the core of contemporary ethical guidance, including the Nuremberg Code, the Belmont Report, the Common Rule, and the Declaration of Helsinki. This means that there should be an explanation of the aims, methods, sources of funding, possible conflicts of interest, and anticipated risks and benefits of a study. The study itself must be scientifically acceptable.

Because all 6 studies have been submitted to the EPA and have not been published in any form that is retrievable by MEDLINE, there is little doubt about their real purpose—the production of data that will be used to affect the pesticide regulatory process. This was not revealed to the study participants. Unacceptable deficiencies in the consent documents (e.g., failure to identify the test compound as a pesticide), inclusion of statements that are potentially coercive, misleading statements about the effects, and a failure to identify the source of funding raise serious doubts as to whether the participant’s signatures were a reasonable reflection of informed voluntary consent.

All the studies included evidence of an unmanaged conflict of interest. The institutional review boards and the investigators



were all part of the same organization. Conflicts of interest have been central to the critiques of several recent studies that involved human participants. The most notable of these focused on the death of Jesse Gelsinger during a phase-I clinical trial of a gene therapy technique.¹⁵ Explicit statements about human subject protection and conflicts of interest are now required by most medical journals,¹⁶ and a recent NAS publication urged the development of “distinct mechanisms for the initial focused reviews of scientific and financial conflicts of interest . . . that should precede and inform”^{15(p11)} reviews by institutional review boards.¹⁵ These policies should be applied to studies submitted to the EPA.

Ascertaining and weighing risk against potential benefit is perhaps the most difficult yet most important task for institutional review boards. The Declaration of Helsinki states that human studies “should be based on adequately performed laboratory and animal experimentation and on a thorough knowledge of the scientific literature.”¹² The reports I reviewed are remarkably devoid of this information. An April 23, 2004, MEDLINE search of the term “pesticide, organophosphates” (restricted to the subtopics poisoning, adverse effects, and toxicity in humans and written in English) yielded 208 articles that were published between 1987 and 1996 and an additional 253 that were published between 1997 and 2004. Although the institutional review boards could have asked for ad-

ditional data from the investigators, there is no indication that they did so before approving the studies. This may be a manifestation of the conflict of interest or a lack of expertise and experience on the part of the members of the institutional review boards.

Safety monitoring consisted largely of serial measurements of vital signs and standard blood chemistries and the use of adverse-event recording forms. Each of the studies appears to have been performed over a short period of time—the dates on the 3 dichlorvos reports span only 3 weeks—which suggests that the studies may have been designed, approved, and executed as a group. Although inclusion and exclusion criteria were specified, and there were withdrawal criteria for some, there was no evidence of active oversight by the institutional review boards. In the case of the 2-phase dichlorvos study in which AChE activity reached the withdrawal criterion in 4 of the 6 dosed participants, there is no evidence that the investigators or the institutional review board considered halting the study. Post-study monitoring of participants in all 6 studies was limited to the time during which AChE activity was expected to return to normal.

It is important to consider design omissions in addition to the deficiencies I have discussed. In studies of chemicals that act on the central nervous system, it is essential to employ tests that are highly sensitive to small differences in brain function. Neuropsychological and electrophysiological tests do just that, and they have been used widely in

studies of mercury exposure and other toxicants¹⁷ and to detect minimal brain dysfunction among patients who have cirrhosis of the liver.¹⁸ In another relevant study, neuropsychological tests were combined with positron emission tomographic scans of patients who appeared to be clinically normal.¹⁹ The researchers found unsuspected deficits in performance on the neuropsychological tests that were correlated with focal reductions in cerebral glucose metabolism. None of the 6 studies I reviewed used tests of this nature. Thus, the conclusions that there were no biologically significant effects are unsupported by rigorous preplanned testing of the type necessary to detect small effects. This may be the most important, and the least appreciated, defect in the design of these studies.

A recent NAS report that concluded that human pesticide testing was permissible contained important qualifiers—the studies should be approached with the “utmost caution and care”^{3(p4)} and were permissible only if there is a “reasonable certainty that participants will experience no adverse effects.”^{3(p5)} In the studies I reviewed, there were no plans for long-term monitoring or for any consideration that there might be delayed or long-term effects. This possibility must be considered because of current knowledge about pesticides.

The discovery that parkinsonism can be caused by the paraquat lookalike MPTP (1-methyl-4-phenyl-1,2,3,6-tetrahydropyridine) led to studies that identified pesticide exposure as a risk factor

for the development of parkinsonism.²⁰ These epidemiological studies have been supplemented by the development of animal models of parkinsonism. Animals that were fed rotenone²¹ or a combination of paraquat and maneb²² exhibited behavioral signs similar to Parkinson’s disease among humans and had neuropathological findings that are typical of the disorder. Two findings are particularly important. First, the combination of maneb and paraquat yielded an effect that was greater than the added effects of separate administration.²² This finding is important to consider in the context of data from the Centers for Disease Control and Prevention that document exposure to multiple pesticides with higher burdens among children.²³ Second, early-life exposure to these pesticides sensitized the animals to the effects of a second exposure during adulthood.²⁴ Occupational exposure to organophosphates may cause the development of a peripheral neuropathy or impairments of mood and visual-spatial function.²⁵ None of the 6 studies considered the development of parkinsonism or other neurological conditions as a risk.

Other recent data show that chlorpyrifos dosing at levels that do not alter brain AChE activity affect the calcium-cyclic adenosine monophosphate response element binding protein, a protein important to brain development.²⁶ This may account for reduced birthweights and head circumferences among children who were born to pesticide-exposed mothers.^{27,28}



Neurotoxicological data make it impossible to assure a potential pesticide-dosing study participant that there is no risk for the development of neurological injury.

The motivation behind industry-sponsored human-dosing studies is clear: the industries want to abolish, or at least reduce, the interspecies uncertainty factor and thereby allow the EPA to accept higher tolerances.²⁹ The motivation to press for higher tolerances is more apparent after a review of some of the findings from a recent EPA organophosphate risk assessment.³⁰ In the assessment, the EPA estimated composite margins of exposure for all of the organophosphates among children and adults of

various ages who live in different parts of the country. The margins of exposure were calculated by dividing a measure of a minimal effect (technically, the point of departure) by the exposure to all organophosphates, which were summed for all routes. Somewhat paradoxically, as the exposure decreases and the margin of exposure increases, the apparent risk decreases. Thus, a high margin of exposure is an indication of low apparent risk, and a low margin of exposure is an indication of higher risk. In the absence of NOEL data for humans, the point of departure used for the margin-of-exposure calculations was based on animal experimentation and was defined

as the amount of various organophosphates required to inhibit brain AChE activity by 10%, a level that may affect brain development. In Figure 1, daily margins of exposure are shown for the most highly exposed children aged 1 to 2 years in the northeast–north-central region of the United States. Margin-of-exposure data are corrected for the tentatively assigned FQPA children's uncertainty factors, which ranged from 1 to 3. When the current uncertainty factors are used, the target margin of exposure is 100. As shown in Figure 1, the most highly exposed children—those at the 99.9th percentile—had margins of exposure below this target.

Abolition of the interspecies uncertainty factor would lower the target margin of exposure to 10, and the most highly exposed children would then have margins of exposure higher than the target. However, this apparent risk reduction would not change the actual risk or exposure. Dichlorvos accounts for almost all the total organophosphate exposure among the highly exposed group.³⁰ It is undoubtedly no coincidence that dichlorvos was the test substance in 3 of the tests I reviewed. It also is worth noting that if the FQPA children's safety factor were raised from 3 to 10, and if other uncertainty factors were preserved, then 5% of all children aged 1 to 2 years would have margins of exposure lower than the target, which would be raised to just over 300.

CONCLUSIONS

Two of the 3 committees that evaluated the ethics of human pesticide-dosing studies have concluded that human pesticide-dosing studies pose serious ethical concerns, and the third committee set conditions that would apparently protect study participants. However, my empirical examination of 6 studies submitted to the EPA shows that these protections were not achieved and are probably not achievable. Hence, these tests should not be conducted, and the EPA should rely on other data during the pesticide reregistration process.

Human-dosing studies have failed to meet widely accepted ethical standards for the conduct of research. The studies I re-

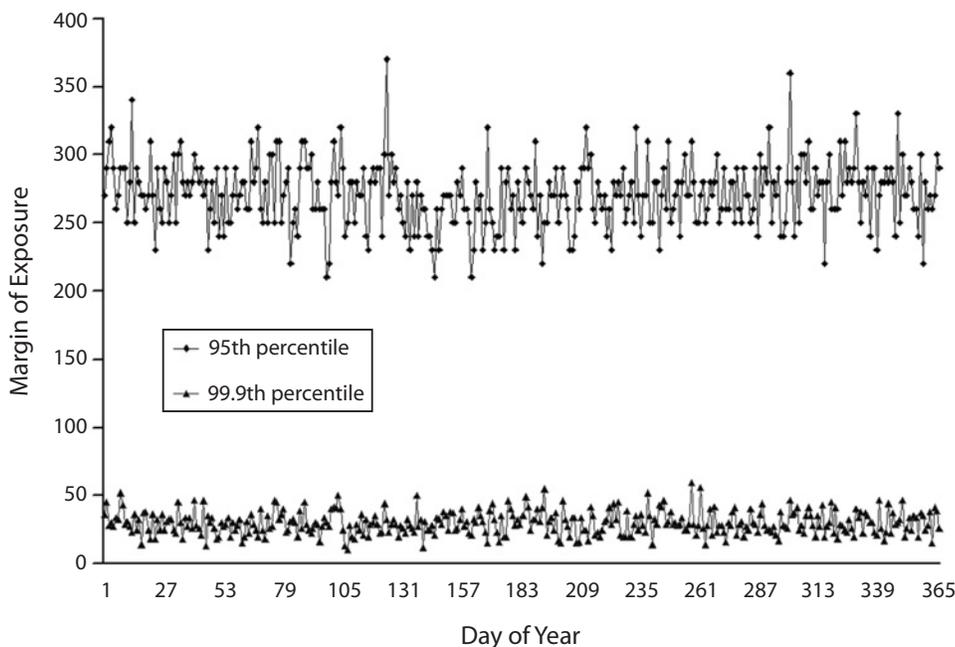


FIGURE 1—Daily margins of exposure at the 99.9th and 95th percentiles of exposure to organophosphates among children aged 1 to 2 years who lived in the northeast–north-central region of the United States.^{29,34}



viewed are all flawed by ethical lapses and poor design, particularly with regard to low statistical power, inadequate test methods, and endpoints that fail to detect small effects on the central nervous system. Therefore, the EPA should not rely on these data during the pesticide reregistration process. In particular, these data should not form the basis for the abolition or the alteration of the interspecies uncertainty factor, a decision that would benefit the pesticide industry financially. To accept these studies would open the door to other poorly conducted studies and would violate the principle that those who engage in unethical activity should not reap rewards.³¹

The EPA should promulgate rules that allow it to convene an in-house ethics review panel that is free of financial conflicts of interest and political influence^{32,33,34} and that is charged with the task of deciding the fate of these and similar studies. ■

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Human Participant Protection

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Occupational Health Research in Developing Countries: A Partner for Social Justice

| Iman A. Nuwayhid, MD, DrPH

Occupational health remains neglected in developing countries because of competing social, economic, and political challenges. Occupational health research in developing countries should recognize the social and political context of work relations, especially the fact that the majority of developing countries lack the political mechanisms to translate scientific findings into effective policies.

Researchers in the developing world can achieve tangible progress in promoting occupational health only if they end their professional isolation and examine occupational health in the broader context of social justice and national development in alliance with researchers from other disciplines. An occupational health research paradigm in developing countries should focus less on the workplace and more on the worker in his or her social context. (*Am J Public Health*. 2004; 94:1916–1921)

HEALTH AND SAFETY

innovations in the workplace,

with low-cost and locally relevant solutions, have been initiated in several developing countries.^{1–3} However, occupational health remains neglected in most developing countries under the pressure of overwhelming social, economic, and political challenges.^{4–6} The traditional workplace-oriented occupational health has proven to be insufficient in the developing world, and tangible progress in occupational health can be achieved only by linking occupational health to the broader context of social justice and national development.^{7–10}

In this article, I describe the history and current state of occupational health in industrialized countries to argue that occupational health researchers in developing countries must focus less on the workplace and more on the worker and the worker's social context in which workplace practices are embedded. Leading occupational health research issues are grouped into 2 domains: an internal domain, which focuses on the workplace (microenvironment), and an

external–contextual domain, which examines the wider social and global issues. Figure 1 lists examples of issues that are addressed in each domain.

LESSONS FROM THE INDUSTRIALIZED WORLD

A striking characteristic of occupational health in the industrialized world, and a message frequently disseminated in developing countries, is the contribution of science to progress in occupational health through data collection, ongoing assessment of problems, and innovative technological solutions.¹¹ However, what is rarely mentioned is the presence in developed countries of a political mechanism that mediates the translation of scientific findings into policies and regulations that are enforced by specialized agencies. In fact, very little progress in occupational health has been or can be achieved without such a mechanism.

The history of occupational health in the United States and other industrially developed

countries shows that progress has not been linear; occupational health has been influenced primarily by events outside the field, namely social movements and changes in the delivery of health care and perception of health.^{11–14} Setbacks and regressions caused by changes in the political mood and the popular attitude toward work-related risks are not infrequent.^{12,15} Nevertheless, the occupational health community has succeeded, even in less favorable times, in addressing occupational health issues by participating in a process of risk assessment and risk management that “determines” the validity and strength of scientific findings versus the economic, technological, and sociopolitical feasibility of intervention.¹⁶

Occupational health researchers in industrialized countries investigate the effect of work on health, depending on a process that translates their scientific findings into policy. A case in point is the current National Occupational Health Research Agenda in the United States,

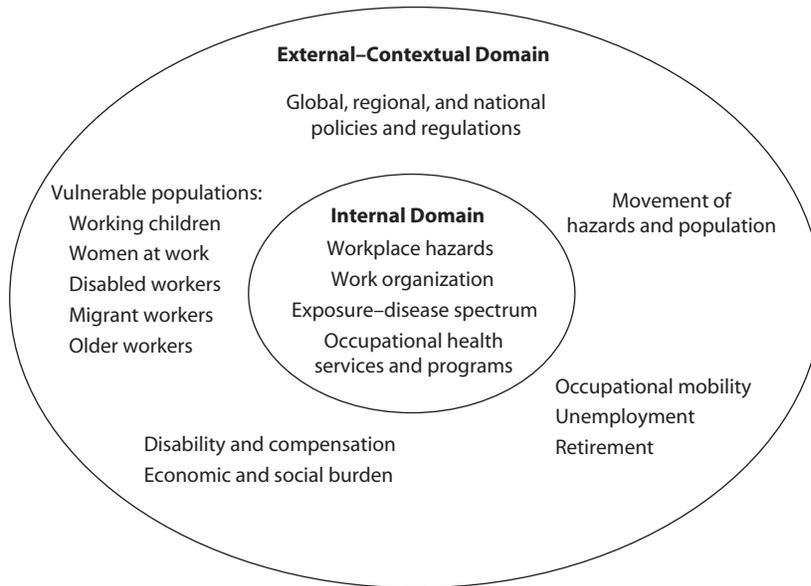


FIGURE 1—Domains of occupational health research.

focus on gathering and disseminating information on workplace hazards to make a stronger and more convincing case for the importance of occupational health.²⁵ This claim is further substantiated by the few internationally funded research projects that clearly show an effect on capacity building and change in practices or policies.^{19,26–28} It is true that traditional occupational health research is necessary in developing countries. However, there are several reasons why traditional occupational health research is not sufficient.

Although it is true that “assessment of the health impact of occupational risks is important for social recognition of these risks, to plan and facilitate adequate interventions for their prevention and to adequately manage the health burdens they cause,”^{29(p265)} the primary obstacle to occupational health in most developing countries remains the lack of a political mechanism that translates information into action. In reality, policymakers in the developing world do not lack information. A casual walk through any type of workplace in most developing countries would easily uncover the range of unsafe practices and occupational hazards. Policymakers are still driven by the need to address other “more pressing” social and health issues³⁰ that are politically less complicated and more saleable to the general public.

The solution to occupational health problems in developing countries therefore requires not

which, in spite of an iterative process of consultation, still focuses on disease and injury, work environment and workforce, and research tools and approaches.¹⁷ Those priorities are limited mostly to the internal domain of occupational health, although the National Occupational Health Research Agenda encompass the understanding of the health effects of long-term exposure to low hazard concentrations as well as the identifications of early indicators of exposure and subclinical health effects. The workplace-centered approach, although limited, serves well the cause of occupational health in developed countries; this is not necessarily the case for occupational health in developing countries. By contrast, without similar parliamentary or democratic political mechanism(s) and risk as-

essment processes, the industrialized model cannot be imported to developing countries.⁵

OPTIONS FOR OCCUPATIONAL HEALTH RESEARCH IN DEVELOPING COUNTRIES

Current deficiencies of occupational health in the developing world—reported in such disparate locations as Bangladesh,¹⁸ Central America,¹⁹ Lebanon,²⁰ South Africa,⁸ and Thailand²¹—are attributed to a lack of governmental interest in occupational health, poor data and data collection systems, and weak enforcement of health and safety regulations.

Occupational health professionals have repeatedly wondered why governments in these countries are relatively

unconcerned with occupational health, and why occupational health is absent where it is most needed,²² particularly given that clear empirical links exist between good occupational health practices, a healthier labor force, and improved productivity. Indeed, workplace interventions such as proper occupational hygiene and ergonomic practices have been presented as one of the tools to break the cycle of poverty, because these improve productivity, salaries, and, consequently, living conditions.^{5,23,24} However, this sequence of positive impacts is not clear to decisionmakers in most developing countries, who still perceive occupational health as a luxury.

Therefore, many occupational health professionals advocate that occupational health research in developing countries



only technological innovation³¹ but also significant institutional and legal developments.³² Occupational health researchers should understand the “political economy” of the labor market at global, regional, and nation–state levels.^{33,34} They must recognize the leading role of forces fighting for social justice, particularly the role of organized labor, which is instrumental to advancing national occupational health agendas and ratifying international labor laws, notwithstanding the repression they face and their questionable representation of the interest of their constituency in many developing countries.^{31–36} Occupational health researchers in developing countries also must be alert to the potentially negative effect of global trade on the health and safety of poor and marginalized workers.³⁷ Research should contribute to the international call to hold multinational corporations accountable to international ethical occupational health practices.³⁸

Consequently, a different research paradigm is warranted for occupational health research in developing countries. The paradigm should make the most efficient use of existing assets and minimize conflict with practical realities. Specifically, instead of focusing on the workplace as an isolated entity and moving outward to the wider social and political arena as done in occupational health research in industrialized countries, occupational health research in the developing world should focus on the social and political issues and

then move inward to address the particularities of the workplace (i.e., from the “external–contextual domain” to the “internal domain”). This approach builds a wider alliance up front with social scientists, economists, political scientists, unionists, non-governmental organizations, women’s organizations, human rights groups, and others as an entry point into the occupational health field. In other words, the occupational health vicious “cycle of neglect” in developing countries (Figure 2) should be broken at the allies’ link (step 5) to build consensus²² and “fundamental change in the *attitude*” (emphasis added) toward the day-to-day exposure to risk.^{39(p532)}

Occupational health research should be “mainstreamed” as an integral component of public and environmental health research^{7,8,40,41} and placed in its broader social and cultural context⁴² by addressing issues such as globalization, the importation

of health hazards, women at work, migrant workers, and child labor, in addition to the narrower social and economic burdens of work-related diseases and injuries. This approach underscores the often forgotten multidisciplinary nature of our profession and calls for research that considers social and economic development within the broader public health context.^{12,23} This occupational health research approach also would increase the pool of professionals, community organizations, unions, and activists concerned with occupational health. Involving unions and community organizations in defining the occupational health research agenda ensures its relevance to people striving for better working and living conditions in their countries. It also should provide evidence to grassroots intervention programs to improve the working and living conditions of workers in the face of official neglect. By such

means, occupational health research may help create responsive political mechanisms within developing countries.

SELECTED ILLUSTRATIONS

Silicosis, asbestosis, lead toxicity, and pesticide poisoning represent striking case studies in which an occupational illness “stepped out” of the isolation of the workplace and into the realm of environmental and public health concerns and, more importantly, into the general public consciousness.⁴³ These occupational diseases were eventually recognized as social diseases rather than occupational illnesses^{44,45} and were thus perceived by the public as scourges against social justice and basic human rights. This transformation in the public’s risk and health perceptions led to sweeping reforms in workplace health and safety practice

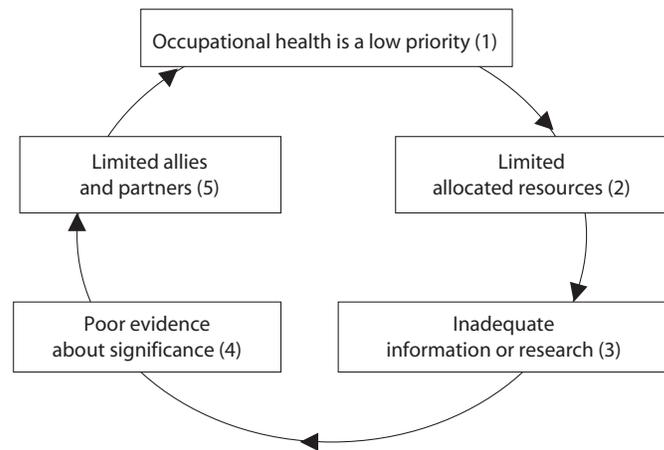


FIGURE 2—The occupational health “cycle of neglect” in developing countries.



and regulations in the industrialized countries.

Similarly, in the developing world, several innovative, integrative occupational health programs have succeeded in examining the interplay between work and widespread nonoccupational illnesses, such as AIDS and tuberculosis, and thus have succeeded in linking occupational and environmental health.^{40,46} Such initiatives are perfect examples of programs that take occupational health research out of its “splendid isolation.”⁴⁷ Child labor presents yet another example in which partnership with other researchers from the disciplines of social science, public policy, and economics is built to counteract the social and economic basis for child labor.⁴⁸

Two occupational health issues are presented to further illustrate the point that an isolated, workplace-based approach falls short of responding to the challenges of occupational health in developing countries.

Women and Work

In addition to their domestic responsibilities of childbearing, child rearing, and family care, women in the developing world have worked in the agricultural and informal sectors for millennia. However, because their work is usually not valued monetarily in these sectors, it is often discounted and rendered invisible. In the formal sector as well, gender inequalities are commonplace in such areas as limited job opportunities, limited tracks for promotion and leadership responsibilities, and discrimination based

on work hazards. Women’s work, particularly in the developing world, is not adequately protected by national policies and is generally restricted by traditional social norms and such misperceptions that women’s work is less significant, is merely supplementary, or is unskilled. Hence, there is an urgency to “examine the wider impact of women’s different productive and reproductive roles on their occupational health.”(emphasis added)^{49(p39)} Again, this challenge to occupational health transcends the boundaries of the workplace and requires a multidisciplinary approach in which occupational health researchers partner with other social scientists and advocates.

Use of Pesticides

Understanding and minimizing the exposure of farmers and their families to pesticides in the developing world cannot be viewed as an isolated medical problem or a mere technical problem. It requires an understanding of farmers’ knowledge, values, and beliefs; of the contribution of the agricultural sector to the overall economy; and of the role and power of international and national agribusiness operating in a country. Occupational health research, therefore, should be part of a larger movement to ensure just and sustainable agricultural development. For example, occupational health should promote integrated pest management practices, organic farming methods, control of the import of illegal or banned chemicals, and more responsibility from agrochemical corporations.

IMPLICATIONS

The call for a different occupational health research paradigm carries 3 major implications. The first concerns the training of occupational health researchers, especially those trained in industrialized countries. Occupational health research from the developing countries has been criticized as not being innovative or as being an extension of research conducted in the country of graduate training, except for suboptimal assessment of exposures and health outcomes.^{25,50} This is not an outcome of lack of training; on the contrary, in most cases, it is a direct result of focused individuals with advanced training who, on return to their home countries, had to produce research in a socially and economically constricted environment where human and financial resources are limited and data are lacking. Therefore, in addition to their traditional technical and methodological training, occupational health researchers from the less-developed countries should be exposed to contextual global, social, and political issues and to the quantitative and qualitative research methodologies of economics and social sciences as they relate to occupational health. This additional education will equip them with better tools to understand and explain the world of work and will better prepare them for new, more effective roles as researchers, as well as practitioners and activists, in underprivileged communities.

The second implication concerns the mission statements and

research interest of leading occupational health journals. To illustrate, the abstracts of all articles published in 1999 in 4 internationally recognized and professionally recommended occupational health journals were reviewed—2 American (*American Journal of Industrial Medicine* and *Journal of Occupational and Environmental Medicine*), 1 British (*Occupational and Environmental Medicine*), and 1 Scandinavian (*Scandinavian Journal of Work, Environment, and Health*). The majority of published articles focused on occupational health issues within the workplace (internal domain). Articles that focused on issues within the external-contextual domain were less frequent, probably because they migrated to specialized policy and social science journals less accessible to occupational health researchers. Because the occupational health journals play a key role in the scientific training and professional outlook of occupational health trainees from the developing nations, it is vital that these journals offer a more comprehensive and relevant perspective.

The third implication is the need to rethink indicators for achievement and progress in occupational health. Objective indicators, such as fatal and nonfatal work-related health outcomes, are crucial for the measurement of progress in the field,⁵¹ but they cannot be the only yardstick used, especially in developing countries. These countries lack historical data or current surveillance systems. In most, even basic objective indicators appear



unattainable, at least in the near future. In terms of occupational health progress and achievement, process (e.g., training of professionals; development of professional theory and methods, programs, advocacy, research, and partnerships) needs to be recognized as much as outcome (e.g., rate of occupational injuries and diseases).

CONCLUSIONS

Occupational health long has been recognized as a complex field,¹⁰ and any attempt to “box” it within a rigid framework that deals only with worker-hazard interaction runs the risk of marginalizing the field. I challenge the claim that occupational health is an unaffordable luxury to be addressed after economic development is secured. Instead, I argue that occupational health is a necessity and call for a revised occupational health research paradigm in developing countries that focuses less on the workplace and more on the workers in their social contexts.^{46,52} A contextual, social justice orientation of occupational health research, as opposed to the narrow traditional approach, places occupational health researchers in tandem with other stakeholders in the call for a just and healthy society. In addition, only by becoming a tool for social change rather than a target can occupational health research effectively understand the hazards of work and its effects on workers and the community in developing countries.

This argument echoes what many occupational health professionals from both hemispheres have repeatedly advocated.^{6,10,35,50,53} The paradigm argued for here also facilitates more research and collaborative opportunities for occupational health researchers nationally, regionally, and internationally, as reported in a few leading initiatives.^{19,26,41,46} Forging a new pathway for occupational health research in developing countries will not be an easy task. However, staying with the prevailing paradigm means a prolongation of neglect, ineffectiveness, and professional stagnation. ■

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The Global Alliance for Vaccines and Immunization: Is It a New Model for Effective Public–Private Cooperation in International Public Health?

The Global Alliance for Vaccines and Immunization (GAVI) has in many ways been remarkably successful in revitalizing the international coalition of institutions and organizations concerned with getting vaccines to the children of the poorest countries. Many have seen this high-profile venture in public–private cooperation as a model for other groups concerned with more effectively helping to solve health problems in the developing world.

We examined major flaws in the GAVI and argue that in fact the alliance does not represent a new paradigm for international public health. However, the experience of the GAVI may suggest an alternative, and more effective, way to conceptualize future global initiatives. (*Am J Public Health*. 2004;94:1922–1925)

William Muraskin, PhD

AT THE END OF 1999, AN alliance of international health agencies, private industry, bilateral donors, philanthropic foundations, and other parties concerned with the health of children in the poorest nations was formed to both finance and speed the delivery of new and improved vaccines to children in the developing world. The coalition was called the Global Alliance for Vaccines and Immunization (GAVI)—and it was backed up by a heavily endowed entity called the Vaccine Fund (for a more intensive treatment of this subject, see Muraskin¹).

Despite its laudable efforts to pioneer a new and more effective model of international cooperation, the GAVI is handicapped by 2 fundamental flaws and thus runs a high risk of ultimate failure, with the danger of hurting other efforts as well (such as alliances like the Global Fund for AIDS, Malaria and Tuberculosis, which has considered the GAVI a model for dealing with developing countries' problems). First, the GAVI, as currently constituted, has failed to achieve a balance between “top-down” and “bottom-up” in its relations with countries, a fact that continues to plague and undermine the initiative. A second and closely related flaw is that the international public health community has still not been able to reach a genuine consensus on the exact role that immunization should play in pro-

tecting the health of children in developing countries.

Top-down globalism plays a necessary and powerful role in initially moving the public health community forward, but it cannot succeed in the long run without genuine bottom-up input and support. Unfortunately, global initiatives are handicapped in generating support, because conflict so frequently arises between the priorities of the founders of global initiatives and those of the countries the initiatives purport to assist. In the absence of genuine grassroots espousal, pressure is placed on global organizers to seduce participants and manipulate enthusiasm rather than actually develop it.

Although the creation and commencement of innovative programs simultaneously in many countries appears to make organization at the global level indispensable, such high-level initiation often lacks, and in fact undermines, local support. Can we solve this problem? The answer is yes, but the solution requires a radically different conceptualization of the proper role of individuals and groups working at the global level. It requires a greater degree of humility than now exists and a radically changed sense of what constitutes “service” to developing countries. Those aspiring to exert global “leadership” will need to see themselves more as facilitators than as movers and shakers. This

change in perspective will require more effort than the lip service currently paid to the bottom-up approach; such a transformation will require finding a way to generate real bottom-up initiation.

Supporters of this new approach do not deny that global initiatives have a vital role to play. Getting truly bottom-up initiatives organized and running will be difficult, and top-down assistance will be required. However, the legitimate global role of top-down initiatives requires a markedly greater level of restraint and a genuine willingness to subordinate global initiatives to the priorities of the people they are intended to help than is currently apparent. We can see this need very clearly in the case of the GAVI.

The GAVI was the creation of deeply committed and morally energized people working at the top level of the international health community. Such dedicated individuals were especially important at the Bill and Melinda Gates Children's Vaccine Program; the Program for Appropriate Technology in Health (PATH), which housed it; the International Federation of Pharmaceutical Manufacturers Association; the World Bank; the Gates Foundation; US Agency for International Development headquarters in Washington, DC; World Health Organization (WHO) headquarters in Geneva, Switzer-

land; UNICEF headquarters in New York, NY; and the Rockefeller Foundation. People in these organizations were global players, with both the strengths and the weaknesses that accompany that position. Although they benefited from seeing the big picture, they were too often severely handicapped by their lack of familiarity with the details on the ground. Not only were in-country field workers from UN agencies, bilateral donors, nongovernmental organizations, and indigenous governments not part of the core group advocating the creation of the GAVI, these workers were to a remarkable extent not consulted by those who created the GAVI. Part of this lack of participation was structurally caused—that is, high-level globalists communicate primarily with their peers rather than with those working at other levels of the system. However, part of the problem was a conscious choice: people focused on the big picture do not want to be bogged down and nitpicked to death by localists who raise a barrage of “parochial” and country-specific objections. Global activists are by nature interested in hearing what can be done, not in hearing about the myriad obstacles to rapid and effective action.

A strong case can be made for employing a bird’s-eye view of the world, and Tore Godal, the executive secretary of the GAVI, has made this case. Workers close to developing countries “see the differences and not the commonalities,” he says, but without some “simple global principles,” one is forced into bilateral negotiations, which consume time, severely slow down the process, and are so country-specific that it is hard to generate usable lessons (interview by the author, Decem-

ber 2000). As a result, a globalist approach is the only way to speed things up. In a world that is increasingly globalized, the legitimacy of this global perspective must be taken into account.

THE LOCAL VS THE GLOBAL

However, workers with long familiarity with conditions in the field are painfully aware of the problems facing any large-scale and ambitious new venture originating on the international level. They have had a great deal of experience with global interventions, not only in trying to actually implement them but also in dealing with the aftermath when donors have moved on to newer, hotter issues. In her classic study of Nepal, *Politics, Plans, and People: Foreign Aid and Health Development*,² Judith Justice of the University of California, San Francisco, has documented the constant changes in global priorities—the flavor-of-the-month—club types of interventions—that have been forced on developing countries over time. She has highlighted the disarray, wasted effort, skewed priorities, and disillusionment that have followed in their wake. Field workers are well aware of that sorry legacy of global activism and are anxious not to relive it. They are forced to know intimately—in a way that global leaders simply cannot, or will not, understand—the limitations of local government, infrastructure, finance, and human resources that plague the developing world and what they mean in practice.

In the case of the GAVI, one of its initial flaws was that its vision came from leaders who were inadequately informed regarding field workers’ opinions

about what could realistically be accomplished within a relatively short space of time—the imbalance of “top-down” and “bottom-up” referred to in the introduction.

Bjorn Melgaard, who was head of the WHO’s Expanded Programme on Immunization, and subsequently of its entire combined vaccine division, has expressed his sympathy with the anxieties of in-country workers confronted with new global initiatives (interview by the author, December 2002):

My major criticism . . . of the [Vaccine] Fund, the GAVI and the Global Fund [for AIDS, Malaria and Tuberculosis] . . . [is that they] operate . . . as new donors on the block and require new formats for planning, implementation, monitoring, reporting, etc. [This] imposes a tremendous burden on countries. . . . New alliances demand their own new systems, and [such demands] undermine the implementation capacity of the Ministries of Health.

What one hears over and over again from those working in-country, whether with the WHO, UNICEF, the nongovernmental organizations, the bilateral donors, or others, is that at the provincial (and often the national) level only a handful of skilled people manage to “do everything.” The pool is small, and global initiatives keep placing the burden of ever-shifting priorities onto the shoulders of the same small group of people. This limitation of human capacity makes it difficult to take on even generously funded programs. Godlee, in a 1994 critique of the WHO in *BMJ*,³ highlighted the importance of the problem—and her words apply even better to the impact of global initiatives in general than to that of one organization:

It may seem harsh to suggest that WHO’s impact on countries may be not just minimal but negative. Such a suggestion is, however, widely acknowledged. The phrase is “donor robbery.” By this, people mean that WHO—and other international agencies—rob countries of precious expertise. Skilled and effective professionals are in short supply in some areas and are therefore snapped up by the international organizations.^{3(p1636)}

Just as field-savvy expatriate agency workers in developing nations were not part of the global groups creating the GAVI, neither were governments in the developing world participants in the process. The GAVI was designed *for* the countries’ good but not *by* the countries. It is vital to realize that the demand for this initiative did not emanate from the designated beneficiaries. Rather, the countries as a group have had to be wooed, “educated,” and financially enticed to accept the GAVI’s goals as their own.

A good example of such seduction can be found in Uganda. In an unpublished report to USAID on immunization written in 1999, right at the time that the GAVI was being formed, Justice states the following:

“Although the National Immunization Program had earlier been given the highest priority in Uganda, current priorities were stated to be malaria among the infectious diseases, followed by respiratory conditions and pneumonia, malnutrition and kwashiorkor, and diseases related to water and sanitation such as severe diarrhea. . . . Hepatitis B [which would be the first GAVI-supported vaccine] does not have a champion, no one who is passionate about it or interested enough to commit time and energy to its promotion and, therefore, it is most unlikely to be placed on the health agenda in the near future. . . .”⁴

Nevertheless, within an astonishingly short period of time after new money for hepatitis B vaccine became available, Uganda had applied for, and received, hepatitis B vaccine funds.

A GAVI BLIND SPOT

The full implications of this situation have been very difficult for the most committed GAVI supporters to assimilate fully. Many of these supporters insist that the mission of the GAVI is simply to carry out aims that the countries themselves have voted for on numerous occasions in the World Health Assembly and elsewhere. For example, the World Health Assembly, with the support of all of its member countries (99% of the countries in the world), voted for making hepatitis B a universal childhood vaccine. Developing countries have supported the concept of 80% diphtheria, pertussis, tetanus vaccine coverage in 80% of all country districts, with a specific date agreed on by everyone. Both targets and dates are core GAVI goals. Nevertheless, such broad statements of goals, or even narrowly set timetables, often have little connection to what developing countries' governments can muster the desire or political will to stand behind.

Many scientists who support the GAVI have explained the obvious reluctance of many countries to actually champion immunization goals as their own by arguing that if the leaders "really understood" the importance of those objectives, they would change their minds and support them—all they need is to be given "the facts." This may be true, but the need for such "education" is the key point—the countries remain pupils who need to be helped to see the light

and change their actual—as opposed to rhetorical—priorities.

VACCINATION ABOVE ALL ELSE

This brings us to the second major flaw of the GAVI: the nonnegotiable status of immunization as the initiative's core goal. Most in-country workers and most developing countries' governments—even their ministries of health—would not place a series of new children's vaccines at the top of their priorities without a major financial enticement. For everyone familiar with conditions in the field, child immunization is only one of a back-breaking press of challenges, and the introduction of new and improved children's vaccines has by no means been the most urgent.

The GAVI champions immunization, and yet its core constituencies—field workers and developing countries' governments—have been unenthusiastic supporters of that goal. And when it comes to questioning the centrality of vaccination, they are joined by a third group, the European bilateral donors. Although bilateral donors have been among the nations most committed to the struggle for equity for all children of the developing world, they have entertained very strong doubts about whether vaccination is the best means of achieving that goal. That very same reservation alienated the bilateral donors from a previous vaccine alliance, the Children's Vaccine Initiative,⁴ and made them its chief critic.

THE BILATERAL DONOR POSITION

The bilateral donor position was clearly presented by Jorn

Heldrup of Dandida, the Danish foreign aid agency, who was present at the GAVI board meeting in November 2002. As he put it in an interview in November 2002:

There are good things to support about the GAVI. . . . The problem is [that] it . . . may undermine the health in developing countries. In Tanzania, for example, there are 10—only 10 people—in the whole country who can deal with the various international initiatives that are thrown at the country. They must deal with them all . . . [and the] GAVI is only one of them. They are pulled one way, then another. What should be important is the countries' own priorities and their looking at all the possibilities [available to them] and [then their] choosing priorities with the limited resources that they have. But that is not possible when these initiatives come down [from on high].

And so Dandida and the other European bilateral donors have pushed for a method that would avoid undermining local decisionmaking. The bedrock on which bilateral donors stand is the "systems approach" to health development, which emphasizes allowing countries to set their own priorities. From that perspective, the donors have been concerned with the entire health system and careful not to overemphasize one type of intervention (such immunization) at the expense of others. They have also strongly emphasized the vital importance of developing countries' governments setting their own priorities—not simply within the health sector, but also in the trade-offs between health, housing, education, industrial development, and so forth. The commitment of bilateral donors to this approach is at odds with the basic assump-

tions of the globalists who created the GAVI.

CAN BOTH APPROACHES WORK?

Many people of goodwill have tried to bridge the gap between those who support a systems approach and those who champion a vaccine-centric focus. Unfortunately, an inherent contradiction between the worldviews of the 2 groups cannot be reconciled, at least at this time.

The heart of the problem is that creators and core supporters of the GAVI have never believed that immunization is just one among many contending programs that should "freely compete" with one another for commitments from developing countries. The GAVI's assertion that vaccines are extremely cost-effective and could easily outdo other interventions in any competition for funds is an attractive rhetorical claim that nevertheless has not been tested. Although the creators of the GAVI have perfunctorily recognized the desirability of countries' setting their own priorities, the supporters of the systems approach have seen local decisionmaking as a paramount value. Saving lives through immunization, not having countries set their own priorities, has always been the GAVI's supreme goal.

For the small and dedicated cadre that enables the GAVI to function, and that constitutes its indispensable human infrastructure, the primacy of immunization is *nonnegotiable*. Immunization is the rock upon which the GAVI and its Vaccine Fund are built. Such is absolutely not the case for the individuals and groups that support the systems approach.

THE PROBLEM WITH INVERTED PYRAMIDS

Ultimately the GAVI is a partnership of organizations, countries, and individuals, almost all of whom have substantial reservations about its goals. Its core base of support is located in the Bill and Melinda Gates Children's Vaccine Program (the name of the project has been changed to the Children's Vaccine Program at PATH), the Vaccine Fund, the Gates Foundation, the key GAVI infrastructural units (the secretariat, working group, and task force on finance), and scattered individuals in the international agencies and developing countries. These people have been the driving force of the GAVI and the cadre that has energized it and made it a dynamic and pioneering initiative. Yet the majority of the GAVI's partners have remained only lukewarm adherents. Most countries that partner with the GAVI have been supporters primarily because of the substantial new money available for the initiative—starting with the \$750 million from the Gates Foundation. Although bilateral donors have cooperated to varying degrees, as a group they have shown no desire to pledge themselves to pick up the long-term costs of the new vaccines, without which the short-term benefits of the GAVI's Vaccine Fund money are not sustainable. The field workers remain skeptics, and the WHO and UNICEF continue to be distracted with a host of other pressing priorities and remain keenly aware that their own institutional self-interests often differ significantly from that of the GAVI.

The bottom line is that the GAVI is a giant inverted pyramid

that rests on the backs of a very small committed base. For its core supporters, the GAVI is a mission, a cause, and a grand experiment. For everyone else, however, it is merely one of numerous initiatives—many of them more urgent. As a consequence, it is dubious that the GAVI represents a model of private–public effective action and that it can serve as a useful guide for other high-level initiatives.

TO MAKE THE GAVI SUSTAINABLE

The GAVI on the surface looks healthy and strong. It continues to move ahead at a breakneck pace with continuous milestones reached and goals achieved. But under the surface, the GAVI suffers from fundamental flaws, some of which pose a potentially fatal threat both to the GAVI and to its long-term goals. What, if anything, can be done?

An indispensable part of any solution would involve openly and purposefully turning the existing inverted pyramid of the GAVI on its head so that the supporters of a systems approach to health development—who constitute a large majority of the international public health community—become core supporters of the GAVI. This cannot happen as long as the GAVI overly privileges immunization in fact as well as in name.

The quite laudable goal of introducing new and improved vaccines would not have to be totally abandoned, but it would have to be integrated with, and subordinated to, broader systems objectives. Where an irresolvable conflict arises, the timetable for vaccine introduction would have to be determined by its effect on the overall mission of strengthening

the entire health system. The continued active engagement of vaccine-centric groups and individuals within the GAVI, despite their inability to dominate it, would guarantee that the importance of immunization was never lost from sight—a danger of the systems approach.

A reformulation of the goals of the GAVI to emphasize building strong foundations that will support lasting achievements can be the start of a painful but necessary way out of the dilemma. Donors (governments, philanthropies, and the general public that supports them both) must face up to the fact that short-term gains, no matter how much they lend themselves to public relations sound bites or fit neatly into donor funding cycles, do not achieve their stated humanitarian objectives. It is time to try another approach. ■

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A Global Perspective on Vaccine Safety and Public Health: The Global Advisory Committee on Vaccine Safety

Established in 1999, the Global Advisory Committee on Vaccine Safety advises the World Health Organization (WHO) on vaccine-related safety issues and enables WHO to respond promptly, efficiently, and with scientific rigor to issues of vaccine safety with potential global importance. The committee also assesses the implications of vaccine safety for practice worldwide and for WHO policies. We describe the principles on which the committee was established, its modus operandi, and the scope of the work undertaken, both present and future. We highlight its recent recommendations on major issues, including the purported link between the measles–mumps–rubella vaccine and autism and the safety of the mumps, influenza, yellow fever, BCG, and smallpox vaccines as well as that of thiomersal-containing vaccines. (*Am J Public Health*. 2004;94:1926–1931)

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THE SUCCESSFUL IMPLEMENTATION of large-scale comprehensive national immunization programs and the consequent eradication or reduction of smallpox, polio, measles, pertussis, meningococcal meningitis, diphtheria, hepatitis B, congenital rubella syndrome, and tetanus were among the most notable public health achievements of the 20th century. Even in countries where resources for national health programs are severely limited, it has been possible to achieve significant progress.¹ There is good reason to expect that these advances will be sustained in the 21st century. It has been suggested that there are 4 elements of successful public health efforts: highly credible scientific evidence, passionate advocates, media campaigns, and law and regulation, usually at the national level² (to which might be added adequate resources and political will).

It is thus paradoxical that, as vaccines have become increasingly more effective, safe, and of good quality, public concerns about their safety have increased, especially in the developed world.³ In recent years, the World Health Organization (WHO) has taken steps to meet these modern challenges to vaccination, including the establishment, in 1999, of the Global Advisory Committee on Vaccine Safety (GACVS). The GACVS

provides advice to the WHO on all vaccine-related safety issues, enabling the organization to respond promptly, efficiently, and with scientific rigor to safety issues of potential global importance.⁴ The committee also assesses the implications of vaccine safety issues for practice worldwide and for WHO policies. In doing so, the GACVS often draws on the advice, experience, and analysis of outside experts.

We report on the principles upon which the GACVS was established, the modus operandi of the committee, and the scope, rather than the details, of the work undertaken by the committee over the past 4 years. We also consider future challenges facing the committee.

THE GACVS: TERMS OF REFERENCE

Several specifications and guidelines led the establishment of the GACVS. First, the committee should be able to consider and make recommendations regarding all aspects of vaccine safety that might be of interest and importance to member states and to the WHO and that are of sufficient importance to affect WHO or national policies. The decisions of the committee should be free of vested interests, including the interests of the WHO itself or of other organizations

involved in achieving the goals of universal immunization coverage and national programs for immunization.

Second, committee members should collectively bring the expertise necessary for evaluation and decisionmaking in the field of vaccine safety, including familiarity with the drug regulatory process, with special reference to the needs of the developing world. The committee should be free to make decisions and recommendations not necessarily in line with the special interests of the institutions at which the committee members work, in accordance with the high standards set by the WHO in terms of absence of conflicts of interest among members of the organization's various committees. Third, all decisions and recommendations of the committee should be based on the best available scientific evidence and expertise and should be authoritative, defensible, and explicable in terms of fact, scientific evidence, and process.

CAUSALITY ASSESSMENT OF ADVERSE POSTIMMUNIZATION EVENTS

One of the first responsibilities of GACVS was to determine a set of criteria according to which the causes of adverse postimmunization events could be judged.

Building on the work of the United States surgeon general and his team from 1964, the committee decided that the following generally established criteria are most relevant in determining causality in assessments of vaccine-related events.^{5,6}

- **Consistency:** The association of a purported adverse event with the administration of a vaccine should be consistent; that is, the findings should be replicable in different localities, by different investigators not unduly influencing one another, and by different methods of investigation, all leading to the same conclusion(s).

- **Strength of the association:** The association should be strong in terms of magnitude (in an epidemiological sense) and the dose–response relationship of the vaccine with the adverse effect.

- **Specificity:** The association should be distinctive; that is, the adverse event should be linked uniquely or specifically with the vaccine concerned rather than occurring frequently, spontaneously, or commonly in association with other external stimuli or conditions.

- **Temporal relation:** There should be a temporal relationship between the vaccine and the adverse event, in that receipt of the vaccine should precede the earliest manifestation of the event.

- **Biological plausibility:** The association should be coherent, that is, plausible and explicable according to known facts in the natural history and biology of the disease.

Not all of these criteria need be present for a causal relationship to be determined, and neither does each carry equal weight. In addition to these prin-

ciples, there are a number of conditions and provisos that should be applied in evaluating causality in the field of vaccine safety. First, the requirement for biological plausibility should not unduly influence consideration of causality. Biological plausibility is a less robust criterion than the others. If an adverse event does not fit with known facts and the previous understanding of the adverse event or the vaccine under consideration, it does not necessarily follow that new or hitherto unexpected events are improbable.

Second, there must be consideration of whether the vaccine is serving as a trigger. A *trigger* in this context is an agent that causes an event to occur earlier than would have occurred some time later anyway. When acting as a trigger, the vaccine could hypothetically expose an underlying or preexisting condition or illness. Finally, with live attenuated vaccines, the adverse event may be attributable to the pathogenicity of the attenuated vaccine–related microorganism and not distinguishable (except in severity) from the disease for which the vaccine is administered. Identification of the vaccine strain of the microorganism or its genetic material in diseased tissue or the patient's body fluids in such a situation would add weight to causality.

An association between vaccine administration and an adverse event is most likely to be considered *strong and consistent* when the evidence is based on the following:

- Well-conducted human studies that demonstrate a clear association with a design testing a priori the hypothesis of such an association. Such studies

will normally be randomized controlled clinical trials, case–control investigations, or cohort studies. Case reports, however numerous and complete, do not fulfill the requirements for testing hypotheses.

- Associations demonstrated in more than one human study and showing consistency between studies conducted by different investigators in different settings, with results that are consistent despite different research designs. An association between dose and adverse effect strengthens the causal association between the vaccine and the effect. This is not necessarily the case if there is a hypersensitivity effect.
- Similarity of the adverse event to the disease the live vaccine is intended to prevent, with a non-random temporal relationship between administration and the adverse incident.

There should ideally be a strict definition of the adverse event in clinical, pathological, and biochemical terms. The frequency of the adverse event should be substantially lower in the nonimmunized population than in the immunized population in which the event is described, and there should not be obvious alternative reasons for its occurrence that are unrelated to immunization.

SCOPE OF THE WORK CONSIDERED BY THE GACVS

The committee has reviewed the following safety issues: macrophagic myofasciitis and aluminum-containing vaccines, the health effects of thiomersal-containing vaccines, autoimmune diseases and vaccines, potential contamination of vaccines with

transmissible spongiform encephalopathy, adverse events following mumps vaccination, mortality following routine infant immunizations, the safety of yellow fever vaccine, risks following immunization in HIV-infected children, the safety of BCG vaccine in immunocompromised individuals, the measles–mumps–rubella (MMR) vaccine and autism, the safety of MMR versus rubella vaccine in the postpartum period, multiple sclerosis and hepatitis B vaccination, acute lymphatic leukemia and hepatitis B vaccination, oculorespiratory syndrome following influenza vaccination, Bell's palsy following vaccination with an inactivated intranasal flu vaccine licensed in Switzerland, influenza vaccination of women during pregnancy, the safety of smallpox vaccines, the safety of polio vaccination in the context of eradication, and enhancement of electronic communications of vaccine safety issues and establishment of a Web site reference.

Outcomes of the deliberations of the committee on these and other issues are reported routinely in the *Weekly Epidemiological Record*, and relevant information can be found at http://www.who.int/vaccine_safety/en. What follows has been selected as illustrative of the work of the committee, in terms of both its proactive approach and its reactive response to reports and concerns brought to it.

NONSPECIFIC EFFECTS OF VACCINES

The GACVS has given considerable attention to the purported nonspecific adverse effects of the diphtheria–tetanus–pertussis (DTP) vaccine on infants aged 18 months or younger in low-

income countries.⁷⁻⁹ It has also been suggested by Kristensen et al. that BCG has an overall non-specific beneficial effect and that measles vaccine is associated with reduced mortality and morbidity that cannot be explained by prevention of measles alone.⁷ The GACVS believes that this set of theories raises critical issues pertaining to the safety of vaccines and immunization practices and that there is a need for further systematic research in the area of vaccine safety. For the time being, the GACVS has found that the reported results and conclusions are not without potential bias and that the results have not been confirmed by others in different settings.

MMR AND AUTISM

There is ongoing debate as to whether autism has a genetic or environmental cause (including the possibility of a prenatal insult), or both. Autistic spectrum disorders represent a continuum of cognitive and neurobehavioral disorders, including autistic disorder or autism. Prevalence rates of autism vary considerably according to intensity of case ascertainment, ranging from 0.7 to 21.1 per 10 000 children (median: 5.2 per 10 000).

Concerns about a possible link between vaccination with MMR and autism were raised in the late 1990s, after the publication of a series of studies claiming an association between both natural and vaccine strains of the measles virus and inflammatory bowel diseases and autism. The authors of more recent studies have also claimed findings supporting such an association. Since public concerns have remained high, in 2002 WHO, on the recommendation of the GACVS, commis-

sioned a review of the risk of autism associated with MMR vaccination. The findings of the review, conducted by an independent researcher, were presented to the GACVS for its consideration. Eleven epidemiological studies were reviewed in detail, taking into consideration study design and limitations.¹⁰⁻²⁰ Three laboratory studies were also reviewed.²¹⁻²³ The conclusion of the review was that existing studies do not show evidence of an association between the risk of autism or autistic spectrum disorders and the MMR vaccine.

On the basis of the results of this review, the GACVS agreed and concluded that there is no evidence for a causal association between MMR vaccine and autism or autistic spectrum disorders. It is the opinion of the committee that additional epidemiological studies are unlikely to add to the existing data but that there is a need for a better understanding of the causes of autism. The committee also concluded that there is no evidence to support the preferred use of monovalent MMR vaccines over the combined vaccine. On the grounds that administration of the single vaccines at intervals carries a higher risk of incomplete immunization and longer periods during which children are unprotected from these diseases, the GACVS did not recommend a change in current MMR vaccination practices.

SAFETY OF MUMPS VACCINES

In 2003, the committee commissioned a comprehensive review of the literature on the safety of mumps vaccination, with special attention to vaccine-derived mumps meningitis. High rates of aseptic meningitis

have been described for the Urabe, Leningrad-Zagreb, and Leningrad-3 vaccines relative to the Jeryl-Lynn vaccine. There is no known viral explanation for this difference based on virus genotype or phenotypic properties. Intensive surveillance of the safety of mumps vaccines during and after mass vaccination campaigns²⁴⁻²⁸ may have contributed to distorted assessments of risk. Risk estimates have varied between studies, reflecting differences in study settings and circumstances and in degrees of surveillance. The available data are insufficient to distinguish between the safety profiles of the Urabe, Leningrad-Zagreb, and Leningrad-3 strains with respect to risk for aseptic meningitis. All reported cases of vaccine-derived mumps meningitis have been associated with recovery, without neurological sequelae.

Now that all mumps virus strains can be characterized by nucleotide sequencing and polymerase chain reaction, it should be possible to address scientifically a number of unresolved questions regarding mumps vaccine safety. These issues include defining the molecular determinants of virus attenuation; characterizing the genetic determinants of virulence; determining the safety of the vaccines in relation to either pure or mixed virus populations, along with their antigenicity; and determining at what stage mutations occur in the virus. The presence of subvariant viruses in different vaccines could be studied. Such knowledge would support the development of more scientifically based mumps vaccines and contribute to a better understanding of the pathogenesis of adverse effects. Molecular assays would distinguish wild-type from vaccine

strains of the mumps virus and thus assist quality control assessments of both existing and future vaccines. The committee has recommended establishment of an international reference laboratory for mumps vaccine virus isolates from vaccinated subjects.

SAFETY OF YELLOW FEVER VACCINE

The GACVS considered the cases of fatal viscerotropic disease following yellow fever vaccination reported in the United States, Brazil, and Australia.²⁹⁻³¹ The cases were attributable to a vaccine-type virus and not to a reversion of the vaccine strain to wild type. In contrast to the viscerotropic complications of yellow fever vaccination, recent neurotropic cases have not been fatal. The latter have been presumed to fall into one of 3 different clinical forms: Guillain-Barré syndrome (immune mediated), encephalopathy (owing to virus invasion), and acute demyelinating encephalomyelitis (caused either by direct virus invasion or by an immune-mediated response). Neurotropic complications of yellow fever vaccine are age related; individuals aged 65 years or older who are first-time vaccine recipients are at higher risk than younger individuals, but the young are not excluded from risk.

The GACVS noted the need for improved ability to predict who is at risk of the serious complications of yellow fever vaccine and what are the predisposing factors. An important and unresolved issue is the safety and efficacy of yellow fever vaccine among HIV-positive individuals. It remains to be determined whether HIV-positive status and the resultant immune deficiency

affect seroconversion, risk of invasion of the nervous system, and risk of encephalopathy and at what stage of HIV disease yellow fever immunization should be regarded as contraindicated. Clarification is needed to determine whether there are differences in the incidence rates of minor and major adverse reactions to the vaccine among HIV-positive individuals.

INFLUENZA VACCINATION OF WOMEN DURING PREGNANCY

The committee has considered the safety of influenza vaccination of women during pregnancy. Manufacturers and national drug regulatory authorities tend to caution against routine use of influenza vaccine in pregnancy because there is a dearth of information regarding the vaccine's safety during the first trimester. The concern is that influenza during pregnancy carries a risk of morbidity significantly higher than usual, along with a greater prospect of hospitalization and of a fatal outcome. The committee has concluded that the risks and benefits of influenza virus vaccination during all stages of pregnancy should be reconsidered, taking into account the high risk to the mother—and to the fetus—of the disease itself. Such advice would not apply to situations in which risk of influenza is low or to live attenuated influenza vaccines, which are not indicated in pregnancy.

BCG IMMUNIZATION IN HIV-POSITIVE INFANTS

The committee recently reviewed the available data on the benefits and risks of BCG immunization in the case of infants living in areas with high prevalence rates

of tuberculosis, with and without concurrent high rates of HIV infection. Only limited population-based data are available on the effectiveness of BCG vaccine in preventing severe tuberculosis in HIV-positive infants, as well as on its safety. On the basis of the evidence available, the committee has advised that (1) no changes be made in the current recommendations for BCG immunization of infants in countries with high prevalence rates of tuberculosis; (2) that population-based studies be undertaken to determine the efficacy and safety of BCG and related vaccines in HIV-negative and HIV-positive children, respectively, in instances in which there are high endemic rates of tuberculosis; and (3) an international reference laboratory be established to systematically differentiate BCG strains and relate data to the antigenicity, efficacy, and safety of different strains.

SAFETY OF SMALLPOX VACCINATION

The committee has considered the safety of smallpox vaccination, including an updated account of the safety of vaccination practices in the United States since January 2003. Interim reports of the US experience have been published in *Morbidity and Mortality Weekly Report*.^{32,33} Adverse effects consistently reported have included myopericarditis at frequencies that exceeded what might occur by coincidence. The committee has noted the importance for smallpox immunization programs to be supported by adverse event monitoring and recognizes that data are insufficient to define the incidence of adverse events among primary vaccinees as op-

posed to individuals revaccinated after a long interval.^{34,35}

THIOMERSAL IN CHILDREN'S VACCINES

In the late 1990s, concerns were raised in the United States about the safety of thiomersal, a preservative used in some vaccines that has the ability to prevent bacterial contamination of multidose vials and contains ethyl mercury. These concerns were based on the realization that as the number of immunizations increased, the cumulative amount of mercury in the US infant immunization schedule could potentially exceed the most conservative recommended threshold for exposure to methyl mercury set by US government agencies. Methyl mercury has been reported to cause neurological abnormalities in newborns after fetal exposure resulting from mothers ingesting large doses over a long period of time.

In 1999, as a result of concern regarding this theoretical risk, 2 US immunization advisory bodies and the European Commission on Proprietary Medicinal Products recommended the expedited removal of thiomersal from vaccines. The change in the United States has placed pressure on other countries to follow this country's lead. However, removal of thiomersal may lead to changes in vaccine potency, stability, and reactogenicity, and this process must proceed with great caution. Furthermore, since thiomersal is an important component in terms of maintenance of sterility in certain multidose vaccine vial preparations, its removal might have serious repercussions for safe vaccine delivery.

Subsequent to the decision having been made in the United

States, reassuring additional information about the safety of thiomersal-containing vaccines has become available. In particular, it has been shown that the pharmacokinetic profile of ethyl mercury is substantially different from that of methyl mercury, the former being rapidly excreted through the gut. In addition, several recently completed epidemiological studies have provided reassuring evidence with respect to the safety of thiomersal in the amounts contained in vaccines. The GACVS has reviewed the issue and found no scientific evidence of toxicity from thiomersal-containing vaccines. As a result, the WHO Strategic Advisory Group of Experts,³⁶ at its June 2002 meeting, strongly affirmed that vaccines containing thiomersal should continue to be available so that safe immunization practices can be maintained.

Thiomersal has been used for more than 60 years as an antimicrobial agent in vaccines and other pharmaceutical products to prevent unwanted growth of microorganisms. There is a specific need for preservatives in multidose presentations of inactivated vaccines such as DTP and hepatitis B. Repeated puncture of the rubber stopper to withdraw additional amounts of vaccine at different intervals poses risks of contamination and consequent transmission to children. Removal of thiomersal could potentially compromise the quality of childhood vaccines used in global programs. Live bacterial or viral vaccines (e.g., measles vaccines) do not contain preservatives because they would interfere with the active ingredients. In the case of certain vaccines, thiomersal is also used during the manufacturing process.

THE WAY FORWARD

Since there will probably continue to be challenges raised by allegations of adverse events linked to immunization, it is expected that the role of the GACVS will continue to expand, with special attention to the following:

- Standards involving consultations with the pharmaceutical industry, national governments, and drug regulatory authorities need to be improved. Decisions will increasingly be made on the basis of the comprehensive vaccine safety database being developed by the committee, which will contain all of the relevant materials, published as well as unpublished, that the committee takes into account. The critiques of data made by the committee will be openly available for consideration and review by others. Decisions of the committee may be appealed or challenged. The committee aims at generating a growing sense of confidence that its decisions and recommendations are open-minded, thoroughly sound scientifically and medically, and in the interests of public health.
- The committee has a desire to work more with, and give support to, national drug regulatory authorities in promoting sound and informed regulatory practices, including ongoing review of vaccine safety issues after registration.
- In the future, the committee can be expected to provide more support for the initiatives of the WHO Department of Immunization, Vaccines, and Biologicals to facilitate the department's work with countries (especially developing countries) with vaccine manufacturing capabilities and

high numbers of vaccine exports to other countries. ■

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Note. *The views expressed in this article are those of the Global Advisory Committee on Vaccine Safety and do not reflect the official positions of any of the agencies or institutions with which the authors are affiliated.*

Contributors

All of the authors substantially contributed to the review of the issues presented in their capacity as members of the Global Advisory Committee on Vaccine Safety, and all actively participated in the drafting and editing of the article.

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Research and Development of New Vaccines Against Infectious Diseases

Infectious diseases are responsible for approximately 25% of global mortality, especially in children aged younger than 5 years. Much of the burden of infectious diseases could be alleviated if appropriate mechanisms could be put in place to ensure access for all children to basic vaccines, regardless of geographical location or economic status. In addition, new safe and effective vaccines should be developed for a variety of infections against which no effective preventive intervention measure is either available or practical.

The public, private, and philanthropic sectors need to join forces to ensure that these new or improved vaccines are fully developed and become accessible to the populations in need as quickly as possible. (*Am J Public Health*. 2004;94:1931–1935)

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THE IMPLEMENTATION OF

large-scale and comprehensive national immunization programs, and the considerable successes that were achieved in the eradication of smallpox and the reduction of polio, measles, pertussis, tetanus, and meningitis, were among the most notable achievements of the 20th century. Even in the poorest countries, it has been possible to achieve significant progress in disease control by immunization.¹ There is good reason to expect that these advances will be sustained and will progress even further in the 21st century.²

However, the world's poorest regions are still suffering a heavy toll of premature deaths and disabilities from infectious diseases for which vaccines do not exist, or need to be improved.³ Infectious diseases are still responsible for at least 15 million deaths per year, making them the largest contributors to the disparity in average life span between rich

and poor countries (77 and 52 years, respectively). In addition to this high death toll, millions of children are suffering from disability and illness because they have not been properly immunized. The most effective way to reduce disease and deaths from infectious diseases is to vaccinate populations at risk. Unfortunately, vaccines are still missing for a number of pathogens, and some of the existing vaccines are not completely protective. For these diseases, it is of crucial importance that research and development of vaccines be a priority.

The following is an overview of a few selected fields of current vaccine development.

DIARRHEAL DISEASES

Conservative estimates place the death toll from diarrheal diseases at 4 million to 6 million per year, with most of these deaths occurring in young children. In the long term, access to

clean water, better hygiene, and improvement of sanitation would have the greatest impact on diarrheal diseases, but immunization against specific pathogens is the best hope for the short term and medium term. The burden of diarrhea among children aged younger than 5 years in the developing world is estimated to be 1.5 billion episodes per year, leading to 3 million deaths. Enterotoxigenic *Escherichia coli* is the most frequently isolated bacterial enteropathogen, followed by shigellas (*Shigella flexneri* and *S sonnei*) and cholera bacteria (*Vibrio cholerae*). Enterotoxigenic *E coli* is also the most common cause of travelers' diarrhea. The development of new vaccines against viral diarrhea caused by rotavirus, present in countries with high and low levels of hygiene, is the focus of intense international efforts.

Rotavirus is the leading cause of severe diarrheal disease and dehydration of infants in both in-

dustrialized and developing countries. By age 3 to 4 years, virtually all children have had the disease. Rotavirus is responsible for 25% of deaths associated with diarrhea and for 6% of all deaths in children younger than 5 years of age.

Rotavirus is a double-stranded RNA virus belonging to the Reoviridae family. In the United States, an oral live tetravalent rhesus–human reassortant vaccine was licensed in 1998; recommended for the routine immunization of infants, it was administered to more than 900 000 children. Efficacy estimates were around 55% against all cases of rotavirus diarrhea and over 70% against severe disease. However, an increased frequency of a rare but severe vaccine-associated side effect, called intussusception, was demonstrated, leading to the vaccine's withdrawal from the market in 1999. Unfortunately, the vaccine, which was undergoing testing concomitantly in Asia and Africa, could not be evaluated in terms of risk-benefit for children in developing countries since the trials were stopped.

A lamb-derived monovalent live-attenuated oral vaccine is licensed in China, but the vaccine cannot be distributed on the international market at present. Several new vaccine approaches are currently being pursued:

- A human-derived monovalent live-attenuated oral vaccine is being tested in phase III trials in Latin America and Asia and has undergone extensive testing in Europe, the United States, South Africa, and Bangladesh.
- A bovine–human reassortant pentavalent live-attenuated oral vaccine is currently in late phase III trials, but large efficacy trials

in developing countries remain to be conducted.

- A human neonatal vaccine and 2 human–bovine naturally occurring neonatal-derived strains are also under development.

It remains to be seen whether intussusception will be associated with any of these new rotavirus vaccines, and several alternative vaccine approaches have been proposed to avoid this potential adverse event.

ACUTE RESPIRATORY INFECTIONS

Both viruses and bacteria are a common cause of acute lower respiratory infection (LRI) in children worldwide. The commonest pathogens causing acute LRI are respiratory syncytial virus (RSV) and *Streptococcus pneumoniae*. Dual infections with viral and bacterial pathogens are frequent and seem to increase the severity of the disease.

The sudden emergence in early 2003 of an epidemic of atypical pneumonia originating in China led to the identification of the severe acute respiratory syndrome (SARS) virus, a coronavirus unrelated to previously known coronaviruses. The virus was later recovered from Chinese masked palm civets and raccoon dogs, which might have acted as an intermediate host between an as yet unidentified natural virus reservoir and man. The development of a vaccine against SARS has been judged a global priority, but it is still only at the early clinical stage.

RSV

RSV infects nearly all children by age 2 years. The global annual infection and mortality figures for RSV are estimated to be 64 million and 160 000, respec-

tively. The disease spectrum includes a wide array of respiratory symptoms, from rhinitis and otitis media to pneumonia and bronchiolitis, the latter 2 being associated with substantial morbidity. In industrialized countries, RSV is a well-documented cause of yearly winter and spring epidemics of bronchiolitis and pneumonia, which are responsible for 18 000 to 75 000 hospitalizations and 90 to 1900 deaths annually in the United States. Existing data clearly indicate that RSV also accounts for a high proportion (20% to 30%) of LRI cases in children aged 1 to 4 years in developing countries.

RSV belongs to the Paramyxoviridae family, genus Pneumovirus. Two subgroups, A and B, have been described, primarily based on differences in the antigenicity of the surface glycoprotein (G). Two factors have complicated the development of vaccines to prevent RSV infection. First, host immune responses appear to play a role in the pathogenesis of disease, as early studies with a Formalin-inactivated vaccine showed that vaccine recipients suffered from more severe disease. Second, naturally acquired immunity is neither complete nor durable and recurrent infections occur frequently. Purified fusion protein vaccines have been shown to be safe and immunogenic in 12- to 48-month-old children. A subunit vaccine containing the RSV F, G, and M proteins, now in phase II in Canada and Australia, has exhibited an excellent safety and immunogenicity profile. Another candidate vaccine is a synthetic peptide of the conserved region of the G protein administered intranasally. Live attenuated RSV vaccines based on temperature-sensitive, cold-adapted

strains of the virus that could be delivered to the respiratory mucosa are probably among the most promising approaches.

S pneumoniae

Infections caused by pneumococci are a major cause of morbidity and mortality all over the world. Pneumonia, febrile bacteremia, and meningitis are the most common manifestations of the disease. The highest rates of pneumococcal disease occur among young children and the elderly. Pneumococci are estimated to cause over 1 million deaths, most of which occur in developing countries, where they probably are the most important pathogen of early infancy. In Europe and the United States, pneumococcal pneumonia is the most common community-acquired bacterial pneumonia, estimated to affect approximately 100 adults per 100 000 each year. In developing countries, infants aged younger than 3 months are especially at risk of pneumococcal meningitis. Even in economically developed regions, invasive pneumococcal disease carries mortality rates of 10% to 20%, and the rate may exceed 50% in high-risk groups.

S pneumoniae is a gram-positive encapsulated bacteria of which about 90 different polysaccharide capsule serotypes have been identified. Most pneumococcal disease in infants is associated with the 11 most common serotypes, which cause at least 75% of invasive disease in all regions. Pneumococcal resistance to essential antibiotics is a serious and rapidly increasing problem worldwide.

Protective immunity against pneumococci is provided by type-specific anticapsular antibodies. However, capsular poly-

saccharide vaccines do not regularly elicit protective levels of antibodies in children aged younger than 2 years, or in immunocompromised individuals. One of the currently licensed vaccines contains purified capsular polysaccharide from each of the 23 capsular types of *S pneumoniae*, which together account for most cases (90%) of serious pneumococcal disease in Western industrialized countries. Relatively good antibody responses are elicited in adults. In some countries, vaccination is recommended for elderly people, particularly those living in institutions.

Experience with *Haemophilus influenzae* type B conjugate vaccines has shown that the immunogenicity of polysaccharide can be improved by chemical conjugation to a protein carrier, thereby eliciting a T-cell-dependent antibody response. Unlike polysaccharide vaccines, conjugate vaccines induce high antibody levels and elicit an immune response in infants and in immunodeficient persons. Moreover, these vaccines induce immunological memory. Therefore, they could reduce bacterial transmission in the community. Introduction of a 7-valent conjugate vaccine in the United States resulted in a dramatic decline in the rates of invasive disease. The vaccine also showed moderate protection against otitis caused by vaccine serotypes. However, the decrease in vaccine-type otitis media was partially offset by an increase in disease caused by nonvaccine types of *S pneumoniae* and by *H influenzae*, a phenomenon referred to as “replacement disease.”

The development and introduction in developing countries of a conjugate *S pneumoniae* vaccine is now one of the highest-

priority projects. Several conjugate vaccines that provide more optimal serotype coverage in developing countries than the currently licensed 7-valent vaccine are in clinical development. They may be available by 2008 to 2010 for vaccination programs in developing countries, although presumably at a high price.

MENINGOCOCCAL MENINGITIS

Bacterial meningitis remains a serious threat to global health, accounting for an estimated 170 000 deaths yearly worldwide. Even with antimicrobial therapy and the availability of sophisticated intensive care, case fatality rates remain at 5% to 10% in industrialized countries and are higher in the developing world. Between 10% and 20% of survivors develop permanent sequelae. Since the introduction of *H influenzae* type b conjugate vaccines, *Neisseria meningitidis* has become the commonest cause of bacterial meningitis in the world. *N meningitidis* is spread by person-to-person contact through the airborne respiratory droplets of infected people. The disease affects mainly young children, but it is also common in older children and young adults. Serogroups A, B, C, Y, and W-135 account for 90% of all disease.

Group A meningococcus has historically been the main cause of epidemic meningococcal disease and still predominates in Africa during both endemic and epidemic periods. The highest burden of disease occurs in sub-Saharan Africa in an area extending from Senegal and Ethiopia, referred to as the “meningitis belt.” Epidemics occur in irregular cycles, lasting for 2 to 3 dry seasons and dying out during

the intervening rainy seasons. The size of these epidemics can be enormous: in 1996, around 200 000 cases were reported, with 20 000 deaths. In the last few years, the emergence of group W-135 as the cause of epidemics has added complexity to the epidemiological situation in the region.

Group B meningococcus accounts for approximately 50% of meningococcal meningitis cases in North America and Europe. In all countries, the incidence of group B disease is highest in infants. Group B epidemics have occurred in the United States, Cuba, Brazil, and Chile. Since 1991, New Zealand has experienced a large epidemic of group B meningococcal infection, with incidence rates up to 10 times the background incidence. Altogether, meningococcus serogroup B incidence may be estimated at between 20 000 and 80 000 cases per year, with 2000 to 8000 deaths.

Polysaccharide vaccines against *N meningitidis* groups A, C, Y, and W-135 are available worldwide, although in restricted quantities, and with a price for the tetravalent vaccine that does not allow widespread use in sub-Saharan Africa. The emergence of the W-135 serogroup in some countries of Africa has prompted the development of a cheaper trivalent polysaccharide A/C/W-135 vaccine. However, polysaccharide vaccines are poor immunogens in young infants and fail to induce immunological memory. In 1999, meningococcal group C conjugate vaccine was successfully introduced into the routine British immunization program, opening the way for the development of conjugate vaccines against the other *N meningitidis* serogroups. Vaccine manufactur-

ers are currently developing conjugate vaccine combinations incorporating groups A, C, Y, and W-135 polysaccharides.

These multivalent meningococcal polysaccharide-protein conjugate vaccines will be available in the United States and Europe within a few years. Nevertheless, it is unlikely that these new vaccines will be available at a price affordable to most of the countries in the African meningitis belt. Therefore, a public partnership between the World Health Organization (WHO) and the Program for Appropriate Technology in Health (a US-based nongovernmental organization), the Meningitis Vaccine Project, is currently developing a serogroup A conjugate vaccine tailored for Africa that will be available at a price of less than US\$1 per dose.

Serogroup B capsular polysaccharide is a poor immunogen, probably because it is structurally identical to glycoproteins expressed by host tissues. Consequently, vaccine research directed against serogroup B meningococcus has focused largely on cell-surface protein antigens (outer membrane proteins). The 2 most-studied outer-membrane-protein vaccines are those produced in response to outbreaks in Norway and Cuba. Both have been used for epidemic control in their respective countries and were found to be 50% to 80% effective.

HIV/AIDS

More than 40 million adults and children are living with HIV/AIDS worldwide and close to 5 million people (including 800 000 children) become infected each year. HIV infections are now almost equally distrib-

uted between men and women, with an estimated 17.6 million women aged 15 to 49 years living with HIV/AIDS. HIV/AIDS is the leading cause of death in sub-Saharan Africa and the fourth biggest killer worldwide. Asia currently experiences the world's fastest-growing HIV/AIDS epidemic. Highly active antiretroviral therapy has reduced progression to AIDS, deaths, and HIV transmission from mother to child in North America and Western Europe. However, success with treatment has not been matched by progress toward prevention, and evidence of rising HIV infection rates is emerging, particularly in marginalized communities. A new determination to fight the epidemic emerged following the United Nations General Assembly Special Session on HIV/AIDS in July 2001, and a general effort is being made to make antiretroviral drugs available to the underprivileged populations. A new initiative (called "3 by 5") launched by WHO in 2003 aims at providing effective therapy to at least 3 million patients by 2005. However, despite these encouraging trends, a preventive vaccine is needed more than ever, particularly in developing countries.

Human immunodeficiency viruses belong to the Lentivirus group of the Retroviridae family. Two types have been described: HIV-1 and HIV-2, the former appearing more aggressive and spreading more rapidly. The development of a safe and effective HIV vaccine is hampered by the tremendous genetic variability of the virus and the paucity of knowledge on possible immune mechanisms of protection. The first clinical trial of an HIV vaccine was conducted in the United

States in 1987. Since then, over 30 candidate vaccines have been tested in over 80 phase I/II clinical trials, involving over 10 000 healthy volunteers. Most of these trials have been conducted in the United States and Europe. A few trials also have been conducted in developing countries (Brazil, China, Cuba, Haiti, Kenya, Thailand, Trinidad, and Uganda). The effort to develop and evaluate HIV vaccines will be strengthened by the African AIDS Vaccine Programme, which was established following an initiative of WHO and the Joint United Nations Programme on HIV/AIDS (UNAIDS), and by a new initiative involving, among others, the Bill and Melinda Gates Foundation, the International AIDS Vaccine Initiative, and the US National Institutes of Health.⁴

Only 2 efficacy trials have been completed so far, both using the same approach of a subunit gp120 envelope glycoprotein, one in the United States (with sites in Canada and Europe) and the other in Thailand. The 120 kDa glycoprotein (gp120) is the major antigenic determinant present on the surface of HIV particles. Definite results from both trials were reported in 2003, demonstrating that immunization did not result in a statistically significant reduction of HIV infection within the study populations. A third efficacy trial involves a live recombinant vector (canarypox-HIV) expressing the *gag*, *env*, and *pol* genes of HIV-1 and combined in a prime-boost vaccination regimen with a gp120 subunit vaccine; begun in Thailand in late 2003, it aims to include 16 000 volunteers. Other interesting approaches being tested in humans are based on DNA prime and recombinant poxvirus boosts.

These vaccines are not intended to prevent HIV infection but to elicit a T-cell immune response that could prevent or delay the occurrence of the disease.

Recombinant adenoviruses represent another promising approach of the same type, especially when combined with a recombinant canarypox in a prime-boost vaccination regimen. Other candidate vaccines include other recombinant bacterial or viral vectors, some of which have shown some promise in controlling viral replication in preclinical studies in nonhuman primate models. Subunit HIV vaccines based on engineered recombinant envelope glycoproteins alone or combined with the nonstructural Tat, Nef, and Rev proteins, DNA vaccines and peptides also are under development.

There is no doubt that the development of a safe, effective, and affordable HIV vaccine remains the scientific and public health challenge of this new century.

HUMAN PAPILLOMAVIRUS

Human papillomavirus (HPV) causes cervical cancer, the second biggest cause of female cancer mortality worldwide with 288 000 deaths yearly. Approximately 500 000 cases of cervical cancer are reported each year, with nearly 80% occurring in developing countries. In the absence of screening programs, cervical cancer is detected too late and leads to death in most cases. The highest incidences are found in some countries of Latin America (93.8 per 100 000 women in Haiti, the highest national incidence in the world), in Africa (61.4 per 100 000 women in Tanzania), and in Asia (30 per 100 000 in India). Epidemiological studies have reported that

75% of the 15- to 50-year-old population in the United States is infected with HPV, with 1% presenting clinical lesions. The prevalence of HPV infection among sexually active women may range from 18% to 25%, especially in some populations of sexually active teenagers.

HPV belongs to the Papovaviridae family. More than 30 types of HPV have been identified that can infect the genital mucosa. It has been established that over 95% of cervical cancer biopsies contain HPV DNA, with oncogenic HPV-16, -18, -33, and -45 comprising more than 80% of the cases. The association of cervical cancer with the presence of sexually transmitted HPV DNA has substantiated the basis for vaccine development. Viral recombinant proteins are being studied as antigenic components of vaccine candidates. Prophylactic vaccine candidates are based on the recombinant capsid proteins L1 and L2, which self-assemble into viruslike particles (VLPs) that can induce virus-neutralizing antibodies, while therapeutic vaccine candidates, based on viral oncogenic proteins E6 and E7, are designed to induce cell-mediated immune responses able to eliminate infected cells.

The results of a controlled efficacy trial of HPV-16 VLPs became available recently and showed that the incidence of persistent HPV-16 infection and HPV-16-related cervical intraepithelial neoplasia was reduced in vaccinated women, with a 100% efficacy rate over a 1.7-year follow-up period. These results suggest that immunizing HPV-16-negative women will eventually reduce the incidence of cervical cancer. Two prophylactic vaccine candidates are at the level of phase III efficacy evalua-

tion: a bivalent HPV-16/18 VLP vaccine produced in insect cells using a recombinant baculovirus, and a tetravalent HPV-6/11/16/18 VLP vaccine produced in recombinant yeast.

CONCLUSION

The biotechnology revolution, culminating in the sequencing of the genome of a great many pathogens, together with increased knowledge of the immune responses to infections, has allowed the unprecedented rational development of new recombinant vaccines that will hopefully help control infectious diseases, including those that appear most complex, such as HIV/AIDS, tuberculosis, and malaria.⁵ However, despite these new tools, the challenges remain formidable.⁶ The development and registration of a new vaccine can take more than 10 years⁷ and cost \$200 million to \$500 million.⁸ The world vaccine market is estimated at approximately \$6.5 billion,⁹ a meager 2% of the global pharmaceutical market, making vaccine research and development considerably less attractive to private investors than drug development. Moreover, many of the diseases for which new vaccines are urgently needed mainly affect developing countries whose market characteristics fail to attract private capital investment.

It is nevertheless vital to continuously develop new vaccines and to improve existing ones.¹⁰ In this context, a new paradigm needs to be developed to include and coordinate the actions of the WHO, international and national funding agencies, the pharmaceutical industry and manufacturers in emerging developing countries, nonprofit foundations,

and nongovernmental humanitarian organizations. Working together, these organizations could harness existing potentials and accelerate the development and testing of new vaccines and the improvement and implementation of existing vaccines. The goal is to offer better safety, efficacy, and delivery methods with lower costs of production, leading to a more efficient distribution and better availability of vaccines, especially in developing countries. ■

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Prevalence of Chronic Diseases in Adults Exposed to Arsenic-Contaminated Drinking Water

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Inorganic arsenic is naturally occurring in groundwaters throughout the United States. This study investigated arsenic exposure and self-report of 9 chronic diseases. We received private well-water samples and questionnaires from 1185 people who reported drinking their water for 20 or more years. Respondents with arsenic levels of 2 µg/L or greater were statistically more likely to report a history of depression, high blood pressure, circulatory problems, and bypass surgery than were respondents with arsenic concentrations less than 2 µg/L. (*Am J Public Health*. 2004;94:1936–1937)

Inorganic arsenic is commonly found in groundwaters throughout the United States. In October 2001, the US Environmental Protection Agency reduced the maximum contaminant level drinking water standard for arsenic from 50 µg/L to 10 µg/L. By 2006, all public drinking water supplies in the United States are required to comply with the new standard. This new standard is based on existing epidemiological evidence documenting the association between arsenic exposure and cancers of the lung and bladder. The health effects associated with inorganic arsenic exposure are numerous and include basal cell cancer of the skin; tumors of the bladder, kidney, liver, and lung^{1–4}; blood vessel damage⁵; peripheral vascular and cardiovascular disease^{4,6–8}; numbness in the hands and feet^{9,10}; and diabetes mellitus.^{11,12}

Many studies have documented associations between arsenic exposure and chronic illness; however, most have focused on high exposures and cancers.^{2,4,5,13–15} Less studied have been the effects of low-level arsenic exposure.

In 1987, a groundwater study conducted by the Wisconsin Department of Natural Resources identified arsenic in groundwater above the maximum contaminant level coincident with a bedrock layer at the interface of the St. Peter Sandstone and Snippee Dolomite. The geologic formation exists beneath more than 20 000 private water supply wells throughout several Wisconsin counties. Water samples collected from 1943 private wells between 1992 and 1993 contained arsenic concentrations that ranged from less than 2 µg/L to 12 000 µg/L. Nearly 20% of the water samples contained concentrations that exceeded the new federal drinking water standard of 10 µg/L.¹⁶

The principal objective of this research was to evaluate the prevalence of 9 different chronic diseases in adults who drink water from privately owned wells in the at-risk area.

METHODS

Between July 2000 and January 2002, 19 townships in the arsenic-contaminated area sponsored well-water testing programs to promote arsenic awareness and remediation options. All township homeowners were eligible and encouraged to obtain a well-water sample kit from the local town hall. A survey, which contained questions about lifetime residential history, usual drinking water consumption, use of water-treatment systems, and family health status, was included in the kit. The homeowners' collected water sample and completed surveys were returned to the town hall for analysis. All the surveys were returned before the homeowners received the results of their water tests.

At the completion of the awareness campaign (approximately 1 month after all samples were returned), homeowners were invited to an informational meeting at the local town hall. During this meeting, they received

the results of their well-water tests and were given the opportunity to ask state experts questions.

Data from the surveys were analyzed with SAS, Version 8.2 (SAS Institute Inc, Cary, NC). Arsenic water concentrations were grouped into 3 strata (<2 µg/L, 2–10 µg/L, >10 µg/L). Analysis was limited to those aged 35 years or older who reported drinking their well water for 20 or more years. To evaluate the magnitude of any association between arsenic water concentrations and chronic disease status, multivariate logistic regression was used to calculate adjusted odds ratios (ORs) and 95% confidence intervals (CIs).

RESULTS

The mean age of the 1185 respondents who met our inclusion criteria was 62 years (SD=12 years). The respondents reported drinking their well water for 20 to 83 years (mean=30 years; SD=10 years). The arsenic water concentrations ranged from 0 µg/L to 2389 µg/L, with a median of 2 µg/L. Most (84%) of the water samples had arsenic concentrations of 10 µg/L or less.

The results of the logistic regression analysis are shown in Table 1. Individuals with wells in the mid strata of arsenic concentrations (between 2 µg/L and 10 µg/L) were significantly more likely to report having depression than were respondents in the lowest strata (arsenic concentrations <2 µg/L) (adjusted OR=2.74; 95% CI=1.14, 6.63). Additionally, respondents with well-water arsenic concentrations greater than 10 µg/L were significantly more likely to report having had cardiac bypass surgery, high blood pressure, and circulatory problems than were respondents whose well water had arsenic concentrations less than 2 µg/L.

DISCUSSION

Our study is consistent with other studies that have found an association between arsenic exposure and cardiac disease,^{4,6–8,17} but the association between arsenic water concentration and depression is novel and

TABLE 1—Associations Between Reported Chronic Illness and Arsenic (As) Exposure

Reported Chronic Illness	2 µg/L ≤ As ≤ 10 µg/L		As > 10 µg/L	
	Crude OR (95% CI)	Adjusted OR (95% CI) ^{a,b}	Crude OR (95% CI)	Adjusted OR (95% CI) ^{a,b}
Bypass	1.54 (0.84, 2.82)	1.77 (0.95, 3.30)	1.91 (0.94, 3.87)	2.34 (1.12, 4.90)*
Angina	2.05 (0.85, 4.90)	2.27 (0.92, 5.59)	1.04 (0.28, 3.90)	1.07 (0.28, 4.07)
Heart disease	1.31 (0.87, 1.97)	1.52 (1.00, 2.35)	1.30 (0.78, 2.17)	1.54 (0.90, 2.68)
Heart attack	1.19 (0.63, 2.23)	1.31 (0.70, 2.50)	1.83 (0.91, 3.68)	2.08 (1.10, 4.31)*
High blood pressure	1.09 (0.80, 1.50)	1.15 (0.82, 1.59)	1.57 (1.10, 2.31)*	1.68 (1.13, 2.49)*
Stroke	0.85 (0.37, 1.93)	0.93 (0.40, 2.14)	1.18 (0.46, 3.06)	1.53 (0.60, 4.07)
Circulatory problems	1.22 (0.56, 2.62)	1.31 (0.60, 2.86)	2.38 (1.10, 5.26)*	2.64 (1.17, 5.95)*
Type 2 diabetes mellitus	1.29 (0.75, 2.20)	1.35 (0.78, 2.33)	1.10 (0.50, 2.10)	1.02 (0.49, 2.15)
Depression	2.70 (1.12, 6.50)*	2.74 (1.14, 6.63)*	2.40 (0.90, 6.98)	2.32 (0.80, 6.82)

Note. OR = odds ratio; CI = confidence interval.

^aReferent group = As < 2 µg/L.

^bAdjusted for gender, age, smoking status, and body mass index.

*Significant at $P \leq .05$.

merits further investigation. Only a few studies have evaluated the effect of arsenic exposure on brain function.^{18–20} Calderon et al.¹⁸ found that arsenic exposure is associated with lower verbal IQ and poorer long-term memory in children. The Agency for Toxic Substances and Disease Registry¹⁷ has stated that acute toxic exposures to inorganic arsenic have been shown to lead to emotional lability and memory loss. A mechanism of action has not been identified, but perhaps long-term exposure to arsenic may interfere with the neurotransmitters associated with depression. Mechanistic research into effects on the brain and mental development is needed to understand the role arsenic may play in the development of neurological disease.

Caution in interpretation of our results is warranted because the health data are self-reported and not verified by medical record review. Also, we did not know the arsenic levels in the homeowner's drinking water over the entire period of more than 20 years or how much arsenic was actually ingested. We assumed that our arsenic water concentration strata assignment was a reasonable surrogate for exposure and would have remained constant over the period. The possibility of other co-minerals and metals in the water samples contributing to health outcomes was not evaluated. ■

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Contributors

K.M. Zierold conducted the analyses and led the writing of the brief. L. Knobloch conceived the study and supervised its implementation. H. Anderson assisted with the study and the analysis. All authors helped to conceptualize ideas, interpret findings, and review and edit drafts of the brief.

Human Participant Protection

No protocol approval was needed for this study.

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Risk of Hospitalization Among Firefighters: The National Health Interview Survey, 1986–1994

David J. Lee, PhD, Lora E. Fleming, MD, PhD, MPH, MS, Orlando Gomez-Marín, PhD, MSc, and William LeBlanc, PhD

This study assessed the risk of hospitalization among firefighters. Data were derived from a nationally representative sample of 235 897 employed men from the National Health Interview Survey. Firefighters aged 30 to 39 years were at significantly increased risk for hospitalization relative to other employed men in the same age group (odds ratio = 1.93; 95% confidence interval = 1.21, 3.09). Findings from this study and others support the call for longitudinal studies to monitor the health of this high-risk occupational group. (*Am J Public Health*. 2004;94:1938–1939)

The occupational risk of death among firefighters was underscored on September 11, 2001, when 345 members of the New York City Fire Department perished during their response to the World Trade Center attack.¹ However, in the 10 years prior to this event, 75 to 112 annual occupational deaths occurred among professional and volunteer firefighters in the United States.² Firefighters are also exposed to risk of communicable diseases, respiratory and cardiovascular diseases, and thermal and musculoskeletal injury.^{3–7} Moreover, they have been shown to be at increased risk for site-specific cancers.⁸

The US Fire Administration has compiled the annual number of firefighter fatalities in the United States for the past 20 years.⁹ The US Fire Administration also compiles information on firefighter injuries occurring at approximately one third to one half of all fires in the United States through the National Fire Incident Reporting System.¹⁰

However, to date, there have been no nationally representative studies of hospitalization risk among firefighters. This study examined hospitalization rates in male firefighters and compared them with hospitalization rates in males employed in all other occupations.

METHODS

Study Population and Design

Conducted annually by the National Center for Health Statistics (NCHS), the National Health Interview Survey (NHIS) is a continuous multipurpose and multistage probability area survey of the US civilian noninstitutionalized population.¹¹ Each year, the NCHS collects health-related information from all adults residing in households selected to participate in the survey. A primary household respondent is asked to report on the health status of any adult member of the household not present for the interview. Throughout the 1986 to 1994 survey years, the response rate ranged between 95% and 98%. For the current analyses, complete data were available on 235 897 employed males, aged 18 to 64 years, who participated in the 1986 to 1994 NHIS. Of these, 923 were firefighters. The analyses were restricted to male workers because the data included only 38 female firefighters.

Measures

Information on paid employment during the 2 weeks before the interview was collected for all persons aged 18 years or older. “Firefighter” was defined according to the following US census occupational codes: 413, 416, and 417.^{12,13} Participants were asked to report how many times they had stayed in a hospital overnight or longer in the past 12 months. Age group (18–29, 30–39, 40–49, and 50–64), race/ethnicity (White, Black, all others), and educational attainment (less than high school education, high school graduate, greater than high school education) were included as covariates.

Analyses

Because of the complex sample survey design, all analyses were completed with



FIGURE 1—Age-specific rates of 1 or more hospitalizations in the previous 12 months, by employment (firefighter vs other) and age group.

SUDAAN (Research Triangle Institute, Research Triangle Park, NC). This software takes into account design effects as well as sample weights, which were adjusted because of the use of multiple survey years.¹⁴ Odds ratios (ORs) and corresponding 95% confidence intervals (CIs) are reported.

RESULTS

Initial analyses of predictors of hospitalization in the previous 12 months indicated that there was a significant interaction between age and occupational status (Figure 1). Therefore, multivariate logistic regression was performed separately within each age group. Occupational status was not associated with risk of hospitalization among 18- to 29-year-old or 40- to 49-year-old participants (Table 1). However, relative to other employed adults in the same age group, the risk of hospitalization was significantly increased for firefighters aged 30 to 39 years (OR = 1.93; 95% CI = 1.21, 3.09) and significantly lower for firefighters aged 50 to 64 years (OR = 0.22; 95% CI = 0.05, 0.94).

DISCUSSION

Information on the reasons for hospitalization was not collected in the NHIS. However, the increased risk of hospitalization

TABLE 1—Multivariate Adjusted Odds Ratios (ORs) and 95% Confidence Intervals (CIs) for Hospitalization During the 12 Months Preceding the Interview Among Male Firefighters vs All Other Employed Males: National Health Interview Survey, 1986–1994

Age Group, y, and Employment Type	Multivariate Adjusted OR ^a		
	n	OR	95% CI
18–29			
Not a firefighter	64 712	1.00	
Firefighter	189	0.94	0.40, 2.19
30–39			
Not a firefighter	70 065	1.00	
Firefighter	355	1.93	1.21, 3.09
40–49			
Not a firefighter	54 547	1.00	
Firefighter	275	1.17	0.70, 1.94
50–64			
Not a firefighter	45 650	1.00	
Firefighter	104	0.22	0.05, 0.94

^aAdjusted for survey design, race/ethnicity, and educational level.

found in firefighters aged 30 to 39 years is likely caused, in part, by their occupational exposures. For example, 6 of the 14 non-heart-disease-related occupational deaths in 2001 occurred in professional firefighters aged 36 to 40 years (data exclude World Trade Center deaths).¹⁵ Furthermore, the average age of firefighters filing workers' compensation claims is 35 years; the most commonly reported injuries leading to these claims are strains or sprains, overexertion, and burns.¹⁶

The lower risk of hospitalization among older firefighters may reflect, in part, a reduced occupational risk as these individuals move into more supervisory positions within the fire service and, perhaps, the acquisition of additional job-related safety skills. This lower risk also may be related to the healthy worker survivor effect. Firefighters who maintain good health in their later years will not face early retirement because of disability. Thus, older individuals who remain firefighters throughout their working lives could be expected to be healthier, on average, compared with per-

sons employed in other, less physically demanding occupations.

Findings from this study and the ongoing monitoring of occupational morbidity and mortality among firefighters reinforce the need for better training, the use and proper maintenance of safety equipment, the implementation of an incident management system by fire departments, and a focus on firefighter fitness.^{17,18} Finally, this study, along with others documenting a range of adverse health effects associated with firefighting, supports the call for longitudinal studies to monitor the health of this high-risk occupational group. ■

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Contributors

D.J. Lee and L.E. Fleming designed and coordinated both the research and the writing of the brief. O. Gomez-Marín and W. LeBlanc contributed to the study design, conducted the statistical analysis, and contributed to the writing of the brief.

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Human Participant Protection

No protocol or institutional review board approval was needed for this study, because data were collected anonymously from a public health surveillance system in which adults voluntarily consented to interviews.

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Epidemiology of Hospitalizations Resulting From Dog Bites in California, 1991–1998

Katherine A. Feldman, DVM, MPH, Roger Trent, PhD, and Michele T. Jay, DVM, MPVM

We used population-based hospital discharge data to describe hospitalizations resulting from dog bites in California from 1991 through 1998, when there were 6676 such hospitalizations (average 835 per year; range 732 to 930), and the annual cumulative incidence for all ages was 2.6 per 100 000. Children had more than twice the risk of adults, and Asians had lower rates than Whites. Children aged 0 to 9 years were more likely to suffer wounds to the head and face. (*Am J Public Health*. 2004;94:1940–1941)

Dog bites are a poorly understood and complex public health problem. The incidence and emergency department treatment of dog bites have been reported,^{1,2} but there is little information on hospitalizations resulting from dog bites. We used population-based hospital discharge data to describe hospitalizations in California from 1991 through 1998.

The California Office of Statewide Health Planning and Development provided hospital discharge data, coded according to the *International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM)*.³ Hospitals report the principal diagnosis (the condition causing the hospitalization) and up to 24 other diagnoses (contributing conditions to the length of stay or charges). Since 1991, California hospitals are required to report the external cause of injury (E-codes) for the first hospitalization for an injury, permitting tabulation of incident cases without duplication. By law, discharge records involving an injury must be assigned an E-code with an error tol-

erance of 0.1%, or the submitting hospital can be fined.

Records with E-code E906.0 (dog bite) were extracted for years 1991 through 1998. Ethnicity (Hispanic origin) was added in 1995; race/ethnicity data after 1995 was recoded to the earlier coding scheme. Descriptive statistics were calculated using SAS version 8 (SAS Institute Inc, Cary, NC) and EpiInfo 6.04 (Centers for Disease Control and Prevention, Atlanta, Ga). California Department of Finance intercensal population estimates were used as the denominator (the average of the 1991 and 1998 populations) data to calculate cumulative incidences per 100 000 California residents.⁴ Cumulative incidence ratios, 95% confidence intervals, and relative risks were calculated.

The 3-digit prefix of the principal diagnosis was analyzed; for the 10 most frequent diagnoses, the anatomic injury locations were analyzed using the *ICD-9* subcode. The first diagnosis involving an infectious agent (*ICD-9* codes 020 to 041) within the first 8 additional diagnoses was extracted. For 1998 only (the most recent year analyzed and therefore the most relevant to the current economy), total hospitalization charges were calculated.

In California from 1991 through 1998, there were 6676 hospitalizations resulting from dog bites (average 835 per year; range 732 to 930). The overall average annual cumulative incidence was 2.6 per 100 000; no temporal trends were detected over this period. Cumulative incidences per 100 000 per year were greatest for young children (Table 1). The overall average annual cumulative incidences per 100 000 by race were greatest for Blacks and Whites: White, 3.0; Black, 3.1; Hispanics, 2.3; Asians, 0.8. Asian race was highly protective (cumulative incidence ratio=0.3, 95% confidence interval [CI]=0.2, 0.3) relative to White race. Males accounted for a greater proportion (58%, $P<.0001$) of hospitalizations, and males were significantly younger than females (mean 28.2 vs 33.8 years, $P<.0001$). Males had a higher average annual cumulative incidence for all age categories.

Ten principal diagnosis categories accounted for 75% of hospitalizations (Table 2). The remaining 25% comprised over 200 categories. Of those hospitalized with the 10

TABLE 1—Annual Cumulative Incidence and Cumulative Incidence Ratios, by Age Group of Hospitalizations Resulting From Dog Bites: California, 1991–1998

Age Group, y	Annual Cumulative Incidence per 100 000 population	Cumulative Incidence Ratio ^a (95% CI)
0–4	5.5	2.8 (2.6, 3.0)
5–9	4.3	2.2 (2.0, 2.4)
10–14	2.3	1.2 (1.1, 1.3)
15–19	1.2	0.6 (0.5, 0.7)
20–39	2.0	Referent
≥ 40	2.4	1.2 (1.2, 1.3)
Overall	2.6	

Note. CI = confidence interval.

^aRelative to age group 20 through 39 years.

most frequent diagnoses, 74% of children aged 0 to 9 years suffered wounds to the head and face, compared with 10% of people aged 10 years or older (relative risk [RR]=7.6, 95% CI=6.8, 8.5). Seventy-one percent of people aged 10 years or older suffered wounds to the forearm, hand, and fingers, compared with 18% of children aged 0 to 9 years (RR=3.9, 95% CI=3.5, 4.3). Of the 6676 hospitalizations, 606 (9%) listed an infectious condition in the principal or first 8 “other” diagnoses (Table 2). The mean length of stay was 3.5 days (median 3 days, range 1 to 117 days), and increased with increasing age (2.7 days for children aged 0 to 4 years compared with 4.2 days for those aged 40 years and older).

Charges reported in hospital discharge data include daily hospital, ancillary, and patient care services, but not hospital-based physician fees or preadmission or postdischarge charges. In 1998, hospitalizations with charges reported (n=828) totaled \$9 373 019. When the median charge of \$7374.50 was added for each hospitalization not reporting charges (n=102), charges totaled \$10 125 218.

This is the first epidemiological report of hospitalizations resulting from dog bites in the United States using population-based data, collected over 8 years. Coding for dog bites is unambiguous, and the diagnosis of dog bite is

TABLE 2—The 10 Most Frequently Reported Principal Diagnosis Categories and the 3 Most Commonly Reported Associated Infections for Hospitalizations Resulting From Dog Bites: California, 1991–1998

ICD-9 Category (3-Digit Prefix)	Description	Percentage of Total
10 Most frequently reported principal diagnosis categories (n = 6676)		
682	Cellulitis and abscess (not of finger or toe)	18.2
873	Open wound of head	16.3
882	Open wound of hand except finger(s) alone	10.1
881	Open wound of elbow, forearm, and wrist	8.0
891	Open wound of knee, leg (except thigh), and ankle	6.1
883	Open wound of finger(s)	4.9
870	Open wound of ocular adnexa	4.5
816	Fracture of 1 or more phalanges of hand	2.6
880	Open wound of shoulder and upper arm	2.0
681	Cellulitis and abscess of finger and toe	1.9
3 most commonly reported associated infections (n = 606)		
041.1	Bacterial infection in conditions classified elsewhere, <i>Staphylococcus</i>	29.5
027.2	Other zoonotic bacterial diseases, pasteurellosis	22.4
041.0	Bacterial infection in conditions classified elsewhere, <i>Streptococcus</i>	14.7

Note: ICD-9 = International Classification of Diseases, 9th Revision.

sensitive and specific; we are therefore confident that our data reflect all California hospitalizations resulting from dog bites. Findings reported here confirm discharge rates and length of stay reported using sampled data⁵ and provide new information regarding diagnoses, anatomic location, and differences among races.

Most dog bite injuries in the United States result from owned pets,⁶ and thus there is a large population at which to target interventions. The American Veterinary Medical Association Task Force on Canine Aggression and Human-Canine Interactions published a model community prevention program.⁷ Interventions might include education of dog owners by health care, veterinary, and animal care professionals. Improved surveillance of dog bites and better implementation of strict animal control laws should also be priorities. Local control ordinances targeting specific breeds are unlikely to be effective and are not recommended for reducing dog bite incidences.^{7,8} Although it is impossible to prevent all dog bites, it should be possible to reduce the number of bites and the significant associated morbidity, mortality, and costs. ■

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At the time of the study, Katherine A. Feldman and Michele T. Jay were with the Veterinary Public Health Section, Disease Investigations and Surveillance Branch, and Roger Trent was with the Injury Surveillance and Epidemiology Section, Epidemiology and Prevention for Injury Control Branch, of the California Department of Health Services, Sacramento, Calif.

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Contributors

K. A. Feldman designed the study, obtained and analyzed the data, and interpreted the results. M. T. Jay provided supervision and contributed to the conception and design of the study and the interpretation of results. R. Trent contributed to the conception and design and to the interpretation of results. All authors contributed to the writing of the article.

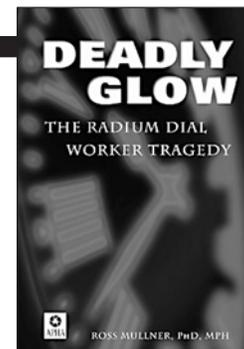
Human Participant Protection

No protocol approval was needed for this study.

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Deadly Glow

The Radium Dial Worker Tragedy

By Ross Mullner, PhD, MPH

Deadly Glow is an important story of a public health tragedy. Dr. Mullner chronicles the lives of numerous young women who worked in radium application plants in the early 1900s painting numerals on instrument and watch dials. The harmful effects of radium deposited in the body became known from their dreadful experience.

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Environmental Justice, Cumulative Environmental Risk, and Health Among Low- and Middle-Income Children in Upstate New York

Gary W. Evans, PhD, and Lyscha A. Marcynyszyn, MA

Environmental risks are not randomly distributed in the population; instead, they are inversely correlated to income.¹ Economically disadvantaged children live in noisier² and more crowded homes³ and are exposed to more environmental toxins¹ than their middle-income counterparts. Housing quality is also inversely related to income.^{4,5} Ethnic minorities also suffer disproportionate environmental risk,⁶ and a few studies reveal no income–environmental quality link.⁷ Although poor children are substantially more likely to confront singular environmental risks in their immediate environments, exposure to cumulative environmental risks may be a particularly important and unstudied aspect of environmental justice and health. If the ecology of childhood poverty is characterized by the confluence of environmental risks, examination of the health consequences of singular risks may underestimate the true environmental risk profile of low-income children.

We examined how exposure to residential crowding, interior noise levels, and housing problems, singularly and in combination, related to chronic physiological stress in a sample of low- and middle-income children in rural upstate New York.

METHODS

Participants

The income-to-needs ratio is a per capita index, adjusted annually for costs of living; a ratio equal to or less than 1 is the US Census Bureau's definition of poverty. One hundred fourteen third- through fifth-grade children (mean age=9.1 years, SD=1.10, 52% male) in this study lived in poverty (mean income-to-needs ratio=0.81). One hundred two third- through fifth-grade middle-income (mean income-to-needs ratio=2.79) children (mean age=9.2 years, SD=1.08, 52% male) also participated in the study. Sixty percent of the low-income sample lived with a single parent.

Objectives. We documented inequitable, cumulative environmental risk exposure and health between predominantly White low-income and middle-income children residing in rural areas in upstate New York.

Methods. Cross-sectional data for 216 third- through fifth-grade children included overnight urinary neuroendocrine levels, noise levels, residential crowding (people/room), and housing quality.

Results. After control for income, maternal education, family structure, age, and gender, cumulative environmental risk exposure (0–3) (risk > 1 SD above the mean for each singular risk factor [0, 1]) was substantially greater for low-income children. Cumulative environmental risk was positively correlated with elevated overnight epinephrine, norepinephrine, and cortisol in the low-income sample but not in the middle-income sample.

Conclusions. Cumulative environmental risk exposure among low-income families may contribute to bad health, beginning in early childhood. (*Am J Public Health*. 2004;94:1942–1944)

Eighty-six percent of mothers in the low-income sample were high school graduates, with 3% also completing college. Twenty-four percent of the middle-income sample lived with a single parent. One hundred percent of mothers in the middle-income sample were high school graduates, with 44% also completing college. Representative of the rural northeast, the sample was predominantly White (96%). Our participants were drawn from a sample (n=270) of rural, low-income families (<1 income-to-needs ratio) and middle-income families (2–4 times the income-to-needs ratio) recruited from public schools, housing assistance programs, Head Start families, and cooperative extension programs in rural upstate New York. Our participants included the subset of the original sample in which 1 or more physiological stress measures were available.⁸ Response rates could not be determined for the original sample because of voluntary responses to advertisements, announcements, and public presentations. The refusal rate of eligible families (income criterion and child age) was less than 5% and similar for both low- and middle-income families. The present sample of 216 children who have overnight neuroendocrine data does not differ regarding any background characteristic (age [$P<.35$], gen-

der [$P<.15$], income [$P<.26$], single parent [$P<.78$], and mother's education [$P<.45$]) from the original sample of 270 children.

Procedure

One child per household and his or her mother participated in home interviews. Parental informed consent and child assent were obtained for all participants. Crowding was measured by dividing the number of people living in the household by the number of rooms (including bathrooms). Indoor noise was monitored for two 2-hour periods on different days with a Bruel & Kjaer Model 2236 Sound Level Meter (Bruel & Kjaer, Naerum, Denmark). Noise level during each period was assessed as Leq dbA (a measure of average sound pressure); means for each of the 2 periods were totaled and divided by 2 to produce an average. Housing quality assessment consisted of trained observer ratings with a standard instrument.⁹ Raters trained to criterion (>90% independent agreement) conducted a walk-through evaluation of each residence with a 73-item rating scale (0- to 2-point scales) consisting of 5 subscales: structural quality (e.g., cracks in walls), clutter and cleanliness (e.g., materials on table/counters in kitchen), hazards (e.g., loose stair rail), indoor climate (e.g., ventilation), and chil-

dren's resources (e.g., designated play space). Extensive data on the reliability and validity of this standard housing quality index are available in Evans et al.⁹

Cumulative environmental risk exposure was estimated for each child. For the entire distribution of households, the mean and standard deviation for each environmental risk factor (i.e., crowding, noise, housing quality) were calculated. Risk exposure for each environmental risk factor was designated as greater than 1 SD above the mean for each respective factor and given a score of 1. The other exposure levels were considered lower risk and coded as 0. These 3 dichotomized environmental risk factors were then summed to form an index of cumulative environmental risk exposure (possible range=0–3).

Overnight (8:00 PM–8:00 AM) urine samples were collected, processed, and then deep frozen (–80°C) until subsequent biochemical assays could be conducted by technicians blind to the children's income status and environmental risk condition. Epinephrine and norepinephrine were assayed with high-performance liquid chromatography with electrochemical detection.¹⁰ Free cortisol was measured with radioimmunoassay.¹¹ Creatinine was assessed to control for differences in body mass and incomplete urine voiding.¹² These neuroendocrine indices are reliable and valid indicators of chronic stress¹³ associated with the development of cardiovascular disease and compromised immune functioning.¹⁴

RESULTS

Table 1 depicts descriptive information on each of the environmental risk factors. Low-income children were exposed to significantly more crowding ($t[214]=7.33, P<.01$), housing problems ($t[214]=8.31, P<.01$), and noise ($t[214]=3.21, P<.01$). A significant difference in the number of cumulative risks was detected for the 2 samples as well ($t[214]=5.62, P<.01$). Data for exposure to 2 or more cumulative environmental risks were collapsed because of the small number of children exposed to all 3 environmental risk factors.

Ordinary least-squares regression, statistically controlling for children's income-to-needs ratio, family structure (single-parent status), maternal educational attainment, and children's gender and age, was used to examine cumulative environmental risk exposure and chronic stress. The raw β coefficients are shown for the simultaneous equations (i.e., entered on the last step). Because most of the impact was associated with the category of 2 or more environmental risks, cumulative risk was fitted as a dichotomous categorical variable (0–1 risk=0; ≥ 2 risks=1).

Cumulative environmental risk exposure was significantly related to overnight urinary neuroendocrine levels in low- but not middle-income children (Table 2). For low-income children, all 3 indices of chronic physiological stress are significantly related to cumulative, environmental risk exposure. For middle-

income children, cumulative environmental risk exposure was unrelated to any of the chronic stress indices.

We also examined with the same statistical controls in ordinary least-squares regression the relations between each singular risk factor (i.e., crowding, noise, housing quality) and chronic physiological stress. None of the singular risk factors was significantly related to any of the physiological stress outcomes within either the low- or middle-income samples.

DISCUSSION

We investigated whether the natural covariation of environmental risk factors among children living in poverty has potential long-term health consequences for children. Considerable evidence indicates that low-income households face considerable environmental inequity, and suffer from greater exposure to a host of adverse physical conditions.¹ A unique, key feature of the environment of poverty with potentially far-reaching implications for children's health is the confluence of environmental risks confronting poor families.

Crowding, noise, and housing quality were assessed in a sample of low- and middle-income, rural elementary school children aged 8 to 10 years. Neuroendocrine indices of chronic stress increased in tandem with cumulative environmental risk exposure for the low-income children but not for the middle-income children. These significant increases in chronic physiological stress occurred independent of children's household income, family structure, gender, age, and maternal education. Low-income children exposed to a convergence of suboptimal living conditions suffered greater chronic stress compared with other indigent children who faced singular or no environmental risk. In contrast, middle-income children faced lower levels of environmental risk (only 3% faced 2 or more risks), which may explain why cumulative environmental risk was unrelated to chronic physiological stress in middle-income children. More than 5 times as many low-income children (16%) were exposed to 2 or more risks.

This study would benefit from a longitudinal investigation of cumulative risk exposure and children's health. Longitudinal research would offer stronger evidence, given the current

TABLE 1—Descriptive Statistics for Environmental Risk Exposure Among Low- and Middle-Income Children in Rural Upstate New York

Environmental Risk	Low Income		Middle Income	
	Mean (SD)	Percent at Risk	Mean (SD)	Percent at Risk
Crowding (people/room)	.69 (.21)	18	.50 (.12)	8
Housing problems (0-2)	.71 (.30)	21	.42 (.20)	1
Noise (Leq dBA)	64.97 (7.18)	25	61.45 (7.41)	9
Cumulative environmental risks				
0		53		86
1		31		11
≥ 2		16		3
Level of cumulative risk exposure (SD)	.66 (.75)		.18 (.45)	

Note. Environmental risk is defined categorically (0, 1) as exposure to > 1 SD above the mean for the entire sample for each respective risk factor (crowding, noise, housing quality). Cumulative environmental risk is the sum (0–3) of these 3 environmental risk factors. Because of the small number of children exposed to 2 environmental risk factors, exposure to 2 and 3 environmental risks is collapsed into 1 group (≥ 2).

TABLE 2—Cumulative Environmental Risk, by Chronic Physiological Stress Index: Means (SD), β (SE) as if Last Entered, and ΔR^2 for Cumulative Environmental Risk After Control for Income-to-Needs Ratio, Single-Parent Status, Mother's Education, and Child Age and Gender

Income Level	Mean (SD)		β (SE)	ΔR^2
	0 (0–1 Risk)	1 (≥ 2 Risks)		
Cortisol ($\mu\text{g}/\text{mg}$ creatinine)				
Poverty	.030 (.023)	.047 (.044)	.021* (.007)	.07
Middle-income	.023 (.013)	.025 (.012)	.000 (.010)	.00
Epinephrine (ng/mg creatinine)				
Poverty	4.71 (4.29)	8.07 (7.76)	3.61* (1.22)	.07
Middle-income	3.74 (3.17)	1.42 (0.54)	-2.08 (1.76)	.02
Norepinephrine (ng/mg creatinine)				
Poverty	29.01 (17.99)	48.75 (36.49)	22.05* (5.46)	.12
Middle-income	32.02 (15.67)	25.40 (8.28)	-8.14 (9.22)	.01

Note. Because most of the impact of cumulative risk was associated with the category of ≥ 2 environmental risks, cumulative risk was fitted as a dichotomous variable (0 = 0–1 risk; 1 = ≥ 2 risks) in the regression analyses.

* $P < .01$.

cross-sectional design, and enable us to study the duration and timing effects of cumulative environmental risk on children's health.¹⁵ Other environmental risks (e.g., tobacco smoke) as well as psychosocial risk factors (e.g., family turmoil, parenting quality) that covary with poverty^{16–18} should also be incorporated in future work. We also need research that includes families from low-income urban, inner-city settings, where the concentration of environmental risks may be even greater than those documented in the present rural population. Environmental injustice is a function of both race and income^{1,6} and also could be influenced by urbanization. The generalizability of our results is constrained by our reliance on an opportunity sample of predominantly White elementary school children living in rural areas of upstate New York. Future work might include additional markers of morbidity such as hypertension or allostatic load.¹⁴

Our results have important implications for understanding the role of the environment in income-related health inequities. Foremost, they suggest that attention to singular environmental risk factors in isolation may obscure recognition of important health outcomes arising from cumulative risk exposure, especially among low-income populations. This study illustrates the value of conceptualizing cumulative, environmental risk exposure in a manner that begins to capture its natural, ecological covariation among some segments of the pop-

ulation. Cumulative environmental risk exposure within the home is associated with elevated neuroendocrine activity indicative of chronic stress among a sample of low-income White children living in a rural area; in contrast, cumulative environmental risk exposure appears unrelated to chronic stress levels among their middle-income counterparts. ■

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Contributors

G.W. Evans conceptualized and conducted the study. Both authors conducted the data analysis and wrote the article.

Human Participant Protection

The protocol for the study was approved by the Cornell University institutional review board.

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High-Intensity Targeted Screening for Elevated Blood Lead Levels Among Children in 2 Inner-City Chicago Communities

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Lead is an environmental toxicant that affects nearly every system in the body.¹ Among children, lead is associated with decreased intelligence, growth and hearing impairment, anemia, and attention and behavioral problems.² High levels of exposure can cause severe brain damage and death. Young children, especially those who are aged younger than 2 years, are particularly susceptible to lead because their central nervous systems are still developing and because they absorb more lead from their environments than do adults.² Among children who are aged younger than 6 years, the Centers for Disease Control and Prevention (CDC) defines an elevated blood lead level as greater than or equal to 10 micrograms of lead per deciliter of blood ($\mu\text{g}/\text{dL}$), but there are subtle effects on health at lower levels.³ Deteriorating lead-based paint is the most common high-dose source of lead exposure among young children in the United States.¹ In 1973, the Consumer Product Safety Commission established a maximum lead content in paint of 0.5% by weight, and in 1978 that amount was lowered to 0.06%.⁴ Eighty-nine percent of homes in Chicago were built before 1978.⁵

A federal strategy to eliminate childhood lead poisoning by 2010 was developed by the CDC, the Department of Housing and Urban Development, the Environmental Protection Agency, and other agencies.⁶ Two key elements of the strategy are to identify and care for lead-poisoned children and to refine lead poisoning prevention strategies. High-intensity targeted screening is a tool that allows the CDC and its local partners to assess testing levels among children in high-risk communities and to examine the blood lead burden among children in specific locales.

Chicago, Ill, is the third largest city in the United States and has an estimated 308 000

Objectives. We assessed the prevalence of elevated blood lead levels (≥ 10 micrograms of lead per deciliter of blood), risk factors, and previous blood lead testing among children in 2 high-risk Chicago, Ill, communities.

Methods. Through high-intensity targeted screening, blood lead levels were tested and risks were assessed among a representative sample of children aged 1 to 5 years who were at risk for lead exposure.

Results. Of the 539 children who were tested, 27% had elevated blood lead levels, and 61% had never been tested previously. Elevated blood lead levels were associated with chipped exterior house paint.

Conclusions. Most of the children who lived in these communities—where the prevalence for elevated blood lead levels among children was 12 times higher than the national prevalence—were not tested for lead poisoning. Our findings highlight the need for targeted community outreach that includes testing blood lead levels in accordance with the American Academy of Pediatrics' recommendations. (*Am J Public Health.* 2004;94:1945–1951)

children who are aged younger than 6 years.⁵ It is divided into 77 communities, some of which have many risk factors for childhood lead poisoning, including a high percentage of residents who are poor, who live in old housing, who receive Medicaid assistance, and who are of minority race/ethnicity.^{7,8} Of the 114 126 Chicago children who were tested for lead poisoning in 2001, 11.2% had blood lead levels greater than or equal to 10 $\mu\text{g}/\text{dL}$, and 1.9% had blood lead levels greater than or equal to 20 $\mu\text{g}/\text{dL}$.⁹

The results of a collaborative blood lead study in 2 Chicago communities by the CDC and the Chicago Department of Public Health (CDPH), which was conducted in partnership with community-based organizations, are presented in this article. The objectives of our study, which was conducted during October and November 2001, were to (1) assess the prevalence of children with elevated blood lead levels who had not been previously tested, (2) obtain an unbiased prevalence estimate of elevated blood lead levels among children aged 1 to 5 years who lived in these 2 Chicago communities, and (3) identify de-

mographic, behavioral, and environmental risk factors for elevated blood lead levels among these children.

METHODS

Study Design

Our study included a population-based cross-sectional blood lead sampling scheme and the administration of personal and environmental risk factor questionnaires. The study population was composed of children aged 1 to 5 years who had lived in their Chicago residence for at least the past 30 days. A population-based cluster survey design was used to select households in 2 high-risk Chicago communities, Austin and Englewood. Because of the large size of these communities (3 and 4 square miles, respectively), a simple random sample was not feasible. Our cluster survey design followed the Expanded Program on Immunization model, but it was improved in accordance with the recommendations of Brogan et al.¹⁰

Housing unit information was obtained from 1990 tax assessment data that included

information about each property in Chicago, such as the year a unit was built. Samples were selected by (1) dividing each community into clusters, i.e., primary sampling units (Austin=305 total clusters; Englewood=308 total clusters), on the basis of a grid system that randomly and equally divided the communities; (2) using the population proportional to estimated size method to randomly select clusters (Austin=29 random clusters; Englewood=41 random clusters); and (3) selecting a sample of households (Englewood=7 out of 210 total households; Austin=6 out of 180 total households) within each cluster by randomly selecting 1 household within the cluster that had equal selection probability. A cluster was approximately 4 city blocks.

An address was randomly selected as a starting point for each data collection team. After visiting the first address, each team went to the next address on the same side of the street, in descending order, and then up the opposite side until its quota of households was met or until the street ended. If the quota was not met when the street ended, the team went to another street on its list, which was mapped in a clockwise direction for safety reasons, so we always knew where the team was going. To account for nonresponse rates, the data collection teams noted the outcome of each household visit (i.e., eligible, ineligible, refused, vacant). A household was recorded as “occupied but the residents not at home” only after the team had visited the household at least 3 times. To increase participation rates, CDPH note cards with a phone number were left at vacant households, and participating families were given a \$15 grocery store gift certificate. A household was defined as any unit (i.e., an area that included at least 1 bedroom, 1 bathroom, and a kitchen) where people could live at a given address, and nearly all the addresses visited (mostly houses) had more than 1 household.

A data collection team comprised at least 1 CDPH staff member, 1 CDC staff member or 1 CDC-trained public health graduate student, and 1 community member. Team members were trained in cultural sensitivity, data collection, capillary and venous blood drawing, and personal safety. Approximately 20 teams were used during the study period.

Sample sizes for the 2 communities were calculated to provide a large enough sample so that the margin of error around the prevalence estimate (95% confidence interval [CI]) was $\pm 10\%$. Sample size calculations assumed an intraclass correlation of 0.23, which implied a design effect of 2.4.

Questionnaire Data

Each team administered 2 questionnaires to a consenting parent or a legal guardian from each eligible household: a child questionnaire to assess risk factors for lead exposure and to obtain information about the eligible children and a household questionnaire to assess the home environment, demographics of the people who lived in the residence, and lead poisoning prevention knowledge (assessed through 5 true/false questions developed by CDPH). It took 15 to 20 minutes to administer the questionnaires.

Health Education

During the interview, the team provided the parent or guardian with educational material about lead poisoning prevention, ways to reduce lead hazards in the home, and childhood immunization. Free blood lead screenings were promoted and were provided by the CDPH to children who were not selected for our study.

Blood Lead Survey

Capillary blood lead samples were collected because it was convenient and because previous studies have shown a high correlation between capillary and venous sampling (the preferred diagnostic method).^{11–13} CDC technicians with extensive field experience trained team members in the appropriate collection¹⁴ of 200- μ l samples of capillary blood from each eligible child in the household. A venous blood sample was randomly collected from 10% of the participating children by trained CDPH phlebotomists as a quality-control measure. The CDC laboratory used the Perkin-Elmer Model 4100ZL atomic absorption spectrometer with Zeeman background correction (Perkin-Elmer LAS, Shelton, Conn) to test the capillary and the venous blood samples for lead. When capillary samples did not have a sufficient quantity for measurement ($n=24$), CDPH staff collected venous samples within 3 months. These re-

sults were used in the analysis when capillary results were not available.

Data Analysis

Data were entered into Epi Info (CDC, Atlanta, Ga), and 10% of the records were completely reentered to assess the accuracy of data entry. Statistical analyses were performed with SAS (SAS Institute Inc, Cary, NC) and SUDAAN (Research Triangle Institute, Research Triangle Park, NC) software. Sampling weights that represented both the number of households in the clusters and the overall number of households in the 2 communities were used to calculate prevalence estimates.

Children were matched with the CDPH childhood lead poisoning prevention database (variables were first name, last name, and date of birth) to determine if they had been previously tested for blood lead. Children were considered previously tested if the 3 variables matched perfectly and if the match occurred before October 27, 2001.

Logistic regression techniques were used to examine risk factors for elevated blood lead levels that were obtained from the household and child questionnaires. Risk factors included child activities and country of birth, length of time at residence, previous renovation activity in the household, parental smoking status, occupation and hobbies, and condition of paint on exterior surfaces of the residence. On the basis of previous studies,^{15–17} the following were selected as confounding variables: age and gender of child, receipt of public assistance, receipt of public or Section 8 housing, and educational level of the parent or guardian. Age of residence and minority status were not considered confounders because all the homes visited were built before 1978 and nearly all the participants were Black.

A univariate analysis was conducted first to assess each risk factor's association with elevated blood lead levels; risk factors significantly associated with elevated blood lead levels were evaluated separately in multivariate analyses. During the first multivariate analysis, we assessed each risk factor while the selected confounding variables and interaction terms were controlled. During the second multivariate analysis, we used a forward-selection strategy to add 1 risk factor variable

at a time to the most predictive model, which included the a priori confounders, until all risk factors in the model were statistically significant. Only statistically significant risk factors identified in the first multivariate analysis were included in the second multivariate analysis, and interactions between risk factors and confounding variables were assessed during both analyses. The variance inflation factor was used to assess collinearity between variables in the predictive models.

Paired venous and capillary specimens from 41 children were collected and analyzed. Linear regression analysis showed a close relationship between the test methods, with a slope of 0.92, a correlation of 0.69, and an intercept of 0.71. A bias plot of the paired results showed an equal distribution both above and below the mean, and 93% of the capillary/venous pairs were within 2 standard deviations of the mean.

RESULTS

Of the 4854 households visited (Austin=2456; Englewood=2398), 78.5% were ineligible for participation (e.g., no children aged 1–5 years lived at the residence, residence was unoccupied), and the refusal rate was 5.9%. The most common reason for nonparticipation was that the child had had a recent blood lead test. Forty-one children from 25 households were excluded from the analyses because insufficient (n=36) or no (n=5) blood was collected. The final sample included 539 children from 366 households.

Household Characteristics

An average of 6 persons (range=2–18) lived in participating households, and half the housing units in the study were built between 1900 and 1919. Thirty-seven households (10%) had a resident whose occupation possibly involved lead, such as battery recycling or manufacturing, painting or construction, and automobile or radiator repair. Of the 366 households, 222 (61%) had a resident who was a current smoker, 387 (73%) of the families rented the unit in which they lived, 194 (36%) children had a parent or guardian who completed high school, and 165 (31%) had a parent or guardian who completed some high school (Table 1).

TABLE 1—Frequency and Weighted Prevalence of Study Population Characteristics by Community and Blood Lead Levels: Chicago, Ill, 2001

Child characteristic	Total (N = 539) All BLLs	Austin (n = 189) ^a		Englewood (n = 350) ^a	
		BLLs <10 µg/dL, % (n = 142)	BLLs ≥10 µg/dL, % (n = 47)	BLLs <10 µg/dL, % (n = 234)	BLLs ≥10 µg/dL, % (n = 116)
Child characteristic					
Race^b					
Black	529	96.8	98.5	98.5	97.4
White	3	1.3	0.0	0.5	0.0
Other	9	1.9	1.5	1.0	2.6
Gender					
Male	280	47.8	65.0	52.1	59.7
Female	254	52.2	35.0	47.9	40.3
Unknown	5				
Age, y					
1	103	11.5	21.4	18.4	15.7
2	120	19.4	23.6	17.2	26.3
3	118	19.4	38.8	24.5	18.9
4	104	32.0	7.8	19.1	25.1
5	94	17.7	8.4	20.8	14.0
Asthma					
Yes	163	30.5	30.4	30.6	32.5
No	371	69.5	69.6	69.4	67.5
Unknown	5				
Any prior blood lead test					
Yes	212	39.5	32.9	46.4	36.5
No	327	60.5	67.1	53.6	63.5
Household characteristic					
Receipt of any form of public assistance^c					
Yes	495	82.6	92.2	94.4	93.7
No	41	17.4	7.8	5.6	6.3
Unknown	4				
Caretaker education					
None	2	0.0	0.0	0.0	1.8
≤8th Grade	13	1.0	3.2	2.1	2.6
Some high school	165	26.5	53.8	29.7	41.3
High school diploma or GED	194	31.8	27.6	40.6	35.9
Some college	125	34.6	13.8	22.4	15.8
College graduate	25	6.1	1.6	5.2	2.6
Unknown	15				
Home ownership type^b					
Owner occupied	138	29.6	36.6	21.9	8.8
Rental	387	68.7	63.4	77.7	86.5
Section 8 or public housing	8	1.7	0.0	0.4	4.7
Unknown	6				
Year dwelling was built (N=366)					
Before 1900	84	4.4	10.3	39.9	23.4
1900–1919	181	46.9	64.5	41.6	54.2
1920–1939	75	41.6	20.6	11.9	22.4
1940–1959	8	6.0	0.0	0.6	0.0

Continued

TABLE 1—Continued

1960–1978	14	1.1	4.6	6.0	0.0
1979–present	0	0.0	0.0	0.0	0.0
Unknown	4				
Potential exposures					
Parental occupation that involves lead					
Yes	50	9.5	8.3	5.3	9.7
No	480	90.5	91.7	94.7	90.3
Unknown	9				
Parental hobby that involves lead					
Yes	6	1.1	2.8	0.5	0.5
No	524	98.9	97.2	99.5	99.5
Unknown	9				
Smoker in the residence					
Yes	351	59.4	82.4	60.6	79.1
No	179	40.6	17.6	39.4	20.9
Unknown	9				
Home renovation in the past 6 months					
Yes	241	50.9	54.9	50.8	40.7
No	278	48.7	43.9	45.7	54.2
Not sure	20	0.4	1.2	3.5	5.1
Unknown	6				
Chipped paint on front porch					
Yes	78	8.6	37.1	14.5	18.9
No	413	91.4	62.9	85.5	81.1
Unknown	48				
Chipped paint on exterior front windows					
Yes	123	17.5	38.9	24.7	33.4
No	372	82.5	61.1	75.3	66.6
Unknown	44				
Observation of child eating dirt in the past year					
Yes	93	13.6	29.4	14.6	23.5
No	438	86.4	70.6	85.4	76.5
Unknown	8				
Observation of child eating paint in the past year					
Yes	51	1.0	12.9	9.4	21.3
No	477	99.0	87.1	90.6	78.7
Unknown	11				
Use of folk remedies/medications					
Yes	28	0.5	2.0	6.4	9.1
No	505	99.5	98.0	93.6	90.9
Unknown	6				

Note. BLL = blood lead level; GED = general equivalency diploma.

^aWeighted percentages exclude missing observations.

^bRespondents could choose more than 1 category.

^cThis category includes several questions from the survey that were collapsed (eg, Do you receive Medicaid? food stamps? ...). Therefore, respondents could choose more than 1 category.

Child Characteristics

Gender was not recorded for 5 children, and the gender could not be determined by the children's names (CDPH was not able to locate and follow up with these families to determine gender). Among the child participants with known gender, 52% were male,

and the average age of the children was 2.9 years. Ninety-nine percent of them were Black, 2% were Hispanic, and less than 1% was White (respondents could choose more than 1 race). One hundred twenty-six (24%) of the children had been told by health-care professionals that they had asthma. Ninety-

two percent of the study population reported ever receiving some form of public assistance, the most common of which were Medicaid services (70%), food stamps (60%), public aid (56%), and Women, Infants, and Children (WIC) services (51%).

Blood Lead Results and Follow-up

Of the 539 children tested, 327 (61%) never had their blood lead previously tested: 79% were aged 1 year (79%), and the percentages decreased with increasing age (Figure 1). Fifty-eight percent of the children who received Medicaid services had never had a previous test compared with 67% of the children who did not receive Medicaid services. Among the children who had ever received Medicaid services, 63% of those who had blood lead levels greater than or equal to 10 µg/dL had never had a previous test compared with 55% of those who had blood lead levels less than 10 µg/dL.

The prevalence of elevated blood lead levels in the 2 communities was 30.0% (unweighted) and 26.6% (weighted); the weighted prevalence was higher in Englewood (33.6%) than in Austin (23.2%). These estimates compare favorably with 2001 CDPH surveillance data in which 30.9% of the children in Englewood and 25.9% of the children in Austin had elevated blood lead levels. The CDPH reported that 44.7% of the children aged younger than 6 years in Englewood and 28.0% of the children in Austin were tested for blood lead during 2001.⁹ Overall, 163 (30.2%) children in the study had blood lead levels greater than or equal to 10 µg/dL, 62 (11.5%) had blood lead levels greater than or equal to 15 µg/dL, 33 (6.1%) had blood lead levels greater than or equal to 20 µg/dL, and 7 (1.3%) had blood lead levels greater than or equal to 30 µg/dL. The weighted mean blood lead level was 9.0 µg/dL (95% CI= 7.8, 10.2) in Englewood and 8.3 µg/dL (95% CI=7.3, 9.3) in Austin.

The study identified 62 children in 49 households who had confirmed blood lead levels greater than or equal to 15 µg/dL, levels for which the CDPH routinely initiates follow-up home inspections.

Risk Factors

When we controlled selected confounding variables, elevated blood lead levels were as-

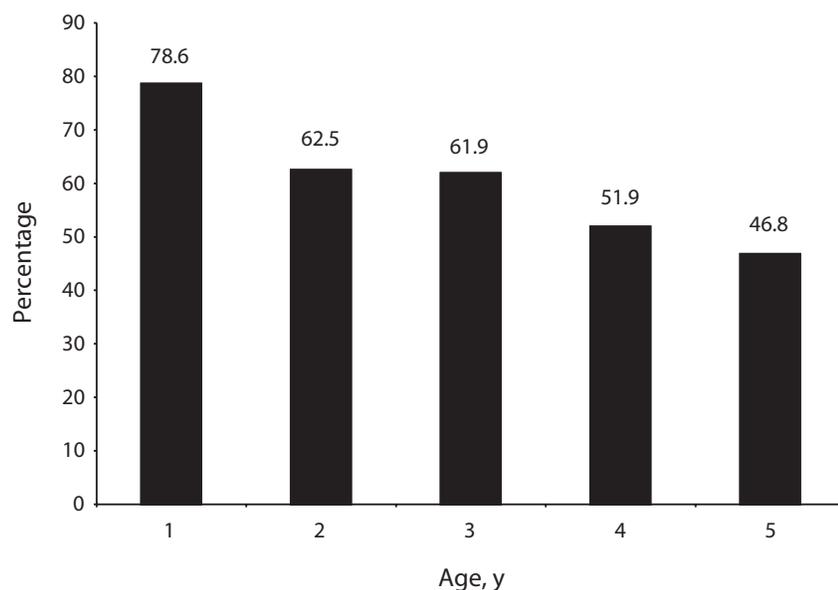


FIGURE 1—Percentage of children identified by a high-intensity targeted screening who had not previously had a blood lead test.

sociated individually with each of the following: observation of chipped paint on the front porch of the residence (odds ratio [OR]=2.91; 95% CI=1.37, 6.18), observation of chipped paint on the front exterior windows of the residence (OR=2.85; 95% CI=1.42, 5.71), observation by the parent or guardian of the child eating paint during the past year (OR=3.80; 95% CI=1.78, 8.12), presence of a

smoker in the household (OR=2.58; 95% CI=1.43, 4.65), and observation by the parent or guardian of the child eating dirt during the past year (OR=2.08; 95% CI=1.10, 3.93).

During the second multivariate analysis, elevated blood lead levels were associated with each of the following risk factors when selected confounders were controlled: observation by the parent or guardian of the child

eating paint during the past year (OR=4.73; 95% CI=2.02, 11.10), chipped paint on the front porch of the residence (OR=2.75; 95% CI=1.24, 6.10), and presence of a smoker in the house (OR=2.29; 95% CI=1.13, 4.65). Together these factors were predictors of elevated blood lead levels after all confounding variables were adjusted (Table 2). Our ability to assess effect modification between risk factors and confounders was limited because of small numbers in some calculations of the factors of interest. A collinearity assessment did not identify significant correlations between variables in any of the models.

DISCUSSION

Three fifths (327 of 539) of the children identified by the high-intensity targeted screening as having elevated blood lead levels had not been previously tested for lead, which indicated that children who live in old housing—a known risk factor for elevated blood lead levels—are not being adequately screened. Blood lead testing is the main method for identifying children who have elevated blood lead levels, because children who have elevated blood lead levels of 10 to 30 $\mu\text{g}/\text{dL}$ do not show abnormalities on routine medical histories, physical examinations, or other laboratory tests.¹⁸ The CDC, the CDPH, and the American Academy of Pediatrics have recommended the development of strategies that target blood lead testing among children who are at the highest risk for lead poisoning.^{19,20} Nevertheless, this study population, which had many risk factors for lead poisoning, was overlooked by routine health services and public school entrance requirements (among school-aged children).²¹

Improved approaches are needed to increase testing and follow-up care of the children who most need these services. Increasing door-to-door campaigns (such as high-intensity targeted screening) to reach into communities or providing incentives to parents who bring their children into well-child services may be useful. Educating parents and guardians about the children who are at high risk for lead poisoning and about the importance of having their children tested for blood lead may encourage parents to ask health care providers to test their children.

TABLE 2—Odds ratios for Elevated Blood Lead Levels and Significant Exposure Variables in the Multivariate Model: Chicago, Ill, 2001 (N = 539)^a

Exposure Variable	OR (95% CI)	P
Observation of child eating paint in the past year	4.73 (2.02, 11.10)	.0003
Chipped paint on the front porch	2.75 (1.24, 6.10)	.0109
Presence of a smoker in the residence	2.29 (1.13, 4.65)	.0198
Caretaker education < high school diploma or GED ^a	2.92 (1.32, 6.47)	.0200
Child is male ^a	2.36 (1.45, 3.83)	.0004
Age, y (continuous) ^{a,b}	0.77 (0.55, 1.07)	.1079
Receipt of public assistance ^a	0.67 (0.29, 1.55)	.3406
Receipt of public housing or Section 8 housing ^a	1.36 (0.67, 2.77)	.3894

Note. OR = odds ratio; CI = confidence interval; GED = general equivalency diploma.

^aConfounders included in the final model were determined to be risk factors on the basis of previous studies and were controlled in the multivariate model.

^bThe continuous variable is noncategorical and was considered for all ages included in the analysis.

Pediatricians should be reminded of local blood lead–testing policies, and they should be encouraged to review a child’s blood lead–testing history and to test if indicated when children present for any medical care.

A slightly larger percentage of children who were reported to have received Medicaid services had not been previously tested for lead compared with children who were reported to have not received Medicaid services. One explanation for the difference is that some children who received Medicaid services were not tested for lead because they did not have well-child visits. It also is possible that there could have been some misclassification, because parents reported their child’s Medicaid status in this study and we did not validate their responses by matching the child’s name with the Medicaid database. However, this finding indicates that new strategies also are needed to increase testing by Medicaid providers. For example, even when Medicaid-enrolled children receive well-child visits, there may not be laboratory/phlebotomy services onsite, which may result in children not being tested. To improve testing rates among the Medicaid population, the CDPH identifies Medicaid-enrolled children who have not been tested. This is done through a database match between the state Medicaid agency and the CDPH blood lead–testing database. The CDPH provides outreach, including phone calls, letters, and home visits, to the children identified. Efforts are made to ensure that they receive early and periodic screening, diagnosis and treatment services, and help finding a medical home. Additionally, when determining whether or not to test children for lead, health care providers should use risk-assessment questionnaires to assess all children’s risks for lead exposure. Our study found several risk factors that could be used when assessing a child’s risk for an elevated blood lead level. For example, a parent’s or guardian’s observation of the child eating paint or dirt during the past year was predictive of an elevated blood lead level and is consistent with other reports.^{22,23}

The association between children who have elevated blood lead levels and the presence of smokers in their homes is consistent with a recent study that reported an association between environmental tobacco smoke

and increased blood lead levels among US children aged 4 to 16 years.²⁴ Although the relationship between smoking and elevated blood lead levels is not understood, our finding reconfirms that children who are at high risk for lead poisoning may be at high risk for multiple environmental exposures that can affect their health, including environmental tobacco smoke. These children also may be at risk for other health conditions, such as asthma. Nearly one fourth of the children in our study were reported to have asthma by their caregivers. While in the home, lead-testing teams can provide health education on asthma and other conditions, make referrals for medical care, and inquire about vaccination status in addition to counseling about lead poisoning prevention. Discussing hazards and health conditions other than lead poisoning while in the home is important because making contact with the family again is often difficult. In our study, returning and meeting with families to collect confirmatory tests for the children who had elevated capillary test results took several weeks. In some cases, the children who had elevated blood lead levels had moved to another address or were not home after repeated visits.

A potentially useful finding for improving targeted screening was the association between elevated blood lead levels and visible chipped exterior paint on the front porch or the windows of older homes. We found that conducting a brief visual inspection of the front exterior of the home was a good predictor of risk for lead exposure among young children who live in older homes. This is consistent with a published study that found children were at greater risk for elevated blood lead levels if they lived in lesser-valued older houses, perhaps because of poorer maintenance and deterioration.²⁵ However, our results differed from a recent study that showed visual assessments of interior items in need of repair or replacement poorly reflected the amount of lead in household dust as measured with dust wipes,²⁶ a technique that we did not use in this study. We found that 46.2% of the children who had elevated blood lead levels had chipped paint on the front porch of their home. If other studies can replicate this finding, it would prove to be a simple, low-cost method for targeting screen-

ing efforts and would compliment the use of geographic information system technology for finding children who are at high risk for lead poisoning.^{27–29}

The high prevalence of elevated blood lead levels in these communities (Austin=23.2%; Englewood=33.6%) demonstrates the need for state and local surveillance data to accurately describe the number of children who have elevated blood lead levels and to direct prevention efforts. These communities have approximately twice the prevalence of elevated blood lead levels estimated by Chicago’s citywide surveillance data (14%)⁹ and 12 times the current national prevalence estimates (2.2%).³⁰ National data, such as the National Health and Nutrition Examination Survey, are not designed to provide state- and local-level prevalence estimates. Similarly, statewide and even citywide estimates may not accurately reflect elevated blood lead level prevalence in specific communities. One of the advantages of the design used in our study is that we could obtain prevalence estimates that were representative of these communities. Information collected by community studies, such as high-intensity targeted screening projects, can supplement local data, particularly when it validates existing surveillance data. Other urban areas can benefit from high-intensity targeted screening projects; however, because our study required effort and resources above the normal public health outreach activities, future projects may be best suited in communities where there is a need to know the prevalence of elevated blood lead levels or where there is a need to evaluate screening penetration.

Our study had several limitations. First, we were not able to assess possible differences between children who did and did not participate in the study. Second, because we conducted the study in October and November, more families than expected refused testing of their school-aged children because their children had recently been tested in accordance with school entrance requirements. Third, the estimated number of children who had not been previously tested may have been inflated because of the rigorous matching methodology (a perfect match of first name, last name, and date of birth) and because of incomplete reporting of test results to CDPH.

Lastly, our project required human and financial resources beyond normal public health outreach activities. The CDC contributed \$60 000 in addition to staff and laboratory supplies to support the project. The CDPH had several staff work overtime. A separate, more comprehensive cost analysis is planned.

CONCLUSIONS

This community approach found and tested many children who lived in old housing, a known risk factor for elevated blood lead levels, and who had been overlooked by routine health services. Although national policies that restrict the use of lead have successfully reduced lead in children's environments in the United States, many children still are exposed to lead in their homes and in their communities. Elimination of elevated blood lead levels among young children will require strategic planning and the use of local data to determine which children are at greatest risk and to develop interventions to improve blood lead testing among these children. Elimination of childhood lead poisoning as a public health problem also will require a more intense effort to make the homes of children at risk for elevated blood lead levels lead-safe, ideally before the children develop elevated blood lead levels. ■

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Contributors

T.A. Dignam, A. Evens, S.M. Ramirez, and P.A. Meyer developed the study protocol and conducted the study.

E. Eduardo provided data analysis. K.L. Caldwell provided laboratory support and expertise. N. Kilpatrick contributed to field work coordination and data entry. G.P. Noonan and M.A. McGeehin contributed to the study concept and staff supervision. W.D. Flanders provided statistical support. All the authors contributed to the writing of the article.

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Racial and Ethnic Differences in the Seroprevalence of 6 Infectious Diseases in the United States: Data From NHANES III, 1988–1994

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Racial/ethnic differences in chronic disease morbidity and mortality are well documented.^{1,2} Most studies provide evidence that socioeconomic factors play a major role in explaining racial differences in health status.³ Infectious diseases are also an important cause of mortality and morbidity, and they account for approximately 10% of the excess all-cause mortality observed among Blacks relative to Whites.^{4,5} Several studies, including previous reports involving use of data from the third National Health and Nutrition Examination Survey (NHANES III),^{6–11} have shown significant racial/ethnic differences in the prevalence of infectious diseases in the US population.

The objectives of this study were to examine racial/ethnic differences in the seroprevalence of 6 infectious diseases and to assess the extent to which demographic, socioeconomic, and behavioral characteristics explain these differences. Data collected during NHANES III, a nationally representative survey of the US population, were analyzed to assess differences in seroprevalence of 3 enteric pathogens, hepatitis A virus (HAV), *Toxoplasma gondii*, and *Helicobacter pylori*, and 3 blood-borne/sexually transmissible diseases, hepatitis B virus (HBV), hepatitis C virus (HCV), and herpes simplex virus type 2 (HSV-2).

Serologic measurements of the prevalence of these infectious agents were included in the survey because either the agents are not reportable (in the case of *T gondii*, *H pylori*, and HSV-2) or only clinical cases are reportable (in the case of the hepatitis viruses) and the majority of infections are asymptomatic. Thus, there was a need for population-based serologic studies designed to estimate the extent of the infection burden and to develop and evaluate prevention efforts.

Objectives. We examined racial/ethnic differences in the seroprevalence of selected infectious agents in analyses stratified according to risk categories to identify patterns and to determine whether demographic, socioeconomic, and behavioral characteristics explain these differences.

Methods. We analyzed data from the third National Health and Nutrition Examination Survey, comparing differences among groups in regard to the prevalence of infection with hepatitis A, B, and C viruses, *Toxoplasma gondii*, *Helicobacter pylori*, and herpes simplex virus type 2.

Results. Racial/ethnic differences were greater among those in the low-risk category. In the case of most infectious agents, odds associated with race/ethnicity were almost 2 times greater in that category than in the high-risk category.

Conclusions. Stratification and adjustment for socioeconomic factors reduced or eliminated racial/ethnic differences in the prevalence of infection in the high-risk but not the low-risk group, wherein race/ethnicity remained significant and might have been a surrogate for unmeasured risk factors. (*Am J Public Health*. 2004;94:1952–1958)

METHODS

Survey Design and Data Collection

The goal of NHANES, conducted by the National Center for Health Statistics of the Centers for Disease Control and Prevention, is to provide national statistics on the health and nutritional status of the noninstitutionalized, civilian US population through household interviews, standardized physical examinations, and collection of blood samples in special mobile examination centers.¹² NHANES III, conducted between 1988 and 1994, included a sample of approximately 40 000 individuals aged 2 months or more from 89 randomly selected locations throughout the United States.

The survey was divided into two 3-year components so that national estimates could be produced for each 3-year period as well as for the overall 6-year interval. NHANES III was based on a complex, stratified, multi-stage probability cluster sample design.¹² Children aged younger than 5 years and adults aged older than 59 years, along with

Black Americans and Mexican Americans, were sampled at higher frequencies than other groups.

Interviews conducted in respondents' homes and examination centers collected information on a wide range of demographic, socioeconomic, and behavioral characteristics. Data on race/ethnicity (non-Hispanic White, non-Hispanic Black, or Mexican American) were obtained via self-report. Individuals who did not identify themselves as belonging to 1 of the categories just mentioned were not assessed separately but were included in the overall analysis.

Individuals aged 20 years or older who were examined and provided a blood sample for the laboratory assays were included in the present analyses. Only participants examined in the first phase (1988–1991) of the study were tested for *H pylori* antibody. Sexual behavior and drug use data were obtained from individuals aged 20 to 59 years, and thus analyses focusing on sexually transmissible and blood-borne infections were restricted to this age range.

Rates of availability of serum for testing of the 3 enteric infections were consistent across all racial/ethnic groups and outcomes (85%–94% of those examined) but were lower among respondents in the oldest age group (80%–82% among those aged 70 years or older vs 88%–95% among all other age groups). Availability of serum was also consistent across all racial/ethnic groups for the 3 sexually transmitted infections (91%–96% of those examined for HBV and HCV and 71%–77% of those examined for HSV-2) and across all age groups for both HBV and HCV (93%–95% of those examined). In the case of HSV-2 testing, availability was lowest among those aged 50 to 59 years (47% vs 77%–80% in the 20- to 49-year age group). More detailed information on serum availability and response rates can be found in previous reports.^{7–11}

Laboratory Analyses

Details on the serologic methods used have been published in previous reports.^{7–13} Briefly, anti-HAV IgG enzyme immunoassay (HAVAB, Abbott Laboratories, Abbott Park, Ill) was used in screening for HAV; for *T gondii* antibody, IgG enzyme immunoassay (Sanofi Diagnostics Pasteur, BioRad, Hercules, Calif) was used; and for *H pylori* antibody, IgG enzyme immunoassay (Wampole Laboratories, Cranbury, NJ) was used. Antibody to hepatitis core antigen (anti-HBc) enzyme-linked immunoassay (CORAB, Abbott Laboratories) was used in screening for HBV; anti-HCV with a second-generation enzyme immunoassay (EIA 2.0, Abbott Laboratories) was used in screening for HCV; and a type-specific immunodot assay was used in screening for HSV-2.¹³

Statistical Analysis

Prevalence estimates were weighted to represent the overall US population and to account for oversampling and nonresponse to the household interview and physical examination. Standard errors were calculated with SUDAAN,¹⁴ a family of statistical procedures used in analyses of data derived from complex sample surveys. All estimates were age adjusted, via the direct method, to the 1980 US population.¹⁵

As a means of better interpreting racial/ethnic differences in seropositivity, a core group of socioeconomic and demographic fac-

tors were evaluated without correction for multiple comparisons; a univariate *t* statistic derived from a general linear contrast procedure included in SUDAAN was used in these analyses. Factors shown to be significant in the univariate analysis, along with additional cofactors and possible interaction terms identified from previous modeling of these data,^{7–11} were entered into the logistic models. Models were reduced through a backward stepwise approach to include variables shown to be significant in the case of the overall sample or any of the racial/ethnic groups.

Main effects models were constructed to control for the influence of various cofactors on race/ethnicity-specific odds of infection. These models, presented to illustrate the influence of the cofactors on the effect of race/ethnicity in comparison with age adjustment alone, should be interpreted cautiously because they did not evaluate interactions within the data. Interactions between race/ethnicity and each of the variables included in the final logistic model were evaluated to determine whether racial/ethnic differences varied according to levels of socioeconomic or risk behavior predictors. Several variables interacted with race/ethnicity; therefore, for ease of interpretation, and because the aim of the analyses was to determine the effects of these cofactors on the odds of infection associated with race/ethnicity, interactions were specified in terms of a stratified modeling scheme.

High- and low-risk strata were formed for each disease outcome by grouping individuals at the lowest and highest levels of risk for each of the variables interacting with race/ethnicity. Individuals who did not fall into these strata were evaluated (data not shown), and results showed that they exhibited odds ratios for race/ethnicity similar to those revealed in the main effects models. The small sample sizes in some of the variable categories limited our ability to stratify groups on all possible interaction terms. Variables in these categories and all remaining factors from the main effects models were included in the stratified logistic models as control variables (Table 1).

Variables used in the models focusing on enteric disease outcomes were as follows: age (20–29, 30–39, 40–49, 50–59, 60 years or

more); gender; poverty index (calculated by dividing total family income by poverty threshold adjusted for family size at year of interview¹⁶), according to which individuals were categorized as either “below poverty” (index value below 1) or “at or above poverty” (1 or above on the index); education (no schooling or elementary school, some high school, high school, some college), household crowding (number of residents in household divided by number of rooms in household, grouped as fewer than 0.5, 0.5–1, or more than 1 person per room); metropolitan residence (residence in a county with a population of 1 million or more vs all others); and foreign country of birth (non-US born vs US born). Prevalence estimates and logistic models are presented for the overall study population and for those in the low- and high-risk strata.

In the case of the 3 sexually transmissible/blood-borne infections, prevalence estimates are presented for individuals aged 20 to 59 years, because the sexual behavior and drug use variables used in stratifying groups according to risk were collected only among this age group. The procedure used in defining risk groups and creating models for these pathogens was similar to that used for enteric pathogens. In addition to a core group of socioeconomic and demographic variables (age [coded as 20–29, 30–39, or 40–59 years], gender, poverty index, crowding, foreign country of birth, education [coded as less than high school, high school, or some college], and marital status (divorced or separated vs all others), the models also included behavioral risk factors associated with disease outcomes such as age at first sexual intercourse (less than 18 years vs 18 years or greater), lifetime number of sexual partners (0–9 vs 10 or more), and illegal drug use.

The drug use variables were limited to cocaine (including crack; coded as ever vs never used) and marijuana (coded into the following categories of use: 0–2 times, 3–99 times, and 100 or more times) and did not include information on mode of administration or injection history. Table 1 provides a description of the variables entered into the high- and low-risk models for each type of infection. Prevalence estimates and models were also stratified according to gender in the case of HSV-2, because gender exhibited a significant

interaction with race/ethnicity. Interactions between gender and the other infectious diseases were not significant, so estimates are provided for men and women combined.

RESULTS

Table 2 presents race/ethnicity-specific, age-adjusted seroprevalence for each of the infectious agents in the overall study population and among members of each risk stratum. In these analyses, non-Hispanic Blacks and Mexican Americans were compared with non-Hispanic Whites. Tables 3 and 4 present, for each pathogen, comparisons of age-adjusted and fully adjusted odds ratios ac-

ording to race/ethnicity for the overall sample and for the low-risk and high-risk strata. We present results from the main effects models to allow comparisons with the models that adjusted for age only and those that stratified groups according to risk. Since race/ethnicity interacted with many of the other variables, estimates based on the main effects models should be interpreted cautiously.

Enteric Pathogens

Hepatitis A virus. Among adults aged 20 years or older, the age-adjusted prevalence of HAV antibody was 37.4% (95% confidence interval [CI]=35.1%, 39.8%). Prevalence varied dramatically according to race/

ethnicity, with non-Hispanic Blacks and Mexican Americans exhibiting odds 1.7 times and 2.8 times higher than those of non-Hispanic Whites. After stratification, racial/ethnic differences remained significant in the low-risk group; however, in the high-risk group, only Mexican Americans exhibited a significantly higher prevalence than non-Hispanic Whites.

Race/ethnicity was highly significant in the logistic regression model controlling for age, and it remained significant in the main effects model (Table 3). Adjustment in the main effects model for sociodemographic factors, including foreign country of birth, did not eliminate the significantly greater odds of infection among both non-Hispanic Blacks and Mexican Americans

TABLE 1—Risk Stratification Modeling Specifications

Infectious Agent	Low-Risk Model	High-Risk Model
Enteric infections		
<i>Hepatitis A virus</i>		
Criteria	Household income above poverty level, 12 or more years of education, household with fewer than 0.5 persons per room, born in the US	Household income below poverty level, fewer than 12 years of education, household with 0.5 or more persons per room
Adjusted for	Age	Age and foreign country of birth
<i>Toxoplasma gondii</i>		
Criteria	12 or more years of education, residence in a metropolitan area, born in the US	Fewer than 12 years of education
Adjusted for	Age and household crowding	Age, household crowding, residence in a metropolitan area, foreign country of birth
<i>Helicobacter pylori</i>		
Criteria	12 or more years of education, born in the US	Fewer than 12 years of education
Adjusted for	Age, gender, metropolitan residence, household crowding, and poverty	Age, gender, residence in a metropolitan area, household crowding, poverty, and foreign country of birth
Blood-borne/sexually transmissible infections		
<i>Hepatitis B virus</i>		
Criteria	Single, married, or widowed; never used cocaine; used marijuana fewer than 3 times; between 0 and 9 lifetime sexual partners; born in the US	At least one of the following: divorced or separated, ever used cocaine, used marijuana at least 100 times, 10 or more lifetime sexual partners
Adjusted for	Age, education, household crowding, and age at first intercourse	Age, education, household crowding, age at first intercourse, and foreign country of birth
<i>Hepatitis C virus</i>		
Criteria	Never used cocaine, born in the US	Ever used cocaine
Adjusted for	Age, poverty, education, household crowding, marital status, age at first intercourse, number of sexual partners, and marijuana use	Age, poverty, education, household crowding, marital status, age at first intercourse, number of sexual partners, marijuana use, and foreign country of birth
<i>Herpes simplex virus type 2 (stratified on gender)</i>		
Criteria	Never used cocaine, used marijuana fewer than 3 times, between 0 and 9 lifetime sexual partners	At least one of the following: ever used cocaine, used marijuana at least 100 times, 10 or more lifetime sexual partners
Adjusted for	Age, education, and household crowding	Age, education, and household crowding

TABLE 2—Age-Adjusted Seroprevalence for Selected Infectious Agents, by Race/Ethnicity: NHANES III, 1988–1994

Infectious Agent	Overall Sample		Low-Risk Group	High-Risk Group
	Total No. Tested	Prevalence, % (95% CI)	Prevalence, % (95% CI)	Prevalence, % (95% CI)
Hepatitis A virus ^a	15 580	37.4 (35.1, 39.8)	22.7 (20.7, 24.7)	70.3 (65.0, 75.6)
Non-Hispanic Black	4 213	50.0 (47.8, 52.2)*	38.0 (33.7, 42.3)*	56.7 (50.5, 62.8)
Mexican American	4 264	81.9 (79.3, 84.4)*	50.6 (43.0, 58.3)*	92.9 (88.9, 97.0)*
Non-Hispanic White (reference)	6 483	29.0 (26.9, 31.1)	21.3 (19.3, 23.3)	48.5 (36.1, 61.0)
<i>Toxoplasma gondii</i> ^a	14 909	25.4 (23.9, 27.0)	19.9 (17.8, 22.0)	34.3 (32.0, 36.7)
Non-Hispanic Black	4 032	26.5 (24.3, 28.7)	21.1 (18.5, 23.8)	30.4 (26.9, 33.8)
Mexican American	4 010	25.2 (22.3, 28.1)	16.6 (13.1, 20.1)	29.1 (25.8, 32.5)
Non-Hispanic White (reference)	6 290	24.0 (22.2, 25.7)	19.8 (17.3, 22.3)	32.2 (29.2, 35.3)
<i>Helicobacter pylori</i> ^a	7 465	34.6 (31.5, 37.6)	26.4 (23.7, 29.1)	49.2 (45.6, 52.9)
Non-Hispanic Black	1 851	54.0 (51.7, 56.3)*	49.0 (45.2, 52.8)*	59.7 (55.9, 63.5)*
Mexican American	2 021	63.0 (59.5, 66.6)*	52.4 (43.7, 61.1)*	67.8 (62.0, 73.6)*
Non-Hispanic White (reference)	3 353	28.4 (25.8, 31.1)	23.2 (20.4, 26.0)	41.0 (36.4, 45.7)
Hepatitis B virus ^{a,b}	10 624	5.6 (4.8, 6.5)	2.3 (1.5, 3.2)	6.7 (5.5, 7.8)
Non-Hispanic Black	3 275	13.7 (11.9, 15.5)*	9.6 (6.6, 12.7)*	15.0 (11.9, 18.0)*
Mexican American	3 288	5.3 (4.0, 6.6)*	3.5 (1.8, 5.3)*	7.6 (4.6, 10.7)
Non-Hispanic White (reference)	3 589	3.0 (2.4, 3.7)	1.5 (0.7, 2.3)	4.4 (3.3, 5.6)
Hepatitis C virus ^{a,b}	10 612	2.4 (1.9, 3.1)	1.2 (0.8, 1.6)	14.5 (10.4, 20.3)
Non-Hispanic Black	3 268	4.1 (3.2, 5.4)*	2.3 (1.6, 3.2)*	20.1 (16.2, 25.1)
Mexican American	3 282	3.4 (2.6, 4.6)*	3.3 (1.8, 6.1)*	19.0 (13.0, 27.6)
Non-Hispanic White (reference)	3 590	2.0 (1.5, 2.7)	0.9 (0.6, 1.5)	14.9 (7.5, 29.8)
Herpes simplex virus type 2 ^{a,b}	8 262	25.1 (22.7, 27.5)	20.1 (17.5, 22.8)	32.7 (28.3, 37.2)
Male	4 034	20.8 (17.3, 24.4)	12.6 (8.4, 16.8)	26.9 (21.8, 32.0)
Non-Hispanic Black	1 203	42.8 (37.9, 47.8)*	37.5 (26.6, 48.4)*	41.4 (34.3, 48.6)*
Mexican American	1 321	26.7 (21.8, 31.7)*	21.1 (14.3, 27.8)*	28.7 (20.5, 36.9)
Non-Hispanic White (reference)	1 345	17.5 (13.3, 21.6)	10.3 (5.4, 15.2)	23.5 (17.4, 29.6)
Female	4 228	29.4 (26.6, 32.2)	24.6 (21.5, 27.7)	50.5 (41.6, 59.4)
Non-Hispanic Black	1 417	64.8 (60.9, 68.7)*	60.4 (54.9, 65.8)*	80.3 (72.5, 88.2)*
Mexican American	1 341	37.9 (32.5, 43.2)*	37.3 (31.9, 42.7)*	58.4 (53.1, 63.7)*
Non-Hispanic White (reference)	1 302	22.2 (19.0, 25.5)	16.6 (12.8, 20.3)	44.9 (33.4, 56.5)

Note. NHANES = National Health and Nutrition Examination Survey; CI = confidence interval. *H pylori* testing was performed only on phase 1 specimens.

^aIncludes all racial/ethnic groups.

^bEstimates are for individuals aged 20–59 years only.

**P* < .05.

demonstrated significantly greater odds of infection among non-Hispanic Blacks and Mexican Americans than among non-Hispanic Whites. When sociodemographic variables were included, the difference between non-Hispanic Blacks and non-Hispanic Whites was eliminated in the main effects model and in the low-risk stratum. In the high-risk stratum, both non-Hispanic Blacks and Mexican Americans were significantly less likely than non-Hispanic Whites to be seropositive (Table 3).

Helicobacter pylori. Analysis of adults aged 20 years or older from the first phase of the survey demonstrated an overall age-adjusted prevalence of 34.6% (95% CI=31.5%, 37.6%) for *H pylori* antibody, and the pattern of racial/ethnic differences was similar to that seen with HAV. Non-Hispanic Blacks were almost twice as likely as non-Hispanic Whites to be seropositive, and Mexican Americans were 2.2 times more likely to be seropositive than non-Hispanic Whites. The age-adjusted model revealed significant racial/ethnic differences. The odds ratio for Mexican Americans was reduced in the main effects model, but differences were still significant. Racial/ethnic differences were further reduced in the high-risk model but exhibited slight increases for non-Hispanic Blacks and Mexican Americans in the low-risk model.

Sexually Transmissible/Blood-Borne Pathogens

Hepatitis B virus. The overall age-adjusted prevalence of HBV antibody among adults aged 20 to 59 years was 5.6% (95% CI=4.8%, 6.5%; Table 2). Non-Hispanic Blacks exhibited odds 4.6 times higher than those of non-Hispanic Whites, and Mexican Americans exhibited 1.8 times higher odds. Higher prevalences of infection were observed among non-Hispanic Blacks than among non-Hispanic Whites in both risk groups, but Mexican Americans exhibited a significantly higher prevalence than non-Hispanic Whites only in the low-risk group.

The age-adjusted model showed that both non-Hispanic Blacks and Mexican Americans had significantly higher odds of infection than non-Hispanic Whites (Table 4). In the main effects model controlling for socioeconomic and behavioral variables, the difference between non-Hispanic Blacks and non-Hispanic

in comparison with non-Hispanic Whites, although the difference between Mexican Americans and Whites was greatly reduced.

The extent of differences between Mexican Americans and non-Hispanic Whites did not vary significantly across the risk strata, probably because the small sample size did not allow stratification by foreign birth. Foreign birth was the strongest predictor, although its effect varied by race/ethnicity. There were no significant differences in the

risk of infection between non-Hispanic Whites and non-Hispanic Blacks in the high-risk stratum, but significant differences were still observed in the low-risk stratum.

Toxoplasma gondii. The overall age-adjusted prevalence of *T gondii* antibody among adults aged 20 years or older was 25.4% (95% CI=23.9%, 27.0%), with few differences between race/ethnicity groups in either the overall population or the 2 risk strata (Table 2). Summary statistics derived from the age-adjusted model

TABLE 3—Relative Odds of Hepatitis A Virus, *Toxoplasma gondii*, and *Helicobacter pylori* Infection, Age Adjusted and Stratified by Risk Category: NHANES III, 1988–1991

Infectious Agent	Age Adjusted		Full Model		Lowest Risk		Highest Risk	
	Odds Ratio (95% CI)	P						
Hepatitis A virus	n = 14 960		n = 13 489		n = 3257		n = 1609	
Non-Hispanic Black	3.3 (2.8, 3.9)	<.001	2.4 (2.0, 2.9)	<.001	3.1 (2.3, 4.1)	<.001	1.5 (0.7, 3.2)	.29
Mexican American	22.3 (16.6, 30.1)	<.001	6.7 (5.2, 8.6)	<.001	5.9 (3.9, 8.9)	<.001	7.9 (2.8, 22.4)	<.001
Non-Hispanic White	Reference		Reference		Reference		Reference	
<i>Toxoplasma gondii</i>	n = 14 332		n = 14 200		n = 3629		n = 5768	
Non-Hispanic Black	1.2 (1.02, 1.4)	.03	1.03 (0.9, 1.2)	.71	1.2 (0.9, 1.6)	.13	0.8 (0.6, 0.99)	.04
Mexican American	1.3 (1.1, 1.5)	.02	0.6 (0.5, 0.8)	<.001	0.9 (0.6, 1.3)	.45	0.4 (0.3, 0.5)	<.001
Non-Hispanic White	Reference		Reference		Reference		Reference	
<i>Helicobacter pylori</i>	n = 7225		n = 6404		n = 3512		n = 2546	
Non-Hispanic Black	3.9 (3.2, 4.9)	<.001	3.4 (2.8, 4.2)	<.001	4.3 (3.3, 5.7)	<.001	2.1 (1.5, 2.9)	<.001
Mexican American	6.4 (4.9, 8.5)	<.001	2.5 (1.7, 3.7)	<.001	4.0 (2.5, 6.6)	<.001	2.1 (1.4, 3.4)	.002
Non-Hispanic White	Reference		Reference		Reference		Reference	

Note. NHANES = National Health and Nutrition Examination Survey; CI = confidence interval. Odds ratios were derived from logistic regression analyses. *H. pylori* testing was performed only on phase 1 specimens.

TABLE 4—Relative Odds of Hepatitis B Virus, Hepatitis C Virus, and Herpes Simplex Type 2 Infection, Age Adjusted and Stratified by Risk Category: NHANES III, 1988–1991

Infectious Agent	Age Adjusted		Full Model		Lowest Risk		Highest Risk	
	Odds Ratio (95% CI)	P						
Hepatitis B virus	n = 10 152		n = 9114		n = 3234		n = 3727	
Non-Hispanic Black	5.0 (3.9, 6.4)	<.001	3.7 (2.8, 4.9)	<.001	6.5 (3.3, 12.7)	<.001	2.8 (2.0, 3.9)	<.001
Mexican American	1.6 (1.1, 2.3)	.009	0.6 (0.3, 1.04)	.07	2.3 (1.1, 4.8)	.03	0.8 (0.4, 1.6)	.49
Non-Hispanic White	Reference		Reference		Reference		Reference	
Hepatitis C virus	n = 10 140		n = 8417		n = 5844		n = 1013	
Non-Hispanic Black	2.1 (1.4, 3.1)	<.001	1.2 (0.8, 2.0)	.40	1.4 (0.7, 2.7)	.33	1.1 (0.6, 2.2)	.70
Mexican American	1.5 (0.97, 2.3)	.06	1.8 (1.03, 3.3)	.04	2.3 (0.9, 6.1)	.08	1.1 (0.6, 2.3)	.72
Non-Hispanic White	Reference		Reference		Reference		Reference	
Herpes simplex 2	n = 3869		n = 3576		n = 1386		n = 1881	
Male	n = 3869		n = 3576		n = 1386		n = 1881	
Non-Hispanic Black	3.2 (2.4, 4.3)	<.001	2.6 (2.0, 3.5)	<.001	4.2 (2.1, 8.4)	<.001	2.1 (1.6, 2.7)	<.001
Mexican American	1.4 (1.1, 1.9)	.01	1.2 (0.9, 1.7)	.23	1.3 (0.7, 2.5)	.40	1.0 (0.8, 1.4)	.88
Non-Hispanic White	Reference		Reference		Reference		Reference	
Female	n = 4060		n = 3915		n = 2745		n = 679	
Non-Hispanic Black	5.2 (4.2, 6.5)	<.001	5.7 (4.4, 7.3)	<.001	6.0 (4.0, 9.1)	<.001	4.2 (2.7, 6.4)	<.001
Mexican American	1.6 (1.3, 1.9)	<.001	1.4 (1.1, 1.8)	.02	1.5 (1.03, 2.3)	.04	0.7 (0.4, 1.1)	.11
Non-Hispanic White	Reference		Reference		Reference		Reference	

Note. NHANES = National Health and Nutrition Examination Survey; CI = confidence interval. Odds ratios were derived from logistic regression analyses.

Whites was reduced but remained significant; however, the difference between Mexican Americans and non-Hispanic Whites became nonsignificant. In the model for the low-risk

group, the odds for both non-Hispanic Blacks and Mexican Americans were significantly higher than those for non-Hispanic Whites and higher than those revealed in the age-

adjusted model. In the high-risk group, the odds for non-Hispanic Blacks were further reduced but remained statistically significant. The difference between non-Hispanic Whites

and Mexican Americans became nonsignificant in the high-risk model.

Hepatitis C virus. The overall age-adjusted prevalence of HCV antibody was 2.4% (95% CI=1.9%, 3.1%; Table 2). In comparison with non-Hispanic Whites, prevalence estimates were twice as high among non-Hispanic Blacks and 1.7 times higher among Mexican Americans. Racial/ethnic differences remained significant only in the low-risk group. Non-Hispanic Black race/ethnicity was a significant predictor in the age-adjusted model but not in the full main effects model. The difference in seroprevalence associated with Mexican American ethnicity was significant only in the full model ($P=.04$). Race/ethnicity became nonsignificant after stratification according to both low and high risk and adjustment for the remaining cofactors in the main effects model.

Herpes simplex 2. The overall age-adjusted prevalence of HSV-2 antibody was 25.1% (95% CI=22.7%, 27.5%; Table 2). Women exhibited a significantly higher prevalence of infection than men, and this difference varied among the different racial/ethnic groups; therefore, all analyses were stratified according to gender. Among men, race/ethnicity differences were significant both overall and in the low-risk group. In the high-risk group, only the estimate for non-Hispanic Blacks remained significantly higher than that for non-Hispanic Whites. Among women, race/ethnicity differences were significant regardless of risk stratification.

In the case of men, non-Hispanic Black race/ethnicity was associated with an increase in the odds of HSV-2 infection in all models, despite adjustment or stratification; however, the odds ratio in the high-risk group, while remaining significant, was lower than in the other models. Mexican American ethnicity was no longer significant in any of the models other than the age-adjusted model. Among women, non-Hispanic Black race/ethnicity was significantly associated with greater odds of infection than those observed in non-Hispanic Whites in all models, although the odds ratio was highest in the low-risk stratum. With the exception of the high-risk group, Mexican American women also exhibited significantly higher odds of infection than non-Hispanic White women.

DISCUSSION

The data presented in this article have already been used to describe the increased burden of infectious diseases among US racial/ethnic minority groups.^{7–11} Here we have presented a summary of race/ethnicity patterns in the seroprevalence of 6 infectious diseases, using data collected from this nationally representative sample of the US population to determine the effects of socioeconomic and risk behavior factors on differences among racial/ethnic groups. Stratification of the sample into low- and high-risk groups and statistical modeling were used to control for the effects of these factors on the prevalence of infection.

In the case of the enteric pathogens HAV and *H pylori*, racial/ethnic differences were reduced, but not always eliminated, by statistical modeling and risk group stratification. Such findings suggest that the socioeconomic variables used in the present analyses are important predictors of risk but that they can account only partially for racial/ethnic disparities in the prevalence of infection with these enteric diseases.

Significantly higher odds of *T gondii* infection among non-Hispanic Blacks and Mexican Americans were observed only in the age-adjusted model. These differences became nonsignificant in the low-risk strata and were reversed in the high-risk strata, wherein non-Hispanic Blacks and Mexican Americans had lower odds of infection than non-Hispanic Whites. *T gondii* is transmitted through consumption of raw or uncooked meat or ingestion of oocysts from the soil. Information on frequency and type of meat consumption and soil exposure not available in this survey may better explain why racial/ethnic differences were shown to reverse after risk group stratification.

Stratification according to risk, based on reported behaviors and after controlling for socioeconomic and demographic variables, had a greater impact on the prevalence of the sexually transmissible/blood-borne infections than on that of the enteric pathogens. Within the high-risk group, seroprevalence estimates for the 3 sexually transmissible/blood-borne infections were no longer significantly higher among Mexican Americans than among non-

Hispanic Whites. Statistical modeling and stratification into high- and low-risk groups eliminated the difference in the prevalence of infection between non-Hispanic Whites and non-Hispanic Blacks only in the case of HCV antibody. This finding was primarily attributable to the influence of reported cocaine use as a predictor of infection, regardless of other characteristics.

In the case of HBV, the effect of race/ethnicity was reduced in the high-risk group, but the difference between non-Hispanic Whites and non-Hispanic Blacks remained significant. In the low-risk group, the effect of race/ethnicity increased slightly relative to the effects observed in the age-adjusted and main effects models. A similar pattern was seen with HSV-2. Modeling or stratification on risk behaviors that interacted with race (drug use and number of sexual partners) had no effect on HSV-2 seropositivity in comparisons of non-Hispanic Whites and non-Hispanic Blacks. Sample sizes within the 0–9-lifetime-partners group were not adequate to allow further explorations of risk based on this exposure category.

The socioeconomic characteristics of a given population (e.g., crowding, income, education) and individual sexual or drug use behaviors affect infection risks, regardless of race/ethnicity. However, the background prevalence of an infection in a population with which an individual interacts may have an equally important impact on infection potential. Even in communities heterogeneous in terms of race/ethnicity, individuals live and interact predominantly with people of their own racial background,^{6,17} and this situation may increase within-group spread of infection and limit transmission across race/ethnicity boundaries.

Classification of the sample into risk groups reduced but did not consistently remove all racial/ethnic differences. Mexican Americans still exhibited higher odds of infection for the enteric pathogens (other than *T gondii*) than did non-Hispanic Whites, and non-Hispanic Blacks exhibited higher odds of sexually transmissible/blood-borne infections. A reduction was observed only in the case of HCV, which has such a low prevalence that any adjustment or stratification removes the effect of race/ethnicity.

NHANES selects a population-based sample that is representative of the overall US population. We assessed infectious disease prevalence in this population along with information on socioeconomic factors and risk behaviors to help clarify racial/ethnic differences in the prevalence of selected pathogens. As expected, racial/ethnic differences were greatly reduced or even eliminated in the high-risk stratum. It is these high-risk factors, rather than race/ethnicity, that have the greatest effects on the prevalence of infection. Since the majority of infections occur among members of these risk groups, and such individuals can transmit infections to others regardless of risk profile, prevention programs that target these factors or behaviors will have the greatest impact in terms of reducing prevalence of infection.

However, in our study, racial and ethnic disparities were greatest among individuals who did not fit the usual risk profile for these infectious diseases. Thus, race/ethnicity may be a surrogate for other characteristics or behaviors that place these individuals at increased risk. More research is needed among low-risk populations to determine the additional factors (e.g., condom use, sexual network characteristics, or cultural differences) that may determine infection risks in these populations. Until these factors are identified, race/ethnicity remains a factor that, when assessed appropriately, may be of value in guiding decisions regarding the targeting of prevention strategies. Our data suggest that unless individuals who might be considered to be at low risk are brought into the prevention spectrum as well, the *Healthy People 2010*¹⁸ goal to eliminate racial/ethnic disparities in the prevalence of infectious diseases in the United States will not be met. ■

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Contributors

G.M. McQuillan and R.S. Kington contributed to the conception and design of the analysis and to the writing of the article. D. Kruszon-Moran and L.R. Curtin contributed to the data analysis, and B.J. Kottiri and J.B. Lucas contributed to interpretation of the data and to the writing of the article.

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Human Participant Protection

Informed consent was obtained from survey participants before their participation, and the institutional review board of the National Center for Health Statistics approved the study protocol.

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Effects of Restaurant and Bar Smoking Regulations on Exposure to Environmental Tobacco Smoke Among Massachusetts Adults

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Environmental tobacco smoke (ETS) exposure has been shown to cause respiratory illnesses, including lung cancer, childhood asthma, and lower respiratory tract infections, as well as having developmental and cardiovascular effects.^{1–3} Exposure to ETS is unevenly distributed across the US working population. Food service workers—waiters, waitresses, cooks, bartenders, and counter help—are the least likely group to be covered by smoke-free policies.^{4,5}

To protect restaurant patrons and employees, many communities have adopted regulations restricting smoking in bars and restaurants. These restrictions vary from less stringent policies to total bans in which smoking is prohibited with no exceptions. Intermediate policies include restriction of smoking to enclosed, separately ventilated areas. Importantly, provisions exist that provide loopholes in these policies, such as variances from regulations and exemptions for particular circumstances.⁶

In our study, we sought to (1) examine the association of local clean indoor air regulations with adult exposure to ETS in Massachusetts restaurants and bars and (2) specify the relation between the strength of local regulations and exposure in these establishments. To the best of our knowledge, this is the first investigation to quantitatively examine the effects of local restaurant and bar smoking regulations on exposure to ETS through the use of a representative state sample.

METHODS

Data were derived from a larger longitudinal study, carried out between January 1, 2001, and June 15, 2002, designed to examine the impact of community-based tobacco control interventions on adult and youth smoking behavior. In that study, interviewers from

Objectives. We examined the association of local restaurant and bar regulations with self-reported exposure to environmental tobacco smoke among adults.

Methods. Data were derived from a telephone survey involving a random sample of Massachusetts households.

Results. Compared with adults from towns with no restaurant smoking restrictions, those from towns with strong regulations had more than twice the odds of reporting nonexposure to environmental tobacco smoke (odds ratio [OR]=2.74; 95% confidence interval [CI]=1.97, 3.80), and those from towns with some restrictions had 1.62 times the odds of reporting nonexposure (OR=1.62; 95% CI=1.29, 2.02). Bar smoking bans had even greater effects on exposure.

Conclusions. Strong local clean indoor air regulations were associated with lower levels of reported exposure to environmental tobacco smoke in restaurants and bars. (*Am J Public Health.* 2004;94:1959–1964)

the Center for Survey Research of the University of Massachusetts at Boston conducted 20-minute random-digit-dialing telephone surveys involving a random sample of Massachusetts households with telephones. Smokers, young adults, and recent quitters were oversampled. Sixty-six percent of eligible households were successfully screened during the study period, and interviews were completed with 70% of the eligible respondents, resulting in a sample of 6739 adults aged 18 years or older.

Measures

We examined 2 outcome measures related to ETS exposure in bars and restaurants. Both were determined by adults' responses to the following questions: "In the past 12 months, when you were eating in a restaurant in [town], how often did you see someone smoking?" and "In the past 12 months, when you were out at a bar or club in [town], how often did you see someone smoking?" In the case of each of these items, the interviewer read the actual name of the town in which the respondent reported residing at the time of the interview.

To answer these questions, adults first had to report that they had dined at a restaurant or visited a bar or club in their town in the past 12 months and that they did so at least

rarely. As a result, sample sizes were restricted to 5394 and 2466 for analyses of exposure in restaurants and bars, respectively. We created binary variables indicating "non-exposure" (never or rarely) or "exposure" (sometimes, often, or always) to ETS in restaurants and bars.

Explanatory Variables

Town of residence. The zip code of each respondent was obtained in the screening interview. In the case of town-specific questions, interviewers gathered information from respondents about their town of residence. This information was later cross-referenced to zip code and a list of the 351 Massachusetts towns. The 65 cases in which the town name used for questioning was not the respondent's actual town of residence were excluded, limiting the overall sample sizes to 5339 for the restaurant analyses and 2433 for the bar analyses.

Restaurant and bar regulations. We acquired data on local restaurant smoking regulations in place in each of the 351 cities and towns in Massachusetts during the survey period (January 2001 through July 2002). More complete descriptions of this database have been presented elsewhere.⁶ Using actual town of residence, we linked individuals' survey re-

TABLE 1—Descriptive Statistics for Analysis Variables

	Total, % (No.)	95% Confidence Interval
Strength of restaurant ordinance ^a		
Weak	63.7 (4254)	62.6, 64.9
Medium	22.4 (1492)	21.4, 23.4
Strong	13.9 (928)	13.1, 14.7
Strength of bar ordinance ^b		
Weak	89.0 (5941)	88.3, 89.8
Strong	11.0 (733)	10.2, 11.7
Gender		
Male	42.5 (2837)	41.3, 43.7
Female	57.5 (3837)	56.3, 58.7
Race/ethnicity		
White	83.5 (5530)	82.6, 84.4
Non-White	16.5 (1095)	15.6, 17.4
Age, y		
18–44	54.6 (3630)	53.4, 55.8
≥45	45.4 (3022)	44.2, 46.6
Education, y		
<16	58.3 (3809)	57.1, 59.5
≥16	41.7 (2722)	40.5, 42.9
Income, \$		
≤30 000	21.2 (1167)	20.2, 22.3
>30 000	78.8 (4330)	77.7, 79.9
Marital status		
Not married	42.2 (2689)	41.0, 43.4
Married	57.8 (3680)	56.6, 59.1
No. of children in household		
0	59.6 (3972)	58.4, 60.8
≥1	40.4 (2688)	39.2, 41.5
Smoking status		
Nonsmoker	81.5 (5437)	80.5, 82.4
Current smoker	18.5 (1237)	17.6, 19.5
Frequency of dining out at restaurants in town ^c		
Low	62.9 (3381)	61.6, 64.2
High	37.1 (1992)	35.8, 38.4
Frequency of visiting bars or nightclubs in town ^c		
Low	68.9 (1680)	67.1, 70.8
High	31.1 (757)	29.2, 32.9
Town residents voting “yes” on Question 1, %		
<50	58.4 (3894)	57.2, 59.5
≥50	41.6 (2780)	40.5, 42.8

Note. All distributions are based on valid cases only.

^aWe categorized restrictions as “weak” (no enclosed, separately ventilated areas), “medium” (smoking allowed in enclosed, separately ventilated areas only), or “strong” (smoking prohibited, including in bar areas, with no variances).

^bWe categorized restrictions prohibiting smoking with no variances as “strong” and all other restriction categories as “weak.”

^cResponses were dichotomized into “low” (rarely or sometimes) and “high” (often or always).

areas; or prohibited in restaurant dining or bar areas (or both) and (2) whether variances (exceptions or exemptions to the regulations) were permitted. In the analyses specific to restaurants, we categorized restrictions as “weak” (no enclosed, separately ventilated areas), “medium” (smoking allowed in enclosed, separately ventilated areas only), or “strong” (smoking prohibited, including in bar areas, with no variances). If a regulation prohibited smoking but a variance existed, the restaurant was coded in the “medium” category. In the bar and club analyses, we categorized restrictions prohibiting smoking with no variances as “strong” and all other restriction categories as “weak.”

Control variables. In our model estimates, we controlled for years of education (less than 16 vs 16 or more), marital status (married vs nonmarried), number of children aged younger than 18 years living in the household (0 vs 1 or more), and gender. As a result of initial analyses revealing that younger adults were more likely to frequent restaurants and bars than older adults, we dichotomized respondents into 2 age groups (18–44 years and 45 years or older). Race and ethnicity were also combined to create 2 groups (non-Hispanic White and non-White). Data on household income were obtained through asking respondents to select the income category that best described their total household income, before taxes, in the past year. Family-level income was dichotomized into 2 categories (\$30 000 or less and \$30 001 or more).

We also controlled for individual-level smoking status. “Current smokers” were classified as those who reported having smoked at least 100 cigarettes in their lifetime and currently smoked “every day or some days”; “non-smokers” were categorized as those who currently smoked “not at all” and those who had not smoked 100 cigarettes in their lifetime.

A potential confounding variable was respondents’ frequency of dining out at restaurants and visiting bars and clubs in their own towns. Adults who patronize restaurants and bars at high rates may do so in other towns as well as their own, obscuring the effect of town-level ordinances. Respondents who reported having dined out at a restaurant in the past 12 months were asked “When you go out to eat, how often do you go to restaurants

sponses to the level of regulation effective in their town on the date of the interview.

To measure the strength of local regulations, we recorded provisions vital to protec-

tion from ETS exposure in restaurants and bars, including (1) whether smoking was allowed; restricted to designated areas; restricted to enclosed, separately ventilated

TABLE 2—Exposure to Environmental Tobacco Smoke in Restaurants and Bars, by Strength of Local Ordinance

Strength of Ordinance ^a	Nonexposure, % (95% CI)	Exposure, % (95% CI)	Unadjusted OR ^b (95% CI)
Restaurants^c			
Weak	55.8 (53.3, 58.4)	44.2 (41.6, 46.7)	1.00
Medium	70.2 (66.1, 74.0)	29.8 (26.0, 33.9)	1.87* (1.50, 2.31)
Strong	81.2 (76.2, 85.4)	18.8 (14.6, 23.8)	3.42* (2.49, 4.69)
Bars^d			
Weak	10.4 (8.4, 12.7)	89.6 (87.3, 91.6)	1.00
Strong	51.8 (41.9, 61.5)	48.2 (38.5, 58.1)	9.27* (5.85, 14.68)

Note. OR = odds ratio; CI = confidence interval.

^a $P < .01$ for overall χ^2 test.

^bReflects the likelihood of not being exposed to environmental tobacco smoke in restaurants or bars.

^cWe categorized restrictions as “weak” (no enclosed, separately ventilated areas), “medium” (smoking allowed in enclosed, separately ventilated areas only), or “strong” (smoking prohibited, including in bar areas, with no variances).

^dWe categorized restrictions prohibiting smoking with no variances as “strong” and all other restriction categories as “weak.”

* $P < .01$, from logistic regression analysis.

in [town]?” Responses were dichotomized to represent low restaurant attendance (rarely or sometimes) and high restaurant attendance (often or always).

A similar question was asked of respondents who reported having visited a bar or nightclub in the past 12 months: “When you go out to bars and nightclubs, how often do you go to bars and clubs in [town]?” Responses were dichotomized to represent low bar/club attendance (rarely or sometimes) and high attendance (often or always) in the respondent’s town of residence. “Never” responses were excluded because those reporting never going to restaurants, bars, or clubs were not queried regarding exposure to tobacco smoke in these establishments.

Contextual town-level variables. Since this was a cross-sectional analysis, we were not able to establish with certainty whether reported exposure levels were a consequence of the regulations or whether another variable (e.g., antismoking sentiment in the town) was responsible for variations in both regulations and exposure. In an effort to control for town-specific antismoking sentiments preceding the implementation of restaurant and bar regulations in Massachusetts, we included a dichotomous indicator of whether or not 50% or more of the voters in the respondent’s town had voted in favor of Question 1 in 1992, the ballot initiative that created the Massachusetts tobacco control program.

Data Analysis

We first examined the bivariate association between strength of local regulations and reported ETS exposure in restaurants and bars. To determine statistical significance, we used χ^2 tests and their associated P values. We then performed multivariate logistic regression analyses examining the effects of regulation strength on ETS exposure while controlling for potential confounding variables. We used an iterative model building procedure⁷ to select a parsimonious model for the data. We assessed the significance of variables using likelihood ratio tests in which the alpha level was set at .10.

All variables with missing values were modeled as categorical variables. We used indicator variables to code the categorical variables and included a “missing” category for each variable so that the full data set of adult respondents could be examined in each analysis. The regression coefficients corresponding to missing data categories are not shown in the tables, because they were not of interest; however, none of these coefficients were significant. All analyses were weighted to adjust for the oversampling of smokers, young adults, and recent quitters.

RESULTS

Descriptive statistics for variables used in the analyses are presented in Table 1. During

the study period, only 13.9% of respondents lived in a town with a regulation that endorsed the highest level of protection from ETS exposure in restaurants. The majority of adults resided in towns characterized by “weak” regulations regarding exposure in restaurants (63.7%), while about one fifth lived in towns with medium-level restaurant regulations (22.4%). Only 11.0% of respondents resided in towns with regulations supporting the highest level of protection from ETS in bars; the remainder (89.0%) lived in towns with “weak” bar regulations.

Weighted percentages indicated that 57.5% of the respondents were female, 83.5% were Caucasian, and 54.6% were between the ages of 18 and 44 years. Most were married (57.8%), and 40.4% reported the presence of at least one child in their household. In terms of socioeconomic indicators, 41.7% of respondents had attained at least a college education, and 78.8% reported a household income greater than \$30 000 in the past year. During this time period, 18.5% of respondents were classified as current smokers, while 28.6% lived in a household with at least one adult smoker.

Of the respondents who had ever dined at restaurants in their towns, 37.1% reported doing so often or always. Of respondents who had ever visited a bar or club, 31.1% reported high patronage of these establishments. Finally, 41.6% of the respondents lived in towns in which the majority of residents had voted “yes” on Question 1.

Bivariate analyses (Table 2, top) show a graded association between strength of restaurant regulations and reported ETS exposure. Of the adults living in towns characterized by weak regulations, for example, 55.8% reported not being exposed to ETS in restaurants, as compared with 70.2% of those residing in towns with medium-level regulations and 81.2% of those residing in towns with strong regulations ($P < .01$). Relative to respondents residing in towns with weak regulations, those living in towns with medium-level regulations had 1.9 times the odds of not being exposed to ETS (95% confidence interval [CI]=1.50, 2.31), while those residing in towns with strong regulations had 3.42 times the odds of nonexposure (95% CI=2.49, 4.69).

TABLE 3—Adjusted Odds Ratios for Nonexposure to Environmental Tobacco Smoke in Restaurants

	Full Model, ^a Adjusted OR ^c (95% CI)	Final Model, ^b Adjusted OR ^c (95% CI)
Main predictor variable		
Strength of ordinance ^d		
Weak	1.00	...
Medium	1.65** (1.32, 2.07)	1.62** (1.29, 2.02)
Strong	2.79** (2.00, 3.89)	2.74** (1.97, 3.80)
Control variables		
Gender		
Male	1.00	...
Female	1.05 (0.88, 1.26)	...
Age, y		
18–44	1.00	1.00
≥45	1.42** (1.16, 1.74)	1.46** (1.20, 1.77)
Race/ethnicity		
White	1.00	...
Non-White	1.07 (0.83, 1.38)	...
Education, y		
<16	1.00	...
≥16	1.06 (0.87, 1.30)	...
Income, \$		
≤30 000	1.00	...
>30 000	0.83 (0.65, 1.05)	...
Marital status		
Not married	1.00	...
Married	1.15 (0.95, 1.40)	...
No. of children in household		
0	1.00	1.00
≥1	1.21*** (0.98, 1.48)	1.26* (1.04, 1.53)
Smoking status		
Nonsmoker	1.00	...
Current smoker	1.04 (0.89, 1.22)	...
Frequency of dining out at restaurants ^e		
Low	1.00	...
High	1.01 (0.84, 1.21)	...
Town residents voting “yes” on Question 1, %		
<50	1.00	1.00
≥50	1.66** (1.35, 2.03)	1.65** (1.35, 2.00)

Note. OR = odds ratio; CI = confidence interval.

^aIncluding all control variables, regardless of significance of contribution to the model.

^bDetermined through an iterative model selection procedure and including variables that contributed significantly to the model according to log-likelihood ratio test with alpha level of .10.

^cReflecting the likelihood of not being exposed to environmental tobacco smoke.

^dWe categorized restrictions as “weak” (no enclosed, separately ventilated areas), “medium” (smoking allowed in enclosed, separately ventilated areas only), or “strong” (smoking prohibited, including in bar areas, with no variances).

^eResponses were dichotomized into “low” (rarely or sometimes) and “high” (often or always).

P* < .05; *P* < .01; ****P* < .10.

A similar relationship was found in the case of bars and clubs (Table 2, bottom). Among those who lived in towns with the strongest regulations specific to bars and

clubs, 51.8% reported nonexposure, as compared with only 10.4% of those living in towns with weak regulations (*P* < .01). The odds ratio of nonexposure in bars or night-

clubs was 9.27 (95% CI = 5.85, 14.68) among respondents who lived in towns with strong regulations relative to those who lived in towns with weak regulations.

Table 3 presents results from an extension of the analysis, including estimates from the full (column 1) and final (column 2) adjusted logistic regression models predicting nonexposure to ETS in restaurants. The gradient effect of restaurant regulations on nonexposure was unchanged after control of possible confounding factors. In the full model, odds ratios for nonexposure were 1.65 (95% CI = 1.32, 2.07) and 2.79 (95% CI = 2.00, 3.89) in restaurants associated with medium-level and strong regulations, respectively. Being older and married, having at least one child in the household, and residing in a town in which 50% or more of the residents voted yes on Question 1 were associated with nonexposure in restaurants. Interestingly, individual smoking status was not significantly associated with nonexposure in restaurants.

The final model (column 2, Table 3) for nonexposure in restaurants highlighted the regulation gradient effect; the odds ratios associated with each level of regulation remained unchanged from those observed in the full model. The single strongest predictor of nonexposure to ETS in this model was living in a town with strong restaurant regulations; adults living in these towns had almost 3 times (odds ratio [OR] = 2.74; 95% CI = 1.97, 3.80) the odds of not being exposed to ETS in restaurants as those residing in a town with weak regulations. Age, presence of children in the household, and town-level vote on Question 1 remained significantly associated with nonexposure (*P* < .01).

A similar pattern can be seen in Table 4 for nonexposure in bars and nightclubs. In the full model, the odds ratio of nonexposure was 7.47 (95% CI = 4.59, 12.22) among adults living in towns with strong regulations relative to those living in towns with weak regulations, holding constant all other measures. Being older and married, reporting less frequently visiting bars or nightclubs, and living in a town with a vote of 50% or greater in favor of Question 1 increased the likelihood of reporting nonexposure to ETS in town restaurants.

TABLE 4—Adjusted Odds Ratios for Nonexposure to Environmental Tobacco Smoke in Bars and Clubs

	Full Model, ^a Adjusted OR ^c (95% CI)	Final Model, ^b Adjusted OR ^c (95% CI)
Main predictor variable		
Strength of ordinance ^d		
Weak	1.00	1.00
Strong	7.47** (4.59, 12.22)	7.26** (4.47, 11.76)
Control variables		
Gender		
Male	1.00	...
Female	1.07 (0.71, 1.62)	...
Age, y		
18–44	1.00	1.00
≥45	1.88** (1.21, 2.91)	1.88** (1.22, 2.90)
Race/ethnicity		
White	1.00	...
Non-White	1.44 (0.81, 2.58)	...
Education, y		
<16	1.00	...
≥16	0.81 (0.53, 1.25)	...
Income, \$		
≤30 000	1.00	...
>30 000	0.94 (0.49, 1.81)	...
Marital status		
Not married	1.00	1.00
Married	1.53*** (0.97, 2.41)	1.46*** (0.96, 2.24)
No. of children in household		
0	1.00	...
≥1	1.00 (0.62, 1.61)	...
Smoking status		
Nonsmoker	1.00	...
Current smoker	0.78 (0.54, 1.12)	...
Frequency of visiting bar or nightclub ^e		
Low	1.00	1.00
High	0.50** (0.30, 0.85)	0.48** (0.29, 0.82)
Town residents voting “yes” on Question 1, %		
<50	1.00	1.00
≥50	3.32** (2.21, 5.00)	3.05** (2.00, 4.65)

Note. OR = odds ratio; CI = confidence interval.

^aIncluding all control variables, regardless of significance of contribution to the model.

^bIncluding only those variables that contributed significantly to the model according to log-likelihood ratio test.

^cReflecting the likelihood of not being exposed to environmental tobacco smoke.

^dWe categorized restrictions prohibiting smoking with no variances as “strong” and all other restriction categories as “weak.”

^eResponses were dichotomized into “low” (rarely or sometimes) and “high” (often or always).

P* < .05; *P* < .01; ****P* < .10.

In the final bar and club model, living in a town with strong regulations was the strongest predictor of nonexposure in these establishments. The odds ratio of nonexposure was 7.26 (95% CI = 4.47, 11.76) among respon-

dents living in towns with the highest levels of protection from ETS in bars relative to those living in towns with weaker regulations. Age, marital status, frequency of visiting bars, and town-level vote on Question 1 remained

significantly associated with nonexposure (*P* < .01). Again, smoking status was not associated with nonexposure.

DISCUSSION

We began our analysis with 2 main goals: (1) to examine the effects of local clean indoor air regulations on ETS exposure in restaurants and bars and (2) to specify the effects of varying levels of local regulations (from weak to strong) on reported exposure.

Results clearly showed that more restrictive restaurant and bar regulations are associated with lower levels of reported ETS exposure in restaurants and bars among adult residents of Massachusetts. Those living in towns with strong regulations had approximately a 3-fold greater likelihood of nonexposure to smokers in restaurants relative to those living in towns with weak regulations. Those residing in towns with mid-level regulations had more than 1.5 times the odds of not being exposed to ETS in restaurants as adults in towns with weak regulations. Most striking in this study was the relation between strength of bar regulation and reported exposure; adults living in towns in the strong category had a 7-fold greater likelihood of nonexposure to smokers relative to those residing in towns with regulations in all other categories.

Interestingly, individual smoking status was not significantly associated with nonexposure to ETS in restaurants and bars. This may have been attributable to the fact that smokers see decreasing numbers of smokers in restaurants and bars, as a result of shifts toward more restrictive smoking policies, and thus are less likely to smoke in these establishments. This finding may also reflect changing norms related to the social unacceptability of smoking in restaurants and bars. That is, smokers may perceive there to be fewer smokers as a result of these changing social norms, even in restaurants and bars where smoking is present. Future research will profit from investigating the role of smoking status in self-reported ETS exposure in these venues.

Importantly, the regulation gradient was not reduced by adjustment for sociodemographic, behavioral, or town-level characteristics in the multivariate models. Such robust findings were unexpected in light of consider-

able factors—at both the individual and the town level—that heavily favor a finding of no effect. All else being equal, strength of regulation was the strongest predictor of nonexposure to ETS in restaurants and bars.

Several limitations of this study should be acknowledged. First, the outcome variable did not assess ETS exposure directly; rather, respondents were asked how often they see smokers when they go to restaurants or bars in their town. Although this is an indirect measure of exposure, it has been shown that self-reported data on number of smokers one sees at a particular location is highly correlated with levels of ETS exposure, as confirmed by ambient nicotine measurements.⁸ Coghlin et al. found that once the number of smokers one sees and the total number of hours one sees these smokers are taken into account, further information (including proximity of smokers and intensity of smoking) adds little to estimation of exposure according to nicotine levels.⁸

The ETS exposure assessment literature indicates that self-reports of seeing smokers (or being in the presence of smokers) represent a valid measure of biochemically confirmed exposure levels.^{9–11} According to Repace, the single most important predictor of ETS exposure levels is density of smokers in an environment^{12–14}; thus, frequency of seeing smokers in an environment is well supported as a measure of assessing ETS exposure in that environment. Moreover, given the limitations of this measure, the fact that we detected strong effects only strengthens our findings.

Second, limitations inherent to our study design could have biased the results toward the null hypothesis. Because of the cross-sectional nature of this study, the results do not take into account the length of time in which regulations had been operational in each town. In our analyses, we included the ordinance that was in effect on the day of the adult's interview. This omission of "lag time" would presumably have diluted any effect, yet we found a strong influence of local regulations on ETS exposure.

A third limitation is that individuals are likely to dine out in towns other than their own, and this may be especially true of those living in small towns. Along the same lines, the question regarding seeing smokers in

restaurants and bars assessed exposure over a 1-year period before establishment of the current regulations in a given respondent's town. In some cases, a regulation may not have been in effect for most of the period regarding which the adult was queried. Both of these factors could contribute to misclassification of the independent variable, biasing the results toward the null hypothesis. However, this proved not to be the case, suggesting that the true magnitude of the effect is probably stronger than what was observed in our study.

The main contribution of our study is that it validates, by means of self-reported ETS exposure, our clean indoor air coding system specific to restaurants and bars. Results revealed substantive differences in terms of exposure between regulations that restrict smoking to enclosed, separately ventilated areas only and those that prohibit smoking entirely. In that we examined the impact of regulations in regard to their intended aim—reducing exposure to ETS—the present findings support the reliability of our scale. Analytical distinctions in regulations were strongly associated with graded levels of reported exposure, validating the use of our coding system in future research investigating the effects of local restaurant and bar smoking regulations. ■

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Contributors

All of the authors contributed to conceptualization of the research question and the design of the study. A.B. Albers and M. Siegel conducted the data analysis and prepared the article. D.M. Cheng was responsible for analytic design, statistical and methodological guidance, and data interpretation. L. Biener was the principal investigator of the study and directed survey administration and data collection. All of the authors reviewed and edited the final version of the article.

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Human Participant Protection

This study was approved by the institutional review boards of the University of Massachusetts at Boston (survey administration and data collection site) and the Boston University Medical Center (data analysis site for the study described in this article). All participants provided informed consent.

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Disparities in Smoking Cessation Between African Americans and Whites: 1990–2000

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Previous studies in the United States have shown that tobacco consumption has generally decreased among all racial/ethnic groups.^{1,2} Although prevalence had been higher in African Americans than in Whites since at least 1965,³ recent data indicate that the proportions of current smokers are now similar.¹ Among African Americans, smoking prevalence has not decreased uniformly across all demographic groups (e.g., gender, nativity, and region).^{2,4,5}

Rather than “racial/ethnic group,” the term “racially classified social group” (RCSG) was employed in this article to emphasize that “race-ethnicity” as self-reported by survey respondents is not viewed as a biological or genetic construct with implications of immutable group differences based on phenotypic observations such as skin color. The idea of human populations as social groups recognizes the social character of human evolution and diversity rather than the classifications upon which fixations of “race biology” are imputed.^{6–8}

Since the mid-1980s, public health efforts have increasingly promoted cessation initiatives targeting African Americans.^{9,10} Epidemiological research on smoking cessation has revealed that African Americans are less likely than Whites to make successful quit attempts,¹¹ although they are no less likely to want to quit.^{10,12,13} A study of National Health Interview Survey (NHIS) data found increasing quit ratios from 1965 to 1991 for both African Americans and Whites as well as a persistent difference between these 2 groups.¹⁴ Pierce et al., in an analysis of 1974–1985 NHIS data, found a greater disparity in the rate of change in smoking cessation between African American and White men than that of African American and White women.¹⁵ In contrast, a longitudinal study during 1985–1995 of young adults (18–35 years old) in 4 cities by Kiefe et al. did not find an African American–White difference in cessation after control for socioeco-

Objectives. We examined disparities in smoking cessation rates between African Americans and Whites from 1990 through 2000.

Methods. We performed an analysis of smoking cessation with data from the National Health Interview Surveys of 30660 African Americans and 209828 Whites, 18 to 64 years old, with adjustment for covariates in multiple logistic regression models.

Results. Whites were significantly more likely than African Americans to be former smokers, and this disparity in the quit ratio persisted from 1990 through 2000. After adjustment for covariates, disparities were substantially reduced especially among women. Among former smokers, African Americans were significantly more likely than Whites to have quit successfully within the past 10 years.

Conclusions. Statistical adjustment for covariates reduces African American–White disparities in quit ratios, and recent cessation patterns suggest possible future reductions in disparities. (*Am J Public Health.* 2004;94:1965–1971)

nom status.¹⁶ An analysis of the influence of gender and race/ethnicity on cessation (which did not control for socioeconomic status) concluded that the age of initiation could obscure differences in cessation behavior.¹⁷ Intervention studies and clinical trials have observed different outcomes in the quitting behavior of African Americans and Whites.^{18–20} Some researchers have found effective pharmacological treatment targeting African Americans,²¹ whereas others have suggested genetic explanations for these variations.^{6,22–25}

To our knowledge, ours is the first study to analyze differences in the quitting behavior of African American and White Americans during 1990–2000. Using NHIS data for 1990 to 2000, our study examined different measures of quitting behavior and explored differences between African Americans and Whites. One implication of this analysis is that it may foreshadow future rates of smoking-related diseases and health disparities. The results may also be useful in developing more effective policies and interventions targeting specific groups of smokers.

METHODS

The NHIS is a national cross-sectional household survey of health behavior consist-

ing mostly of personal interviews of noninstitutionalized civilians. The survey has a stratified cluster probability sample design that oversamples African Americans and Hispanics. Additional information about the design of the NHIS has been previously reported.^{26,27}

Although the NHISs are not longitudinal surveys, the multiple-year cross-sectional data they yield may indicate general trends. The specific NHIS data sets used in this analysis are 1990, 1991, 1993–1995, and 1997–2000 (Table 1). Data for 1992 were excluded because they consisted of 2 different surveys (i.e., Cancer Epidemiology and Cancer Control Supplements) with dissimilar variables. The 1993 data set did not include complete information about smoking cessation and thus could not be used for all analyses. The 1996 NHIS did not collect complete data about adult smoking behavior. The age range of respondents was 18 to 64 years. The sample did not include Hispanics and consisted of 30 660 African Americans and 209 828 Whites. Annual sample sizes ranged from 2138 to 4785 for African Americans and from 14 632 to 33 949 for Whites.

Most epidemiological analyses of cessation have been limited to self-report data. Studies have generally found self-report to be valid even when compared with biochemical mea-

TABLE 1—Proportions of Never, Former, and Current Smokers, by Racially Classified Social Group: 1990–2000

	1990**	1991**	1993**	1994**	1995**	1997**	1998**	1999**	2000**	Average	Point Difference	Mean Difference
Never smokers												
African American	57.0	57.3	58.3	58.3	59.6	59.6	61.1	60.2	62.8	59.4	5.8	10.7
White	47.4	48.9	47.6	46.4	48.5	49.1	49.4	49.9	50.9	48.7	3.5	
Former smokers												
African American	16.8	12.2	15.8	14.6	14.5	13.7	14.1	15.5	13.9	14.6	-2.9	-11.2
White	26.8	23.8	27.0	27.3	26.0	25.6	25.6	25.8	25.0	25.8	-1.8	
Current smokers												
African American	26.2	30.5	26.0	27.2	25.9	26.8	24.8	24.3	23.3	26.1	-2.9	0.6
White	25.8	27.3	25.4	26.3	25.6	25.3	25.0	24.3	24.1	25.5	-1.7	
Ever smokers												
African American	43.0*	42.7*	41.7*	41.7*	40.4*	40.4*	38.9*	39.8**	37.2**	40.7	-5.8	-10.6
White	52.6	51.1	52.4	53.6	51.5	50.9	50.6	50.1	49.1	51.3	-3.5	

Note. All proportions were rounded. Average proportion refers to the mean for all years combined (1990–2000). Point difference is the proportion in 2000 minus the proportion in 1990. Mean difference is the average proportion of African Americans minus the average proportion of Whites. Ever smokers consisted of both former and current smokers.

* $P < .01$; ** $P < .001$. The 2 sets of P values were based on χ^2 analysis of (a) never, former, and current smokers, and (b) never and ever smokers.

tures, although some differences in misclassification have been observed between African Americans and Whites.^{28,29}

The quit ratio is conventionally defined as the proportion of ever smokers (i.e., current and former) who are former smokers.^{17,30} Although frequently used as a point prevalence estimate of cessation in cross-sectional studies, the conventional quit ratio (CQR) has been found to be problematic.¹⁷ The proportion of ever smokers who quit for at least 12 months was used as the successful quit ratio (SQR), as 1 year of complete cessation is generally recognized as a “gold standard” in determining successful quitting.^{3,30} Most of the analyses of quit ratios are limited to the SQR.

In view of the historical difference in cessation rates between African Americans and Whites, we analyzed more recent versus longer durations of successful quitting. The recency of successful quitting (i.e., for 1 year or more) among former smokers was categorized as 10 years or fewer versus more than 10 years (from the time of the NHIS interview), as our analysis showed that there were no differences in study results between quitting in the past 1 to 5 years and quitting in the past 1 to 10 years. The 10-year threshold or interval has also been used by other investigators.^{1,3,16,31} For individual survey years between 1990 and 2000, we calculated the proportion of former smokers

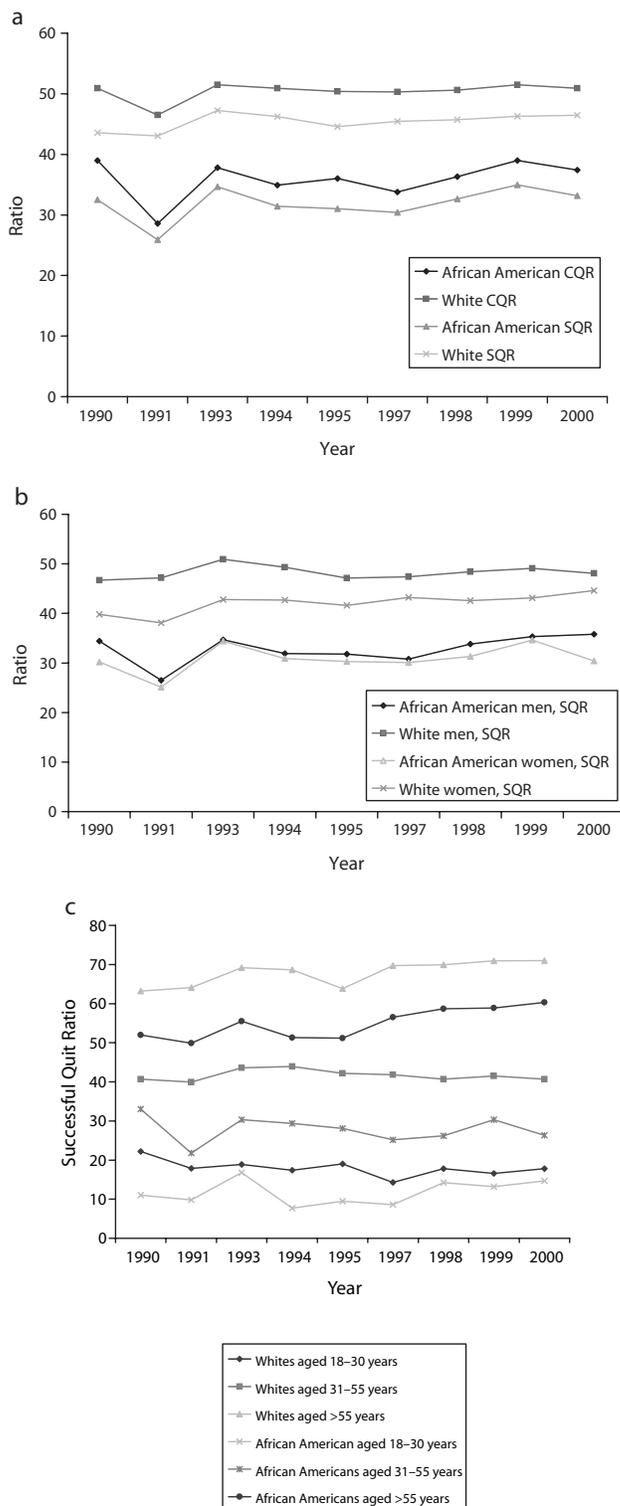
who successfully quit within the last 10 years, as it extended our analysis before the 1990s.

The independent categorical variables were gender, age (18–24 years, 25–34 years, 35–44 years, 45–54 years, and ≥ 55 years), education (less than high school, high school graduate, and some college or more), marital status (married and nonmarried), and geographic regions (Northeast, South, Midwest, and West, based on the standard US census classification). Annual family income was not included in the analysis because missing data, although greater for African Americans, was high for both RCSGs during the earlier part of the decade. For example, between 1990 and 1995, on average, 13.2% of income data were missing for Whites compared with 19.5% for African Americans. Also, in some other NHIS multivariate analyses^{2,5} and other smoking studies,¹⁵ income has not been shown to be a significant or strong predictor of quitting when paired with education among African Americans.

The SAS³² and the SUDAAN³³ computer programs were used for data analysis. SUDAAN was used to calculate the correct standard errors for the complex survey design of the NHIS. In implementing SUDAAN, the mildly conservative option used the “With Replacement” design with the “Logistic Procedure.” Output from the program included the

standard error of the logistic regression coefficient, the quit ratios, confidence intervals, and the “design effect,” calculated as the ratio of the variance of the estimator to the variance of the estimator assuming a simple random sample.³³ Odds ratios and 95% confidence limits for the odds ratios were also obtained. Cross-tabulations were used to assess bivariate relationships between the response variables and the sociodemographic predictors (i.e., age, gender, education, geographic region, and marital status) included in the multivariate analyses.

For Figures 1 and 2, yearly point prevalences for various quit ratios and proportions are plotted over time for the RCSG. Each piecewise linear graph or profile is compared with other profiles by using a log-linear model, where the response variable is dichotomous (e.g., quit smoking: yes, no) and the independent variables are year, and the selected factors are RCSG (Figure 1a), combination of RCSG and gender (Figure 1b), or a combination of RCSG and age (Figure 1c). A full model, for example, would include the main effects of racially classified social group and year, as well as the RCSG-by-year interaction. A main effect model would consist solely of year and RCSG. A conservative procedure using the standard error (SE) and the design effects from SUDAAN were included in the log-linear model to compute an “effec-



Note. RCSG = racially classified social group; CQR = conventional quit ratio; SQR = successful quit ratio.

FIGURE 1—Conventional and successful quit ratios, 1990–2000, by (a) RCSG, (b) RCSG and gender, and (c) RCSG and age.

“tive” sample size because of the complex survey design, as follows in the next paragraph.

In discerning the presence of an RCSG-by-time interaction, an exact procedure is cumbersome because of the problems associated with combining multiple years of NHIS data. Moreover, as noted in Botman and Jack,²⁷ it is not possible to model the correlation over time for some primary sampling units, which occur every year in the NHIS survey. Instead, the approach here estimates the frequency of quitters versus nonquitters by using the SE and design effect (DEFF) output from each year separately. Specifically, and by definition, $DEFF = SE \times SE / VARSRS$, where VARSRS is the variance of a simple random sample. For binomial sampling, $VARSRS = QR \times (1 - QR) / ne$, where QR represents the quit rate expressed as a proportion and ne is the associated effective sample size. To illustrate, consider the conventional quit ratios profile in Figure 1, 1990, where the unweighted sample size for African Americans is 5452, the $QR = 0.39$, the SE of the QR is 0.0136 (1.36%), with a DEFF of 1.86. Then, $VARSRS = 0.00009944$ and $ne = 2393$, so the associated sample size for the log-linear model would be $0.39 \times 2393 = 934$ quitters and $2393 - 934 = 1459$ nonquitters. For the log-linear model, the SAS PROC CATMOD procedure was used.

For the multiple logistic regression (MLR) analysis, 3 separate models were constructed using the following dependent variables: (1) current versus former smoker; (2) current versus former smokers by RCSG and gender; and (3) former smokers who successfully quit within 10 years of an NHIS survey year (more recently) compared with more than 10 years (longer term cessation). Age of initiation was only available for a limited number of NHIS years. It was used as a covariate for the years 1997–2000 in the model assessing successful quitting among former smokers.

RESULTS

Sociodemographic characteristics of African Americans and Whites remained stable throughout the 1990–2000 period, and the distributions were fairly consistent with the US Bureau of Census estimates between 1990 and 2000.

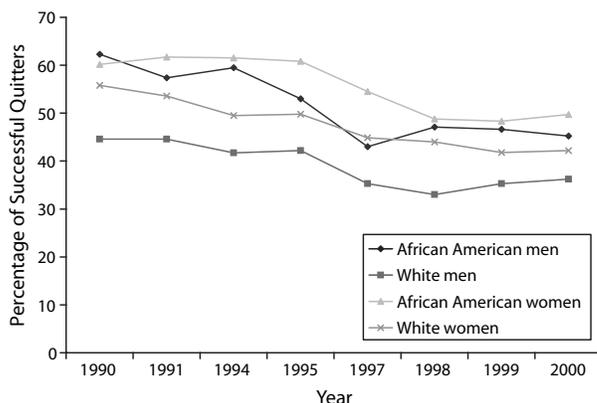


FIGURE 2—Percentage of successful quitters who quit within the past 10 years, 1990–2000, by racially classified social group and gender.

The proportion of former smokers among African Americans is on average 57% (14.6/25.8) the rate of Whites and declined by 2.9% (compared with 1.8% for Whites) from 1990 to 2000 (Table 1). However, the proportion of African American never smokers was on average 10.7% higher than for Whites and increased 5.8% over the decade compared with a 3.5% increase for Whites. As shown in Table 1, African Americans consistently had a lower proportion of ever smokers and experienced a larger decrease in ever smokers over the study period compared with Whites.

Also, the rate of smoking decreased 2.9% and 1.7%, respectively, for African Americans and Whites (Table 1). The mean ratio of former smokers to current smokers from 1990 to 2000 was 0.56 for African Americans and 1.01 for Whites. Thus, the proportion of never smokers was higher among African Americans, but the proportion of former smokers was lower, resulting in similar RCSG smoking prevalence rates.

Although annual fluctuations were observed (Figure 1a), there was a 1.6% decrease in the CQR of African Americans between 1990 and 2000, and the disparity in the CQR between African Americans and Whites at the beginning of the decade (11.9) increased by the year 2000 (13.5). For any given survey year, the SQR pattern was similar but 2 to 8 points lower than the CQR. Log-linear models (not shown) indicated that, for the SQR, the year-by-RCSG interaction approached statisti-

cal significance ($P=.07$), with a highly significant year and RCSG effect. If 1991 (an atypical year) was deleted, both the year and the RCSG-by-year interaction would no longer be significant. However, there was a highly significant RCSG effect ($\chi^2=412$, $P<.0001$).

Figure 1b presents gender and RCSG successful quit ratios and indicates that White men have the highest SQRs, and this pattern is consistent for the entire decennial. African American women have the lowest SQR of any gender and RCSG.

As shown in Figure 1c, compared with African Americans, Whites had a higher SQR in each age category. Notably, the SQRs were highest for those older than 55 years for both African Americans and Whites and generally increased through the decade. Although there was a small but significant age-by-year interaction, age effects predominate, with each pair of age groups being significantly different, using contrasts in the main effects log-linear model ($P<.0001$).

Figure 2 presents the proportion of successful quitters who quit recently (i.e., within the last 10 years) of any given NHIS between 1990 and 2000 by RCSG and gender. For all groups, there was a general decline in the percentage of successful quitters who quit within the past 10 years. In 2000, cross-sectional results showed that African Americans had a significantly higher proportion than Whites of recent successful quitters between 1990 and 2000. In the full model, there were no signifi-

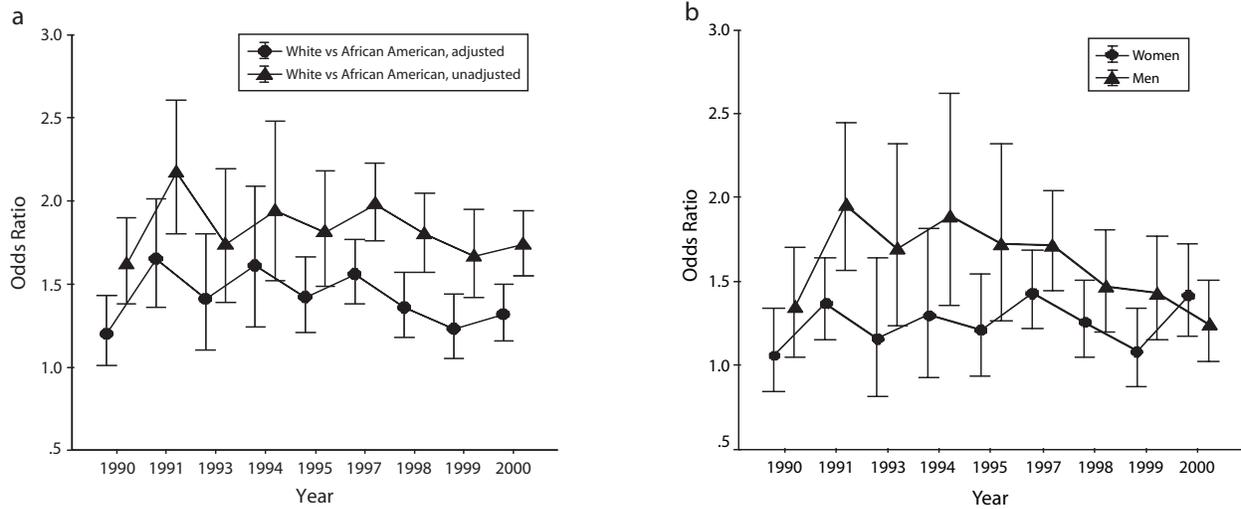
cant interactions with year. In the reduced model (year, RCSG, gender, RCSG-by-gender), year was highly significant ($\chi^2=453$, $P<.0001$), indicative of a general decline over time for all groups. In the reduced model, there was a relatively small RCSG-by-gender interaction ($\chi^2=11.2$, $P=.0008$), partly indicated by the fact that African American men had much lower SQRs than women in 1997. There were highly significant main effects of RCSG ($\chi^2=170$, $P<.0001$) and gender ($\chi^2=66.7$, $P<.0001$) as, overall, African Americans had a higher proportion of successful quitters who quit within the 10 years preceding any NHIS year than Whites, and women had a higher proportion than men.

The adjusted odds ratios for MLR models for each year predicting former versus current smokers are presented in Figure 3a. In each year, Whites compared with African Americans were significantly more likely to be former smokers than current smokers. In separate models of men and women examining former versus current smoking status (Figure 3b), the adjusted odds ratios of White versus African American men generally declined after 1994, indicating greater parity between these groups. The adjusted odds ratios for White versus African American women were not statistically significant in 3 of the 4 years between 1990 and 1994 but were not significant in 3 of the 5 later years (1995–2000).

Among former smokers, the unadjusted and adjusted odds ratios show that African Americans were significantly more likely than Whites to have successfully quit within 10 years before each NHIS (Figure 4) for every year except 2000. This general pattern varied when separate models were run by gender. Additional MLR analyses using age of initiation as a covariate for the years 1997–2000 did not affect the results (data not shown).

DISCUSSION

Research on tobacco use and health disparities requires complex analyses so as not to obscure, overstate, or simplify differences. Our study's findings revealed both positive developments (i.e. quitting behavior within the past 10 years for African American former smokers) and continuing challenges in closing the smoking cessation gap between



Note. Adjusted for covariates, age, gender, education, marital status, and geographic region.

FIGURE 3—Odds ratios for being a former vs current smoker, 1990–2000, among (a) Whites vs African Americans (adjusted and unadjusted) and (b) Whites vs African Americans (adjusted) for women vs men separately.

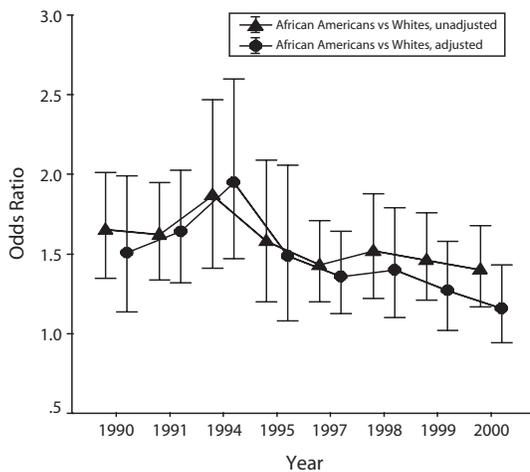


FIGURE 4—Adjusted and unadjusted odds ratios among African American vs White former smokers for having successfully quit ≤ 10 years ago vs > 10 years ago, 1990–2000.

African Americans and Whites. Between 1990 and 2000, African Americans had a much lower annual average of former smokers (14.6%) than did Whites (25.8%), and this disparity increased slightly at the end of the decade. Using the higher standard of the SQR, we did not find any attenuation in the African American–White disparity between 1990 and 2000, nor did we find a significant

RCSG-by-year interaction effect when 1991 (an outlier year) was excluded.

Over the past decennial period, as larger percentages of African Americans (59.4% annual average compared with 48.7% for Whites) have refrained from becoming smokers, the prevalence of current smokers (even with the overall decline in African American former smokers) has diminished. Studies have

attributed this pattern largely to cultural and social influences (e.g., parental prohibitions, social norms) that have limited smoking initiation among African American teenagers, women, and nonnative populations and in certain geographic regions.^{2,4,5,34,35} These results also suggest that cultural preventive influences have been more effective than cessation in reducing current smoking among African Americans.

The MLR models revealed that for each year, Whites were more likely to be former smokers compared with African Americans; however, for most of the post-1994 period, the adjusted odds ratios of African Americans and Whites for former versus current smokers were less than 1.5 (Figure 3a) and were not statistically significant in women for most years (Figure 3b). Also, adjusted findings showed that the odds ratios of African American and White men with respect to quitting continued to decline after 1994. Among former smokers, the finding that African Americans were more likely to have quit smoking for at least 1 year within the 10 years previous to each NHIS between 1997 and 2000 might portend future improvement in quit ratios and smoking prevalence among African Americans (Figure 4).

We speculate that as a greater number of older African American smokers die, it is likely

that the pool of future smokers will be smaller and younger. It is possible that these individuals will make more successful attempts to quit because of less severe physiological addiction, improved socioeconomic status, greater concern about the consequences of smoking, and better access to cessation therapies. This proposition is consistent with studies that have observed a leveling off or reduction in gains via cessation^{36,37} as well as the size and the characteristics of the “hard-core” smoker population.³⁴ It is also likely that cultural influences could have a considerable impact (e.g., changes in social norms about quitting, greater community effort and social network support to stop smoking) on future patterns of cessation among African Americans.

Although African American–White differences in cessation continue to exist, they are reduced considerably if not eliminated after statistical adjustment for sociodemographic factors. Our results, like those of other researchers,^{22–25} do not support genetic explanations for African American–White differences in quitting. Disparities in smoking cessation among RSCG are strongly influenced by socioeconomic status^{6,12,15,16,38,39} and do not appear to be a fixed attribute reflecting biological or genetic differences between African Americans and Whites.

Our analysis has a number of important strengths. First, we are not aware of any other studies that have analyzed cessation patterns between African Americans and Whites for most of the years between 1990 and 2000. Second, we used the higher standard of cessation (i.e., 1-year SQR) and used multiple-year nationally representative samples that included a large number of African Americans. In addition, we adjusted for sociodemographic covariates to assess the disparity in cessation, although we could not adjust for racial discrimination or racism, as these variables were not collected by the NHIS.

This study also has several limitations. First, NHIS data on cessation are derived from self-report, and although there is evidence to support the validity of self-reported smoking measures, there may be some differences in reporting of cessation.^{28,29} Second, as noted earlier, these data are from annual cross-sectional samples and are not cohort or longitudinal studies, and therefore consider-

able caution must be exercised regarding any causal or temporal inferences.^{26,27}

Third, quitting behavior has been shown to be inversely related to the number of cigarettes consumed per day, and African Americans smoke on average fewer cigarettes daily than Whites¹; however, data on the number of cigarettes smoked at the time of quitting were not collected by the NHIS for former smokers. Fourth, we note that recidivism among former smokers could potentially affect the results from year to year.^{40,41} Fifth, data from the NHIS are based on noninstitutionalized populations and excluded persons such as incarcerated individuals,^{2,5} a population that includes a disproportionate number of African American men who are likely to have higher-than-average smoking rates. If these populations were counted, the quit ratios would likely be lower than estimates derived from the NHIS, and smoking prevalence rates would probably be higher.

It should be noted that quit ratios are crude indicators that are typically unadjusted for sociodemographic differences, and they do not explain disparities by RSCG. Also, because many former smokers stopped long ago, quit ratios reflect recent patterns of quitting as well as long-term cessation trends,^{2,17} and the ratios of Whites have been higher historically than those of African Americans.

Moreover, neither the quit ratios nor other analyses account for a factor that may systematically overestimate quitting by time period among African Americans in cross-sectional studies, namely, the impact of excess mortality. Because of the disproportionately greater mortality from lung cancer and some other smoking-related diseases (especially among African American men),^{42,43} the denominators (i.e., ever smokers) of the quit ratios for African Americans are likely to be proportionally smaller than those of Whites. As a result, such estimates of cessation may artificially inflate the rate of quitting among African Americans. The problem of overestimation would be relatively less important at younger ages (as shown in Figure 2b) because the effect of African American–White differences in mortality from smoking-related diseases would be less relevant. Analyses based on longitudinal data are needed to account for the differential in mortality.

The process of cessation is both an individual and a collective experience. On the individual level, social, physiological, and psychological factors converge to motivate people to stop smoking, sustain them through the withdrawal process, and help them to resist the temptation to relapse.⁴⁴ On the collective or societal level, public policies regarding tobacco control (i.e., excise taxes, restrictions of sales, smoking prohibitions), social institutions (e.g., medical and health organizations, schools), innovations in cessation strategies (e.g., nicotine-replacement therapies, media communications), and organizations (e.g., unions, antismoking coalitions, civic groups) have contributed to a broad social consensus against tobacco consumption in American society.¹ During the past decade and longer, public health efforts have increasingly targeted high rates of smoking among African American adults^{9,44,45} with community-based interventions (both prevention and cessation) emphasizing multidisciplinary and culturally appropriate strategies.

In addition, many African American communities have engaged in activism against tobacco industry promotional campaigns (e.g., Uptown brand cigarettes and billboard advertisements in minority communities) and in community awareness projects that have stimulated debate as well as alliances between African American social, civic, and health organizations.^{26,46,47} For the foreseeable future, differences in quitting as conventionally measured will likely persist, because the historical imbalances and sociodemographic correlates of quitting may not be quickly or easily rectified. In addition to the longer-term goal of eliminating social inequities, addressing the disparity in cessation will require more immediate strategies such as increasing the number of cost-effective and accessible interventions targeting specific groups of African Americans. ■

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Cigarette Smoking and Exposure to Environmental Tobacco Smoke in China: The International Collaborative Study of Cardiovascular Disease in Asia

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Cigarette smoking is a major public health challenge worldwide. Whereas cigarette smoking caused an estimated 3 million annual deaths worldwide at the end of the 20th century, this number is predicted to soar to more than 10 million by 2020, with the burden of smoking-related mortality shifting from developed to developing nations.^{1–3} By 2030, 70% of annual smoking-related deaths worldwide will occur in developing countries.⁴

With a population of 1.2 billion, China is the world's largest producer and consumer of tobacco.⁵ Several epidemiological studies conducted in China have documented that cigarette smoking increases mortality from cancer and from respiratory and cardiovascular disease.^{6–10} Two previous national surveys have reported a high prevalence of cigarette smoking in Chinese men.^{5,11} However, detailed information on home and workplace exposure to environmental tobacco smoke (ETS) was not reported in these surveys.

The objectives of this study were to estimate the prevalence and number of cigarette smokers in the general adult population in China, to examine the extent of ETS exposure in China, and to investigate the contribution of home and workplace exposure to ETS.

METHODS

The International Collaborative Study of Cardiovascular Disease in Asia (InterASIA) was a cross-sectional study of cardiovascular disease risk factors in the general population aged 35–74 years in China and Thailand. Details of the study's design and methods have been published elsewhere.¹² In brief, InterASIA used a 4-stage stratified sampling method to select a nationally representative sample in China. A total of 19 012 persons were randomly selected and were invited to

Objectives. We estimated the prevalence of cigarette smoking and the extent of environmental tobacco smoke exposure (ETS) in the general population in China.

Methods. A cross-sectional survey was conducted on a nationally representative sample of 15 540 Chinese adults aged 35–74 years in 2000–2001. Information on cigarette smoking was obtained by trained interviewers using a standard questionnaire.

Results. The prevalence of current cigarette smoking was much higher among men (60.2%) than among women (6.9%). Among nonsmokers, 12.1% of men and 51.3% of women reported exposure to ETS at home, and 26.7% of men and 26.2% of women reported exposure to ETS in their workplaces. On the basis of our findings, 147 358 000 Chinese men and 15 895 000 Chinese women aged 35–74 years were current cigarette smokers, 8 658 000 men and 108 402 000 women were exposed to ETS at home, and 19 072 000 men and 55 372 000 women were exposed to ETS in their workplaces.

Conclusions. The high prevalence of cigarette smoking and environmental tobacco smoke exposure in the Chinese population indicates an urgent need for smoking prevention and cessation efforts. (*Am J Public Health.* 2004;94:1972–1976)

participate. A total of 15 838 persons (83.3%) completed the survey and examination. The analysis reported in this article was restricted to the 15 540 adults who were aged 35–74 years at the time of the survey.

Trained research staff administered a standard questionnaire including questions from the lifetime smoking questionnaire used in the US National Health and Nutrition Examination Survey.¹³ The questionnaire was translated into Chinese and translated back into English independently by investigators who were fluent in both languages. Information about current and former cigarette smoking, including age at which smoking was initiated, years of smoking, and cigarettes smoked per day, was obtained. Cigarette smokers were defined as persons who smoked at least 100 cigarettes in their lifetime. Those who were smoking tobacco products at the time of the survey were classified as current smokers.

Reported exposure to ETS at home was assessed by asking study participants whether any household member smoked cig-

arettes in their home, and if so, how many cigarettes per day were smoked in this setting. Study participants were classified as having been exposed to ETS at home if any household member smoked. Study participants were also asked how many hours per day they were close enough in proximity to tobacco smoke at work that they could smell it. Study participants were classified as having exposure to ETS at work if they could smell tobacco smoke at least 1 hour per day at work. These ETS exposure questions have been validated by serum cotinine measures in the National Health and Nutrition Examination Survey III.¹⁴

The prevalence and mean levels were weighted to represent the total Chinese adult population aged 35–74 years. The weights were calculated based on the 2000 China Population Census data and the InterASIA sampling scheme and took into account several features of the survey including oversampling for specific age or geographic subgroups, nonresponse, and other demographic

TABLE 1—Prevalence and Estimated Number of Cigarette Smokers Aged 35–74 Years by Gender and Age Group: China, 2000–2001

Age Group, years	Current ^a		Former ^b		Never ^c	
	% (SE)	No. ^d (SE)	% (SE)	No. ^d (SE)	% (SE)	No. ^d (SE)
All	34.3 (0.5)	163 253 (2568)	6.4 (0.3)	30 425 (1244)	59.4 (0.5)	282 892 (2522)
Men						
35–74	60.2 (0.8)	147 358 (2522)	10.6 (0.5)	25 872 (1130)	29.2 (0.7)	71 491 (1878)
35–44	63.3 (1.2)	60 190 (1728)	7.0 (0.6)	6684 (584)	29.7 (1.1)	28 218 (1258)
45–54	62.3 (1.4)	46 557 (1729)	10.4 (0.9)	7793 (659)	27.3 (1.3)	20 442 (1087)
55–64	57.8 (1.6)	26 015 (1136)	12.8 (1.0)	5745 (482)	29.4 (1.5)	13 226 (783)
65–74	48.9 (2.3)	14 596 (942)	18.9 (1.7)	5650 (566)	32.2 (2.1)	9605 (771)
Women						
35–74	6.9 (0.4)	15 895 (963)	2.0 (0.2)	4553 (540)	91.2 (0.5)	211 401 (2469)
35–44	4.7 (0.6)	4209 (526)	0.8 (0.2)	751 (207)	94.5 (0.6)	84 459 (1860)
45–54	6.6 (0.8)	4600 (605)	2.1 (0.5)	1486 (345)	91.3 (0.9)	64 138 (1733)
55–64	8.8 (0.9)	3691 (410)	2.5 (0.6)	1056 (243)	88.7 (1.1)	37 087 (1236)
65–74	11.2 (1.4)	3395 (451)	4.1 (0.9)	1259 (275)	84.7 (1.6)	25 718 (1251)

^aCurrent cigarette smokers were those who smoked at the time of the survey and had smoked more than 100 cigarettes in their lifetimes.

^bFormer cigarette smokers were those who had smoked more than 100 cigarettes in their lifetime but were no longer smoking at the time of the survey.

^cNever smokers were those who had never smoked or smoked fewer than 100 cigarettes in their lifetimes.

^dEstimated population in thousands.

or geographic differences between the sample and the total population. Standard errors were calculated by a technique appropriate to the complex survey design. All data analyses were conducted using Stata 7.0 (Stata Corp, College Station, Tex) software.

RESULTS

Overall, 60.2%, or an estimated 147 358 000, Chinese men aged 35–74 years had smoked at least 100 cigarettes during their lifetime and were current cigarette smokers. An additional 10.6%, or an estimated 25 872 000, Chinese men in the same age range had smoked at least 100 cigarettes during their lifetime but were not current smokers at the time of the survey (Table 1). The prevalence of current and former cigarette smokers was much lower among women, at 6.9% (an estimated 15 895 000 women) and 2.0% (an estimated 4 553 000 women), respectively. The prevalence of current cigarette smokers was higher in younger than in older men, but the prevalence of former smokers was higher in older than in younger men. The prevalence of both current and former cigarette smokers increased with

age among women. The age-standardized prevalence of current cigarette smokers was significantly higher among rural residents compared with male (61.6% vs 54.5%; $P < .001$) and female (7.8% vs 3.4%; $P < .001$)

urban residents. The age-standardized prevalence of current smokers was similar among men in North and South China (58.6% vs 61.2%; $P = 0.08$) and was significantly higher among women in South China than in North China (7.8% vs 5.6%; $P < .01$).

Among current cigarette smokers, the average number of cigarettes smoked was 20 per day for men and 7 per day for women. Among current cigarette smokers, the average number of pack-years of cigarette smoking, an estimate of lifetime exposure (the product of packs of cigarettes per day and years of smoking), was 20 for men and 11 for women. As expected, pack-years of cigarette smoking increased with age. The mean age of starting cigarette smoking was 22.0 years for men and 23.7 years for women. Younger smokers reported an earlier age of initiation than did the older smokers.

Of the nonsmokers, 41.4%, or an estimated 117 060 000, Chinese men and women aged 35–74 years reported exposure to ETS at home (Table 2). The prevalence of persons who reported home exposure to ETS was much higher among women (51.3%) compared with men (12.1%). The prevalence of home exposure to ETS was higher in older age groups for men and in younger age groups for women. There were 26.3%, or an

TABLE 2—Prevalence of Home or Workplace Exposure to Environmental Tobacco Smoke Among Nonsmokers, by Gender and Age Group: China, 2000–2001

Age Group, years	Home		Workplace	
	% (SE)	Estimated Population ^a (SE)	% (SE)	Estimated Population ^a (SE)
All	41.4 (0.7)	117 060 (2110)	26.3 (0.6)	74 443 (1809)
Men				
35–74	12.1 (0.9)	8658 (700)	26.7 (1.2)	19 072 (961)
35–44	6.0 (1.1)	1685 (333)	31.1 (2.0)	8771 (667)
45–54	13.1 (1.9)	2664 (404)	29.9 (2.4)	6106 (562)
55–64	19.9 (2.4)	2634 (344)	22.9 (2.4)	3028 (359)
65–74	17.5 (3.1)	1674 (322)	12.2 (2.5)	1166 (257)
Women				
35–74	51.3 (0.8)	10 8402 (2041)	26.2 (0.7)	55 372 (1620)
35–44	57.5 (1.2)	48 533 (1463)	33.8 (1.2)	28 521 (1184)
45–54	51.4 (1.4)	32 915 (1264)	25.0 (1.3)	16 017 (952)
55–64	49.7 (1.8)	18 437 (896)	20.9 (1.5)	7732 (634)
65–74	33.1 (2.3)	8516 (708)	12.1 (1.7)	3102 (463)

^aIn thousands.

estimated 74 443 000, Chinese men and women aged 35–74 years who reported exposure to ETS at work. The prevalence of persons who reported workplace exposure to ETS was similar among men (26.7%) and women (26.2%). The prevalence of workplace exposure to ETS was higher in younger age groups compared with older age groups.

Among nonsmokers, 22.9% of Chinese men and women aged 35–74 years reported exposure to ETS at home only, 7.9% at work only, and 18.4% both at home and at work. Overall, 49.2%, or an estimated 139 421 000, Chinese men and women nonsmokers aged 35–74 years reported exposure to ETS at home or at work. The percentage of nonsmokers who reported exposure to ETS at home only was much higher among women (29.0%) than among men (5.1%), whereas the percentage of nonsmokers who reported exposure to ETS at work only was much

higher among men (19.7%) than among women (3.9%). The percentage of nonsmokers who reported exposure to ETS both at home and at work was much higher among women (22.3%) than among men (7.0%). The prevalence of exposure to ETS at home but not at work was higher in older age groups for men and in younger age groups for women (Figure 1). The prevalence of exposure to ETS at work but not at home was higher in younger age groups for both men and women.

The age-standardized prevalence of ETS exposure among nonsmoking men was significantly higher in urban compared with rural areas (39.8% vs 29.4%; $P < .001$) and in North compared with South China (37.4% vs 27.1%; $P < .001$), mainly because of a higher proportion of work-related ETS exposure in urban and North China. The age-standardized prevalence of ETS expo-

sure among nonsmoking women was similar in urban and rural areas (53.3% vs 55.9%) as well as in North and South China (54.5% vs 55.9%).

Of the nonsmokers, 38.4% of Chinese men and women aged 35–74 years had 1 household member who smoked in their home, 5.0% had 2 household members who smoked in their home, and only 0.6% had 3 or more household members who smoked in their home (Table 3). The percentages of 1, 2, and 3 or more household members who smoked in their home were higher for women (47.7%, 6.1%, and 0.7%, respectively) than for men (11.0%, 1.8%, and 0.2%, respectively). Among nonsmokers, 9.8%, 12.2%, and 15.0% of Chinese men and women aged 35–74 years reported exposure to ETS at work for 1, 2 to 3, and 4 or more hours per day, respectively (Table 3). The percent distribution by number of hours per day of exposure to ETS at work was similar among men and women.

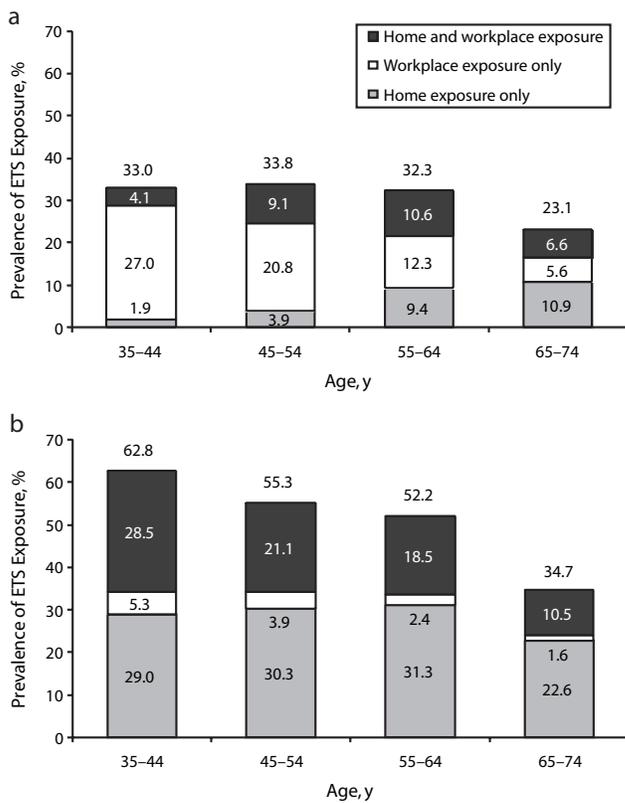


FIGURE 1—Prevalence of environmental tobacco smoke (ETS) exposure among nonsmokers by gender and age group in China, 2000–2001.

CONCLUSIONS

This study indicates that, of Chinese adults aged 35–74 years, 60.2% (147 358 000) of men and 6.9% (15 895 000) of women were current cigarette smokers. In addition, 49.2% (139 421 000) of nonsmokers aged 35–74 years reported exposure to ETS at home or at work. Overall, more than 300 million Chinese adults aged 35–74 years were exposed to active or passive cigarette smoking. This number is very significant because cigarette smoking has become the leading cause of preventable death in China and the world.^{6–10,15}

Two national surveys on the prevalence of cigarette smoking were conducted in China in 1984 and 1996.^{5,11} In the 1984 national survey, a multistage randomly selected sample of 519 600 Chinese men and women aged 15 years or older participated in the survey.¹¹ Overall, the prevalence of cigarette smoking, defined as persons who had ever smoked at least 1 cigarette daily for at least 6 months, was 61.0% among men and 7.0% among women. In the 1996 national survey, 120 298 persons aged 15 to 69 years were selected from 145 disease surveillance populations in the 30 provinces in China, using a 3-stage cluster, random sampling method.⁵ Using the same definition for cigarette smok-

TABLE 3—Percentage of Nonsmokers, by Home Exposure (Number of Household Members Reported Smoking in Their Homes) and Workplace Exposure (Number of Hours Exposed to Cigarette Smoke at Work), Gender, and Age Group: China, 2000–2001

Age Group, years	Exposed, ^a % (SE)					
	Smokers per Household			Hours of Exposure per Day		
	1	2	≥3	1	2-3	≥4
All	38.4 (0.7)	5.0 (0.3)	0.6 (0.1)	9.8 (0.5)	12.2 (0.5)	15.0 (0.6)
Men						
35-74	11.0 (0.9)	1.8 (0.4)	0.2 (0.1)	9.1 (0.9)	11.0 (1.0)	14.4 (1.0)
35-44	6.1 (1.2)	0.5 (0.2)	0.02 (0.02)	8.2 (1.3)	10.9 (1.4)	17.5 (1.8)
45-54	12.0 (1.8)	1.5 (0.7)	0.4 (0.3)	11.5 (2.1)	11.4 (1.8)	14.8 (1.8)
55-64	16.7 (2.2)	4.0 (1.2)	0.3 (0.2)	10.6 (2.2)	12.5 (2.5)	10.6 (2.0)
65-74	14.8 (3.0)	3.2 (1.3)	0.0 (0.0)	4.1 (1.8)	8.4 (2.5)	6.8 (2.7)
Women						
35-74	47.7 (0.8)	6.1 (0.4)	0.7 (0.1)	10.0 (0.6)	12.6 (0.6)	15.3 (0.7)
35-44	57.1 (1.2)	3.2 (0.5)	0.2 (0.1)	9.7 (0.8)	14.7 (1.0)	17.4 (1.0)
45-54	46.1 (1.5)	8.6 (0.9)	0.7 (0.2)	10.0 (1.1)	12.3 (1.2)	14.3 (1.3)
55-64	40.8 (1.8)	10.1 (1.1)	1.5 (0.4)	13.0 (1.7)	10.1 (1.6)	14.9 (1.8)
65-74	30.2 (2.3)	4.0 (1.1)	1.1 (0.5)	7.2 (1.9)	7.0 (1.7)	8.3 (2.0)

^aAmong those employed.

ing as the 1984 survey, the prevalence of current smoking was 63.0% among men and 3.8% among women.

Our study employed a multistage stratified random sampling method to select a representative national sample from the Chinese general population. Cigarette smokers were defined as persons who had smoked at least 100 cigarettes during their lifetime. Our findings cannot be directly compared with the 2 previous national surveys, because of differences in sampling methods and definitions of cigarette smoking. However, our study confirmed the previous findings that the prevalence of current cigarette smoking was extremely high among men. In addition, we found that the prevalence of cigarette smoking among women was higher than previously reported.

This study provides an opportunity to compare the prevalence of cigarette smoking in China with other countries because the survey instruments and definitions for cigarette smoking were identical to those used in other national surveys. The prevalence of cigarette smoking in Western populations was much lower for men and higher for women compared with that noted in China.^{16–18} For example, the prevalence of

current smokers was 26.4% among men and 22.1% among women in the 1997–1998 US National Health Interview Survey.¹⁷ The prevalence of cigarette smoking in China was similar to other economically developing countries in Asia.^{19,20}

Our study is among the first surveys to provide detailed information on ETS in the general population in China. Our findings indicated that a high proportion of men and women are exposed to ETS smoke at work in China, which is cause for concern. Prohibition of cigarette smoking in the workplace is not required by law in China.

Epidemiological studies have documented that cigarette smoking is a leading preventable cause of death in China, similar to what is seen in other countries.^{4,6–10} Exposure to ETS has also been related to an increased risk of lung cancer and cardiovascular disease in Chinese population as well as in other populations.^{21–25}

Our findings have important public health implications. The high prevalence of cigarette smoking in Chinese men indicates an urgent need for smoking prevention and cessation efforts. Smoking prevention efforts are also needed to further decrease the currently low prevalence of cigarette smoking among

women. The large number of men and women being exposed passively to cigarette smoke in their workplace argues for legal prohibition of cigarette smoking in the workplace environment in China. ■

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Contributors

Dongfeng Gu participated in study design, data collection, and development. Xigui Wu, Xiufang Duan, and Xue Xin supervised data collection and quality control. Kristi Reynolds participated in data analysis and interpretation. Robert F. Reynolds and Paul K. Whelton participated in study design and interpretation of study findings. Jiang He participated in study design, supervised data collection and quality control, and wrote the article.

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Human Participant Protection

The institutional review board at the Tulane University Health Sciences Center approved the InterASIA study. In addition, ethics committees and other relevant regulatory bodies in China approved the study. Informed consent was obtained from each participant before data collection. During the study, participants with untreated conditions identified during the examination were referred to their usual primary health care provider.

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Immigration and Acculturation in Relation to Health and Health-Related Risk Factors Among Specific Asian Subgroups in a Health Maintenance Organization

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The Office of Management and Budget (OMB) defines Asians and Pacific Islanders (APIs) as “person[s] having origins in any of the original peoples of the Far East, Southeast Asia, the Indian subcontinent, or the Pacific Islands.”^{1,2} This growing population in the United States includes Chinese, Japanese, Filipinos, Koreans, Pacific Islanders (e.g., Native Hawaiians and Samoans), Southeast Asians (e.g., Vietnamese and Hmong), and persons from the Indian subcontinent.³ In addition to their cultural diversity, US APIs differ in their immigration history. Statistics based on the 1990 census show that although 80% of Japanese residents were born in the United States, only 20% of Vietnamese were born here.⁴ APIs also have become increasingly integrated with other racial groups: Of the 4% of the California population identifying with more than 1 race in the US Census, more than a quarter identified with an API group.⁵

Because data on Asians have tended to be aggregated in studies, little is currently known about how anthropometric and lifestyle characteristics that represent risk factors for several major diseases vary among Asian subgroups. Studies that have presented disaggregated data have shown heterogeneity in health profiles among subgroups^{3,6–16} and by birthplace and acculturation.^{7,9,17–34} Thus, aggregating this heterogeneous population may mask important health differences among specific subgroups.^{35,36}

The objective of this study was to examine variations in selected constitutional and lifestyle characteristics among specific Asian subgroups in the Northern California Kaiser membership population. Toward this aim, we compared the prevalence of purported risk (and protective) factors, including anthropometry, soy consumption, smoking, alcohol consumption, physical activity, general health status, and disease conditions, among each

Objectives. We sought to determine how risk factors for disease vary among Asian subgroups.

Methods. Using data from a case–control study conducted at Northern California Kaiser Medical Centers (from 1996 to 2001), we compared prevalence of selected risk factors among Asian subgroups and evaluated the associations of these risk factors with sociodemographic factors.

Results. Chinese and Japanese patients had a lower body mass index (kg/m²) than did other Asians. In all subgroups, being born in the United States was associated with having a body mass index greater than 25 kg/m². Compared with other Asians, more Japanese and multiple-race Asians smoked, and more Filipino and multiple-race Asian smokers started smoking at 18 years or younger. Filipinos and multiple-race Asians also were more likely to report diabetes.

Conclusions. These data support the importance of efforts to distinguish among Asian subgroups in public health practice and research. (*Am J Public Health*. 2004;94:1977–1984)

major Asian subgroup with the corresponding prevalences among all Asians (the combined subgroups) and among Whites (reference group representing the health profile of the “host” country). We also determined for each subgroup the effect of sociodemographic and immigration and acculturation characteristics on the odds of particular risk factors.

METHODS

Study Population

We used data from a case–control study of bone fractures conducted in 5 Northern California Kaiser Permanente Medical Care Program (KPMCP) centers in Hayward, Oakland, San Francisco, Santa Clara, and South San Francisco.^{37,38} KPMCP is a group practice prepaid health maintenance organization (HMO) with approximately 2.5 million members in 14 counties of Northern California (approximately 25% of the population). Case and control subjects were identified for November 1996 through May 2001 and were interviewed through October 2001.

Specific information about the ascertainment of case and control subjects has been

published elsewhere.^{37,38} Briefly, eligible case subjects were Kaiser members aged 45 years and older who were identified weekly through computerized radiology, inpatient, and outpatient records as having a fracture of the foot, forearm, humerus, pelvis, or shaft of the tibia or fibula. Non-Whites were oversampled. Overall, 67.8% of eligible case patients agreed to participate, for a total of 3168 case participants.

Control subjects were randomly sampled from the computerized Kaiser membership records over the same time period as case patients, within specific gender, race/ethnicity, and age groups. Overall, 74.6% of eligible control subjects agreed to participate, for a total of 2413 control participants.

Data Collection

Interviews were conducted by trained interviewers either in participants’ homes or other place of convenience or by telephone (38.1%). Most interviews were conducted in English, although a few (n=5) were conducted in Mandarin or Cantonese. “Language barrier” was not stated by any subject as a reason for declining an interview. For case participants,

questions referred to specified periods before the fracture occurred, whereas for control participants, questions referred to specified preinterview periods. No data from proxy interviews are included in these analyses.

Study Variables

Unknown or missing values were excluded from the analyses unless otherwise specified.

Sociodemographic, immigration, and acculturation characteristics. Sociodemographic, immigration, and acculturation characteristics were the primary independent variables of interest in our analyses. Participants were asked “What is your race and ethnicity? Please tell me all that apply.” The available choices (read to participants) were White, Black or African American, Hispanic or Latino, Japanese, Chinese, Filipino, Other Asian, Pacific Islander, Native American, and other. Participants indicating that they were “other Asian” were asked a subsequent question—“From what Asian countries are you a descendant?”—to assign them to a more specific group. Participants who reported belonging to more than 1 racial/ethnic group, at least one of which was an Asian group, were called “multiple-race Asians.” Of the 79 multiple-race Asians, 13 identified with only Asian subgroups, and 66 identified with at least 1 Asian subgroup and 1 non-Asian subgroup. Subgroups with fewer than 30 members were combined into the “other Asians” group.

Immigrant and generational status was based on country of birth, year or age at which family moved to the United States, and country of birth of parents and grandparents. United States–born (US-born) participants who had at least 1 US-born parent were coded as US-born (> first generation) and those whose parents were both foreign-born were coded as US-born (first generation). Foreign-born participants were classified into 3 categories of foreign-born: <50% of life in US, 50%–75% of life in US, >75% of life in US. An index indicating language-speaking preference as a measure of acculturation^{39–42} was constructed from the preferred language in 4 settings: reading and speaking, thinking, conversing with friends, and listening to/watching radio and TV programs. This language index ranges from 0 to 4, where 0 is preferring English in all 4 contexts, and 4 is preferring a foreign language in all 4 contexts.

Constitutional and lifestyle characteristics as disease risk factors. Self-reported weight and height were combined as body mass index (BMI)=kg/m². BMI categories were based both on distributions in the study sample and on categories used in previous studies.^{43,44} Participants were asked their usual frequency of consumption of soy milk and tofu and of alcohol (beer, wine or champagne, hard liquor) during the past 12 months. In addition, participants were asked for their smoking history, as well as for details regarding frequency and duration of smoking. Participants were considered to be current smokers if they reported having smoked in the past year.

Participants were also asked about their participation in specific types of physical activity during the past year. We combined past-year physical activity into 3 domains: household activities, low-impact exercises or stretching, weight-bearing exercises, and recreational activities. Participants were also asked about their participation in specific types of physical activity at 16 years of age; we grouped these activity types into 3 domains: daily living activities, household or yard work, and recreational activities. A previous study in which participants were asked to recall what kinds of physical activity they engaged in 20 to 30 years ago found recall of leisure-time moderate and vigorous activity to be fair (intra-class correlation coefficients 0.40–0.45).^{45,46} The specific types of activity comprising each domain are shown in Table 1.

Self-reported health and selected diseases or health conditions. Finally, participants were asked to rate their overall health on a 4-point scale, from “poor for your age” to “excellent for your age.” Participants were also asked whether a doctor or other medical practitioner had ever told them that they had a specific health or medical condition (Table 1). Unknown or missing values were coded as a negative response (i.e., as not having had the condition of interest).

Statistical Analysis

We generated frequency distributions of the characteristics for Whites, all Asians, and each Asian subgroup. The distributions for Asians were adjusted to the gender and 10-year age distribution of Whites with the direct method of standardization.⁴⁷ Uncondi-

tional logistic regression was used to compute odds ratios (ORs) and 95% confidence intervals (CIs) for the associations between sociodemographic, immigration, and acculturation factors and lifestyle and constitutional characteristics adjusted for age, gender, mode of interview (phone vs in-person), Kaiser race/ethnicity (to adjust for sampling), and case–control status. All analyses were conducted with SAS version 6.12.⁴⁸

RESULTS

Demographic Characteristics

Overall, approximately three quarters of the study population was female; the distributions of gender and age among the participants reflect the characteristics of persons who incurred fractures at the sites of interest (Table 2). Although case participants were slightly more likely than control participants to be female, all of the other characteristics were similar between case and control participants within each racial/ethnic group (data not shown).

Fewer Asians (combined group) than Whites had more than a college education. However, educational attainment varied across Asian subgroups, with Japanese having the highest levels and Filipinos having the lowest. With the exception of multiple-race Asians, more Asians were married and fewer were widowed, divorced, or separated compared with Whites. Proportionally more Japanese and multiple-race Asians were living alone compared with other Asian subgroups.

Immigrant status varied widely across subgroups; more Chinese, Filipinos, and other Asians had recently immigrated, whereas more Japanese were born in the United States. Language preference was consistent with immigrant status across subgroups, with the exception of Filipinos, among whom, despite the high proportion of foreign-born residents, a fairly high proportion of participants preferred to speak English.

Anthropometry

Asians tended to be substantially lighter and shorter than Whites (Table 1), although the proportion of participants in the highest category of weight (>70 kg) varied (from 8% among Japanese to 48% among multiple-race

TABLE 1—Gender- and Age-Adjusted^a Distribution (%) of Health and Health-Related Risk Factors, by Race/Ethnicity

Factor	All Asians			Japanese (n=99)	Filipino (n=268)	Other Asians ^b (n=92)	Multiple-Race Asians (n=79)
	White (n=3164)	Combined (n=801)	Chinese (n=263)				
Weight (kg)^c							
≤60	24.3	51.9	54.7	57.5	53.7	39.4	33.8
61–70	25.8	26.7	28.4	34.3	21.8	33.7	18.6
>70	49.9	21.4	16.8	8.3	24.5	26.9	47.6
Height, m							
≤1.60	20.8	54.0	48.3	62.1	58.7	58.6	47.2
1.61–1.70	43.0	33.6	38.5	28.1	33.0	27.9	29.5
>1.70	36.2	12.4	13.2	9.8	8.3	13.5	23.3
Body mass index, kg/m^{2c}							
≤25	49.6	67.0	76.8	75.2	62.3	53.3	46.3
26–30	33.0	25.8	18.4	19.3	29.2	37.6	39.8
>30	17.5	7.1	4.7	5.5	8.6	9.1	13.9
Tofu or soy milk consumption in past year							
None	66.3	16.9	4.5	3.2	28.6	18.0	30.2
<Once per week	23.1	27.0	20.0	20.8	31.1	31.4	43.0
≥Once per week	10.7	56.0	75.5	76.0	40.3	50.7	26.8
Alcohol use: ever drank any alcoholic beverage^d in past year							
73.5	45.3	36.2	61.6	48.0	54.5	49.5	
Smoking							
Ever smoker	51.7	22.8	14.6	35.6	23.5	18.7	37.7
Current smoker	13.5	6.1	3.4	3.1	7.5	4.8	13.2
Started smoking at 18 years or younger, of ever smokers	60.6	35.2	14.8	9.5	57.0	32.5	43.9
Physical activity							
Adulthood (at least 4 times per month in past year)							
Household ^e	61.5	54.6	45.0	59.0	62.6	54.8	63.8
Low-impact or stretching ^f	35.9	31.3	34.1	30.2	28.0	30.8	36.0
Recreational ^g	64.6	61.2	63.4	65.1	60.7	61.0	62.4
Childhood (at least 4 times per month at 16 years)							
Daily living ^h	92.9	91.1	91.3	92.9	91.5	94.9	86.3
Household ⁱ	48.9	47.0	36.0	50.2	61.2	41.8	39.3
Recreational ^j	93.2	83.3	81.3	87.9	78.9	88.7	89.3
Health status: fair–poor health							
12.2	15.0	13.1	15.6	16.3	12.6	19.6	
Disease conditions							
Diabetes	8.1	12.9	6.4	5.5	21.2	7.8	19.9
Angina, heart attack, heart failure	10.8	6.6	3.8	5.0	6.5	7.4	16.0
Stroke or blood clot in brain	5.6	3.6	3.5	2.9	2.6	9.6	5.6
Epilepsy, seizures, convulsions, fits	2.4	0.5	0.3	0.9	0.3	0.6	0.7
Kidney disease	2.6	2.1	2.0	2.1	1.0	2.3	1.4
Cataracts	21.6	20.0	20.5	18.6	19.9	14.8	18.6
Glaucoma	5.9	6.1	5.3	7.4	5.0	7.0	7.2
Parkinson's disease	0.8	0.4	0.3	0.9	0	1.7	0

Continued

Asians). Chinese and Japanese had lower BMIs than the other Asian groups.

Foreign-born patients were less likely than US-born patients to have BMIs of less than 25 m/kg² (Table 3). Filipino women were considerably less likely than their male counterparts to have high BMIs, although an association with gender was not seen for any other subgroup. Among all subgroups, there was a nonsignificant trend toward lower BMIs at older ages. An inverse association between BMI and education was seen among multiple-race Asians. In multivariate models, the magnitudes and confidence intervals for each of these factors did not change appreciably (data not shown).

Soy Consumption

The percentage of Asians consuming tofu or soy milk was considerably higher than that of Whites, but among the subgroups, more Chinese and Japanese than other Asian subgroups consumed soy products (Table 1). In a multivariate regression model, soy consumption was associated with recent immigration (OR=3.1 [95% CI=1.6, 6.1] and OR=2.4 [95% CI=1.3, 4.6], respectively, among foreign-born Asians who had been in the United States 50% or less and 50% to 75% of their lives, compared with US-born Asians of second generation or later).

Alcohol Consumption

Asians were less likely than Whites to report alcohol consumption during the past year, although prevalence varied from 36% among Chinese to 62% among Japanese (Table 1). In a regression model, women were less likely than men to report ever having consumed alcohol (OR=0.4 [95% CI=0.3, 0.6]), and Asians who were never married were more likely than those who were ever married to report ever having consumed alcohol (OR=5.1 [95% CI=2.0, 12.8]). Other characteristics associated with a lower odds of drinking among Asians were older than 70 years (OR=0.5 [95% CI=0.3, 0.9], compared with Asians 60 years or younger) and preferring a foreign language in all contexts (OR=0.3 [95% CI=0.2, 0.6], compared with preferring English in all contexts). Having a college education was associated with a higher odds of drinking (OR=1.3 [95% CI=

TABLE 1—Continued

Arthritis	38.3	31.2	32.2	31.1	31.7	20.7	33.1
Depression	17.6	6.1	5.5	4.5	6.6	5.8	8.0
Cancer	16.1	8.3	7.7	10.7	5.1	4.3	10.8
Breast cancer	4.8	3.6	3.6	3.5	2.7	1.3	6.2
Underactive thyroid	12.4	5.8	7.2	3.6	4.1	6.5	3.7
Overactive thyroid	2.7	3.2	2.1	5.3	2.7	6.2	2.6
2 or more of the above conditions	34.5	27.3	26.7	25.9	24.0	18.6	36.4

^aRelative distributions were adjusted to the gender and 10-year age distributions of Whites.

^bOther Asians consisted of 24 Indians/South Asians, 20 Pacific Islanders, 17 Koreans, 3 Thai, 19 Other Southeast Asians, and 9 others.

^cExcluded 1 White woman and 1 Chinese woman whose values for weight were determined to be outliers (269 and 26 kg, respectively).

^dIncludes beer, wine, and mixed drinks.

^eIncludes gardening or yard work, and heavy housework.

^fIncludes stretching exercises or yoga, tai chi, and calisthenics or conditioning exercises.

^gIncludes brisk walking or hiking, bicycling, taking an exercise class, swimming or water exercises, playing tennis, social dancing, running or jogging, golf, and bowling.

^hIncludes walking to bus, school, or errands.

ⁱIncludes working on a farm, and heavy housework.

^jIncludes calisthenics or general exercise, swimming, playing team or racquet sports, social dancing, ice or roller skating, and gym class.

0.9, 1.9], compared with having less than a college education).

Smoking

Overall, proportionally fewer Asians than Whites had ever smoked or were current smokers (Table 1). Japanese and multiple-race Asians showed the highest proportion of ever smokers (36% and 38%, respectively), and Chinese the lowest proportion (15%). Filipinos and multiple-race Asians showed the highest proportion of current smokers and also were more likely than those in the other Asian subgroups to have started smoking at 18 years or younger.

Table 4 shows that, with the exception of multiple-race Asians, women were considerably less likely than men to have ever smoked. Older age was associated with smoking among Chinese. Foreign-born Asians were less likely than their US-born counterparts to smoke, although among Japanese, the opposite trend was seen. Japanese, Filipinos, and multiple-race Asians who preferred a foreign language were less likely than their English-preferring counterparts to smoke, although the confidence intervals for these odds ratios included 1.

Physical Activity

For adulthood physical activity, Asians (combined group) had a slightly lower prevalence of

engaging in household and low-impact and stretching physical activities than did Whites, although there were slight variations across subgroups (Table 1). The percentage who engaged in low-impact and stretching exercises ranged from 28% among Filipinos to 36% among multiple-race Asians. For retrospective reports of physical activity at 16 years of age, proportionally fewer multiple-race Asians compared with other subgroups engaged in daily living activities (e.g., walking to bus, school, or errands), and more Filipinos reported participating in household physical activities.

In regression models with recreational physical activities as the outcome, Japanese women were less likely than Japanese men to report participating in recreational physical activity (OR=0.2 [95% CI=0.0, 0.8]), whereas among multiple-race Asians, women were 4 times more likely than men to participate in physical activity (OR=3.9 [95% CI=1.2, 13.0]). Among Japanese, Filipinos, and other Asians, having more than a high school education was associated with more physical activity (OR=2.5 [95% CI=0.9, 7.0], OR=2.4 [95% CI=1.4, 4.2], and OR=2.8 [95% CI=1.0, 8.4], respectively). Living with someone was associated with less physical activity among Japanese and Filipinos (OR=0.2 [95% CI=0.1, 0.7] and OR=0.3 [95% CI=0.1, 1.2], respectively).

General Self-Reported Health and Selected Diseases and Health Conditions

A slightly higher percentage of Asians (combined group) than of Whites reported being in fair or poor health, from 13% among Chinese and other Asians to 20% among multiple-race Asians (Table 1). A higher percentage of Filipinos and multiple-race Asians than of Whites or of any other Asian subgroups reported having diabetes. Other notable findings regarding disease frequency were the higher prevalences of angina, heart attacks, and heart failure among multiple-race Asians and the higher prevalence of stroke or blood clots and the lower percentage of arthritis among other Asians. All of the subgroups reported lower prevalences of epilepsy, seizures, convulsions or fits, depression, cancer, and underactive thyroid compared with Whites. Among Filipinos, only older age was associated with having diabetes (data not shown).

DISCUSSION

Because previous health research has typically considered US Asians as a single group, little is known about how health and health-related risk factors vary among specific Asian subgroups.³⁶ Our data show substantial variation across subgroups in constitutional and lifestyle characteristics that were not detectable in the combined-group data. For example, we found that Japanese and multiple-race Asians were more likely than other subgroups to have ever smoked and that Filipinos were more likely to have started smoking at an early age. Chinese and Japanese consumed soy products more frequently than did other Asians, a finding consistent with results from a case-control study of breast cancer.³⁰ We also found variations in the prevalence of certain health conditions—most notably a high prevalence of diabetes among Filipinos, which, to our knowledge, has not been previously reported.

The fact that the comparability of our results with those reported in the sparse published literature on health characteristics among Asians mostly depends on where and when studies were conducted indicates that geographical and temporal heterogeneity in health may exist among Asians. For example, we found that Chinese and Japanese had lower BMIs com-

TABLE 2—Percentage Distributions of Demographic, Immigration, and Language Characteristics, by Race/Ethnicity

Characteristic	White (n = 3164)	All Asians combined (n = 801)	Chinese (n = 263)	Japanese (n = 99)	Filipino (n = 268)	Other Asians ^a (n = 92)	Multiple-race Asians (n = 79)
Gender							
Male	24.3	23.3	28.5	16.2	17.5	33.7	22.8
Female	75.7	76.7	71.5	83.8	82.5	66.3	77.2
Age, y							
45–50	14.3	18.5	15.6	7.1	17.9	31.5	29.1
51–60	25.8	31.0	29.3	15.2	33.6	38.0	39.2
61–70	22.5	29.5	29.3	30.3	32.5	23.9	25.3
> 70	37.4	21.1	25.9	47.5	16.0	6.5	6.3
Education completed (mutually exclusive categories)^b							
High school or less	33.2	36.5	39.3	20.8	40.9	40.8	43.1
College or less	42.7	47.7	44.0	52.2	50.5	39.1	37.6
Some graduate	24.1	15.8	16.7	27.0	8.6	20.1	19.4
Marital status^b							
Married	53.5	69.1	76.2	63.3	65.2	78.1	47.7
Widowed/divorced/separated	38.2	26.7	18.9	27.6	31.8	20.5	50.6
Never married	8.4	4.2	4.9	9.1	3.0	1.4	1.9
Living arrangement^b							
Alone	32.1	15.3	15.5	29.2	7.2	9.8	38.6
Not alone	67.9	84.7	84.5	70.8	92.8	90.2	61.4
Immigrant status^b							
US-born							
> First generation	75.9	11.8	13.2	33.8	2.4	4.7	42.2
First generation ^c	11.5	14.9	13.4	37.6	3.9	8.4	7.2
Foreign-born, % of life lived in US							
> 75	3.3	4.6	7.4	6.1	2.5	2.6	2.8
50–75	6.7	25.3	30.0	11.1	25.6	29.6	23.8
< 50	2.6	43.4	36.1	11.3	65.6	54.7	24.0
Language,^b no. of non-English contexts endorsed^d							
0	96.3	45.9	39.5	81.2	32.6	47.3	72.9
1	1.4	11.8	9.1	4.4	19.3	8.3	10.0
2	1.1	9.1	4.3	2.8	12.5	14.4	5.7
3	0.8	15.0	9.2	9.3	25.7	14.2	10.9
4	0.4	18.3	38.0	2.4	10.0	15.8	0.5

^aOther Asians consisted of 24 Asian Indians/South Asians, 20 Pacific Islanders, 17 Koreans, 3 Thai, 19 other Southeast Asians, and 9 others.

^bRelative distributions were adjusted to the gender and 10-year age distributions of Whites.

^cBoth parents are foreign born.

^dBased on the following questions: “In general, in what language do you read and speak?”, “In what language do you usually think?”, “In what language do you usually speak with your friends?”, and “What are the languages of the radio and TV programs you prefer?”

Filipinos.⁹ In the Klatsky study, the odds of having a BMI equal to or greater than 24.4 kg/m² were 1.6 to 3.0 times higher for Asian men born in the United States than for those born in Asia, although this association was not seen for women.⁹ We found higher BMIs among US-born compared with foreign-born residents within all subgroups, but we did not detect effect modification by gender. The discrepancies in the BMI results among studies may reflect temporal differences in these populations, particularly given the rapidly changing immigration patterns.

Our results also showed associations of selected health characteristics with immigrant status and, to some extent, acculturation. An analysis of NHIS data on self-reported health status and other indicators of health showed better health among recent immigrants compared with their US-born counterparts.⁷ The authors proposed 2 hypotheses for these observed patterns: (1) persons who immigrate tend to be healthier and more robust than those who do not (i.e., the “healthy migrant” effect⁴⁹), and (2) other cultures tend to subscribe to and practice healthier lifestyles than those of the mainstream American culture. Asian immigrants may also be less likely than US-born Asians to report poor health or to seek professional treatment because of other cultural, economic, or political reasons,⁵⁰ including lack of financial means to pay for medical care or fear of deportation (if they are undocumented aliens). We found that foreign-born Asians were generally healthier than US-born Asians in the characteristics we examined. However, this pattern was not seen in all subgroups; for example, foreign-born Japanese were twice as likely to smoke compared with their US-born counterparts.

In our study population, immigration status appeared to be more strongly associated with constitutional and lifestyle characteristics than did language. English proficiency is often used as a marker of acculturation in studies of Hispanics/Latinos and some Asian racial/ethnic groups.^{21,22,26,39–42,51} In our population, however, either acculturation was not strongly associated with the characteristics we examined or else language may not have been a sensitive measure of acculturation. In the San Francisco Bay area, Asian languages have become increasingly prevalent in the media and in stores

pared with other Asians, a result consistent with national data from the 1992–1994 National Health Interview Survey (NHIS)³ and the 1995–1997 Study of Women’s Health Across

the Nation.¹⁵ However, our data differ slightly from the findings of Klatsky and Armstrong⁹, which showed that among Kaiser enrollees, Chinese had lower BMIs than did Japanese and

TABLE 3—Associations Between Sociodemographic, Immigration, and Acculturation Characteristics and Having a BMI Greater Than 25 kg/m², by Asian Subgroup

Characteristic	Odds Ratio (95% Confidence Interval) ^a				
	Chinese (n = 260)	Japanese (n = 99)	Filipino (n = 265)	Other Asians (n = 91)	Multiple-race Asians (n = 77)
Gender (reference: male)					
Female	0.8 (0.4, 1.4)	2.6 (0.5, 12.4)	0.3 (0.2, 0.6)	0.8 (0.3, 1.8)	1.7 (0.5, 5.7)
Age, y (reference: ≤60)					
61–70	1.2 (0.6, 2.2)	0.3 (0.1, 1.1)	0.7 (0.4, 1.3)	0.6 (0.2, 1.7)	1.2 (0.4, 3.7)
> 70	0.5 (0.2, 1.1)	0.6 (0.2, 1.8)	0.6 (0.3, 1.3)	0.4 (0.1, 2.6)	0.8 (0.1, 5.2)
Education completed (reference: high school or less)					
College or less	0.7 (0.4, 1.3)	0.6 (0.2, 1.8)	0.8 (0.5, 1.5)	0.7 (0.3, 1.9)	0.3 (0.1, 0.9)
Marital status (reference: married)					
Widowed/divorced/separated	2.4 (1.1, 5.2)	1.2 (0.4, 3.2)	0.8 (0.4, 1.5)	1.0 (0.3, 3.2)	2.3 (0.8, 6.3)
Never married	1.1 (0.3, 4.5)	0.4 (0.0, 4.0)	1.2 (0.3, 4.8)	1.8 (0.2, 21.7)	0.6 (0.0, 8.0)
Living arrangement (reference: live alone)					
Live with someone	0.5 (0.2, 1.1)	2.3 (0.7, 7.1)	2.7 (0.8, 9.1)	0.2 (0.0, 1.6)	0.5 (0.1, 1.6)
Birthplace (reference: US-born)					
Foreign-born	0.3 (0.2, 0.6)	0.4 (0.1, 1.4)	0.5 (0.2, 1.3)	0.3 (0.1, 1.1)	0.2 (0.1, 0.5)
Language preference (reference: mostly English ^b)					
Mostly foreign language	0.8 (0.5, 1.5)	1.1 (0.2, 5.3)	1.0 (0.6, 1.8)	0.5 (0.2, 1.2)	0.7 (0.2, 2.7)

^aAdjusted for race/ethnicity recorded in the Kaiser admissions database, mode of interview (in-person vs phone), gender, and age, except for the characteristics gender and age, which were adjusted only for Kaiser race/ethnicity and mode of interview.

^bLanguage index = 0, 1, 2.

TABLE 4—Associations Between Sociodemographic, Immigration, and Acculturation Characteristics and Ever Having Smoked, by Asian Subgroup

Characteristic	Odds Ratios (95% Confidence Intervals) ^a				
	Chinese (n = 222)	Japanese (n = 94)	Filipino (n = 238)	Other Asians (n = 76)	Multiple-race Asians (n = 69)
Gender (reference: male)					
Female	0.2 (0.1, 0.4)	0.3 (0.1, 0.9)	0.1 (0.0, 0.1)	0.1 (0.0, 0.3)	0.5 (0.2, 1.8)
Age, y (reference: ≤60)					
61–70	1.2 (0.5, 3.1)	0.6 (0.2, 1.9)	0.6 (0.3, 1.3)	1.0 (0.3, 3.7)	4.0 (1.2, 13.6)
> 70	2.5 (1.1, 5.7)	0.5 (0.2, 1.6)	0.6 (0.2, 1.5)	3.9 (0.5, 30.9)	0.8 (0.1, 8.7)
Education completed (reference: high school or less)					
College or less	0.9 (0.4, 2.1)	0.9 (0.3, 2.7)	0.7 (0.3, 1.5)	1.0 (0.2, 4.5)	0.5 (0.2, 1.7)
Marital status (reference: married)					
Widowed/divorced/separated	1.0 (0.4, 2.4)	2.0 (0.7, 5.3)	3.0 (1.2, 7.3)	5.7 (0.9, 35.0)	3.0 (0.9, 10.2)
Never married	1.3 (0.2, 6.9)	1.9 (0.4, 10.0)	3.9 (0.7, 22.7)	3.1 (0.1, 79.8)	10.8 (0.7, 156.4)
Living arrangement (reference: live alone)					
Live with someone	2.6 (0.7, 9.6)	0.4 (0.1, 1.0)	0.6 (0.1, 2.6)	0.5 (0.1, 4.6)	0.4 (0.1, 1.6)
Birthplace (reference: US-born)					
Foreign-born	0.5 (0.2, 1.1)	2.8 (0.9, 8.3)	0.1 (0.0, 0.2)	0.1 (0.0, 1.0)	0.2 (0.1, 0.7)
Language preference (reference: mostly English ^b)					
Mostly foreign language	0.9 (0.4, 2.0)	0.1 (0.0, 1.4)	0.5 (0.2, 1.2)	1.0 (0.2, 4.2)	0.4 (0.0, 3.8)

^aAdjusted for race/ethnicity recorded in the Kaiser admissions database, mode of interview (in-person vs phone), gender, and age, except for the characteristics gender and age, which were adjusted only for Kaiser race/ethnicity and mode of interview.

^bLanguage index = 0, 1, 2.

catering specifically to Asians. Also, limited English proficiency may not be as much of a barrier to immigrants navigating daily life in the United States as it may be in other parts of the country or may have been in the past; thus, English proficiency may not be reflective of the degree of acculturation among Asians in this area. English is used throughout Asia, and as a result, recent immigrants may already have some degree of English knowledge. Additional research is needed to validate appropriate measures of acculturation for specific Asian subgroups, as has been done for Hispanics.^{39,40}

Although the proportion of persons of multiple race is currently small (4% in California overall), the proportion among those younger than 18 years is as high as 10% in some regions of California, such as the San Francisco Bay area.⁵² For most of the characteristics we examined, the prevalence among multiple-race Asians fell between those among Whites and among all Asian groups combined. Unfortunately, small numbers of participants limited our ability to examine patterns for more specific multiple-race groups. The assessment of multiple race/ethnicity in studies presents analytic challenges such as small numbers and colapsibility of groups.⁵³ However, the increasing numbers of people who identify with multiple races and the potential utility of research of these populations in understanding disease etiology warrant the continued collection of multiple race/ethnicity information.^{53,54}

Risk factor prevalence estimates reported in this study are not representative of those in the general population, because they are based on fracture patients and persons without previous history of fracture from an HMO. The generalizability of our results is further limited by the underrepresentation among the Kaiser membership of the very lowest and highest socioeconomic strata of the general population.^{55,56} Our intent was to compare health and related risk factors across the Asian subgroups within the study sample; thus, our reported prevalences should not be compared with other reports of prevalence. Because the participant interviews were conducted primarily in English, our sample may underrepresent non-English speakers. However, our data show heterogeneity in language preference: 18% of Asians preferred a foreign (non-English) language in all contexts.

All of our data are based on self-report and thus may be subject to misclassification. For example, previous studies have shown that the validity of self-reported anthropometric measures varies according to demographic factors such as age, gender, race/ethnicity, income, and education and on behavioral characteristics such as smoking and physical activity, as well as on BMI itself.^{57,58} Despite the large overall number of Asians in this study, another limitation is the small numbers of participants from certain Asian subgroups, so that analyses beyond Chinese, Japanese, and Filipino were not possible. Similar analyses in larger, more representative databases—including the NHIS,⁵⁹ the National Health and Nutrition Examination Survey,⁶⁰ and the California Health Interview Study⁶¹—not only would provide a better understanding of health patterns in these 3 large Asian subgroups but also would yield needed information for the smaller Asian subgroups. These large databases would also allow an examination of the independent and joint effects of sociodemographic, economic, and immigration factors on health behaviors and outcomes. Our study, based on a secondary analysis of data from a case-control study of fractures, lacked potentially important information regarding sociocultural factors that may be relevant to influencing health behaviors among Asians. Despite the limitations of this study, there were several noteworthy strengths, including relatively large numbers of Chinese, Japanese, and Filipino participants; identification and inclusion of multiple-race Asians; and a detailed analysis of characteristics that have seldom been examined for specific Asian subgroups.

The heterogeneity in health and in sociodemographic, immigration, and acculturation factors among Asian subgroups reinforces the notion that epidemiological studies should, to the extent possible, collect detailed information on specific race/ethnicity and should conduct analyses to examine variations in risk factors and disease without relying on broad racial/ethnic labels. Such research would provide a basis for the development of effective public health interventions by identifying specific subpopulations that experience health disparities compared with the general population or that are at high risk of disease. ■

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S.L. Gomez conceptualized the hypothesis, conducted the data analysis, and wrote the article. J.L. Kelsey contributed to the design of the study and the collection of the data and provided overall advice on the article. S.L. Glaser and M.M. Lee contributed to the writing of the article. S. Sidney contributed to the design of the study, the collection of the data, and the writing of the article.

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Human Participant Protection

Informed consent procedures were approved by the Kaiser Permanente and Stanford University institutional review boards.

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High-Risk Alcohol Consumption and Late-Life Alcohol Use Problems

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Excessive alcohol consumption is a significant public health problem and contributes to elevated mortality, morbidity, and related health care costs.^{1,2} Accordingly, there have been increasing efforts to identify patterns of high-risk alcohol consumption and examine the associations between these patterns and alcohol use–related symptoms and problems.^{3–10} Most of the studies have focused on mixed-age samples of individuals, have used cross-sectional designs, and have not considered older women and men separately. Thus, we know relatively little about patterns of high-risk alcohol consumption among older individuals, changes in these patterns with age, the association between these patterns and late-life alcohol use problems, or variations in these associations by gender.

To examine these issues, we focus on a community sample of older women and men and address 2 questions: (1) What proportion of older adults who consume alcohol engage in high-risk patterns of consumption, as defined by current standards? Are there gender differences in patterns of high-risk alcohol consumption and in changes in these patterns over time? (2) How well do alternative definitions of high-risk patterns of alcohol consumption predict late-life alcohol use problems, and do these predictions vary by gender or by age?

LATE-LIFE ALCOHOL CONSUMPTION

Several guidelines have been proposed to identify high-risk alcohol use patterns in mixed-age populations.¹¹ In general nutritional guidelines, the Department of Agriculture recommended limits of no more than 2 drinks per day for men and 1 drink per day for women.¹² The National Institute on Alcohol Abuse and Alcoholism advised weekly limits of no more than 14 drinks per week for men and no more than 7 drinks per week for women.¹³ Among adults aged 65 years or

Objectives. We used several different guidelines for appropriate alcohol use to identify patterns of high-risk alcohol consumption among older women and men and examined associations between these patterns and late-life alcohol use problems.

Methods. A sample of 1291 older adults participated in a survey of alcohol consumption and alcohol use problems and was studied again 10 years later.

Results. Depending on the guideline, 23% to 50% of women and 29% to 45% of men engaged in potentially unsafe alcohol use patterns. The likelihood of risky alcohol use declined over the 10 years; however, the numbers of drinks consumed per week and per day were associated with alcohol use problems at both assessment intervals.

Conclusion. Our findings imply that guidelines for alcohol consumption should be no more liberal for older men than for older women. (*Am J Public Health.* 2004;94:1985–1991)

older, at-risk alcohol use has been defined as, on average, more than 1 drink per day, more than 7 drinks per week, or more than 3 drinks on heavier alcohol use occasions.¹⁴

Although these and other comparable guidelines have been examined in mixed-age populations, only a few studies have focused on older adults. In a study of primary care patients aged 60 years or older, 15% of men regularly had more than 14 drinks per week and 12% of women regularly had more than 7 drinks per week.¹⁵ With respect to daily limits, among current drinkers, up to 27% of men and 12% of women aged 60 years or older sometimes consume 3 or more drinks on 1 occasion.^{16–19} Graham et al.²⁰ surveyed adults aged 65 years or older and found that among current drinkers, 29% of men and 6% of women had consumed 5 or more drinks on 1 occasion in the past 12 months.

These studies indicate that among nonabstinent adults aged 60 years or older, between 15% and 30% of men and between 5% and 15% of women consume alcohol in excess of current weekly/daily guidelines.²¹ We estimated the proportion of older women and men who drink in excess of specific weekly and daily guidelines and, by following individuals over 10 years, investigated how high-risk alcohol use patterns change with age.

ALCOHOL CONSUMPTION AND ALCOHOL USE PROBLEMS

We identified 3 studies that examined the connections between patterns of alcohol consumption and alcohol-related symptoms or problems among older adults. In a study of adults older than 55 years, Chermack et al.²² noted that individuals who consumed an average of more than 1 drink per day, and those who consumed 5 or more drinks on any 1 day, were more likely to experience alcohol-related symptoms than were individuals who consumed less alcohol.

Hilton²³ found that among individuals who consumed 5 or more drinks on 1 occasion as often as once a week, 13% to 18% of those aged 50 to 59 years and 19% to 24% of those aged 60 years or older had alcohol use–related problems. Frequent heavy drinkers were much more likely to report alcohol use–related symptoms and consequences.²⁴ Finally, in their study of older problem drinkers, Walton et al.²⁵ found that both average and maximal consumption levels at baseline were associated with subsequent alcohol-related problems. We focus here on a community sample of older adults and identify relations between different levels of alcohol consumption and the presence

of alcohol use problems among women and men.

One issue that arises with respect to current guidelines is whether they should be different for women and for men.²⁶ As far as we know, no existing studies have compared the prevalence of alcohol use problems among older women and men who consume comparable numbers of drinks per week or day; we address that issue here.

METHODS

Participants

A sample of 1884 late-middle-aged community residents (aged 55 to 65 years at baseline) was recruited between 1986 and 1988 in northern California to participate in a study of late-life alcohol consumption and alcohol use problems. A screening procedure excluded individuals who had never consumed alcohol. The sample was composed of individuals who had had outpatient contact with a health care facility within the last 3 years and was comparable to similarly aged community samples with regard to such health characteristics as prevalence of chronic illness and hospitalization.²⁷ Informed consent was obtained from all participants; additional details about recruitment are available elsewhere.^{28,29}

We contacted these individuals again 1 and 4 years later and obtained 95% response rates at both follow-up points.^{29,30} By the 10-year follow-up, 489 individuals had died; of the 1395 participants who were still living, 1291 (93%) completed the follow-up surveys. We focus here on the baseline and 10-year follow-up data, which were collected by a combination of mail and telephone surveys.

The follow-up sample was composed of 529 women and 761 men. On average, at baseline, these women and men were slightly older than 61 years; about three quarters had completed high school. The men were less likely than the women to be White (90% of men vs 94% of women), were more likely to be married (78% of men vs 62% of women), were more likely to be employed (54% of men vs 47% of women), and had more personal annual income (\$32 200 for men vs \$22 200 for women). Overall, 92% of the participants had consumed alcohol in the 2

years before baseline; the other 8% had consumed alcohol earlier in their lives.

Measures

Alcohol consumption was assessed with items adapted from the Health and Daily Living Form.³¹ The frequency of alcohol consumption was assessed by responses to 3 questions asking how often per week (never, less than once, once or twice, 3 to 4 times, or nearly every day) participants consumed typical amounts of wine, beer, and hard liquor in the last month. When a respondent reported consuming 2 or 3 beverages, we could not ascertain whether these beverages were consumed on the same day or on different days. Thus, we estimated the frequency of alcohol consumption based on each of these 2 possibilities and averaged them.

The usual number of drinks consumed per week and per day was assessed by the frequency of consumption of each beverage and additional items that tapped the usual number of drinks of wine (in glasses), beer (in glasses or cans), and hard liquor (in shots) consumed on days in the last month when the individual drank that beverage.

We also estimated the largest amount of alcohol consumption, as assessed by questions that asked about the largest amount of wine, beer, and hard liquor participants consumed on any 1 day in the last month. We converted the responses to reflect the ethanol content of these beverages and then summed them.³² Evidence supporting the validity of these types of self-report measures of alcohol consumption has been reported for mixed-age and older adults.^{33–36}

An index of alcohol use problems in the last 12 months was composed of 12 items drawn from the Drinking Problems Index.³⁷ The items were dichotomized (yes/no) and assessed interpersonal problems, such as whether family members or friends had expressed worries about the participant's alcohol use or a friendship had ended because of the participant's alcohol use, and functioning problems, such as whether alcohol use had caused the respondent to have a fall or accident, skip meals, or neglect daily activities. Individuals who gave positive responses to 2 or more of these items were considered to have an alcohol use problem.

Analytic Plan

We conducted repeated measures analyses of variance to examine the change from baseline to the 10-year follow-up, gender differences, and gender by time interactions on alternative indexes of high-risk levels of alcohol consumption. Then, for each of the alternative indexes, we conducted 2-way analyses of variance, separately at baseline and at the 10-year follow-up, to examine whether the number of individuals with alcohol use problems varied by guideline adherence and gender.

We also estimated the sensitivity, specificity, and overall accuracy of the alternative guidelines. Sensitivity was defined as the percentage of individuals who had an alcohol use problem whose alcohol consumption exceeded the guideline; that is, the percentage of correctly identified positive cases. Specificity was defined as the percentage of individuals who did not have an alcohol use problem whose alcohol consumption was within the guideline; that is, the percentage of correctly identified negative cases. Accuracy was defined as the percentage of individuals who either had an alcohol use problem and exceeded the guidelines or did not have a problem and drank within guideline limits.

RESULTS

Alcohol Consumption

At baseline, more than 70% of women and men consumed alcohol on 1 or more days per week in the last month, about 50% consumed alcohol on 3 or more days, and about 35% consumed alcohol on 5 or more days (Table 1). A significant time \times gender interaction indicated a steeper decline among women than among men in the frequency of alcohol use 1 or more days per week.

With respect to weekly consumption, at baseline, 38% of women and 48% of men had more than 7 drinks per week; 16% of women and 29% of men had more than 14 drinks per week. With regard to daily consumption, at baseline, 51% of women and 62% of men had more than 1 drink on the days they drank; 8% of women and 19% of men had more than 3 drinks on 1 occasion. Almost 39% of women and 52% of men consumed more than 7 drinks per week or more than 3 drinks per day; 17% of women

TABLE 1—Alcohol Consumption by Women (n = 529) and Men (n = 761), at Baseline and Follow-up: California, 1986–1998

Index of consumption	Baseline, %	Follow-Up, %	F _{time}	F _{gender}	F _{time × gender}
Frequency of consumption					
Drank alcohol ≥ 1 d/wk					
Women	73.2	59.2			
Men	73.5	66.6	69.13**	2.85	8.16**
Drank alcohol ≥ 3 d/wk					
Women	50.1	41.8			
Men	52.2	47.4	24.04**	2.41	1.82
Drank alcohol ≥ 5 d/wk					
Women	35.3	30.8			
Men	38.0	38.1	2.98	4.29*	3.34
Quantity of weekly consumption					
> 7 drinks/wk					
Women	38.4	28.9			
Men	48.4	42.1	33.92**	23.45**	1.34
> 14 drinks/wk					
Women	16.4	11.3			
Men	29.3	26.3	12.76**	47.69**	< 1
Quantity of daily consumption					
> 1 drink/d					
Women	51.4	39.3			
Men	62.2	54.5	51.11**	28.61**	2.63
> 2 drinks/d					
Women	23.3	15.7			
Men	44.8	38.2	24.80**	105.54**	< 1
> 3 drinks/d					
Women	8.3	4.2			
Men	19.1	15.2	16.06**	48.42	< 1
Quantity of weekly/daily consumption					
> 7 drinks/wk or > 3 drinks/d					
Women	38.8	29.3			
Men	51.6	43.7	40.46**	32.12**	< 1
> 14 drinks/wk or > 4 drinks/d					
Women	16.8	11.9			
Men	31.1	27.2	13.74**	52.88**	< 1

Note. F=F statistic.
*P<.05; **P<.01>

and 31% of men drank more than 14 drinks per week or more than 4 drinks per day. There was a significant decline on all the quantity indexes over the 10-year interval; there were no significant interactions reflecting differential declines by gender.

Correspondence Between Alcohol Consumption and Alcohol Use Problems

At baseline, for each of the guidelines, individuals who exceeded the recommended

amounts of alcohol consumption were more likely to have alcohol use problems (Table 2). On all guidelines, men were more likely to have alcohol use problems. There were significant interactions between adherence to the guidelines (1=yes; 0=no) and gender (1=female; 0=male) such that men who exceeded guidelines were more likely to have alcohol use problems than women who exceeded guidelines. Individuals who exceeded higher weekly and daily alcohol use

guideline levels were more likely to have alcohol use problems.

Comparable results were obtained when the same analyses were conducted on the 10-year data (Table 3). In all alcohol use guideline groups, the proportion of individuals who reported alcohol use problems declined in comparison with baseline levels. As at baseline, individuals who exceeded recommended amounts were more likely to have alcohol use problems than were individuals whose alcohol consumption was within limits.

We used baseline data to estimate the sensitivity, specificity, and overall accuracy of the alternative guidelines. The guideline of no more than 1 drink per day had the highest sensitivity but also the lowest specificity and accuracy (Table 4). The guideline of no more than 14 drinks per week (with or without a limit of no more than 4 drinks per day) had high specificity and overall accuracy, but low sensitivity. The guideline of no more than 7 drinks per week (with or without a limit of 3 drinks per day) had moderate to high sensitivity, specificity, and accuracy.

Subsidiary Analyses

We first considered why men who used alcohol in excess of suggested guidelines were more likely to have alcohol use problems than were women at comparable numbers of drinks per week and per day. We thought that the most likely explanation was that men consumed a larger maximal volume of alcohol. To examine this idea, we selected individuals who at baseline exceeded the combined guidelines of 7 drinks per week/3 drinks per day. Using this sample, we conducted logistic regression analyses in which the step 1 predictors were gender, marital status, and the number of drinks per week and per day, the step 2 predictor was the largest amount of alcohol consumed per day, and the criterion was the presence of alcohol use problems.

After entering the number of drinks per week and per day, men were more likely to have alcohol use problems than were women ($\beta=-.52$; $P<.05$). However, after the largest amount of alcohol consumption was entered, the gender difference in alcohol use problems was no longer significant ($\beta=-.38$; $P>.05$). The findings were comparable when we re-

TABLE 2—Percentage of Women (n = 529) and Men (n = 761) With Alcohol Use Problems at Baseline, by Weekly and Daily Consumption

Index of Consumption	Women	Men	F _{drinks/wk}	F _{gender}	F _{drinks/wk × gender}
Quantity of weekly consumption					
0–7 drinks/wk	4.3	11.2			
> 7 drinks/wk	25.1	44.2	176.67**	31.85**	7.85**
0–14 drinks/wk	7.7	15.5			
> 14 drinks/wk	35.6	55.4	219.06**	23.17**	5.18*
Quantity of daily consumption					
0–1 drink/d	3.5	7.3			
> 1 drink/d	20.6	39.5	143.06**	31.97**	11.97**
0–2 drinks/d	6.9	11.0			
> 2 drinks/d	30.1	47.4	209.28**	14.03**	7.96**
Quantity of weekly/daily consumption					
≤ 7 drinks/wk and ≤ 3 drinks/d	4.0	9.0			
> 7 drinks/wk or > 3 drinks/d	25.4	44.3	201.56**	27.18**	10.62**
≤ 14 drinks/wk and ≤ 4 drinks/d	7.3	14.1			
> 14 drinks/wk or > 4 drinks/d	37.1	56.1	258.18**	20.23**	5.65*

Note. F = F statistic.
*P < .05; **P < .01.

TABLE 3—Percentage of Women (n = 529) and Men (n = 761) With Alcohol Use Problems at Follow-up, by Weekly and Daily Consumption

Index of Consumption	Women	Men	F _{drinks/wk}	F _{gender}	F _{drinks/wk × gender}
Quantity of weekly consumption					
0–7 drinks/wk	2.9	6.6			
> 7 drinks/wk	15.0	33.1	132.76**	22.36**	14.34**
0–14 drinks/wk	3.6	8.9			
> 14 drinks/wk	28.3	42.5	204.66**	13.93**	3.22
Quantity of daily consumption					
0–1 drink/d	0.9	5.2			
> 1 drink/d	14.9	28.2	116.55**	21.05**	6.07*
0–2 drinks/d	3.4	7.0			
> 2 drinks/d	22.9	35.1	167.54**	9.15**	3.71
Quantity of weekly/daily consumption					
≤ 7 drinks/wk and ≤ 3 drinks/d	2.4	5.4			
> 7 drinks/wk or > 3 drinks/d	16.1	33.7	160.04**	20.11**	15.17**
≤ 14 drinks/wk and ≤ 4 drinks/d	3.2	7.8			
> 14 drinks/wk or > 4 drinks/d	30.2	44.4	259.46**	12.18**	4.18*

Note. F = F statistic.
*P < .05; **P < .01.

hol consumption. To consider this issue, we conducted repeated measures analyses of variances on individuals who consumed more than 7 drinks per week or more than 2 drinks per day at both baseline and follow-up, and who had an alcohol use problem at baseline but not at follow-up. The findings showed that these individuals consumed fewer drinks per week and per day and consumed less alcohol on maximal alcohol use occasions at 10 years than at baseline.

At baseline, participants lost to mortality or attrition consumed alcohol somewhat less frequently than surviving participants but were somewhat more likely to have alcohol use problems. Therefore, we focused on whether the associations at baseline between alcohol consumption and alcohol use problems of these participants were comparable to those of the surviving participants. Analyses of variance like those in Table 2 showed similar associations between the number of drinks per week and per day and alcohol use problems at baseline among individuals who dropped out of the study or died as among surviving participants.

DISCUSSION

We have shown that a substantial proportion of older adults engage in patterns of alcohol consumption that exceed suggested guidelines, that the prevalence of excessive consumption declines with age, and that there is correspondence between the number of drinks consumed per week/per day and late-life alcohol use problems among both women and men. In addition, at comparable numbers of drinks, older men were more likely to have alcohol use problems than were older women.

Alcohol Use Guidelines and Patterns of Alcohol Consumption

Current guidelines for alcohol consumption recommend limits varying from 1 drink per day for women and 2 drinks per day for men to a weekly limit of 7 drinks for women and 14 drinks for men with no more than 3 drinks on heavier-use occasions.^{12–14} At baseline, 8% of women and 19% of men exceeded the limit of 3 drinks per day. These percentages are close to prior estimates of nonabst-

peated the analyses on participants who exceeded the guideline of 14 drinks per week/4 drinks per day. Men consumed higher absolute amounts of alcohol than women at each level of weekly and daily alcohol use.

The likelihood of alcohol use problems decreased over the 10-year interval, even among participants who exceeded alcohol use guidelines. Again, we suspected that this was because these drinkers decreased their alco-

TABLE 4—Sensitivity, Specificity, and Accuracy of Using the Alternative Alcohol Consumption Guidelines to Predict Alcohol Use Problems: Baseline Assessment

Index of Consumption	Sensitivity ^a	Specificity ^b	Accuracy ^c
Quantity of weekly consumption			
> 7 drinks/wk			
Women	78.5	67.2	68.6
Men	78.7	62.8	67.2
> 14 drinks/wk			
Women	47.7	87.9	83.0
Men	59.9	82.0	76.0
Quantity of daily consumption			
> 1 drink/d			
Women	86.2	53.5	57.5
Men	89.9	48.2	59.6
> 2 drinks/d			
Women	56.9	81.5	78.5
Men	77.9	67.5	70.3
Quantity of weekly/daily consumption			
> 7 drinks/wk or > 3 drinks/d			
Women	80.0	67.0	68.6
Men	84.1	60.5	66.9
> 14 drinks/wk or > 4 drinks/d			
Women	50.8	87.9	83.4
Men	64.3	81.2	76.6

^a Percentage who had alcohol use problems and exceed the guidelines.

^b Percentage who did not have alcohol use problems and who are within the guidelines.

^c Percentage who either had alcohol use problems and exceed the guidelines or do not have problems and are within the guidelines.

ment older women and men who consume 3 or more drinks per day.^{16–19}

Consistent with previous reports,^{15–17,19,20} older men were more likely than older women to drink in excess of current guidelines. Both women and men showed declines in alcohol consumption and in the percentage of individuals who exceeded 1 or more low-risk alcohol use guidelines. These longitudinal findings extend those of prior cross-sectional studies by confirming an age-related decline in alcohol consumption and by showing that this decline is comparable among women and men.^{15–17,20,23} However, part of the decline may owe to a period effect of lowered alcohol consumption.^{38,39}

Patterns of Alcohol Consumption and Alcohol Use Problems

Older adults whose alcohol consumption exceeded acceptable guidelines were more likely to have alcohol use problems.^{3–11} The

finding that alcohol consumption in excess of either weekly or daily guidelines was associated with an elevated risk of alcohol use problems suggests that consumption guidelines for older adults should include both limits. The combined limits provide a clearer idea about recommended alcohol consumption and apply to individuals who drink on most or all days and to those who drink more heavily only on weekends or special occasions.

At baseline, almost 40% of women and more than 50% of men exceeded the limits of 7 drinks per week/3 drinks per day. Moreover, 25% of women and 44% of men who exceeded these limits had 1 or more alcohol use problems. Thus, these guidelines apply to a substantial proportion of older adults and identify a large number who have alcohol use problems. Taken together with their relatively high sensitivity for both women and men, these considerations indicate that combined

limits of 7 drinks per week/3 drinks per day may be the preferred guideline for defining heavy/high-risk alcohol use for older adults. Nevertheless, low-risk levels for older adults may be as little as 1 drink per day and a maximum of 2 drinks per occasion, especially among individuals who have coexisting health problems, such as hypertension and diabetes, or who are using medications that interact with alcohol.^{13,40}

Among older adults who exceeded alcohol use guidelines, older men were more likely than older women to have alcohol use problems. This gender difference occurred in part because men who exceeded alcohol use guidelines consumed more alcohol than women did. In addition, compared with women, men may drink more rapidly, consume more of the drinks served to them, be less likely to drink with meals, and concentrate their alcohol use over a shorter interval.²⁶ Thus, even though they consume a comparable number of drinks, men may engage in alcohol use behaviors associated with higher levels of alcohol consumption, resulting in more harmful alcohol use consequences. These considerations support the idea that the recommended number of drinks suggested for older men should not necessarily exceed those recommended for older women.

Among older adults who exceeded alcohol consumption guidelines, those aged between 65 and 75 years (at the 10-year follow-up) were less likely to have alcohol use problems than were those between the ages of 55 and 65 years (at baseline). Reductions in the amount of alcohol consumed tended to explain this finding. As they grow older, many adults may make subtle shifts within relatively stable patterns of alcohol consumption that enable them to continue to drink in ways that reduce the likelihood of experiencing alcohol use problems. In addition, fewer problems may arise because there are relaxed norms and less “surveillance” of older adults, who may be more likely to drink alone and less likely to have family members or friends recognize their excessive alcohol use.

Between 5% and 10% of individuals whose alcohol consumption was below guidelines for at-risk alcohol use nevertheless had had alcohol use problems. These individuals

may have previously exceeded high-risk alcohol consumption guidelines and developed alcohol use problems that subsequently motivated them to cut down or stop their alcohol use. More information is needed about the time lag between the reduction of alcohol consumption and the decline of alcohol use problems and about factors, such as health-related stressors and friends' disapproval of alcohol use, associated with the decision to curtail or stop their alcohol use.⁴¹

Limitations and Conclusions

We recruited a community sample of non-abstinent individuals who may have consumed more alcohol than individuals in a representative population sample. Thus, the proportions of older women and men who exceeded low-risk alcohol consumption thresholds may be somewhat high and cannot be taken as population estimates. Nevertheless, the findings show that many older adults drink in excess of low-risk guideline limits and continue to do so well into their late 60s and early 70s.

On a related point, we assessed alcohol use problems specifically relevant to older adults; some of the problems might be considered to be relatively minor, such as neglecting one's appearance because of alcohol use. To the extent that this is the case, our findings may overestimate the extent to which low levels of alcohol consumption are associated with alcohol use problems that are of more serious concern, such as drunk driving.

In conclusion, our findings support the idea that appropriate alcohol consumption guidelines for older adults are no more than 7 drinks per week/3 drinks per heavy-use occasion and that these guidelines should be no more liberal for older men than for older women. Future research should focus on the type and severity of specific problems associated with high-risk patterns of late-life alcohol consumption and whether these vary for women and men, the social contexts that influence late-life alcohol use, and identification of health status indexes that may influence changes in late-life alcohol use patterns and problems. Most important, to provide more detailed and useful consumption guidelines for older adults, we need to specify how older individuals can maintain relatively stable pat-

terns of moderate alcohol consumption without incurring alcohol use problems. ■

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Note. The views expressed here are the authors' own and do not necessarily represent the views of the Department of Veterans Affairs.

Contributors

All authors have participated in this 10-year longitudinal study since its inception. R.H. Moos, P.L. Brennan, and K.K. Schutte conceptualized ideas, interpreted findings, and reviewed drafts of the article. B.S. Moos organized the data files and conducted the statistical analyses.

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Human Participant Protection

This study was approved by the Stanford University panel on medical human subjects.

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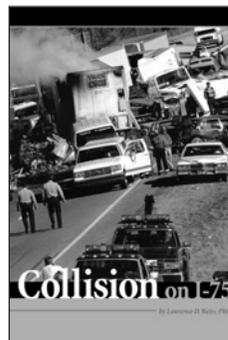
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State Trends in Uninsurance Among Individuals Aged 18 to 64 Years: United States, 1992–2001

David E. Nelson, MD, MPH, Julie Bolen, PhD, Henry E. Wells, MS, Suzanne M. Smith, MD, MPH, MPA, and Shayne Bland, MS

Lack of health insurance has been a long-standing concern in the United States,¹ especially because uninsurance has well-documented negative consequences for the public's health.²⁻⁴ Furthermore, uncompensated care provided to uninsured individuals strains a health care system that is struggling to meet the escalating costs of new technologies and treatments as well as the health care needs of an aging population.⁵

Historically, employment and health insurance status in the United States have been closely linked.⁶ Although percentages have generally declined over time,⁶ nearly 63% of people with insurance are covered through employment-based policies.⁷⁻¹⁰ The United States experienced its longest peacetime economic expansion during the 1990s, with the national unemployment rate declining substantially over this period. Despite this economic expansion, there was little change in national uninsurance estimates; uninsurance increased from 15.0% in 1992 to 16.3% in 1998 and then decreased to 14.6% in 2001.^{7,11,12} However, recent reports suggest that uninsurance is increasing among individuals at middle and high income levels and among those aged 50 to 64 years.^{7,13-15}

But national data can mask important variations in uninsurance across states. According to 3-year state averages calculated for the period 1999 through 2001, uninsurance rates ranged from 7.2% in Rhode Island to 23.2% in New Mexico.⁷ States have different demographics, economies, and policies for public funding of health insurance, all of which contribute to levels of uninsurance.⁶ For example, some states enacted measures to broaden health care access during the 1980s and 1990s.^{16,17}

To date, only a few state-level analyses of uninsurance trends during the 1990s have been conducted, primarily based on Current Population Survey (CPS) data.^{7,9,12,18,19} Unfortunately, CPS data must be pooled across years, because annual sample sizes are small

Objectives. We analyzed state-specific uninsurance trends among US adults aged 18 to 64 years.

Methods. We used logistic regression models to examine Behavioral Risk Factor Surveillance System data for uninsurance from 1992 to 2001 in 47 states.

Results. Overall, uninsurance rates increased in 35 states and remained unchanged in 12 states. Increases were observed among people aged 30 to 49 years (in 34 states) and 50 to 64 years (in 24 states), and increases were also observed among individuals at middle and low income levels (in 39 states and 19 states, respectively), individuals employed for wages (in 33 states), and the self-employed (in 18 states).

Conclusions. Among adults aged 18–64, rates of uninsurance increased in most states from 1992 through 2001. Decreased availability of employer-sponsored health insurance, rising health care costs, and state fiscal crises are likely to worsen the growing uninsurance problem. (*Am J Public Health*. 2004;94:1992–1997)

for many states⁸ and extensive changes in survey wording made in 1995 have raised concerns about the accuracy of trend analyses.^{8,20} Other ongoing federal and privately funded research data collection efforts have not been designed to track state-level trends in uninsurance,⁸ have included data from only a limited number of states,⁸ or have examined changes in health insurance during this time period on populations in only a few states or metropolitan areas.⁸

Little is known about broader, population-wide trends in uninsurance among adults at the state level, especially in the case of certain demographic subgroups (e.g., groups categorized according to age or employment status) among which uninsurance estimates are known to vary widely.^{21,22} With most states currently facing fiscal difficulties, rising unemployment, and increasing health care costs, and with the burden of paying for uninsured health care falling disproportionately on state and local governments, detailed state trend data are needed to describe the extent of the uninsurance problem among adults and help guide policymakers' efforts.

State-specific adult data on uninsurance are available from the Behavioral Risk Factor Surveillance System (BRFSS), which has used the same question over time to gather information on insurance status. We analyzed

BRFSS data from 1992 through 2001 to assess state uninsurance trends among adults aged 18 to 64 years. We limited our analyses to these ages because most adults aged 65 years or older are covered by Medicare.^{7,12} In addition to overall state uninsurance trends, we also examined state-specific trends according to age group, household income, and employment classification.

METHODS

Using the BRFSS, we obtained data from the period 1992 to 2001 for adults aged 18 to 64 years who resided in 47 states. The BRFSS is coordinated by the Centers for Disease Control and Prevention and all state health departments in the United States. Each month, state health departments conduct telephone surveys of randomly selected, noninstitutionalized adults 18 years and older to obtain information on personal behaviors associated with increased risks for chronic diseases and with other health-related factors. More details regarding the BRFSS, including its design, sampling frame, and analytical methods, are available elsewhere.^{23,24}

Arkansas, Wyoming, and the District of Columbia were excluded because of missing data on health insurance status during 1 or more years. Alaska was excluded because of

the substantial misclassification of respondents in this state who were covered by Alaska Native health and medical services. Median state samples ranged from 1494 in 1992 to 3218 in 2001, and state samples across the study period ranged from 948 to 7019. Median state response rates, based on percentages of eligible individuals reached by telephone, ranged from 70.6% in 1992 to 51.1% in 2001.

During all years covered in the study period, respondents' health insurance status was defined according to their responses to the question "Do you have any kind of health care coverage, including health insurance, pre-paid plans such as HMOs, or government plans such as Medicare?" Those who responded "no" were classified as uninsured. Respondents were excluded if they had missing or unknown responses or refused to answer this question. In the case of all of the study years, each state was missing less than 1% of relevant insurance status data.

Age, employment, and household (not individual) income levels were included in the analyses because of their known associations with health insurance status.^{1,15,21,22,25} Individuals were categorized into 3 age groups—18 through 29, 30 through 49, and 50 through 64 years—because, at the state level, numbers were insufficient to analyze data for smaller age groups. Employment status was categorized as follows: employed for wages, self-employed, unemployed, or other employment. Income level was categorized as less than \$25 000, \$25 000 through \$49 999, and \$50 000 or more per year. We also included gender and race/ethnicity in the models. Race/ethnicity was classified as White non-Hispanic, Black non-Hispanic, Hispanic, or other.

Because of the complex survey design, we used SUDAAN²⁶ to analyze these data. Data were weighted for each year through the use of intercensal estimates based on the age, gender, and race distribution of each state's population. Initially, we calculated descriptive statistics to characterize the samples of uninsured individuals during each year.

We tested for nonlinear time trends by fitting state-specific logit models that included uninsurance (outcome variable) and linear and quadratic terms for year (independent

variables). If the quadratic term was not significant ($P > .01$), we assumed that a linear model was appropriate for trend analyses. The logit models for 7 states (Arizona, California, Georgia, Mississippi, Nebraska, New York, Oregon) exhibited significant nonlinear trends, while the models for the other 40 states met the linearity assumption.

We then created state-specific logistic regression models to examine uninsurance trends. These models included uninsurance as the dependent variable and gender, race/ethnicity, survey year, age group, employment category, and income level as independent variables. We also created state-specific models stratified by each age, employment, and income level. In these stratified models, we controlled for other demographic variables. For example, each age-stratified model controlled for gender, race/ethnicity, employment category, and income level. We restricted our models to subgroups with at least 50 state respondents in each year. Data from several states included fewer than 50 respondents in certain race/ethnicity subgroups (e.g., Black non-Hispanic and Hispanic); for these states, we collapsed race categories as necessary.

Although each model contained the same dependent and independent variables, we used one of a pair of modeling strategies based on the results of the linear time trend analyses. For the 40 states with linear trends, the overall and stratified state-specific models contained a linear term for year, and we used odds ratios to estimate average annual changes in the odds of being uninsured during the study period. We used an alternate approach to analyze data for the 7 states with nonlinear time trends. Models for these states treated year as a 10-level categorical variable, and we compared the odds of being uninsured in 2001 with the odds of being uninsured in 1992 (the referent).

We used our models to determine the predicted overall prevalence rates of uninsurance in 1992 and 2001 in each state. Estimates were indirectly standardized to the age, gender, race, and educational level of an "average" person.^{27,28} Although model-based values are not actual prevalence estimates, they allow for appropriate comparisons across states over time and are similar to published state estimates.²⁴ Because of the number of

analyses, and to minimize the role of statistical chance, we considered odds ratios statistically significant only when P values were less than .01.

RESULTS

Table 1 presents median state uninsurance estimates and ranges for 1992, 1996, and 2001 according to demographic group. Uninsurance was more frequent among people aged 18 to 29 years, Black non-Hispanics, Hispanics, people with low incomes, and people who were self-employed or unemployed. Estimates of uninsurance by demographic subgroup varied widely within the states. The most striking increases in uninsurance occurred among the low- and middle-income groups (less than \$25 000 and \$25 000–\$49 999).

Table 2 presents model-based state estimates of uninsurance, along with odds ratios for the overall trend analyses, for 1992 and 2001. Uninsurance estimates varied considerably across states, but the median estimate was higher in 2001 than in 1992 (17.0% vs 13.3%). None of the states had uninsurance prevalence estimates above 20% in 1992, but 11 of the 47 states had estimates above 20% in 2001. State trend models that controlled for demographic variables revealed that, overall, uninsurance estimates increased in 35 states, remained unchanged in only 12 states, and declined in none of the states. The largest average annual increases in the case of states with linear trends occurred in Alabama, Idaho, and West Virginia; among states with nonlinear trends, the largest overall increases occurred in Mississippi, Nebraska, and New York.

Table 3 presents state trends according to age, income, and employment. Uninsurance increased in 1 state among persons aged 18 to 29 years and remained unchanged in the other states. Thirty-four states experienced increases among persons aged 30 to 49 years, and 25 exhibited increases among those aged 50 to 64 years. The only state that experienced a decline among a specific age group was Tennessee (among individuals aged 50 to 64 years). No particular geographic clustering of states that showed increases in different age groups was evident.

TABLE 1—Medians and Ranges of State Uninsurance Estimates Among Individuals Aged 18–64 Years, by Demographic Characteristics: 1992, 1996, and 2001

Characteristic	Median % (Range)		
	1992	1996	2001
Age, y			
18–29	25.4 (13.8–42.5)	22.7 (12.9–39.5)	23.4 (11.7–36.8)
30–49	12.9 (4.5–24.1)	12.6 (6.7–23.7)	13.4 (5.5–25.8)
50–64	9.9 (3.9–25.9)	10.0 (5.2–26.8)	9.7 (3.1–19.5)
Gender			
Female	15.2 (8.2–28.1)	13.9 (6.9–30.3)	12.6 (5.0–27.5)
Male	17.0 (6.7–31.5)	15.4 (9.2–26.5)	16.3 (8.0–28.3)
Race/ethnicity			
White, Non-Hispanic	14.2 (7.1–23.5)	13.2 (7.8–22.5)	12.8 (5.8–22.8)
Black, Non-Hispanic	23.0 (10.7–42.2)	18.9 (5.5–37.6)	18.8 (0.0–39.1)
Hispanic	27.3 (12.5–47.3)	24.4 (8.4–48.7)	26.2 (10.6–49.1)
Other	25.8 (6.6–49.7)	18.3 (5.3–36.7)	21.1 (7.0–40.0)
Employment status			
Employed for wages	12.4 (3.8–22.7)	11.6 (5.0–22.2)	11.5 (3.3–21.6)
Self-employed	23.0 (11.2–39.1)	24.7 (14.2–41.1)	24.6 (11.1–46.7)
Unemployed	44.4 (23.4–75.3)	43.1 (25.3–78.9)	42.3 (20.2–59.5)
Other	18.8 (7.5–35.9)	15.8 (7.5–31.8)	14.8 (4.9–31.4)
Income, \$			
<25 000	30.2 (12.6–44.8)	30.8 (14.9–49.0)	33.0 (17.2–50.7)
25 000–49 999	7.4 (2.7–14.7)	10.6 (4.9–24.5)	13.9 (5.9–22.6)
≥50 000	3.9 (0.8–37.7)	3.5 (1.3–9.3)	4.2 (1.2–9.6)

Many states experienced increases in uninsurance based on household income levels and employment classifications (Table 3). In particular, uninsurance increased in 39 states among people with middle incomes and in 19 states among those with low incomes; in contrast, only 3 states exhibited increases among those at the highest income levels. The only decline occurred among Missouri residents with high incomes. Among individuals with low incomes, increases were somewhat more common in the South and West, although some of the states in all regions experienced increases.

Uninsurance increased in 33 states among people employed for wages, in 18 states among self-employed people, and in none of the states among the unemployed; no declines by employment category occurred in any state. Again, there was no particular geographic clustering of states exhibiting increases in uninsurance.

There were marked differences in demographic-specific trends in uninsurance among states. Eleven states exhibited increases for 6 or more of the 9 subgroups

analyzed here: Colorado, Idaho, Indiana, Kentucky, Maine, Montana, North Carolina, Pennsylvania, South Carolina, South Dakota, and West Virginia. In contrast, no increases in uninsurance estimates were found for any of the demographic subgroups in California, Missouri, Oregon, and Tennessee.

DISCUSSION

Findings from this study of state uninsurance trends among adults younger than 65 years are troubling. Despite the economic expansion occurring during much of the study period, uninsurance increased in the vast majority of states. Particularly striking were the large number of states experiencing increases in uninsurance among persons aged 30 to 64 years, those with middle-level incomes, and those employed for wages. The best that can be said is that, in some states and for some demographic groups, the uninsurance situation among adults aged younger than 65 years did not worsen over this period. Only 4 states (California, Missouri, Oregon, and Tennessee) experienced no increase in uninsur-

ance estimates overall for any of the demographic subgroups analyzed, while 11 states experienced increases for 6 or more of 9 demographic subpopulations.

State trends in uninsurance observed among people aged 50 to 64 years confirm previous research indicating that uninsurance is a growing problem for this age group.^{14,15,25,29} Individuals in this group are typically dependent on private health care coverage, and they may lose insurance coverage because of early retirement, job transitions, higher cost sharing (e.g., increased deductibles), changes in marital status, or declining health.^{10,14,15,25} Even more evident from our study is the growing problem of uninsurance among individuals aged 30 to 49 years. Some of the same issues facing the 50- to 64-year age group may affect individuals aged 30 to 49 years; however, further research is warranted on reasons for the increases in uninsurance among the latter group. With the exception of one state (North Carolina), uninsurance among people aged 18 to 29 years did not change over the study period. Reasons for trends in this group are not clear, but it should be remembered that uninsurance estimates among young adults are higher than those of any other age group.^{30,31}

Income- and employment-specific state trends indicate that uninsurance is no longer a concern only in the case of economically disadvantaged groups.^{6,32} Although the largest increases were most evident for adults at middle and low income levels, some states also exhibited increases among those at the highest income levels. The trend of increasing uninsurance among those employed for wages provides more evidence that employment-based health care coverage is becoming less available to adults in many states.^{10,33,34} The increase in uninsurance among the self-employed may reflect the increased cost of health insurance for those who need to obtain coverage directly from private insurers.³⁵ An increasing proportion of adults are either not being offered insurance through their employers or cannot afford to pay for private insurance policies.^{1,34,36}

Although there were broad overall state uninsurance trends, there was also much state-to-state variability. Some states exhibited widespread increases in uninsurance across

TABLE 2—Overall Model-Based State Prevalence Estimates and Trends in Uninsurance, 1992 to 2001

State	1992 Estimate, %	2001 Estimate, %	Change Over Time, Odds Ratio (99% Confidence Interval) ^a
Alabama	12.5	18.9	1.07 (1.04, 1.09) ^b
Arizona ^c	16.9	20.2	1.31 (0.96, 1.80)
California ^c	17.3	15.1	0.82 (0.65, 1.05)
Colorado	13.8	19.5	1.06 (1.03, 1.09) ^b
Connecticut	12.5	14.8	1.03 (1.00, 1.06)
Delaware	13.9	14.3	1.00 (0.97, 1.04)
Florida	17.1	22.0	1.04 (1.02, 1.06) ^b
Georgia ^c	15.1	17.0	1.18 (0.88, 1.60)
Hawaii	6.7	9.5	1.05 (1.02, 1.08) ^b
Idaho	13.4	21.0	1.08 (1.05, 1.10) ^b
Illinois	12.3	15.3	1.04 (1.01, 1.06) ^b
Indiana	12.9	19.0	1.06 (1.04, 1.09) ^b
Iowa	11.4	14.6	1.04 (1.01, 1.07) ^b
Kansas	12.6	15.9	1.04 (1.01, 1.07) ^b
Kentucky	13.4	17.5	1.05 (1.02, 1.07) ^b
Louisiana	19.0	23.5	1.04 (1.02, 1.06) ^b
Maine	11.3	17.7	1.07 (1.04, 1.10) ^b
Maryland	13.3	16.9	1.04 (1.01, 1.07) ^b
Massachusetts	11.7	13.4	1.02 (0.99, 1.05)
Michigan	11.3	13.8	1.03 (1.00, 1.06) ^b
Minnesota	10.0	11.2	1.02 (0.99, 1.04)
Mississippi ^c	13.5	17.5	1.44 (1.07, 1.93) ^b
Missouri	17.5	15.3	0.98 (0.95, 1.01)
Montana	14.0	20.3	1.06 (1.03, 1.09) ^b
Nebraska ^c	12.6	18.1	1.67 (1.14, 2.43) ^b
Nevada	17.4	22.8	1.05 (1.02, 1.08) ^b
New Hampshire	12.9	17.3	1.05 (1.01, 1.08) ^b
New Jersey	13.4	17.4	1.04 (1.01, 1.07) ^b
New Mexico	16.0	21.3	1.05 (1.02, 1.08) ^b
New York ^c	14.3	20.2	1.67 (1.27, 2.18) ^b
North Carolina	12.0	17.7	1.06 (1.04, 1.09) ^b
North Dakota	12.2	15.5	1.04 (1.01, 1.07) ^b
Ohio	11.5	15.6	1.05 (1.02, 1.08) ^b
Oklahoma	17.0	23.1	1.05 (1.03, 1.08) ^b
Oregon ^c	19.1	17.7	0.89 (0.66, 1.21)
Pennsylvania	10.7	15.2	1.05 (1.03, 1.08) ^b
Rhode Island	11.1	14.0	1.03 (1.00, 1.07) ^b
South Carolina	12.8	19.2	1.06 (1.03, 1.09) ^b
South Dakota	10.8	15.9	1.06 (1.03, 1.09) ^b
Tennessee	13.7	14.0	1.00 (0.98, 1.03)
Texas	19.1	22.9	1.03 (1.01, 1.05) ^b
Utah	13.1	16.5	1.04 (1.01, 1.06) ^b
Vermont	12.8	14.4	1.02 (0.99, 1.04)
Virginia	13.8	16.9	1.03 (1.01, 1.06) ^b
Washington	13.6	14.6	1.01 (0.99, 1.03)
West Virginia	14.7	23.1	1.08 (1.06, 1.10) ^b
Wisconsin	10.7	14.4	1.05 (1.02, 1.08) ^b
Prevalence estimate median (range)	13.3 (6.7–19.1)	17.0 (9.5–23.5)	...

^aAfter control for age, gender, race/ethnicity, employment, and income level.

^bSignificant increase ($P < .01$).

^cState with nonlinear trends; odds of being uninsured in 2001 vs 1992.

many subpopulations, while others showed minimal or no changes. Of note was that 3 of the 4 states with no increases for any population group (California, Oregon, and Tennessee) instituted fairly comprehensive efforts to expand health care coverage during the 1990s, which may have contributed to the trends observed in these states.^{37,38}

However, reasons for state variations in uninsurance trends cannot be directly ascertained from the present data. Findings from surveillance systems such as the BRFSS are best viewed as hypothesis generating in nature, as opposed to explanatory. Our results should not be viewed as sufficient evidence for evaluating the effects of specific state health insurance programs or policies. Further research is needed to better understand the effects of policy or program changes within states.

Uninsurance is a multifaceted, dynamic problem influenced by many factors, none of which occur in isolation. States differ in terms of economic level of activity and employment base (and, by extension, the degree of employer-sponsored coverage), health care inflation, and health care access policies or programs.^{39,40} For example, the shift over time in employment from manufacturing to service industries may play a role, as service industry employers are less likely to offer health benefits.^{18,33,41}

A comparison of our findings with those of other surveys is not possible for a number of reasons. First, several surveys (e.g., the Medical Expenditure Panel Survey, the Survey of Income Program and Participation, and the Community Tracking Survey) are not designed to provide state estimates of insurance coverage.⁸ The National Survey of America's Families provides state-specific estimates, but only for 13 states, and it does not include all the years covered in this study.^{8,42} Second, as mentioned previously, state-level estimates from the CPS are based on small numbers of respondents in many cases, published state data are not limited to adults aged 18 to 64 years, and the CPS involves a different definition of uninsurance, one that changed in 1995. Third, in our trend analyses, we used regression modeling to control for changes over time in state demographics.

Our study involved several limitations. Our findings are applicable only to adults aged 18

TABLE 3—State Trends in Uninsurance From 1992 to 2001, by Age, Income, and Employment Category: Odds Ratios From Logistic Regression Models

	Age, y			Income, \$			Employment Category		
	18-29	30-49	50-64	<25 000	25 000-49 999	≥50 000	Employed for wages	Self-employed	Unemployed
Alabama		a	a	a	a		a		
Arizona ^b							a		
California ^b									
Colorado		a	a	a	a		a	a	
Connecticut		a			a		a		
Delaware					a				
Florida		a		a	a		a		
Georgia ^b								a	
Hawaii		a	a	a				a	
Idaho		a	a	a	a		a	a	
Illinois		a		a	a		a		
Indiana		a	a	a	a	a	a		
Iowa			a		a		a		
Kansas		a	a		a		a		
Kentucky		a	a	a	a		a	a	
Louisiana		a			a		a	a	
Maine		a	a	a	a		a	a	
Maryland		a			a		a	a	
Massachusetts			a		a				
Michigan		a			a				
Minnesota		a	a		a				
Mississippi ^b		a			a		a		
Missouri						c			
Montana		a	a	a	a		a	a	
Nebraska ^b		a			a		a	a	
Nevada		a		a	a		a		
New Hampshire		a	a		a				
New Jersey		a	a		a			a	
New Mexico		a		a	a		a		
New York ^b		a	a		a		a	a	
North Carolina	a	a		a	a		a	a	
North Dakota		a			a		a		
Ohio		a	a		a		a	a	
Oklahoma		a	a		a	a	a		
Oregon ^b									
Pennsylvania		a	a	a	a		a	a	
Rhode Island			a		a				
South Carolina		a	a	a	a		a	a	
South Dakota		a	a	a	a		a	a	
Tennessee			c						
Texas		a		a	a		a		
Utah		a			a			a	
Vermont					a				
Virginia			a	a			a		
Washington					a		a		
West Virginia		a	a	a	a	a	a	a	
Wisconsin		a	a		a		a		
No. of states with increase	1	34	24	19	39	3	33	18	0
No. of states with no change	46	13	22	28	8	43	14	29	47
No. of states with decrease	0	0	1	0	0	1	0	0	0

Note. Blank cells signify no change. Each stratified model controlled for gender, race/ethnicity, and the other demographic subgroups (age, income, employment). For example, age-stratified models controlled for gender, race/ethnicity, income, and employment.

^aSignificant increase in odds ratio.

^bStates with nonlinear trends involved comparisons of the odds of being uninsured in 2001 with being uninsured in 1992.

^cSignificant decrease in odds ratio.

to 64 years in the general populations of the states examined; previous research has shown that some state and federal health reform efforts, such as the State Children's Health Insurance Program, can increase health insurance coverage rates among children and the indigent.^{5,16} We relied on self-reports to ascertain uninsurance status; however, previous studies suggest that self-reported information on health insurance status is highly valid.^{43,44} In addition, our results were based on self-reported insurance status at the time of the interview, whereas other surveys have used different criteria, such as presence or absence of insurance coverage during the previous 12 months, which potentially can result in different estimates.⁸ However, a major strength of the BRFSS data is that the same question was used to assess insurance status across all 10 years of the study period.

Although these limitations are unlikely to have a substantial impact on the trends observed, our data probably underestimate the prevalence of uninsurance, given that people without telephones are more likely to have low incomes,⁴⁵ and low income levels are associated with uninsurance.¹² Typical of other telephone surveys conducted during the 1990s,⁴⁶ BRFSS response rates declined over the study period in nearly all of the states examined. BRFSS weighting procedures partially adjust for nonresponse, but the impact of declining response rates on trends is uncertain.

CONCLUSIONS

Uninsurance remained a persistent problem from 1992 through 2001 and actually worsened in most states among adults aged 18 to 64 years, despite the booming economy present during most of this period. In particular, state uninsurance trends worsened among population groups not traditionally considered to be at risk for uninsurance. Even in states such as Oregon and Tennessee that greatly expanded health care coverage during this period, there was little population-wide improvement in uninsurance rates, and the efforts in these 2 states have been sharply curtailed recently because of substantial funding reductions.^{37,38}

This study strongly suggests that state-level health reform efforts have not been successful

in producing population-wide reductions in the prevalence of uninsurance among persons aged 18 to 64 years. Given the fiscal challenges experienced by states over the past few years, the financial difficulties facing many employers, and rapidly increasing health care costs,⁴⁷ the problem of uninsurance among adults aged younger than 65 years is likely to increase in the absence of broader efforts to address this issue. ■

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Contributors

D.E. Nelson, J. Bolen, and S.M. Smith participated in the conception and design of the study, interpretation of the data, and the writing of the article. H.E. Wells conducted the data analyses. S. Bland participated in the initial planning of the study and preliminary data analyses.

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Correlates of Sex Trading Among Drug-Using Men Who Have Sex With Men

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Men who have sex with men (MSM) have accounted for the largest proportion of persons living with AIDS in the United States since the inception of the epidemic,^{1,2} and an increasing proportion of AIDS diagnoses are among ethnic minority MSM.³ Although the incidence of AIDS among MSM has decreased over time,^{1,2,4} newly increasing incidence rates of HIV⁵ and sexually transmitted infections^{6,7} among MSM suggest a resurgence in the epidemic among this population.

The term “sex trading,” as used in this article, is defined as engaging in sex in exchange for money, drugs, shelter, or food. Individuals who engage in sex trading are at elevated risk for HIV infection. Sex trading was the single greatest predictor of HIV risk behaviors at baseline among the 6025 National Institute of Mental Health Multi-Site HIV Prevention Trial participants.⁸ Evidence across several populations, including adult male^{9,10} and female^{9–12} drug-using and alcoholic inpatients¹³ and homeless and drug-using youths,^{14,15} indicates that sex trading is associated with higher HIV seroprevalence rates. Among MSM, those who engage in sex trading have been found to be more likely than non-sex-trading MSM to engage in unprotected sex with non-sex-trade male^{16–18} and female¹⁷ partners, leading to increased risk for HIV transmission in non-sex-trade encounters. Thus, in addition to increasing their own risk for contracting HIV, sex-trading MSM may infect their non-sex-trade male and female partners. However, scant research has addressed factors associated with sex trading among MSM.

In one study that addressed correlates of sex trading among predominantly white MSM (n=1290) recruited from high-risk environments (such as parks or walkways where men go to meet male sexual partners), younger age, self-identification as bisexual or heterosexual (i.e., not gay), and injection

Objectives. We examined correlates of trading sex for money, drugs, and shelter, or food among drug-using men who have sex with men (MSM).

Methods. Audio computer-assisted self-interviewing questionnaires were completed by 387 MSM. The association of predictors with sex trading was assessed with χ^2 tests and multiple logistic regression.

Results. Sex-trading prevalence was 62.5% (95% confidence interval=57.7%, 67.4%). Sex trading was associated with crack use, injection drug use, childhood maltreatment, nongay self-identification, and homelessness (adjusted odds ratios=3.72, 2.28, 2.62, 2.21, and 1.88, respectively).

Conclusions. Multiple risk factors are associated with sex trading among MSM. Interventions may need to address crack and injection drug use, homelessness, and childhood maltreatment and target non-gay-identified MSM who engage in sex trading. (*Am J Public Health.* 2004;94:1998–2003)

drug use were associated with higher levels of sex trading.¹⁶ Sex trading was associated with higher numbers of sexual partners and more frequent anal sex with men and women.¹⁶

Research in populations other than MSM suggests that several sociodemographic factors may be associated with sex trading. Homelessness is associated with sex trading among male¹⁷ and female^{17,19} adults and adolescents.²⁰ In one study, female crack users who were homeless were almost twice as likely to trade sex compared with those who were not homeless.¹⁹ We are aware of no published research on the relationship between homelessness and sex trading among MSM.

In addition to homelessness, childhood maltreatment may be associated with sex trading. Among women, childhood sexual abuse is positively associated with sex trading.^{21,22} Childhood physical abuse is associated with increased HIV seroprevalence among male street-based sex workers,²³ and childhood sexual abuse is associated with increased HIV risk behaviors among MSM,^{24–26} suggesting increased risk for HIV; however, the relationship between childhood abuse and sex trading among MSM is unclear.

In addition to demographic and personal characteristics, drug and alcohol use may be

associated with sex trading among MSM. In a qualitative study of sex workers in the Netherlands, financing one’s drug addiction was the reason most frequently cited by drug-using males for engaging in sex trading.²⁷ Methamphetamine,^{28–32} alcohol,^{28,31,33–36} and marijuana²⁸ use are each associated with higher levels of HIV risk behaviors among MSM, but their relationship with sex trading is unclear. Several studies indicate a positive correlation between crack use and sex trading among high-risk women,^{11,17,37} as well as among HIV-seropositive heterosexual men, women, and MSM³⁸ and among adults in general.³⁹ In fact, terms such as “strawberry”—which refers to a person who exchanges sex for drugs—have been coined to codify the relationship between sex trading and crack use, particularly among high-risk African American women.¹⁷ Crack use has not often been assessed, however, in published studies on MSM.

We assessed the association of sex trading with age, ethnicity, self-identified sexual orientation, formal education, homelessness, and childhood maltreatment among a high-risk sample of predominantly ethnic minority, urban MSM. In addition, we investigated crack cocaine, methamphetamine, alcohol, marijuana, and injection drug use as correlates of sex trading within this population.

METHODS

Participants

African American, Latino, and White MSM (N=387) were recruited with street-based outreach from public parks, beaches, and street corners in Long Beach, California, combined with limited “snowball sampling.” In addition, some participants were recruited through flyers posted at social service agencies. Participants were recruited for a randomized trial of an HIV prevention intervention for MSM who engage in illicit drug use. Eligibility criteria included use of illicit drugs (not including marijuana) at least once in the past 30 days and for at least 2 days of the past 90 days, having engaged in sexual behavior with another male in the past 60 days, and being at least 18 years of age. The present study is derived from baseline data for men who met the eligibility criteria.

Procedures

Participants were offered \$30 to participate in a 90-minute interview. The interview was self-administered in a private room with audio computer-assisted self-interviewing. The Questionnaire Development System (QDS) software package (NOVA Research, Bethesda, Md) was used to construct the audio computer-assisted self-interviewing questionnaire. Questions were presented on a laptop computer screen to the participant and verbalized by the computer over headphones. Participants were prompted to check off a box on the computer screen to indicate their desired response, a process requiring only limited literacy. Interviewers were on hand to provide technical assistance and quality assurance. Several practice questions using audio computer-assisted self-interviewing were administered before the actual interview began to familiarize participants with the procedures. Individuals who were judged to be too intoxicated to complete the interview were rescheduled for a later date. Individuals who were unable to understand the instructions or the informed consent were excluded from the study.

Questions were pilot tested among respondents from the target population and revised as needed to ensure comprehensibility. A community advisory board participated in the

study planning process and reviewed the questionnaire.

Dependent Variable

In the assessment instrument, respondents were asked in 3 separate questions whether they had ever traded sex for money, drugs, or shelter/food (yes/no). Respondents were further queried about whether they had traded sex for money, drugs, or shelter/food in the past 30 days (yes/no). The 3 dichotomous 30-day sex-trading questions were aggregated to form a single dichotomous variable; an affirmative response to at least 1 of the 3 questions was categorized as recent sex trading, hereafter simply “sex trading.”

Independent Variables

Sociodemographic variables. Variables included age, race/ethnicity, self-identified sexual (gay, bisexual, heterosexual) and gender (transgender) orientation, formal educational attainment (high school diploma or less vs some college or more), and current homelessness (self-identified as without permanent shelter).

Childhood maltreatment. On the basis of previous research with gay and bisexual males that suggests shortcomings of a definition of sexual abuse based solely on age differential between partners,^{26,40} we selected a definition of sexual abuse according to role differential (child vs adult) and advances by the adult perpetrator. Two questions assessed sexual abuse (yes/no) and frequency of sexual abuse. Any sexual abuse was coded as yes. Two questions assessed experience of parental violence in childhood with frequency of being hit by parents and frequency of exposure to interparental physical violence. Each of these variables was dichotomized, and the highest level (i.e., once a week or more often for either variable) was defined as parental violence.

Drug and alcohol use. Crack, methamphetamine, and marijuana use were assessed by use within the past week (yes/no). Injection drug use (heroin, cocaine, speedball, pharmaceuticals) was assessed by use in the past 30 days (yes/no). Alcohol abuse, specifically binge drinking, was assessed on the basis of how many drinks were consumed the last time (within the past 3 months) the partici-

pant drank alcohol (≥ 5 =yes). Substance use questions were adapted from a National Institute on Drug Abuse instrument.⁴¹

Data Analysis

We used χ^2 tests of independence to assess univariate associations between predictors and sex trading. Multiple logistic regression was then used to calculate odds ratios, 95% confidence intervals (CIs), and the net predictive value of each variable (i.e., adjusted for other variables in the model) for sex trading. All initial predictors in the univariate model were included in the multiple logistic regression, except for the following changes. The χ^2 analysis of sexual orientation revealed significant differences in sex trading only between self-identified gay versus the other 3 categories, among which there were no significant differences (Table 1). Consequently, we collapsed sexual orientation into a single dichotomous variable, gay-identified versus heterosexual/bisexual/transgender, for the multiple logistic regression analysis. Childhood sexual abuse and parental violence were found to be equally predictive of sex trading, and the proportion of sex trading was about the same for either alone or both together; thus, we combined the 2 into a single construct, childhood maltreatment, for the multiple logistic regression. Because the results of the adjusted analyses differed from those of the univariate analyses on injection drug use, alcohol abuse, and formal education, χ^2 subanalyses were conducted on each of these variables and sex trading for both levels (yes/no) of crack cocaine use. We performed identical analyses for sexual identification, homelessness, childhood maltreatment, and methamphetamine and marijuana use variables on both levels (yes/no) of crack use to explore the effects of possible interactions in the model. We chose crack use because it was overwhelmingly the most predictive variable.

RESULTS

The mean age of the participants was 37.8 (SD=8.9) years. More than half (57.6%) were African American, almost one third (29.7%) were white, and 12.7% were Latino. Most self-identified as bisexual (43.8%); 39.1%, as

TABLE 1—Frequency and Prevalence of Sex Trading Among Men Who Have Sex With Men, by Sociodemographic Characteristics, Drug Use, and Alcohol Use

	No. (%)	Percentage Engaging in Sex Trading	χ^2
Sociodemographic characteristics			
Age, y			0.64
18–34	130 (33.9)	60	
≥ 35	254 (66.1)	64.2	
Racial/ethnic background			3.52
White	115 (29.7)	59.1	
African American	223 (57.6)	65.9	
Latino	49 (12.7)	53.1	
Sexual/gender orientation			25.59***
Gay-identified	151 (39.1)	47.0 ^a	
Heterosexual	54 (14.0)	75.9	
Bisexual	169 (43.8)	71.4	
Transgender	12 (3.1)	75	
Formal education			6.42*
Some college or college degree	144 (37.2)	54.2	
High school diploma or less	243 (62.8)	67.1	
Homeless			14.57***
No	231 (59.7)	54.5	
Yes	156 (40.3)	73.7	
Childhood maltreatment			14.65***
No	69 (17.8)	42	
Yes	318 (82.2)	66.7	
Drug and alcohol use			
Crack use, past week			44.63***
No	139 (35.9)	40.3	
Yes	248 (64.1)	70.6	
Methamphetamine use, past week			1.35
No	268 (69.3)	64.2	
Yes	119 (30.7)	58	
Marijuana use, past week			0.02
No	174 (45.0)	54.8	
Yes	213 (55.0)	55.5	
Injection drug use, past 30 days			2.88
No	286 (73.9)	59.8	
Yes	101 (26.1)	69.3	
Binge alcohol use, past 3 months ^b			9.00**
No	225 (58.1)	32.2	
Yes	162 (41.9)	47.7	

^aHeterosexual vs gay ($P < .001$); bisexual vs gay ($P < .001$).

^b≥ 5 drinks on last drinking occasion.

* $P < .05$; ** $P < .01$; *** $P < .001$.

gay; 14.0%, as heterosexual; and 3.1%, as transgender. Just under two thirds (62.8%) reported a high school education or less. Nearly 60% reported current homelessness. The majority of participants reported experiencing

childhood sexual abuse (53.0%) or parental violence (70.0%); 82.2% reported childhood sexual abuse, parental violence, or both.

The prevalence of sex trading in our sample ($N = 387$) was estimated to be 62.5%

(95% CI = 57.7%, 67.4%). MSM who engaged in sex trading were less likely to self-identify as gay, had lower levels of formal education, and were more likely to be homeless (Table 1). Those who engaged in sex trading were also more likely to report childhood maltreatment. We found no differences in sex trading by age or ethnicity.

Univariate analyses of drug and alcohol use (see Table 1) indicated that MSM who engaged in sex trading were significantly more likely to report recent crack use and binge drinking. No differences were found in methamphetamine, marijuana, or injection drug use between sex-trading and non-sex-trading MSM.

The adjusted odds ratios shown in Table 2 indicate that significant effects on sex trading were observed for self-identified sexual orientation, homelessness, and childhood maltreatment. MSM who self-identified as other than gay (heterosexual, bisexual, or transgender) were more than twice as likely to engage in sex trading compared with those who self-identified as gay. Homelessness was associated with an almost 2-fold increase in the odds of sex trading. Those who reported experiencing childhood maltreatment were more than 2.5 times as likely to engage in sex trading.

Adjusted odds ratios of drug and alcohol use indicated that crack use was associated with an almost 4-fold increase and injection drug use with a 2-fold increase in the odds of engaging in sex trading. Methamphetamine, marijuana, and binge alcohol use were not associated with sex trading after adjustment for the other variables in the model. The subanalysis of injection drug use and crack use revealed that whereas injection drug use was unrelated to sex trading among MSM who used crack ($\chi^2 = 0$; NS), such use was significantly associated with sex trading among those who did not use crack ($\chi^2 = 11.69$; $P < .01$). The subanalysis of alcohol abuse revealed a significant association between binge drinking and sex trading among MSM who used crack ($\chi^2 = 5.09$; $P < .05$) but not among those who did not use crack ($\chi^2 = .48$; NS). We performed stratified analyses of methamphetamine and marijuana use on sex trading by level of crack use. The effects of methamphetamine and marijuana use on sex trading

TABLE 2—Results of Multiple Logistic Regression on Sociodemographic Characteristics, Drug Use, and Alcohol Use for Sex Trading Among Men Who Have Sex With Men

	Odds Ratio (95% Confidence Interval)
Sociodemographic characteristics	
Age: 18–34 y vs ≥ 35 y	0.94 (0.55, 1.61)
Ethnicity	
African American vs White	1.3 (0.73, 2.32)
Latino vs White	0.65 (0.29, 1.44)
Sexual orientation: nongay vs gay	2.21** (1.35, 3.61)
Formal education: high school diploma or less vs some college/college degree	1.56 (0.96, 2.55)
Homeless: yes vs no	1.88* (1.14, 3.09)
Childhood maltreatment: yes vs no	2.62** (1.41, 4.89)
Drug and alcohol use, yes vs no	
Crack use, past week	3.72*** (2.24, 6.18)
Methamphetamine use, past week	1 (0.55, 1.83)
Marijuana use, past week	0.8 (0.49, 1.32)
Injection drug use, past 30 days	2.28* (1.19, 4.37)
Binge alcohol use, past 3 months ^a	1.42 (0.86, 2.35)

Note. Nongay = heterosexual/bisexual.

^a≥ 5 drinks on last drinking occasion.

* $P < .05$; ** $P < .01$; *** $P < .001$.

were the same regardless of crack use or nonuse. Similarly, stratified analyses of sexual self-identification, homelessness, and childhood maltreatment on sex trading revealed no interactions with crack use.

DISCUSSION

In this study of MSM recruited from street-based venues and community agencies, sex trading was strongly associated with crack use, and with injection drug use. We also found significant associations between sex trading and nongay self-identification, homelessness, and childhood maltreatment.

Our findings indicate that crack use is strongly associated with sex trading among MSM. Although methamphetamine has been identified as a drug of choice among MSM at high risk for HIV,^{28–30,42,43} no association of methamphetamine use with sex trading was observed in this study. In fact, there was a nonsignificant trend of greater methamphetamine use among MSM who did not engage in sex trading. These findings suggest that preventive interventions that address sex trading among MSM must also target use of crack rather than focusing exclusively on methamphetamine.

Although we found a univariate association between sex trading and binge alcohol use, multivariate analysis indicated no significant relationships between these variables. Subanalyses revealed that the lack of a significant relationship between binge alcohol use and sex trading in the multivariate analysis may have resulted from an interaction with crack use. Binge alcohol use was associated with sex trading only among MSM who used crack. Also, we found no univariate association between sex trading and injection drug use, but the multivariate analysis revealed a significant association between these variables. Subanalyses revealed an association between injection drug use and sex trading only among MSM who did not use crack. These findings suggest that alcohol abuse may be a problem among MSM who trade sex and use crack; injection drug use may be a problem among MSM who trade sex but do not use crack. These findings also suggest that preventive interventions may need to target specific types of substance users—crack or injection drug users, and especially users of both crack and alcohol—among MSM who trade sex.

Our findings on homelessness as a predictor of sex trading among MSM extend re-

search findings among high-risk women who trade sex. Overall, the associations between crack use, injection drug use, and homelessness, respectively, and sex trading among MSM suggests an economic imperative to which sex trading is a response. Sex trading may be primarily an economic response driven by the need to obtain drugs or shelter. The high prevalence of sex trading by non-gay-identified men also lends support to an economic hypothesis that these men may be responding to a market for male sex workers among men.

Our findings also extend to the MSM population previous research among women that has documented an association between sex trading and childhood sexual and physical abuse. The more than 2-fold higher odds of sex trading among MSM who experienced childhood maltreatment suggests that prevention of sexual abuse and parental violence and early intervention to address the sequelae of abuse among young men may protect against sex trading in adulthood.

Our study suggests that a segment of drug-using MSM engage in sex trading; this population may represent an important epidemiological link between the broader MSM and heterosexual communities.⁴⁴ Most of the MSM who engaged in sex trading self-identified as heterosexual or bisexual rather than gay, and thus may transmit HIV infection to male and female partners. Previous research has suggested that many male clients of male sex workers also do not self-identify as gay; these clients may also represent vectors for HIV infection to their other male and female partners.^{45,46}

One limitation of our findings is the use of retrospective measures (e.g., childhood maltreatment). Prior reports have found good reliability and validity, however, in retrospective reports of childhood sexual abuse.⁴⁷ Nonetheless, childhood maltreatment may be underreported. In addition, sex trading, as well as sexual risk behaviors and alcohol and illicit drug use, may be subject to reporting bias. We used audio computer-assisted self-interviewing in a private setting to reduce underreporting of sensitive behaviors.^{48–50} Another important caveat is that our nonrandom sample limits the generalizability of the results. Furthermore, eligibility criteria included recent illicit

drug use, which limits generalizability to non-drug-using MSM. The relatively older age (i.e., mean=38 years) of our sample compared with samples in other studies (e.g., Reitsema et al.¹⁶) of MSM recruited through street-based outreach at public venues may result from several factors. First, the HIV prevention intervention for which recruitment was conducted may not have been as appealing to younger compared with older MSM. Second, the \$30 incentive for the 90-minute baseline interview may not have been as attractive to younger men. Third, recruitment venues did not include gay/bisexual youth programs or raves, which might attract a younger group. Thus, our results may not reflect younger MSM. Efforts were made, however, through street-based outreach, to recruit from across a variety of public venues in which hard-to-reach MSM could be found and to sample ethnic minority MSM, who have been underrepresented in HIV/AIDS behavioral research. Nevertheless, our findings cannot be generalized to all MSM. These limitations notwithstanding, our data provide insight into patterns of risk behaviors among an understudied group of MSM at elevated risk for HIV.

The major findings of this study are the associations between crack and injection drug use, nongay self-identification, childhood maltreatment, and homelessness, respectively, and sex trading among MSM. These risk factors suggest that the majority of HIV prevention programs, which rely on social-cognitive, individual, or small-group models, may be inadequate for addressing high-risk behaviors among MSM who trade sex. Interventions for MSM who trade sex may need to target drug dependence and economic hardship to prevent HIV infection risk behaviors. In addition, programs that are overtly identified as gay (e.g., housed in gay service organizations) may be unlikely to reach the high proportion of MSM who trade sex but do not self-identify as gay. Our largely African American sample of MSM also suggests that we may need to overcome the frequent stereotyping of high-risk, drug-using MSM as European American methamphetamine users to facilitate innovations in targeted HIV prevention interventions for men who engage in sex trading. ■

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Contributors

P. Newman conceptualized and conducted the analyses and wrote the article. F. Rhodes designed the study, contributed to interpretation of the analyses, and edited the article. R. Weiss assisted with the analyses, interpretation of the analyses, and editing of the article.

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Human Participant Protection

The study was approved by the institutional review board of California State University, Long Beach. All participants provided written informed consent.

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Effects of Macroeconomic Trends on Social Security Spending Due to Sickness and Disability

Jahangir Khan, MSc, Ulf-G. Gerdtham, PhD, and Bjarne Jansson, Dr Med Sc, PhD

Research into the determinants of social security spending has produced a large body of literature documenting a procyclical pattern in sickness absenteeism.¹⁻³ This pattern is generally believed to result from negative selection of employment during good times (i.e., sicker individuals have an easier time finding jobs when the economy is robust) or increased “shirking” because of reduced fear of job loss.⁴⁻⁶ However, such a pattern is also consistent with deteriorating health when labor markets strengthen.⁷⁻⁹ Hazardous work conditions, the physical exertion of employment, and job-related stress can have negative health effects, especially when job hours are extended during short-lived economic expansions.^{10,11} Cyclically sensitive sectors, such as construction, also have high accident rates, and some byproducts of economic activity, such as pollution and traffic congestion, clearly present health risks. Gerdtham and Ruhm⁸ recently used aggregate data for 23 Organization for Economic Cooperation and Development (OECD) countries over the period 1960–1997 to study the relationship between macroeconomic conditions (unemployment) and fatalities. Their main finding, as well as findings from Ruhm and Neumayer, was that there is strong evidence that mortality increases when unemployment is low.⁷⁻⁹

Our principal objective was to analyze the relationship between macroeconomic conditions, as measured by unemployment rate and social security spending due to sickness and disability on the basis of information from 13 member nations of the OECD over the period 1980–1996. We analyzed social security spending on sickness benefits, disability pension, occupational injury benefits, survivor’s pension, and their aggregates. Knowledge about how spending by different social security programs changes through economic business cycles can affect social security policymaking and help to establish

Objectives. We analyzed the relationship between macroeconomic conditions, measured as unemployment rate and social security spending, from 4 social security schemes and total spending due to sickness and disability.

Methods. We obtained aggregated panel data from 13 Organization for Economic Cooperation and Development member countries for 1980–1996. We used regression analysis and fixed effect models to examine spending on sickness benefits, disability pensions, occupational-injury benefits, survivor’s pensions, and total spending.

Results. A decline in unemployment increased sickness benefits spending and reduced disability pension spending. These effects reversed direction after 4 years of unemployment. Inclusion of mortality rate as an additional variable in the analysis did not affect the findings.

Conclusions. Macroeconomic conditions influence some reimbursements from social security schemes but not total spending. (*Am J Public Health.* 2004;94:2004–2009)

new social security rules that effectively address cost containment.

METHODS

Estimation Strategy

We used linear regression to estimate the relationship between labor market conditions and social security spending. Each of four types of social security spending, as well as the sum of this spending, was transformed to natural log before being used in the regression analysis. Using the subscripts j and t to index country and year, respectively, the basic model specification is as follows:

$$(1) \quad y_{jt} = \alpha_t + X_{jt}\beta + E_{jt}\gamma + C_j + \epsilon_{jt}$$

where y is the natural log of social security spending, E is the unemployment rate, X is a vector of regressors controlling for age and sex distributions in the population and other relevant variables, α_t is year-specific fixed effects, C_j is country-specific effects, and ϵ is a disturbance term. The year effects hold constant factors that vary uniformly across countries over time (e.g., the effects of oil price shocks). The country effects account for factors that differ across locations but that are

time invariant, such as certain country-specific social security institutions; that is, countries’ social security systems differ in terms of their principles of payments, population coverage, and historical basis of formation. Accordingly, the effect of the labor market conditions is identified by within-country variations in unemployment rates relative to the changes occurring in other nations. Importantly, our estimation procedure automatically controls for cross-country differences in social security systems that remain constant over time.

Most of the models used in this context also include a vector for country-specific linear time trends (C_j^*T) to control for factors that vary over time within nations (such as level of education), which implies the following regression equation:

$$(2) \quad y_{jt} = \alpha_t + X_{jt}\beta + E_{jt}\gamma + C_j + C_j^*T + \epsilon_{jt}$$

Finally, in some models, we controlled for per capita income to examine whether macroeconomic fluctuations in social security spending reflect changes in gross domestic product (GDP).

The regressions were estimated by weighted least squares (with observations weighted by the square root of the national

population) to account for heteroscedasticity. We also tested whether the results changed when using unweighted data or when allowing for first-order autocorrelation with country-specific autocorrelation coefficients.

Data

We analyzed annual data from 13 OECD member countries (Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Japan, Luxembourg, Sweden, the United Kingdom, and the United States), during the period 1980–1996. The standardized unemployment rate was our primary proxy for labor market conditions. Information on unemployment was obtained from OECD annual statistics.¹² Information on social security spending (disability pensions, occupational injury benefits, sickness benefits, and survivor's pensions), in million national currency units and at current prices, was taken from the *OECD Social Expenditure Database 1980–98*.¹³ Disability cash benefits consisted mainly of disability pension benefits. In some cases, other benefits were included that were not separated, because preserving the data comparability between countries and over time was prioritized.

Data from 1990 onward were provided in European System of Integrated Social Protection Statistics methodology format for Belgium, Denmark, France, Greece, Ireland, Sweden, and the United Kingdom.¹⁴ The new European System of Integrated Social Protection Statistics methodology format dates from 1990. A match at the level of individual social security programs was attained on the basis of the years for which the format and its predecessor overlapped, which enabled a coherent series to be obtained. For certain programs and aggregate categories, breaks in series were unavoidable. For France, these breaks concerned benefits for occupational injury and disease; for Greece, these concerned benefits for sickness benefits and survivors' allowances (to a lesser extent); and for the United Kingdom, these concerned benefits for survivor's pensions. Such unavoidable breaks in series were excluded from the analysis. German expenditure data referred solely to Western Germany for 1990 and earlier; accordingly, data for Germany before 1991 were excluded from the analysis.

Data on country characteristics and per capita GDP came from the World Development Indicators and different OECD statistic series. All the regressions controlled for the proportion of the population that is female (per 100 persons in each country), for labor-force participation among people aged 55–64 years, for the proportion of people living in urban areas among the total population, and for the age of the social security system. As observed earlier, such variables were expected to affect social security spending independently.^{15,16} Data on control variables, with the exception of labor-force participation among people aged 55–64 years and age of social security system, were obtained from *World Development Indicators 2000*.¹⁷ OECD's *Labour Force Statistics 1979–1999*¹⁸ and the US Department of Health and Human Service's *Social Security Programs Throughout the World–1993*¹⁹ were our data sources for age of the social security system. The data source for GDP per capita, purchasing power parity and total standardized mortality was the OECD,^{20–22} and the data on consumer price index was collected from a document center in the University of Michigan.²³ Country-fixed effects, general time effects, and (usually) country-specific time trends were included. Finally, some mod-

els controlled for the natural logarithm of national GDP per capita. These models were adjusted for purchasing power parity and were expressed in 1990 US dollars. To convert national income to US dollars, we used purchasing power parities instead of conventional market exchange rates, because exchange-rate conversions overstate (understate) real income in high- (low-) income countries.²⁴

Descriptive Statistics

Summary statistics, weighted by the total population resident in each country, are shown in Table 1. Mean, standard deviation (SD), and number of observations (on the basis of which the statistics were calculated) are presented for both dependent and independent variables. Mean total social security spending per capita was US dollars 792.6, with a standard deviation of US dollars 535.4. Per capita sickness benefit was 134.5 US dollars (SD 127.2 US dollars).

Lowest average spending was on occupational injury benefit. Occupational injury benefit per capita was 74.1 US dollars (SD 71.7 US dollars). The highest spending was on disability pension, with an average spending of 324.5 US dollars (SD 258.8 US dollars). Spending on survivor's pension was 262.3

TABLE 1—Variables Employed in the Analysis

Variable	Mean	Standard Deviation	No. of Observations
Dependent variables			
Per capita total social security spending	792.6	535.4	187
Per capita sickness benefit	134.5	127.2	202
Per capita occupational injury benefit	74.1	71.7	203
Per capita disability pension	324.5	258.8	210
Per capita survivor's pension	262.3	220.6	187
Explanatory variables			
Country unemployment rate (%)	7.6	3.8	197
Per capita GDP (US\$)	14335.8	6997.2	221
Mortality, total per 100 000 people (standardized)	779.5	106.3	218
Proportion female in total population (%)	49.8	0.4	221
Proportion people living in urban areas in total population (%)	77.0	11.6	221
Proportion people aged 55–64 years participating on labor market (%)	47.4	12.5	203
Age of social security system (years)	101.8	8.5	221

Note. PPP = purchasing power parity; GDP = gross domestic product per capita of US\$PPP (1990). Data were obtained from 13 OECD member countries during the period 1980–1996. All observations were weighted by country population. Social security spending and gross domestic product were converted to 1990 PPP (US\$). Standardized unemployment rate was according to the OECD definition.

TABLE 2—Predicted Effects of a 1-Percentage-Point Change in the Unemployment Rate on Total Social Security Spending

Regressors	Model Specification					
	A	A(i)	A(ii)	B	B(i)	B(ii)
Country unemployment rate, SE	-0.006 (0.005)	0.045* (0.013)	0.010* (0.005)	-0.004 (0.007)	0.033* (0.012)	0.019* (0.004)
Log GDP per capita, SE				0.115 (0.294)	0.846* (0.189)	0.680* (0.065)
Year effect	Yes	Yes	No	Yes	Yes	No
Country-specific trend	Yes	No	Yes	Yes	No	Yes

Note. PPP = purchasing power parity; GDP = gross domestic product per capita of US\$ PPP (1990). The analysis encompassed 13 Organization for Economic Cooperation and Development member countries (1980-1996). The dependent variable was the natural logarithm of total social security spending per capita, expressed in PPP (US\$). After systematic exclusion, the total number of observations was 162. Observations were weighted by the square root of the country population. All specifications were controlled for country population proportion female, percentage of persons aged 55-64 years in the labor force, age of the social security system, proportion of population in urban areas. The vectors for country dummy variables, year dummy variables, and country-specific time trends were included in different models (indicated in upper panel).

* P < .05.

US dollars (SD 220.6 US dollars). Standard deviations were very high for all kinds of per capita social security spending.

RESULTS

Total Social Security Spending

Table 2 displays the results of a variety of econometric models that relate the strength of the labor market to total social security spending. Model A shows the results of regressing the natural log of total social security spending on standardized unemployment rate, demographic characteristics of country (gender and age), location effects, year effects, and country-specific linear time trends. The unemployment coefficient, shown in the table, measures the effect of 1-percentage-point change in unemployment on the changes in spending, expressed in percent (difference between antilog of coefficient and 1, multiplied by 100) in unemployment. The results show no statistically significant relationship between total social security spending and unemployment. Note that the results are sensitive to whether year effects or country-specific time trends are controlled for (i.e., before control for these effects, unemployment was positively and significantly related to total social security spending). Model B adds control for per capita GDP, which is found to be insignificant and does not change the results of Model A.

Specific Sources of Social Security

Table 3 summarizes results concerning disbursements from each of the 4 social security

TABLE 3—Predicted Effects of a 1-Percentage-Point Change in the Unemployment Rate on 4 Social Security Disbursements

Regressors	Model Specification			
	A		B	
	Sickness Benefit		Occupational Injury Benefit	
Country unemployment rate, SE	-0.053* (0.014)	-0.040* (0.019)	-0.019** (0.011)	-0.005 (0.015)
Log GDP per capita, SE		0.795 (0.810)		0.886 (0.650)
	Disability Pension		Survivor's Pension	
Country unemployment rate, SE	0.007 (0.006)	0.020* (0.008)	0.001 (0.006)	0.011 (0.008)
Log GDP per capita, SE		0.803* (0.339)		0.651** (0.373)

Note. PPP = purchasing power parity; GDP = gross domestic product per capita of US\$ PPP (1990). The analysis encompassed 13 Organization for Economic Cooperation and Development member countries (1980-1996). The dependent variable was the natural logarithm of total social security spending per capita (PPP US\$ in 1990). Total number of observations for sickness benefits, occupational injury insurance, disability pension, and survivor's pensions were 177, 170, 177, and 162, respectively. Observations were weighted by the square root of the country population. All specifications were controlled for the country population proportion female, percentage of persons aged 55-64 in the labor force, age of the social security system, proportion of population in urban areas, country dummy variables, year dummy variables, and country-specific time trends. *P < .05; **P < .10.

schemes separately. In all models, we controlled for demographic variables, years effects and location effects, and country-specific time trends. Model B adds per capita GDP. The results in Model B show that unemployment is significantly associated with sickness benefit and disability benefit and is close to being significant on survivor's pension. No significant association was found for occupational injury benefit (after controlling for GDP). For Model B, a 1-percentage-point decline in unemployment was associated with a 4% increase in sickness benefits, whereas disability pension and survivor's pension fell by 2% and 1%, respectively.

Thus, different sources of social security appear to be affected differently by changes in labor market conditions, and the separate effects tend to cancel each other out with regard to total spending.

The unemployment elasticity of social security spending (i.e., how relative changes in percent of unemployment affect the relative changes in spending) is calculated by using regression coefficients. For sickness benefit, the statistically significant coefficient indicates that a 1-percentage-point fall in unemployment is estimated to raise sickness benefit by 4%. Because the average rate of unemployment is 7.6%, a 1-point decrease

corresponds to a decrease of approximately 13%; the unemployment elasticity of sickness benefit is 4/13 or 0.308. It means that a 1% decrease in unemployment increases sickness benefits by 0.308%. The unemployment elasticity of disability pension is much lower (0.153).

Because both social security spending and income are transformed to natural logged values (log–log model), the regression coefficient of GDP directly measures the income elasticity with respect to social security spending. The income effects in Model B are evident in disability pension scheme and survivor's pension. For all 3 payments, the coefficients for GDP per capita are positive and significant. An increase in GDP per capita by 1% increases occupational injury insurance benefits, disability pension, and survivor's pension by 0.89%, 0.80%, and 0.65%, respectively.

We also used unweighted data or allowed for autocorrelation of the error term with country-specific first-order-autocorrelation processes to estimate the models (both in Table 2 and Table 3). These sensitivity analyses had no important influence on our results (data not presented in the table).

Dynamics

Table 4 shows findings with regard to adjustment patterns of total social security disbursements and from the 4 social security schemes. Unemployment has different effects on spending over time. A durable 1-percentage-point decline in unemployment is estimated to raise total spending by 0.4%, 0.8%, and 0.3%, after 0, 2, and 4 years, respectively (only significant after 2 years).

It appears that total social security spending rises significantly 2 years after a decline in unemployment because spending on disability pension rises whereas all the other social security schemes are unaffected. The accumulated effect of a 1-percentage-point drop in unemployment raises disability pension spending by 1.6% after 2 years. Further, total spending does not rise significantly after 4 years after a drop in unemployment because the effects of unemployment on sickness benefits and disability pensions appear almost to cancel out. For example, the accumulated effect of a 1-percentage-point drop in unemployment increases spending on sickness ben-

TABLE 4—Predicted Effects of a Sustained 1-Percentage-Point Change in the Unemployment Rate

Type of Social Security Spending	Contemporaneous Effect ^a	Effect after 2 years ^b	Effect After 4 Years ^c
Total spending, SE	-0.004 (0.007)	-0.008* (0.003)	-0.003 (0.003)
Sickness benefit, SE	-0.040* (0.019)	-0.007 (0.010)	0.021** (0.011)
Occupational-injury benefit, SE	-0.005 (0.015)	-0.008 (0.008)	0.000 (0.009)
Disability pension, SE	0.020* (0.008)	-0.016* (0.004)	-0.016* (0.004)
Survivor's pension, SE	0.011 (0.008)	-0.003 (0.003)	0.002 (0.003)

Note. PPP = purchasing power parity; GDP = gross domestic product per capita of US\$ PPP (1990). The analysis encompassed 13 Organization for Economic Cooperation and Development member countries (1980–1996). The dependent variable was the natural logarithm of spending per capita from 4 social security schemes and their total (expressed in US\$ PPP in 1990). Number of valid observations varied between 161 and 173. Observations were weighted by the square root of the country population. All specifications were controlled for per capita GDP, the country population proportion female, percentage of persons aged 55–64 in the labor force, age of the social security system, proportion of population in urban areas, country dummy variables, year dummy variables, and country-specific time trends. Values were obtained from regressions that were controlled for country and year fixed effects, country-specific time trends, and unemployment rates for the previous 4 years. The effect of an increase in the unemployment rate lasting for k years is calculated as $\sum_{n=0}^k \beta_{t-n}$, for β_{t-n} the regression coefficient on the n year lag of the unemployment rate. Sample size in lagged models ranged between 150 and 173, depending on whether the full sample was used and on the number of lagged observations.

^aThe first column shows the predicted effect on the natural logarithm of spending per capita from 4 social security schemes and their total of a 1-percentage-point increase in the unemployment rate in the current year.

^bThe second column indicates the effect of a rise in joblessness that began 2 years earlier and continues through the current year.

^cThe third column shows the estimated effect of a sustained increase beginning 4 years earlier.

* $P < .05$; ** $P < .10$.

efits by 2.1% but reduces spending on disability pensions by 1.6%.

Mortality and Social Security Spending

Ruhm,⁷ Gerdtham and Ruhm,⁸ and Neumayer⁹ concluded that mortality decreases in economic recessions. In our data, we found a similar relationship between mortality and unemployment. Therefore, we controlled for mortality rate to analyze whether social security spendings are affected through variations in mortality. Finally, we tested whether the effect of unemployment on total spending and on disbursements from the 4 social security schemes was sensitive to controlling for total standardized mortality. We found that our results were not sensitive to this change in specification (data not shown).

DISCUSSION

Our results showed that spending on sickness benefits and disability pensions was influenced by unemployment rates. As unemployment rates decrease, spending on sickness benefits increases while spending on disability pensions decreases. We also found that the effects switched direction over time. The re-

sults were robust in relation to changes in overall mortality. According to the labor market literature, sickness absenteeism increases immediately in periods of low unemployment.^{1–3} Our results with regard to sickness benefit were consistent with these findings. These results can be explained by the common phenomenon of negative selection of workers into the labor market during periods of economic expansion. That is, workers with ill health enter the labor market because the labor demand is high in economic expansion. Consequently, economic expansion increases sickness absenteeism. In addition, because of reduced fear of unemployment during periods of low unemployment, shirking may be more common.^{4–6} However, the reduction in sick leave spending during periods of high unemployment might be explained by 2 further interactions. First, during periods of low unemployment, work-related sickness increases, and thereby sick leave payments increase as well. During periods of low unemployment, overtime and the pace of work increase in some industrial and commercial sectors. During periods of economic expansion, with an increasing demand for labor, groups with temporary disability are

attracted to the labor market by disability-adjusted job opportunities. A lengthy boom may entail the risk that these groups are incapable of managing physical and psychological job demands (over a long period of time). Accordingly, they may be expected to resort to taking sick leave or a short-term disability pension (either part time or full time). This phenomenon has been detected in an earlier Swedish study.²⁵

Second, according to Johansson and Palme, the reduction in payments can be explained solely by public policy.²⁶ During recessions, when government financing is negatively affected, restrictions on social security can be implemented, for example, in the form of an increased number of qualifying days for reimbursement or lower compensation levels. Naturally, this reduces overall social security spending. Such an explanation does not contradict our findings.

That the amount paid out in disability pension falls immediately when there is an upturn in the economy (unemployment reduces) may be explained, in a similar manner, by more people with reduced working capacity choosing to return to work. This gives rise to an immediate reduction in social security spending. Flexible regulations can facilitate a return to work among people with permanent functional impairments if they can quickly obtain work where job demands are tailored to such impairment. Just as is the case with people on sick leave, these groups are affected by the length of the economic boom and by whether the relationship between job demands and performance is changed. This may explain the changes in reimbursements reported in Table 4, namely that spending on disability pension falls at first but then rises after a lag of 2 to 4 years.

The relationship between GDP per capita and social security spending from occupational injury insurance, disability pensions, and survivor's pensions are significant. Countries with a better economic level have higher spending on these schemes.

Total mortality has been shown to be low during periods of low unemployment.^{27–31} However, Ruhm,⁷ Gerdtham and Ruhm,⁸ and Neumayer⁹ have demonstrated that overall mortality increases during times of expansion and boom. In our analysis, we detected a sim-

ilar association between unemployment and overall mortality in the OECD countries as a whole. Our findings concerning the effect of unemployment on disbursements in terms of social security and its components were not affected by whether we controlled for mortality in the estimated models.

When making cross-country comparisons, the effects of variations and changes in social security regulations between and within countries over time must be taken into account. By using the fixed-effect model, the influence of such effects can be reduced.^{7,8,32} Further, unobserved heterogeneity between countries can be removed from any model by using dummy variables for countries, years, and country-specific time trends. Nevertheless, individual data might provide extensive information about the reasons underlying variations in spending. Aggregated data tend to obscure the scope to observe such variations. For example, individual-level data on mortality as a proxy for a health condition might be replaced by information on utilization of health care or self-reported health.

The concept of work absenteeism, often used by labor-market economists, does not empirically correspond fully to the concept of sickness benefit. For example, the number of qualifying days or payments made by an employer directly to the insured over the first part of a sick-leave period may not be included in spending data produced by social insurance authorities. Conversely, the number of days reported from a questionnaire survey on absence may not be fully comparable with the number of days paid for by the insurance system because of recall error. In addition, absenteeism is influenced by changes in the concept of illness compared with disease in the population over time, ability to cope with psychosocial factors at work (especially during recession), and the changing demographic characteristics of aging populations.³³

CONCLUSIONS

Social security spending from 4 social security schemes acted differently during economic business cycles. Both magnitude and direction of response in spending in addition to changes in economic business cycles varied. Knowledge from this study may con-

tribute to policymaking decisions on the basis of prevailing or expected economic cycles.

Macroeconomic conditions influence most social security payments, but total spending is not affected. We recommend further study based on individual data to better understand the relationship between the macroeconomic business cycle and social security spending. ■

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Contributors

J. Khan wrote the article and analyzed the data. U.-G. Gerdtham planned and conducted the data analysis and contributed to interpretation of the data and writing of the article. B. Jansson conducted the study, selected the relevant social security reimbursements, and contributed to interpretation of the data and writing of the article.

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Human Participation Protection

The ethical committee at Karolinska Institutet, Stockholm, Sweden, approved this study.

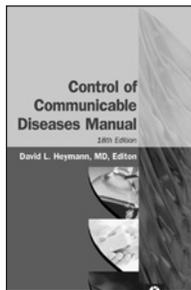
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Effects on Alcohol Use and Anxiety of the September 11, 2001, Attacks and Chronic Work Stressors: A Longitudinal Cohort Study

Judith A. Richman, PhD, Joseph S. Wislar, MS, Joseph A. Flaherty, MD, Michael Fendrich, PhD, and Kathleen M. Rospenda, PhD

Studies of the effects of the events of September 11, 2001, on New Yorkers and residents of surrounding communities,¹ as well as on national samples,²⁻⁴ have demonstrated various mental health outcomes (e.g., depression, anxiety, posttraumatic stress disorder, increased alcohol consumption). In addition, demographic risk factors for experiencing negative outcomes related to September 11 have been identified (female gender, low education level, single marital status).⁵ However, much of this research has been cross-sectional in design, making the determination of causality between the experience of September 11, 2001, and mental health consequences problematic. In addition, the effects of experiencing September 11 have not been studied in conjunction with other ongoing life stressors, especially those that encompass other elements of lack of control over life experiences.

We derived this report from a longitudinal workplace cohort study. The wave 3 mail survey was carried out in the fall of 2001, with some respondents returning the survey pre-September 11 and other respondents returning the survey post-September 11. We assessed the main effect of experiencing September 11-related events on men and women and examined the interaction of these events with 3 chronic stressors that could be viewed as manifestations of lack of control—in this case, with respect to an everyday social role, that of work. These aspects of lack of control over work include low decision-making latitude and sexual harassment and generalized workplace abuse.

We derived this study from the stress paradigm delineating the impact of psychosocial stressors on mental health status. In particular, we addressed the combined effects on participants of a traumatic macrosocial stressor⁶ and everyday stressful experiences in the workplace, which are often chronic in nature⁷

Objectives. We hypothesized that chronic stressors associated with an everyday social role (work) would interact with a traumatic macrosocial stressor (the terrorist attacks of September 11, 2001) in predicting mental health status (during the fall of 2001).

Methods. We used mail surveys returned as part of wave 3 of a workplace cohort study, both before and after September 11, 2001, to assess decision latitude, sexual harassment, generalized workplace abuse, psychological distress, and alcohol use. We also used regression analyses to assess the main effect of September 11 and interactions between September 11 and stressors, after control for baseline mental health.

Results. The main effect of September 11 on elevated alcohol use was significant for women but not for men. For women, work stressors significantly interacted with experiencing the events of September 11 to affect alcohol use and anxiety outcomes.

Conclusions. Women experiencing chronic work stressors were most vulnerable to elevated psychological distress and alcohol use after September 11, 2001. (*Am J Public Health.* 2004;94:2010–2015)

and which may be viewed as being low in controllability.⁸ Moreover, the events of September 11 have been viewed as constituting an apocalyptic moment, producing feelings of powerlessness and victimization on a massive scale,⁹ in contrast to other feelings of powerlessness generated by everyday experiences of interpersonal victimization in the workplace, such as those generated by sexual harassment and generalized workplace abuse.^{7,10} In addition, stress researchers have depicted the negative consequences of cumulative adversity wherein acute events combine with chronic or earlier stressors to have an adverse effect on psychological well-being.^{11,12} We thus hypothesized that there would be negative mental health consequences resulting from the joint effect of experiencing September 11 and ongoing stressors involving other sources of lack of control, such as those experienced in the workplace. In particular, we hypothesized that individuals who experienced September 11 would be at greater risk for deleterious mental health outcomes if they also were subjected to everyday chronic

stressors. However, given the greater vulnerability of women to psychological distress following September 11 found in previous studies,^{2,3,5} our central interest was to explore the extent to which, for women, chronic stressors further contributed to the deleterious effects of experiencing September 11.

METHODS

Sampling and Data Collection

Data were obtained from an ongoing longitudinal mail survey of employees initially selected from an American Midwestern urban university during the fall semester of 1996. The sample was stratified by gender and occupation into 8 groups. Initial wave 1 occupational groups included faculty, graduate student workers/trainees, clerical/secretarial workers, and service/maintenance workers. Employees (2416 men and 2416 women) were sampled from the university payroll database. Data collection used Dillman's¹³ total design method for mail surveys, but additional follow-up strategies were used as well

(supplementary reminder postcards, 2 additional mailings, reminder e-mail messages, and follow-up telephone calls). Respondents were compensated for their time and effort (\$20 at waves 1 and 2 and \$30 at wave 3). The final wave 1 sample comprised 2492 employees (response rate=52%). The lower-than-desired response rate was typical of questionnaires that are self-administered and contain highly sensitive material and identifiers for subsequent tracking.¹⁴ Comparison of the sample with known characteristics of the total population indicated no significant racial/ethnic differences within each occupational stratum. Gender differences between this sample and the total population were also very small and insignificant for 2 of the 4 strata (service workers and student trainees). However, men were overrepresented in the clerical group by a difference of 8.3%, and women were overrepresented in the faculty group by a difference of 11.3%.¹⁵

One year after wave 1 (during the fall semester of 1997), the wave 1 respondents were resurveyed, producing a sample of 2038 employees, with an 82% retention rate. Five years after wave 1 (during the fall semester of 2001), the sample was again surveyed, producing a sample of 1730, with a 70% retention rate of eligible respondents from the wave 1 survey (e.g., minus those who had died). Wave 3 responders did not differ significantly from wave 3 dropouts in levels of sexual harassment, workplace abuse, or decision-making latitude at wave 1. Nor did they differ on 2 of the 3 relevant indices of alcohol consumption (quantity of consumption and escapist motives for alcohol use), but they drank more frequently at wave 1 (5.3 vs 4.3 days per month, $P<.01$). In addition, wave 3 completers manifested significantly lower levels of depression and anxiety symptoms ($P<.01$) compared with dropouts. Wave 3 completers were slightly more likely to be older (mean age 42 vs 37 years, $P<.001$) and White (75% vs 55% Asian, 71% African American, and 59% Hispanic) than dropouts. Because wave 3 respondents' job status varied in terms of whether they were still employed in their original university jobs or were employed at other positions outside the initial university setting, we did not carry out between the

sample and the general university population comparisons.

Measures

Low decision-making latitude was measured with the 9-item scale of the Job Content Questionnaire.¹⁶ The Decision Latitude subscale has 2 highly correlated components: Decision Authority, which assesses the degree to which one perceives the freedom to make decisions and choice of how the job is done, and Skill Discretion, which measures the extent to which the job involves learning new things, developing skills, variety, creativity, and lack of repetitiveness. The α coefficients were .86 for both men and women.

Sexual harassment was measured with a modified version of the Sexual Experiences Questionnaire (SEQ),¹⁷ reworded to make items applicable to both men and women. The modified SEQ contains 19 items that behaviorally depict 3 types of sexual harassment measured by 6 items each: gender harassment, unwanted sexual attention, and sexual coercion. Gender harassment encompasses crude sexual comments or comments that demean the target's gender. Unwanted attention encompasses unwelcome touching and repeated requests for dates. Sexual coercion involves demands for sexual favors, which imply job-related consequences. One item additionally assessed sexual assault. Respondents rated each experience in their current job during the past year as occurring never, once, or more than once. The overall α coefficients were .82 for both men and women.

Generalized workplace abuse was measured by a 29-item instrument developed from transcripts of focus groups conducted, separately for men and women, with representatives of each of the occupational groups later surveyed in the study (see Rospenda et al.¹⁸ for a description of the focus groups). This instrument assesses 5 dimensions of workplace abuse: verbal aggression, disrespectful behavior, isolation/exclusion, threats/bribes, and physical aggression. Verbal aggression (9 items) consists of hostile verbal exchanges involving yelling, swearing, and the like. Disrespectful behavior (9 items) encompasses demeaning experiences such as being humiliated publicly or being talked down to. Isolation/exclusion (5 items) involves having

one's work contributions ignored or being excluded from important work activities. Threats/bribes (3 items) encompasses subtle or obvious bribes to do things deemed wrong or threatened with retaliation for failing to do such things. Physical aggression (3 items) involves being hit, pushed, or grabbed. Experiences were rated in a manner similar to that of the SEQ items. The overall α coefficients were .92 for both men and women.

Experiences in the 2 instruments were scored positively if they occurred more than once, with the exception of sexual coercion, sexual assault, and physical aggression (which, given their severity, were scored positively if they occurred only once). Respondents were categorized as having been harassed or abused during the past year based on the above rules. This scoring method is derived from research on perceptions of sexual harassment indicating that people perceive behaviors involving sexual coercion and assault as more serious than hostile-environment manifestations of sexual harassment.¹⁹ In addition, given empirical evidence for the distinctiveness of the sexual harassment and workplace abuse instruments,²⁰ they are used as measures of separate phenomena.

We focused on the mental health outcomes involving depression, anxiety, and changes in alcohol use, which have shown an association with the experience of September 11 in previous studies. However, we excluded measures in the data set that assessed problem-related alcohol use and alcohol use to intoxication, because these measures covered the past-year time frame and thus we would be unable to determine whether these alcohol use-related outcomes occurred before or after September 11. Depressive symptomatology occurring during the past week was measured on the basis of 7 items from the Center for Epidemiologic Studies Depression Scale, with a scale range of 0 to 21.²¹ The α coefficients were .84 for men and .86 for women. Anxiety during the past week was measured by means of the 9-item tension/anxiety factor of the Profile of Mood States, with a score range of 0 to 36.²² The α coefficients were .80 for men and .82 for women.

Alcohol-related outcomes included frequency of consumption, quantity of consumption, and escapist motives for alcohol use.

Frequency was assessed on the basis of response to the question, During the last 30 days, about how many days did you drink any type of alcoholic beverage? Quantity was assessed on the basis of response to the question, During the last 30 days, how many drinks did you usually have per day? Escapist motives for alcohol use were measured with 5 items developed by the Alcohol Research Group²³: I drink for (1) cheering up, (2) to escape, (3) when tense, (4) to forget things, and (5) to forget worries. The α coefficients were .88 for both men and women.

Analyses

Given our focus on the effects of September 11, 2001, a variable was created to differentiate respondents in terms of when they returned their questionnaire during the wave 3 data collection period. We used September 18, 2001, as the cutoff on the basis of our best estimate of the lag between when the questionnaires were mailed and when they were subsequently logged into the data collection system. We then used χ^2 tests and analyses of variance to contrast men and women in our sample in terms of sociodemographic characteristics, stressor characteristics (the experience of September 11, decision latitude at work, and experiences of sexual harassment and workplace abuse), and mental health at wave 3 (depressive and anxiety symptomatology, quantity and frequency of alcohol use, and escapist motives for alcohol use). Next, we used linear regression analyses to examine, for men and women separately, the main effect of experiencing September 11 on each mental health variable at wave 3, controlling for age, race/ethnicity, education, and the relevant wave 1 baseline mental health variable. Finally, we used linear regression analyses to examine, for men and women separately, interactions between experiencing September 11 and each of the work characteristics (decision latitude, sexual harassment, and generalized workplace abuse) as they affected mental health outcomes, controlling for sociodemographic variables and baseline mental health. Because our outcome variables were skewed, we also ran all analyses using square root transformations. Because the directionality and significance of the findings

TABLE 1—Sociodemographic, Stressor, and Mental Health Characteristics of Wave 3 Participants

	Wave 3 Respondents (n = 1594)			
	Men (n = 724), No. (%)	Women (n = 870), No. (%)	Men (n = 724), Mean No. (SD)	Women (n = 870), Mean No. (SD)
Sociodemographic characteristics				
Age, mean, y	... (...)	... (...)	42.6 (12.4)	40.7 (10.8)**
Race/ethnicity				
African American	104 (14.5)	224 (26.2)***	... (...)	... (...)
Asian/Pacific Islander	114 (15.9)	72 (8.4)	... (...)	... (...)
Hispanic	41 (5.7)	62 (7.3)	... (...)	... (...)
White/other	458 (63.9)	496 (58.1)	... (...)	... (...)
Education				
Less than high school graduate; high school graduate or general equivalency diploma; technical or trade school	70 (9.7)	111 (12.8)***	... (...)	... (...)
Some college or college graduate	116 (16.1)	220 (25.4)	... (...)	... (...)
Some graduate school or completed graduate school	534 (74.2)	534 (61.7)	... (...)	... (...)
Stressor characteristics				
Survey return date				
Before September 11	561 (77.5)	696 (80.0)	... (...)	... (...)
After September 11	163 (22.5)	174 (20.0)	... (...)	... (...)
Work environment in wave 3				
Low decision latitude	... (...)	... (...)	38.4 (6.5)	37.7 (6.4)
Experienced sexual harassment	190 (29.7)	201 (25.3)*	... (...)	... (...)
Experienced generalized workplace abuse	322 (53.3)	447 (60.2)**	... (...)	... (...)
Mental health characteristics				
Depression	... (...)	... (...)	3.4 (3.9)	4.0 (4.5)**
Anxiety	... (...)	... (...)	6.4 (5.5)	7.3 (6.6)**
Drinking frequency	... (...)	... (...)	8.34 (8.9)	5.3 (7.1)***
Drinking quantity	... (...)	... (...)	1.87 (1.2)	1.6 (1.0)***
Escape motives for drinking	... (...)	... (...)	7.1 (2.9)	7.0 (3.1)

* $P < .05$; ** $P < .01$; *** $P < .001$.

remained the same, the nontransformed findings are shown for greater ease of interpretation.

RESULTS

We contrast men and women in the sample in terms of sociodemographic factors, stressors, and mental health status at wave 3, assessed during the fall of 2001 (Table 1). Men were more likely to be White, whereas women were more likely to be African American; in addition, men had attained a

higher education level and were significantly older. In terms of stressors, there was no significant difference between genders in terms of having completed the wave 3 questionnaire before versus after September 11. By contrast, men experienced greater sexual harassment during the past year, whereas women experienced greater generalized workplace abuse. In terms of mental health outcomes, the data show gender differences that are generally found in community samples: men manifested more frequent and heavier alcohol consumption, whereas

TABLE 2—Main Effect of September 11

Survey Returned After September 11	Alcohol Use Quantity, β (SE)
Men only	-0.04 (0.12)
Women only	0.28 (0.10)*

Note. Survey returned before September 11 served as the referent category (coded 0). Control variables included wave 1 alcohol use quantity, age, race/ethnicity, and education.
* $P < .01$.

women were higher on depressive and anxiety symptomatology.

The one main effect manifested by women but not men as a consequence of experiencing September 11 was that women completing the survey after September 11 used more alcohol than did women completing the survey before September 11 (Table 2). There were no differences on any of the other vari-

ables for women, and men showed no effects of experiencing September 11.

When we examined the interaction effects of experiencing September 11 in conjunction with the 3 work stressors, the data again showed that there were no significant effects on any of the mental health outcomes for men (Tables 3 and 4). By contrast, for women, decision latitude interacted with experiencing September 11 in relation to quantity of alcohol consumed, escapist alcohol use motives, and anxiety (Table 3). Moreover, experiences of sexual harassment and workplace abuse interacted with exposure to September 11 in relation to quantity of alcohol consumption. We show the nature of the interaction effects by means of the comparative mean scores on the outcomes, looking at the combination of pre-September 11 versus post-September 11 occurrence with low versus high decision latitude and presence versus absence of sexual harassment and generalized workplace abuse (Table 4). The major

commonality across outcomes involves the combination of experiencing September 11 and the lack of control over the work role (as manifested by either low decision latitude, sexual harassment, or generalized workplace abuse), leading to the highest scores on quantity of alcohol consumption, escapist motives for alcohol use, and anxiety. However, other patterns varied. In the case of decision latitude, experiencing September 11 appeared to make little difference for the high-decision-latitude group in terms of predicting quantity of alcohol consumption. Similarly, for the high-decision-latitude group, experiencing September 11 had little effect on escapist alcohol use motives. The final finding regarding decision latitude was that the high-decision-latitude group had the lowest level of anxiety even after experiencing September 11. In terms of sexual harassment, experiencing September 11 did not affect quantity of alcohol use when sexual harassment was absent. Finally, in the absence of generalized workplace abuse, quantity of alcohol use was slightly lower after experiencing September 11. In summary, experiencing September 11 was most salient as a predictor of alcohol use outcomes and anxiety when it was coupled with chronic work stress involving lack of control over various aspects of the work role.

DISCUSSION

The findings from this study suggest that women who are already experiencing chronic stress (in this case, particular work-related stressors involving lack-of-control issues) are most vulnerable to experiencing elevated alcohol use and anxiety in the face of a traumatic macrosocial stressor such as the events related to September 11, 2001. Future studies could be useful in extending this particular investigation to examine the salience of other chronic stressors, such as those related to family social roles, and to examine a wider array of psychiatric outcomes as well as clinical disorders beyond the elevation of symptomatology per se. Nevertheless, these findings have important implications for the further specification of those most at risk for negative alcohol use and anxiety outcomes and thus represent a potential focus for future interventions aimed at helping individu-

TABLE 3—Interaction Effects of Work Stressors and September 11

	Alcohol Use Quantity, β (SE)	Escape Motives for Alcohol Use, β (SE)	Anxiety, β (SE)
Men only			
Decision latitude (job stress)	-0.01 (0.01)	-0.02 (0.02)	0.00 (0.04)
Survey return date before vs after September 11	-0.30 (0.90)	-2.87 (1.62)	-0.31 (3.50)
Survey return date \times decision latitude	0.01 (0.02)	0.07 (0.04)	0.00 (0.09)
Sexual harassment	0.165 (0.12)	0.59 (0.24)*	1.51 (0.51)**
Survey return date before vs after September 11	-0.02 (0.15)	-0.39 (0.29)	-0.46 (0.60)
Survey return date \times sexual harassment	-0.06 (0.25)	0.12 (0.52)	0.25 (1.06)
Generalized workplace abuse	0.02 (0.12)	0.40 (0.23)	1.14 (0.50)*
Survey return date before vs after September 11	-0.12 (0.20)	-0.06 (0.37)	-0.53 (0.78)
Survey return date \times generalized workplace abuse	0.14 (0.25)	-0.55 (0.48)	0.27 (1.03)
Women only			
Decision latitude (job stress)	0.01 (0.01)	0.02 (0.02)	0.00 (0.04)
Survey return date before vs after September 11	3.16 (0.70)***	4.77 (1.60)**	7.81 (3.82)*
Survey return date \times decision latitude	-0.07 (0.02)***	-0.12 (0.04)**	-0.24 (0.10)*
Sexual harassment	0.03 (0.10)	0.05 (0.25)	3.01 (0.56)***
Survey return date before vs after September 11	0.08 (0.13)	0.22 (0.30)	-1.05 (0.68)
Survey return date \times sexual harassment	0.53 (0.21)*	0.35 (0.55)	0.50 (1.22)
Generalized workplace abuse	0.08 (0.09)	0.12 (0.22)	1.49 (0.53)**
Survey return date before vs after September 11	-0.16 (0.19)	0.18 (0.40)	-2.24 (0.93)*
Survey return date \times generalized workplace abuse	0.65 (0.22)**	-0.08 (0.50)	2.12 (1.18)

Note. Survey returned before September 11 served as the referent category (coded 0). Control variables included wave 1 alcohol use and mood variables and demographic variables (age, race/ethnicity, and education).
* $P < .05$; ** $P < .01$; *** $P < .001$.

TABLE 4—Mean Scores for Significant Interactions Before and After September 11, by Outcome and Work Stressor: Women Only

	Alcohol Use Quantity ^a		Escape Motives for Alcohol Use ^b		Anxiety ^c	
	Before September 11	After September 11	Before September 11	After September 11	Before September 11	After September 11
Decision latitude						
High	1.51	1.53	7.11	7.22	7.43	6.13
Low	1.61	2.29	6.53	7.82	7.43	7.84
Sexual harassment						
No	1.55	1.57	...	...	...	...
Yes	1.65	2.14	...	...	...	...
Generalized workplace abuse						
No	1.54	1.32	...	...	...	...
Yes	1.66	2.00	...	...	...	...

Note. Means adjusted for age, race/ethnicity, education, and baseline measures.

^aAlcohol use quantity scores ranged from 0 (none) to 7 (≥ 6 drinks per day).

^bScores on 5 items developed by the Alcohol Research Group²³ ranged from 5 to 20.

^cScores on the 9-item tension/anxiety factor of the Profile of Mood States²² ranged from 0 to 36.

als cope with the experience of macrosocial stressors such as terrorist attacks and their ramifications.

An interesting issue for further research is that only women, not men and women, manifested both anxiety and alcohol use negative outcomes, especially when the experience of September 11 was coupled with lack of control in the work setting. We might speculate that, given the greater involvement of women in social networks and in the provision of social support to the members of their networks,²⁴ they may have been particularly distressed as a consequence of fears for both their own safety and the safety of their friends and families. This explanation would be consistent with Kessler and McLeod's²⁵ argument that greater involvement by women compared with men in social networks entails an emotional drain, or "cost of caring." Moreover, chronic work stressors might have been viewed as functioning to inhibit the caretaking activities that women believed they needed to perform in the post-September 11 period. Alternatively, given economic insecurities after September 11, 2001, women with work stressors might have had additional worries about job security issues. Another interesting issue for future study involves the extent to

which job characteristics such as decision-making latitude are protective in helping individuals withstand macrosocial stressors. Alternatively, to what extent are individuals with particular psychological traits differentially selected into jobs that embrace high decision-making latitude? Future research should examine the role personality traits might play in the links between occupational role incumbency and protection from the detrimental effects of macrosocial traumatic stressors.

In our initial analyses of the data set, we examined the effect of returning the questionnaire fairly immediately after September 11 (e.g., within 1 month after the events) versus later in the semester. These analyses produced no additional or different findings, so we present the results focused on differences before-September 11 versus after-September 11. However, future research should continue to examine the extent to which the experience of various macrosocial stressors along with other forms of stress has immediate versus longer-term consequences for mental health. In addition, there is a slight possibility that some of the questionnaires returned after September 11 were actually completed before September 11. Thus, future research addressing the impact of a macrosocial

stressor should accurately record timing of assessments.

Finally, we should note other limitations in the interpretation of these findings. First, we used mail surveys, whose limitations include (1) biases from reading or language difficulties of some of the intended respondents and (2) the potential for greater initial nonresponse by individuals uncomfortable with sensitive questions such as those involving work stressors they may have experienced. Second, although other studies have shown negative mental health effects related to September 11 across the country, one could speculate that our findings might have been even stronger in a sample closer to the areas most directly affected by the terrorist attacks. In addition, our particular sample, initially derived from a university workplace, had fewer minority group participants by wave 3. In addition, although wave 3 responders were similar to the initial sample in terms of stressors and most alcohol use outcomes, they showed fewer and less severe symptoms of anxiety than the original participants. Thus, our findings are less generalizable to non-Whites and may have underestimated anxiety reactions to September 11. Finally, our study compared mental health characteristics of respondents before versus after September 11, so we had no direct measures of the particular meanings that September 11 had for those respondents who returned their surveys after that date. Nonetheless, this study contributes knowledge regarding additional risk factors for anxiety and altered alcohol consumption behaviors following a macrosocial stressor—in this case, the terrorist attacks of September 11, 2001. Moreover, the longitudinal nature of the data set provided the means to control for prior mental health status in the determination of the links between the experience of September 11, chronic stressors, and anxiety and alcohol use outcomes. ■

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Contributors

J.A. Richman conceptualized the study and wrote most of the article. J.S. Wislar assisted with the study and completed all of the data analyses. J.A. Flaherty contributed to the conceptualization of the study and the interpretation of findings. M. Fendrich contributed to the study design and interpretation of the findings. K.M. Rospenda contributed to the study design and interpretation of the findings.

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Human Participant Protection

This research was approved by the University of Illinois at Chicago institutional review board.

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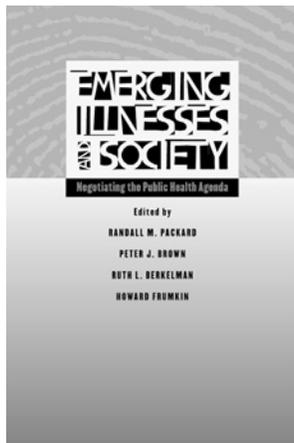
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POST DOCTORAL FELLOWSHIP IN CANCER PREVENTION AND CONTROL

The Massey Cancer Center Cancer Control Post Doctoral Training Program is funded by the National Institutes of Health/National Cancer Institute to stimulate state of the art, cross cutting, multidisciplinary research in behavioral science, behavioral genetics and genetic epidemiology, health services research and palliative care. Our program is innovative and provides quality training in the fundamentals of cancer prevention and control as well as extensive hands on mentored research experience conference presentations, grant writing and publications in peer reviewed journals.

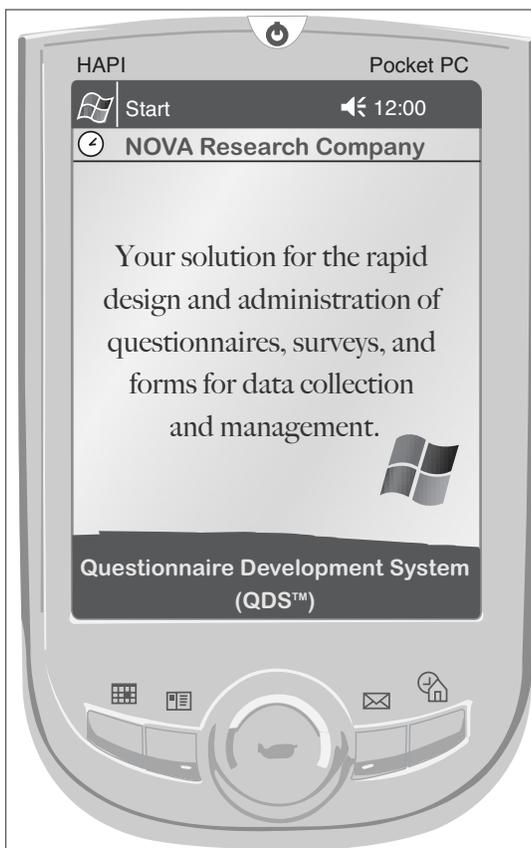
The Massey Cancer Center at Virginia Commonwealth University is among the nation's leading research and clinical institutions, a National Cancer Institute designated Center. It is central Virginia's most important resource for cancer research, and has been internationally recognized for excellence in research, education and patient care. The Center and University are located in the capitol city, downtown Richmond, Virginia, which is within 2 hours of the mountains, the beach, and Washington, D.C.

This 2 year fellowship trains recent doctorates (Ph.Ds in Psychology or Social Sciences, Nursing, Genetics, Epidemiology, Biostatistics, or related field or Dr. PHs, or MDs pursuing research careers); and more experienced doctorates wishing to change their research focus. Stipend is \$30,000 to \$40,000 depending on training and experience. Additional allowances for tuition, travel, research and supplemental training experiences are included. Applicants should have excellent academic credentials, be interested in cancer control related research and have a record of publication. This program encourages applications from women and minorities. Applicants must be U.S. citizens or permanent residents.

Under the directorship of Drs. Elizabeth Fries (Director) and Hermine Maes (Co director), this program has elite faculty researchers/mentors from over 7 departments and institutes. Strengths and interests of our faculty include: decision making, community based research, adolescence, cost and cancer outcomes, cancer surveillance, dietary change, risk communication, tobacco addiction, prevention, and cessation, palliative care, youth smoking and cessation, quality of life, rural and minority health behavior, clinical trials methodology, and genetic epidemiology and twin methodology.

For more information about the cancer control program, see our webpage at http://www.vcu.edu/mcc/research_info/massey_rp_cancer_control.htm, or Contact Dr. Elizabeth Fries, Massey Cancer Center, Virginia Commonwealth University, Box 980037, Richmond, Virginia 23298, or efries@vcu.edu, 804 628 1881.

To apply send copy of current CV and 3 letters of reference with cover letter including statement of interest and goals to the above address. Applications are being accepted now until Feb 25, 2005. Admission will be rolling, and start date may be flexible up to September, 2005.



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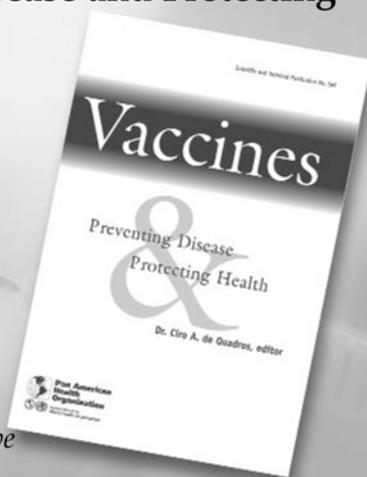
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Traineeships in drug abuse treatment and services research are available in the Department of Psychiatry, University of California, San Francisco (UCSF), in a large, active, multidisciplinary research environment that is supported by multiple research projects and center grants. Scholars work with a preceptor to design and implement studies. The focus is on treatment and services research in drug dependence, including tobacco dependence. Scholars also select an area of focus for independent research. Current research interests of faculty include trials of efficacy and effectiveness of psychosocial and pharmacologic treatment of drug abuse, including tobacco dependence; innovative methodology including internet based studies; treatment of complex patients in non-traditional settings; diagnostic techniques and research on treatment tailored for HIV-positive drug abusers and drug abusers with psychiatric and medical disorders; research on provision of services to drug abusing populations; and instrument development in drug abuse. Many successful applicants are psychologists with strong scientific backgrounds. The program has also included scholars with backgrounds in epidemiology, methodology, nursing, psychiatry, health policy, pharmacology, public health, and social work; and welcomes basic scientists who wish to learn the skills needed to translate their work to treatment and clinical issues. Stipends are funded by the National Institute on Drug Abuse. Preceptors are expected to supplement stipends from non-NIH sources. A priority of the department is the training of women and minorities for academic research careers. The application filing period closes December 31, 2004.

Please see our website at www.ucsf.edu/sftrc or contact Lorel Hiramoto at lorelh@itsa.ucsf.edu or 415-476-7673 for application information. You may fax (in advance) your CV, 2 letters of recommendation, and research statement. Originals should be mailed along with your representative work. Sharon Hall, Ph.D., Barbara Havassy, Ph.D., James Sorensen, Ph.D., and Connie Weisner, Dr.P.H. are Co-Directors.

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Ohio State University POSTDOCTORATE POSITION

The Mathematical Biosciences Institute (MBI) at The Ohio State University is accepting applications for postdoctorate positions to start September, 2005, and which are renewable for up to 3 years. Some positions are co-sponsored by industry or academic bioscience labs. The deadline for applications is January 18, 2005. Short-and long-term visitors may apply at any time.

To access the application form or for more information, visit the MBI website at <http://mbi.osu.edu> or call (614) 292-3648. EOE.



Junior Faculty Opening in Reducing Health Disparities

Department of Health Behavior and Health Education,
School of Public Health, University of Michigan

The Department of Health Behavior and Health Education within the University of Michigan, School of Public Health invites applications for a tenure-track Assistant Professorship from scholars conducting research on reducing racial/ethnic and gender disparities in health. We are particularly interested in candidates with expertise in intervention research and whose work focuses on nutrition/dietary behavior, physical activity, or substance use/abuse. The start date is September 2005.

Candidates should have an earned doctorate in public health or in the social sciences, and demonstrated research and teaching ability. Responsibilities include developing and maintaining an externally funded research program, graduate teaching and advising, and contributing to the academic mission of the department. The successful candidate will have opportunities for collaboration with research centers within the School/University, including the Center for Research on Ethnicity, Culture and Health, the Urban Research Center, the Prevention Research Center, the Program for Research on Black Americans at the Institute for Social Research, and the Institute for Research on Women and Gender.

Salary is negotiable and commensurate with qualifications and experience. To apply, forward a letter of application including a statement of research interests, teaching experience, curriculum vitae, three letters of recommendation, and evidence of successful competition for research funds to:

Harold W. Neighbors, PhD, Professor
Chair, Search Committee on Reducing Health Disparities
Department of Health Behavior and Health Education
University of Michigan
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Harvard School of Public Health Department of Nutrition

Assistant or Associate Professor of International Nutrition

The Department of Nutrition at the Harvard School of Public Health is seeking candidates for the position of assistant or associate professor of international nutrition.

The successful candidate will be expected to develop a research program with a focus on epidemiologic approaches to increasing our understanding of the relation between diet, nutrition, and health in developing countries. This is a broad based search to include individuals with a wide range of interests from under nutrition to chronic disease. The successful candidate will also participate in the department's teaching program and will take an active role in student advising and in the supervision of doctoral research.

Candidates should hold a doctoral degree in nutrition, or in a closely related field, and should have relevant experience in nutritional research including a proven funding and publication record. Broadly based training in human biology is highly desirable.

Please send a letter of application, including a statement of current and future research interests, a *curriculum vitae*, and the names of three references to:

**Chair, Search Committee
for Asst/Assoc. Professor of
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c/o Eleanor Livingston
Department of Nutrition
Harvard School of Public
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665 Huntington Avenue
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Harvard University is committed to increasing the representation of women and minority members among its faculty and particularly encourages applications from such candidates.

HEALTH COMMUNICATIONS ASSOCIATE OR FULL PROFESSOR FACULTY POSITION

The Department of Prevention and Community Health in the George Washington University School of Public Health and Health Services seeks an energetic, resourceful and visionary health communications scholar to lead and administer the planned expansion of the health communications curriculum. Potential exists to create trans-disciplinary academic health communications programs with the GWU School of Media and Public Affairs and other GWU Schools, Departments, Institutes and Centers. The wide-range of organizations in the nation's capital provides an additional avenue for collaborations.

Qualified applicants must have a doctoral degree in communications, the social and behavioral sciences, public health, or a related field and evidence of research and publications in the application of health communications theories to promote health behavior change. Areas of research may include multi-media communications, social marketing, interpersonal communication, risk

communication, and/or health literacy. Strong consideration will be given to applicants focusing on Healthy People 2010 priority areas, including but not limited to, chronic diseases, HIV/AIDS, violence prevention, and/or mental health. In addition, evidence of current external funding as a Principal Investigator is preferred. Consideration will also be given to candidates who provide documentation of previous success in procurement of external funding. Commitment to excellence in teaching and advising of students is expected. This is a tenure-earning position and may be at the associate or full professor level. An academic appointment at a senior rank will be based upon experience and qualifications.

Letters of application should include a statement of interest, curriculum vitae, and contact information including the names, mailing addresses, and telephone numbers of five references, and a reprint of a recent representative publication. Application packets should be mailed to:

Neal Richard Boyd, Ed.D., M.S.P.H.
Chair, Health Communications Search Committee
Department of Prevention and Community Health
School of Public Health and Health Services
George Washington University
2175 K Street, N.W. Suite 700
Washington, D.C. 20037
Attention: Heather Jordan, Administrator

Review of applications will begin November 15, 2004 and will continue until the position is filled. The appointment is expected by July 1, 2005.

Women and minorities are encouraged to apply. The George Washington University is an Affirmative Action/Equal Opportunity employer.

Epidemiologists / Cancer Prevention Researcher

The Cancer Prevention Institute, an independent, non-profit cancer prevention institute in Dayton OH, is seeking outstanding scientists with experience and expertise in cancer epidemiology, and cancer prevention and control research. Faculty appointments (rank commensurate with experience) in the Department of Community Medicine of the Wright State University School of Medicine are available for successful applicants.

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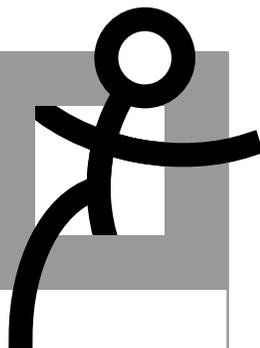
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Associate Dean Clinical and Population Health Research Graduate School of Biomedical Sciences

The Associate Dean will provide campus leadership for expanding clinical and population health research activity and serve as Director of a new Ph.D. program track in Clinical and Population Health Research in the Graduate School. The doctoral program, planned to admit students in fall of 2005, will emphasize core methodological training, combined with research mentoring in one of the many centers, departments, and research organizations affiliated with UMMS. The program has a special emphasis on public sector issues and vulnerable populations. Candidates are expected to possess an earned doctorate, a strong track record of funded research, experience as an academic administrator, and evidence of successful teaching and mentoring of doctoral students. Salary and academic appointment in an appropriate department will be commensurate with experience. Appointment date in fall of 2004 or by January 2005 desired.

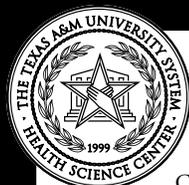
Applicants should submit a statement of interest and resume to: **Thomas Manning, Deputy Chancellor, Chair, Search Committee, University of Massachusetts Medical School, 55 Lake Avenue North, Worcester, MA, 01655; or by email c/o colleen.corey@umassmed.edu.** Review of applicants will continue until position is filled.

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POSITION ANNOUNCEMENT

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The A&M System Health Science Center is an Affirmative Action, EEO employer. The Health Science Center community values and supports diversity among faculty, staff and students. Minority and women candidates are encouraged to apply.

For additional information about The Texas A&M University System Health Science Center, please visit the following website:

www.tamhsc.edu



Associate Director of Behavioral Research

The National Cancer Institute, a major research component of the National Institutes of Health (NIH) and Department of Health and Human Services (DHHS), seeks a senior scientist to serve as Associate Director of the Division of Cancer Control and Population Sciences (DCCPS). The individual will lead the Behavioral Research Program (BRP), which includes the Office of the Associate Director and the following five branches: Applied Cancer Screening Research, Basic Biobehavioral Research, Health Communication and Informatics Research, Health Promotion Research, and Tobacco Control Research. The successful applicant will play a central and highly visible leadership role in the NCI's efforts in the social and behavioral sciences and their application to cancer prevention and control.

The Associate Director provides scientific and administrative leadership for the entire program, supervises the staff of the Office of the Associate Director and the five branch chiefs, and represents the NCI to a wide variety of professional, academic, and advocacy organizations. In addition, the Associate Director develops and facilitates collaborations with other social and behavioral science research funders, including NIH Institutes and Centers, the National Science Foundation, the Centers for Disease Control and Prevention, and many non-governmental organizations. The Behavioral Research Program's grants, contracts, interagency agreements and operating budgets totaled over 140 million dollars in Fiscal Year 2003. This includes over 275 grants and 19 interagency agreements.

This challenging and highly visible role requires broad scientific expertise, a passion for public service, a commitment to collaboration, and an ability to develop effective strategies for overcoming barriers to scientific progress and its application. Candidates must have a Ph.D. or equivalent degree in the social or behavioral sciences, public health, medicine, or a related discipline and a strong record of peer-reviewed publications relevant to health behavior etiology, mechanisms, and/or intervention. Experience in managing complex research projects, scientific staff, training programs, interdisciplinary collaborations, or funding programs is highly valued. The BRP of the DCCPS provides a unique and nationally visible multidisciplinary environment that participates in NCI's many internship, post-doctoral training and visiting scientist programs. The DCCPS also is committed to addressing health disparities through transdisciplinary research and its effective dissemination. This is an excepted service position (Title 42) with a salary range of \$147,476 - \$175,700. Please submit a letter of interest, including the names of at least three references and a cv to Robert T. Croyle, PhD, Director, Division of Cancer Control and Population Sciences, National Cancer Institute, 6130 Executive Blvd., Room 6138, Rockville, MD 20852. Applications will be considered until the position is filled. For more information about DCCPS/NCI, see www.cancercontrol.cancer.gov.

Selection for this position will be based solely on merit, with no discrimination for non-merit reasons such as race, color, gender, national origin, age, religion, sexual orientation, or physical or mental disability.



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Branch Chief for Health Communication and Informatics Research, Behavioral Research Program

The National Cancer Institute, a major research component of the National Institutes of Health (NIH) and Department of Health and Human Services (DHHS), seeks a senior scientist to serve as Chief of the Health Communication and Informatics Research Branch within the Behavioral Research Program (BRP) of the Division of Cancer Control and Population Sciences (DCCPS).

The successful applicant will play a central leadership role in NCI's expanding efforts to accelerate progress in the science of health communication and informatics and the application of this knowledge to cancer prevention, control, and quality of care. The Branch Chief provides scientific oversight of an extramural grants program, develops new research initiatives, represents NCI to relevant professional, academic and advocacy organizations, supervises branch staff, and participates in BRP and DCCPS planning and priority-setting to move communication research to practice in areas such as tobacco control, energy balance, and cancer screening. Effective collaborations within the NCI, including the Office of Communications and the Center for Strategic Dissemination, and with other NIH Institutes and Centers and Federal agencies, such as the Centers for Disease Control and Prevention and the Agency for Healthcare Research and Quality, are essential for the continued success of the program.

This challenging and highly visible role requires broad scientific expertise, a passion for public service, a commitment to collaboration, and an ability to develop effective strategies for overcoming barriers to scientific progress and its application. Candidates must have a Ph.D. or equivalent degree in behavioral science, public health or a related discipline, a strong record of peer-reviewed publications, and substantial experience in health communication research. Scientific expertise in health behavior change, health communication technology, consumer health informatics, and the development and evaluation of communication interventions in medical or public health settings are especially desirable. The BRP of the DCCPS provides a unique and nationally visible multidisciplinary environment that participates in NCI's many internship, postdoctoral training and visiting scientist programs. The DCCPS also is committed to addressing health disparities through transdisciplinary research and its effective dissemination. This is an excepted service (Title 42) position with a salary range of \$125,304 – 147,475. Please submit a letter of interest, including the names of at least three references and a CV to Robert T. Croyle, Ph.D., Director, Division of Cancer Control and Population Sciences, National Cancer Institute, 6130 Executive Blvd., Room 6138, Rockville, MD 20852. Applications will be considered immediately and will be accepted until the position is filled. NCI/NIH is an equal opportunity employer. For more information about DCCPS/NCI, see www.cancercontrol.cancer.gov.

Selection for this position will be based solely on merit, with no discrimination for non-merit reasons such as race, color, gender, national origin, age, religion, sexual orientation, or physical or mental disability.



THE DHHS/NIH/NCI ARE EQUAL OPPORTUNITY EMPLOYERS





**ROLLINS
SCHOOL OF
PUBLIC
HEALTH**

The Department of Global Health, Emory University Rollins School of Public Health is recruiting for a tenure-track position at the level of Assistant or Associate Professor. The successful candidate will be appointed as a Rollins Assistant/Associate Professor, a chair that will be held until tenure is awarded. Candidates should have a doctoral degree and demonstrated commitment to research, teaching and service. Preference will be given to candidates with a strong research record, including current funded research in any area of interest to the faculty, including: community health, environmental health, health economics,

infectious diseases, nutrition, and population and reproductive health. Experience in global health policy; health communications; health service research; and/or program management, design and evaluation will be valued. The candidate will be expected to teach two courses per year, one on methods and another in his/her substantive area and to develop an externally-funded research portfolio.

The Department of Global Health consists of over 30 full-time graduate faculty or jointly appointed faculty and over 60 adjunct faculty (<http://www.sph.emory.edu/hpdih.html>). The department takes pride in its collegial environment and culture of collaborative research and teaching. About 70 MPH/MSPH students are admitted yearly to our 2-year program. Department faculty are closely involved with the Nutrition and Health Sciences PhD program.

Emory is a major, top 25 ranked, AAU Research University. Exciting opportunities for research and collaboration exist with other departments of the School, other units of Emory University, the Centers for Disease Control and Prevention, and CARE International. The department also has an extensive network of collaborating institutions and agencies abroad.

Interested persons should send a letter indicating their interest accompanied by a curriculum vitae and the name of three persons to whom we may solicit references; these should be sent to Reynaldo Martorell, Chair, Department of Global Health, 1518 Clifton Road, N.E., Atlanta, Georgia 30322 USA. Screening of applications will continue until the position is filled. Starting date is negotiable.

Emory is an Equal Opportunity/Affirmative Action Employer

DEPARTMENT OF STATISTICS AND ACTUARIAL SCIENCE

Statistics and Actuarial Science at the University of Waterloo invites applications for a tenured or tenure-track position in quantitative epidemiology. Beginning in 2006, the Faculty of Applied Health Sciences at the University of Waterloo is initiating a significant expansion in the area of public health science, both at the undergraduate and graduate levels. The anticipated growth in student numbers will result in a combined enrollment of 125 students by the end of this decade.

In anticipation of this growth, and in support of its own very strong graduate program in biostatistics, Statistics and Actuarial Science wishes to appoint a faculty member with research interests in biostatistics and quantitative epidemiology to

a joint position with Health Studies and Gerontology in the Faculty of Applied Health Sciences. The successful applicant will be affiliated with the planned Master's program in Public Health. Although an appointment at the Associate Professor level is anticipated, applicants at the Full Professor level with exceptional records will also be given serious consideration. Duties include undergraduate and graduate teaching in both departments, and the development/continuation of an independent research program. Applicants must have a proven ability for research in one or more areas that complement those represented among the biostatisticians in Statistics and Actuarial Science, perhaps the foremost methodology research unit for bio-

statistics in Canada. Excellent teaching and communication skills are also essential. The effective date is expected to be July 1, 2005 or later. The closing date for applications is December 31, 2004.

Please submit a curriculum vitae, and arrange for at least three letters of reference to be sent directly to

**Professor Jerry Lawless, Chair
Statistics and Actuarial Science
University of Waterloo
Waterloo, ON N2L 3G1, CANADA**

All qualified candidates are encouraged to apply; however, Canadians and permanent residents will be given priority. The University of Waterloo encourages applications from all qualified individuals, including women, members of visible minorities, native peoples, and persons with disabilities.





Junior Faculty Opening in Genetics, Health & Society

Department of Health Behavior and Health Education,
School of Public Health, University of Michigan

The Department of Health Behavior and Health Education within the University of Michigan School of Public Health, invites applications for a tenure-track Assistant Professorship from scholars working on genetics, health and society. Start date is September 2005. We are particularly interested in candidates whose work relates to public perceptions of genetic vulnerability, the communication of genetic information, the ethical and social implications of genetic testing, and globalizing genetic technologies.

Candidates should have an earned doctorate in public health or in the social sciences, and demonstrated research and teaching ability. Responsibilities will include developing and maintaining an externally funded program of research, graduate teaching and advising, and contributing to the academic mission of the department.

The successful candidate will find a wide range of existing structures/organizations that provide opportunity for collaboration, including the Interdepartmental Concentration in Public

Health Genetics, the Michigan Center for Genomics and Public Health (MCGPH), the Institute for Social Research, the Institute for Research on Women and Gender, the Center for Research on Ethnicity, Culture and Health (CRECH), the Science & Technology Studies (STS) Program of the International Institute, genetics counseling programs at the Medical School, and the Life Sciences & Society Program at the new Life Sciences Institute, to name only a few.

Salary is negotiable, commensurate with qualifications and experience. **To apply:** please forward a letter of application that includes a statement of research interests and prior teaching experience, curriculum vitae, and three letters of recommendation to: **Rachel C. Snow, ScD, Associate Professor, Chair, Search Committee in Genetics, Health & Society, Department of Health Behavior and Health Education, University of Michigan School of Public Health, 1420 Washington Heights, Ann Arbor, MI 48109-2029, rcsnow@umich.edu.**

The University of Michigan is a nondiscriminatory affirmative action employer.

The University of Arkansas for Medical Sciences (UAMS) COLLEGES OF PUBLIC HEALTH (COPH) AND MEDICINE (COM) seeks Chair, Department of Epidemiology, COPH, and Director, Center for Translational Epidemiology (CTE), COPH/COM

A Chair is sought to develop the UAMS COPH's Department of Epidemiology and to establish and direct a COM/COPH Center for Translational Epidemiology (CTE) that would promote epidemiology-based research and training programs across the UAMS campus.

Funds to start the COPH and build its new campus building were appropriated by the state legislature as part of a comprehensive effort to improve the health of Arkansans by devoting 100% of the state's tobacco settlement dollars to health-related issues. DrPH, MPH and Post-Baccalaureate Certificate programs are offered, and over 200 students are enrolled. The College has rapidly expanded its programs with primary faculty and is accredited by CEPH.

Preference given to candidates with Doctoral degree in epidemiology or Doctoral degree in related area along with MPH with emphasis/substantial experience in epidemiology. Further information available on the COPH's web page at: <http://www.uams.edu/coph>.

Applications/nominations of women and minorities are encouraged. The University of Arkansas is an EEO/AA employer. Please send letter, describing research and administrative experience and interest, with curriculum vitae and names of three references to: **Joseph H. Bates, MD, MS, Epidemiology Search Chair, UAMS Slot #820, 4301 West Markham St., Little Rock, AR 72205; 501-661-2398; jrbates@healthyarkansas.com.**

American Journal of PUBLIC HEALTH AJPH WEBSITE

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Research Institute Director Health Services/Health Policy Research

The Palo Alto Medical Foundation (PAMF) seeks a Director of the PAMF Research Institute/Vice President of Research to head its world-class research institute in Palo Alto, Calif. The Research Institute has an emphasis on health services and health policy research and includes programs in basic and clinical research.

The Director's responsibilities include administrative oversight and scientific leadership of the Research Institute; health services research program development that includes collaboration with physicians, medical informatics, and other administrative and clinical staff of the PAMF Health Services Division; basic and clinical research program development, or oversight of associate directors of those areas; leadership in philanthropic efforts; and communication with the PAMF Board of Directors on Research Institute activities.

The successful applicant will be a nationally recognized senior scientist with an established research program in a health services/policy field. The individual should have proven qualities of leadership and vision; exceptional organizational and administrative skills; demonstrated ability to secure research funding and recruit outstanding young investigators; and a history of good interpersonal relationships that facilitate collaborative efforts. The applicant must be qualified for appointment as an associate or full professor at an accredited university. Applicants should send a curriculum vitae and a statement of intent to **David Druker, M.D., President and CEO, Palo Alto Medical Foundation, 795 El Camino Real, Palo Alto, California 94301.**

PAMF is an equal opportunity employer.



Georgia State University, a leading urban research institution located in Atlanta, Georgia, announces a long-term, multi-million dollar investment to support a world-class, interdisciplinary urban health research program focused on amelioration of health disparities that confront urban communities. **The Partnership for Urban Health Research** represents a university-wide commitment involving the Colleges of Health and Human Sciences, Arts and Sciences, and Law. Over the next four years, Georgia State will recruit 16 new faculty members and offer a host of expanded graduate education and research opportunities. Initial research efforts will be directed at Chronic Disease and Aging, HIV/AIDS and Infectious Disease, Injury and Violence, and Substance Abuse and Mental Health. Information about the university can be found at the Georgia State website: www.gsu.edu

Georgia State is currently recruiting for new tenure-track faculty in the following urban health disciplines:

Community Psychology
Criminal Justice
GIS and Public Health
Health Communication
Health Promotion and Behavior
Sociology of Health

For detailed information and individual position recruitment announcements, go to: <http://urbanhealth.gsu.edu/urbanhealth.html>. Requests for position announcements ONLY may be directed to: publichealth@gsu.edu. EOE



UNC CHARLOTTE

The University of North Carolina at Charlotte

College of Health and Human Services

Department of Health Behavior and Administration

The Department of Health Behavior and Administration at the University of North Carolina Charlotte invites applications for two tenure-track positions at the Assistant or Associate Professor level to begin August, 2005: (1) **Assistant/Associate Professor (Epidemiology)** applicants must have a PhD or DrPH (by August, 2005) including a graduate degree in epidemiology; (2) **Assistant/Associate Professor (Public Health)** applicants must have a doctorate in public health (by August, 2005), experience with CEPH accreditation, and will be expected to provide leadership in the implementation of a revised master of science in health promotion (public health) degree program including student internship activities.

Successful candidates will join a research intensive unit in the College of Health and Human Services and contribute to current graduate programs in the College including health administration (MHA), health promotion (MS), and nursing (MSN) as well as a planned inter-departmental health services research PhD program (<http://www.health.uncc.edu/>).

The Department is committed to research and teaching excellence. Preference will be given to candidates with a focused research agenda; current research funding or strong evidence of potential for establishing a successful program of funded research; teaching experience at both undergraduate and graduate levels; and post-doctoral training. Candidates with research programs incorporating one or more of the following topics are preferred: aging, bioinformatics, chronic disease, community health, end-of-life care, health disparities, health literacy, health outcomes, program planning and evaluation; vulnerable populations (children, minorities, poverty, rural, women).

UNC Charlotte, a doctoral/research intensive university, is the fourth largest of the 16 institutions in the University of North Carolina system. Current enrollment exceeds 20,000 (20% graduate students). It serves the people of North Carolina, with special emphasis on Charlotte, the nation's 26th largest city with an urban population over 550,000. In 2006, the College of Health and Human Services will occupy a new, state-of-the-art, 161,000-square-foot-building.

Applications - including a vita, a description of research agenda, a statement of teaching philosophy, a copy of all graduate transcripts, and three letters of recommendation - should be sent either to the Epidemiology Search Committee or to the Public Health Search Committee, Department of Health Behavior and Administration, UNC Charlotte, 9201 University City Blvd., Charlotte, NC 28223. The review of candidates will begin October 15, 2004 and continue until the position is filled. UNC Charlotte is an Equal Opportunity/Affirmative Action employer. As an AA/EOE employer, minority applicants and individuals with a disability are encouraged to apply.

Department of Public Health

Four Tenure Track Faculty Positions

OSU's Department of Public Health in the College of Health and Human Sciences is seeking applicants for four full-time nine-month tenure track faculty positions. Successful candidates are expected to develop a grant-funded research program and must have an established record of funded research and peer-reviewed publications at the Associate/Full Professor levels, and significant potential for securing external funding for research and developing a research program at the Assistant Professor level. Preference will be given to candidates with a demonstrable commitment to promoting and enhancing diversity. Each position includes teaching and mentoring graduate students in master's (MS, MPH) and doctoral degree (PhD) programs. The Department has programs in Environment, Safety, and Health; Health Policy and Management; Health Promotion and Education; and International Health.

Associate/Full Professor – The successful candidate will engage in social and behavioral science and/or intervention research directed at preventing risky behaviors (e.g., poor nutrition, inactivity, smoking), obesity, and/or chronic diseases such as diabetes. A focus on women, other vulnerable populations, or health disparities is desirable. Experience in community-based research approaches is preferred. Qualifications include a doctorate in the social/behavioral science areas of public health or in a related field.

Associate/Full Professor – The successful candidate will engage in social and behavioral science and/or intervention research in HIV and STI prevention, reproductive health, and/or women's health. Experience in community-based research approaches and/or a focus on health disparities or vulnerable populations is preferred. Qualifications include a doctorate in the social/behavioral science areas of public health or in a related field.

Assistant/Associate/Full Professor – The successful candidate will engage in research on health care delivery, financing, organization, or policy. The applicant should have research interests in one or more of the following areas: improving the organization, financing and delivery of long term care for an aging population; social disparities in treatment and access to health care; and operations and financing of public and private health insurance programs. A focus on under-served populations is desirable. Qualifications include a doctorate in public health or related field with training in health services research, health policy, health economics, or organizational studies, and expertise in quantitative research methods.

Assistant/Associate/Full Professor – This position is for a biostatistician who will engage in independent and collaborative research with faculty in the department and college. A doctorate in biostatistics or a related statistical science is required. Advanced training in epidemiology (MPH) is desirable. Collaborative research potential in a public health environment is essential. Experience teaching graduate courses in biostatistics, especially to non-statistics majors, is preferred.

Oregon State University is one of ten American universities to hold the Land, Sea, and Space Grant designation. OSU is a Carnegie Doctoral/Research-Extensive university located in Corvallis, a community of 50,000 people situated in the Willamette Valley between Portland and Eugene. Ocean beaches, lakes, rivers, forests, high desert, the rugged Cascade Range, and the urban amenities of the Portland metropolitan area are all within a 100-mile drive of Corvallis. Approximately 15,600 undergraduate and 3,400 graduate students are enrolled at OSU.

Submit a letter of interest outlining research and educational interests, curriculum vitae, list of three references, and a recent representative peer-reviewed publication to: S. Marie Harvey, DrPH, MPH, Professor & Chair, Department of Public Health, 256 Waldo Hall, Oregon State University, Corvallis, OR 97331-6404, phone (541) 737-3825, fax (541) 737-4001. For full consideration please apply by 1/15/05. Appointment begins 9/16/05. For full position description see: www.oregonstate.edu/jobs.

Oregon State University is committed to affirmative action and equal opportunity in employment and education.



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Faculty Position

University of Illinois at Chicago

Department of Human Nutrition

The Department of Human Nutrition at the University of Illinois at Chicago is seeking applications for a tenure-track faculty position (rank open) available for Spring 2005. We seek a candidate who can develop and sustain an independent research program relevant to human nutrition as well as participate in teaching at both the Undergraduate and Graduate levels. Individuals should be highly motivated and have a demonstrated track record in research. Candidates with post doctoral experience are particularly encouraged to apply. Senior applicants should also have a history of academic accomplishments and extramural funding.

The applicants' research interests must involve aspects of human nutrition including, but not limited to clinical, community-based or nutritional epidemiology.

The search will remain open until the position is filled. Interested applicants should submit a two to three page description of past research and future plans, curriculum vitae, and the names of three potential references by January 1, 2005 to:

Alan M. Diamond, Ph.D.
Professor and Head
Dept. of Human Nutrition
University of Illinois at Chicago
1919 West Taylor Street, MC 517
Chicago, IL 60612-0319
(312) 996-2083
adiamond@uic.edu
UIC is an AA/EOE.

Columbia University

Mailman School of Public Health

Assistant Professor of Clinical Sociomedical Sciences

functioning as the Director of the NY/NJ
AIDS Education and Training Center

Columbia University, Mailman School of Public Health, is seeking a faculty member at the rank of Assistant Professor of Clinical Sociomedical Sciences functioning as the Director of the New York/New Jersey AIDS Education and Training Center (AETC). The AETC is housed in the Center for Applied Public Health in the Department of Sociomedical Sciences. The mission of the AETC is to assist health care professionals, through state-of-the-art education and training to provide optimum quality services and sensitive care to HIV positive persons. The NY/NJ AETC is funded by the Health Resources and Services Administration and is part of a national network of regional centers. The program collaborates with 11 health care and training organizations located throughout New York and New Jersey to provide training on the treatment, management, diagnosis, and counseling of individuals with HIV. Candidates must have a doctoral degree in medicine, nursing, pharmacy, dentistry, public health, or a related field; at least five years of relevant work experience; successful previous experience managing large programs; excellent leadership and communication skills; knowledge and skills in professional education and training; and a deep understanding of HIV/AIDS and the health care delivery system. Familiarity with the AIDS Education and Training Centers and/or the Ryan White CARE Act preferred as is knowledge of the NY/NJ region. Clinical experience and/or adult learning experience a plus. The candidate selected will receive an appointment in the Department of Sociomedical Sciences as Assistant Professor of Clinical Sociomedical Sciences. A letter of application, curriculum vitae, and the names of three referees should be sent by November 30, 2004 to:

Richard Parker PhD,
Chair, Search Committee,
Chair Department of Sociomedical Sciences,
Columbia University Mailman School of Public Health,
722 West 168th Street, New York,
NY 10032.

*Columbia University is an Equal Opportunity
Affirmative Action employer.*

University of Pittsburgh

(4) full-time, tenure-stream faculty positions

The Department of Behavioral and Community Health Science (BCHS), Graduate School of Public Health, University of Pittsburgh is accepting applications for four (4) full-time, tenure-stream faculty positions. The successful applicant for each position must possess an earned doctorate degree and be experienced in public health approaches, particularly community-based, behavioral, and social ecological applications. Evidence is essential indicating the candidate's ability to be successful in obtaining research funding, to be published in peer-reviewed journals, and to attain tenure. Each BCHS faculty member is expected to teach approximately two courses per year, advise and mentor both masters and doctoral students and maintain professional service activities. The BCHS Department is guided by team and participatory approaches; therefore, the ability to work collectively and in harmony with colleagues, diverse communities and service organizations is a must.

Aging Specialist (Open Rank-Position #0003208): This individual will lead the Department's Certificate Program in Gerontology; serve as liaison with the Center for Healthy Aging within the Graduate School of Public Health; serve as liaison with other areas of the University that specialize in the health of the elderly; work with relevant community organizations; and participate in and lead on-going grant initiatives involving senior wellness in the Department of BCHS.

Evaluation Research (Assistant Professor-Position #34209-6): Requirements: At least two years professional experience beyond the earned doctorate in evaluating health promotion and disease prevention programs; must be well-versed in both quantitative and qualitative applications; must be familiar with participatory and culturally com-

petent approaches; and skilled in analyzing quantitative data sets. Annual salary range: \$68,000 to \$73,000.

Communications/Informatics (Assistant Professor-Position #34209-7): Requirements: Expertise in public health and cross-cultural communications, media advocacy and related theories, research, interventions and other applications; must have an active research agenda; familiarity with web-based communication, mass media campaigns, political messaging and communications as a toll for healthy behavioral and social change. Annual salary range: \$68,000 to \$73,000.

Community Health Development (Assistant Professor-Position #34209-8): Requirements: Expertise in participatory-based community research, evaluation and practice; skilled in other empowerment models of community organizing; strong grounding in relevant theory; experience working on public health initiatives with local and regional community groups; familiarity with community health indicators and other related measures; must have strong group process skills. Annual salary range: \$68,000 to \$73,000.

Letters of application **MUST INCLUDE:** Position number, a statement of interest, complete curriculum vitae and contact information (names, addresses, telephone numbers and e-mail addresses of three references and forwarded to: **Robert M. Goodman, Ph.D., Professor and Chair, Department of Behavioral and Community Health Sciences, c/o Edi M. Bernardon, 214 Parran Hall, Graduate School of Public Health, University of Pittsburgh, 130 DeSoto Street, Pittsburgh, PA 15261.** Recruitment process will remain open until the positions are filled.

*The University of Pittsburgh is an Affirmative/Equal Opportunity Employer
Women and Minorities are Encouraged to Apply*

PhD Trained Epidemiologist

The Division of General Internal Medicine, University of Pittsburgh, is seeking an experienced Epidemiologist with a PhD in Epidemiology or a related field. This candidate will work collaboratively with established health services investigators conducting research, teaching and mentoring fellows. Salary and rank commensurate with qualifications. Send letter of interest and CV to **Wishwa Kapoor, MD, 200 Lothrop Street, 933 West MUH, Pittsburgh, PA 15213** (fax 412 692-4825) or e-mail Noskoka@upmc.edu.

The University of Pittsburgh is an Affirmative Action, Equal Opportunity Employer.

NEW YORK CITY DEPARTMENT OF HEALTH AND MENTAL HYGIENE

PUBLIC HEALTH/ PREVENTIVE MEDICINE RESIDENCY PROGRAM

Two-year ACGME-accredited residency offers outstanding opportunities for training and research in a dynamic urban setting. Practicum and clinical training at the NYC DOHMH combined with MPH degree at the Columbia University Mailman School of Public Health. Separate track in CANCER PREVENTION AND CONTROL. Stipend, health insurance and full tuition provided. NYS license required by start date (7/1/05); applications due 12/31/04.

For more information, visit
<http://www.nyc.gov/html/doh/html/phmrp/phmrp.html>
or contact

healthrp@health.nyc.gov
or (212) 341-3957.

NYC Dept. of Health & Mental
Hygiene is an EOE M/H/F/V



Florida International University

FIU

Miami's Public Research University

The Robert Stempel School of Public Health in the College of Health and Urban Affairs at Florida International University is engaged in a major expansion of faculty in all core areas of public health education. Currently, the School has graduate programs accredited by CEPH, ACEHSA, and ADA. At this time, we seek to fill up to twelve faculty positions. These positions are tenure/tenure-track; a doctoral degree in an appropriate discipline is required. Rank is open for all positions.

Biostatistics (2): Open Rank

Epidemiology (1): One associate/full professor position.

Environmental Health (3): Three assistant professor positions.

Health Policy & Management (1): Open Rank

Health Promotion & Prevention (3): Open Rank

Dietetics & Nutrition (1): One assistant professor position.

Successful candidates will demonstrate potential for effective teaching, scholarly activity including competitively funded research and publications in nationally recognized scholarly refereed journals, and ability to communicate effectively with ethnically and culturally diverse populations. Responsibilities will include teaching and student advisement, research, and serving the university, professional, and neighboring communities. Salary is commensurate with qualifications and experience.

Florida International University is a comprehensive Research Extensive Institution that also is designated as a minority institution. Our mission is to enhance the public's health by conducting innovative research, training future leaders and health professionals from diverse backgrounds, translating research into policy and practice, and serving our local communities as well as communities around the world, especially in Latin America and the Caribbean.

A letter of interest, vitae, and the names of three professional references who can comment on teaching and research experience or potential will constitute an application. Review of applications will begin October 15, 2004 and continue until successful candidates are identified. Send inquiries and application to:

Public Health Search and Screen Committee, University Park Campus, VH 216, Florida International University, 11200 SW 8th Street, Miami, FL 33199.

For additional information, contact Dev S. Pathak at (305) 348-1377, or pathakd@fiu.edu. EOE

FACULTY POSITION

HEALTH SERVICES RESEARCH CLINICAL SCIENCES AND ADMINISTRATION DEPARTMENT COLLEGE OF PHARMACY UNIVERSITY OF HOUSTON

The University of Houston College of Pharmacy invites qualified individuals to apply for full time, tenure track faculty positions at the rank of Associate and Assistant Professor. Area of research interest sought is Health Services Research. The successful candidates will join existing groups of academicians in the area and be expected to develop and maintain an independent research, teaching, and service program.

Candidates should possess a PharmD, PhD and/or MD degrees and have completed postdoctoral training programs in the research area. Clinician applicants must be eligible for Texas licensure. Salary will be commensurate with qualifications and experience. Applicant screening will be immediately and will continue until the positions are filled.

Interested individuals should forward a letter of intent, complete curriculum vitae and the names of three references with regular and email addresses, telephone and fax numbers to:

Lynn Simpson, Pharm.D.
Clinical Sciences and Administration
College of Pharmacy
University of Houston
1441 Moursund St.
Houston, TX 77030
Telephone: 713-795-8381; Fax 713-795-8383
Email: Lynn@uh.edu

*The University of Houston is an Affirmative Action/Equal Opportunity employer.
Minorities, women, veterans and persons with disabilities are encouraged to apply.*

San Francisco State University

The Department of Health Education at San Francisco State University (SFSU) is seeking a tenure-track associate professor for Fall 2005.

Qualifications: Doctoral degree in Health Education, Behavioral Medicine, Health Psychology, Medical Anthropology, or Community Health-related field. Advanced degrees in Public Health and training in self care or complementary approaches to health is desirable. For this position knowledge of health promotion/disease prevention, behavior change theory and practice (individual/community), the contribution of culture to health and healing, and strategies to mitigate health disparities are relevant to this position. Applicants should have the potential of securing funding for applied community-based research and a commitment to quality teaching.

Responsibilities: The successful candidate will teach courses in both the Master of Public Health and the Bachelor of Science program in health education and or holistic health. Scholarship in applied research, grantsmanship as well as university and community service and advising are expected.

Application review will begin Dec 8, 2004 and continue until position is filled. Submit a curriculum vitae, description of current teaching and research interests, representative publications to committee chair. Three letters of recommendation (with information on teaching experience if applicable) and University transcripts will be requested of finalists:

Zoe Clayson, Ph.D, Chair, Search Committee
Department of Health Education, HSS 326,
email: zoeclay@sfsu.edu
Phone: 415-338-1413 FAX: 415-338-0570
URL <http://www.sfsu.edu/~hed/>

EOE



Director

Clinical Research Unit Denver, Colorado

Kaiser Permanente of Colorado is accepting applications for the Physician Director of Research of the Clinical Research Unit (CRU.) Kaiser Permanente of Colorado is a non-profit group model HMO, consisting of the Medical Group with over 600 physicians and the Kaiser Foundation Health Plan of Colorado (Health Plan) with 417,000 members. Kaiser Permanente of Colorado has an outstanding record of innovation, and excellence in clinical care and has had a fully automated medical record in place for six years, which complements the comprehensive administrative databases that have been in place since 1990.

The mission of the CRU is to develop, conduct and translate high-quality research into practice. The CRU, with a budget of \$9 million in 2003, 12 investigators and a staff of 70, focuses on translational research, including health services, behavioral and clinical research. CRU conducts federal, foundation, and industry funded research, including multiple research collaborations with similar units in other HMOs and academic medical centers.

Applicants must be physicians who possess leadership experience, including a successful track record of developing staff, building relationships, and developing and promoting a strategic vision for health services, behavioral and clinical research. In addition, applicants should have several years of research experience, including success in obtaining grant funding from federal agencies such as the NIH, AHRQ, and CDC, and experience supervising large and multi-institutional grants. Additional formal training in research methodologies (e.g., MPH or comparable training) is desirable. Please contact: **Chantal Papez/Physician Recruitment, 303-344-7302, E-Mail: chantal.papez@kp.org FAX 303-344-7818 EOE, M/F, V/H**

UNMC Eppley Cancer Center Associate Director Cancer Prevention and Control

The University of Nebraska Medical Center (UNMC) Eppley Cancer Center, a National Cancer Institute-designated Clinical Cancer Center, seeks outstanding candidates for the position of Associate Director, Cancer Control and Prevention. The position may be tenured or tenure-leading with academic rank commensurate with experience.

Applicants should have a Ph.D., M.D. or other doctoral level degree, with appropriate post-doctoral training and a track record of funding in cancer epidemiology and/or cancer prevention and control. The successful applicant will be expected to develop a comprehensive, extramurally-funded cancer epidemiology, cancer control and prevention research programs and to collaborate with other Cancer Center Investigators including our NCI SPORE program in pancreatic cancer and our NCI-funded Cancer Research Training Program. The Cancer Center has active multidisciplinary research programs in lymphoma, breast, prostate, pancreas, GI, and aero digestive cancers.

Resources to build population sciences research in the Cancer Center, including funds to recruit several cancer epidemiology, and cancer control and cancer prevention faculty, is expected to be part of the successful candidate's recruitment package. EOE.

Applicants should send their CV and a statement outlining their vision for the development of cancer epidemiology, and cancer and prevention programs to:

**Dr. Ken Cowan,
Director UNMC Eppley Cancer Center,
University of Nebraska Medical Center
986805 Nebraska Medical Center,
Omaha, NE 68198-6805.**

Applicants can apply online to position # 0013 at <https://jobs.unmc.edu>. Additional information about the UNMC Eppley Cancer Center is available at www.unmc.edu/cancercenter/

POSTDOCTORAL FELLOWSHIP

CANCER PREVENTION AND CONTROL

The UNC Lineberger Comprehensive Cancer Center at the University of North Carolina at Chapel Hill seeks candidates for a two to three year postdoctoral fellowship in cancer prevention and control research. Qualified individuals must have completed a Ph.D., M.D., or equivalent degree and must be a U.S. citizen or have permanent resident status.

For further information visit:
[<http://cancer.med.unc.edu/training/ccep/postdocs.asp>](http://cancer.med.unc.edu/training/ccep/postdocs.asp)

or contact:

Michael O'Malley, Ph.D.
UNC Lineberger Comprehensive
Cancer Center, CB# 7295
University of North Carolina at
Chapel Hill,
Chapel Hill, NC 27599-7295
(clover@med.unc.edu)

Applications should include a statement of research interest/proposed work, a curriculum vitae, and three letters of recommendation.

Applications are due
December 17, 2004.
The fellowship will begin in
summer 2005.

*The UNC Lineberger Comprehensive
Cancer Center and the University of
North Carolina at Chapel Hill are
Equal Opportunity Employers.
Women and minorities are strongly
encourage to apply and self identify on
their application.*



DEPUTY COMMISSIONER FOR ENVIRONMENTAL HEALTH

Westchester County, New York seeks a forward-thinking leader to be Deputy Commissioner for Environmental Health, serving a population of almost one million persons residing in urban, suburban, and rural communities in a 450 square mile, geographically diverse region immediately north of New York City. Responsible for administrative and technical aspects of environmental health operations including quality sanitation and engineering standards, enforcement and regulation. Management of approximately 100 professional, technical, and administrative staff. Must demonstrate an understanding of and experience in working collaboratively with advocates, industry and the public toward a healthy environment.

Must be familiar with environmental health regulations and issues, and principles of public health sanitation and protection. Must be able to communicate and work effectively with public officials, professional organizations, private agencies and community groups on complex public health issues. Master's degree and six years relevant experience.

Interested individuals are requested to submit their statement of qualifications to:

Maria Palumbo
Personnel Administrator
Westchester County Department of Health
145 Huguenot Street
New Rochelle, New York 10801

Equal Opportunity Employer.

FACULTY POSITIONS IN EPIDEMIOLOGY AND SOCIAL/BEHAVIORAL SCIENCES

UNIVERSITY OF FLORIDA

COLLEGE OF PUBLIC HEALTH AND HEALTH PROFESSIONS

The College of Public Health and Health Professions invites applications for tenure-track assistant or associate professor faculty positions in Epidemiology and Social & Behavioral Sciences. Applicants must have an appropriate graduate degree (PhD, DrPH, or MD/MPH) and demonstrate the ability to develop and implement a focused line of research. Incumbents will be expected to teach in the College's MPH program.

The College of Public Health and Health Professions (www.phhp.ufl.edu) is in the process of building a vibrant faculty of public health to develop academic and research programs. The College hosts several major centers devoted to the study of health related issues and is part of the University's Health Science Center which includes 5 other colleges.

Send a letter of interest, a CV, and three letters of recommendation to Dr. Mary Peoples-Sheps, Chair of Search Committee, POB 100182 UFHSC, Gainesville, FL 32610, by 12/15/04 (Phone 352-273-6443). Preferably, apply online at <http://hr.ufl.edu/job> (online instructions are included) for positions 30039, 30116 and 30239 and send letter of interest and 3 letters of recommendation to the above address.

Contact 352-273-6213 or 352-273-6198 if assistance is needed to apply online. Call 352-392-1251 or TDD 352-392-7056 if an accommodation due to a disability is needed to apply for this position. An Equal Opportunity Institution.

THE SCHOOL OF PUBLIC HEALTH, UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL

invites applicants for the position of Chair, Department of Health Behavior and Health Education.

The Chair occupies a tenure track faculty position at the Full Professor level, serves as the chief academic officer for the Department and is responsible for senior leadership and vision in research, service and teaching. The department consists of 22 full time faculty, 59 adjunct faculty, 8 professional staff, 51 doctoral students, 82 MPH students, and a vigorous program of research, teaching and public service. HBHE faculty hold grants valued at over \$3.5 million per year, predominantly from the NIH and CDC.

The Chair will foster an environment of scholarly inquiry, enhance an already outstanding program of funded research, maintain strong academic programs in both residential and distance formats. The Chair will be an articulate spokesperson for health education and health behavior within the SPH and UNC, as well as national and international communities.

Candidates must possess an earned doctorate in an appropriate field. Successful candidates will have a distinguished record of leadership in research, teaching, professional and public service, facilitating community partnerships, academic administration, faculty mentorship, interdisciplinary collaboration and promoting diversity.

Review of applications will begin immediately and continue until the position is filled. Letters of application and curriculum vitae should be sent to david_stein@unc.edu or:

David Stein
School of Public Health Dean's Office
170 Rosenau Hall, CB #7400
University of North Carolina at Chapel Hill
Chapel Hill, NC 27599-7400

Please see our website for more information (www.sph.unc.edu).



**THE UNIVERSITY
of NORTH CAROLINA
at CHAPEL HILL**

*The University of North Carolina at Chapel Hill is an Equal Opportunity, ADA Employer.
Minorities and women are encouraged to apply.*



The College of Public Health would like to announce a newly formed Department of Global Health at the University of South Florida in Tampa, Florida. We are pleased to extend this opportunity to invite applicants to apply for two full-time faculty positions with a 12-month appointment in Global Health at the rank of Associate or Full Professor. One position is expected to have an academic and professional focus on Global Communicable Diseases and the other on Global Health.

The mission of the Department of Global Health is to focus on providing educational opportunities for those interested in emerging infectious diseases worldwide and in the implementation of health improvement programs with a transnational impact. The Department currently offers the MPH, MSPH, and PhD in Global Communicable Diseases and the MPH in Global Health. Beginning this fall, the department will also offer a joint degree program in Health Informatics (MPH) and will shortly be offering Bio-Informatics (MSPH) with the International Institute for Information Technology in Pune, India. Students from the Department of Global Health will undertake an international field experience in selected sites in Belize, Venezuela, Panama, and India.

This new Department is also developing an exciting and innovative program of research through a multi-disciplinary core of faculty with expertise in emerging infectious diseases and international health in Latin America, the Caribbean Basin, and India. The selected faculty will find many research opportunities through the department's research centers, affiliated faculty and joint programs with the USF Center for Biological Defense, the Global Center for Disaster Management and Humanitarian Assistance, the USF-India Centers for Health and HIV/AIDS Research and Training (CHART-India), the Donald Price Parasitology Repository and Laboratory, the Department of Infectious Diseases in the USF College of Medicine, the State of Florida Department of Health Laboratory located on the USF campus and the Gorgas Memorial Institute of Tropical and Preventive Medicine in Panama.

Global Health position (#2016)

Minimum Qualifications: All applicants should have at minimum a doctoral degree in science, medicine, public health, or related field that will support global health research, and a demonstrated record of achievement in teaching, academic research, and/or the management/administration of health programs, including an established record of obtaining extramural funding, and peer-reviewed publications. Candidates must have five or more years in an academic environment at the rank of Assistant or Associate Professor, or equivalent professional experience. For consideration at the rank of Full Professor candidates must have had a minimum of five years experience as an Associate or Full Professor and a national reputation in their area of technical competence, or have been a senior administrator in an international health agency.

Preferred Qualifications for Global Health position: Candidates for the Associate/Full Professor position should have a history of writing for and obtaining funding from international agencies for health related programs in overseas settings; a minimum of five years of senior-level administrative experience in health improvement activities in international programs; graduate, including doctoral-level, teaching experience in one or more of the areas of health promotion, international public health program design and implementation; community based health assessment; health improvement programs, or similar experience in the above areas; demonstrated communication skills; a vision for the applicant's role in the Global Health Department; and demonstrated ability to work within a diverse and interdisciplinary environment.

Global Communicable Disease position (#13122)

Minimum Qualifications: All applicants should have at minimum a doctoral degree in science, medicine, public health, or related field (parasitology, microbiology, tropical diseases, infectious diseases) that will support research and teaching in global communicable diseases, and a demonstrated record of achievement in teaching and academic research and service. Candidates must have five or more years in an academic environment at the rank of Assistant or Associate Professor. For consideration at the rank of Full Professor candidates must have had a minimum of five years experience as an Associate or Full Professor and a national reputation in their area of technical competence and expertise

Preferred Qualifications for Global Communicable Disease: Candidates for the Associate/Full Professor position should have an established record of scholarly research including extramural funding, grant administration, and peer-reviewed publications; graduate, including doctoral level, teaching experience in one or more of the areas of communicable/infectious diseases, parasitology, bacteriology, bloodborne pathogens, and/or opportunistic co-infections; a vision for the applicant's role in the Global Health Department; and the ability to work within a diverse and interdisciplinary environment.

Application Procedure: Applicants for both positions should submit a current curriculum vitae (CV), a list of five references, and a cover letter describing teaching, research, and service interests and additional qualifications to: Dr. Tom Mason, Global Health Search Committee Chair (#2016) or Dr. Boo Kwa, Communicable Disease Search Committee Chair (#13122), c/o Katherine Johnson, Coordinator, Global Health at the College of Public Health, 13201 Bruce B. Downs Blvd., MDC 56, Tampa, FL 33612 or fax to 813/974-7452. No phone calls please. For full consideration by the Search Committee, apply by December 3, 2004; however, the position will remain open until filled. The salary will be nationally competitive and commensurate with experience.

Affirmative Action: According to Florida Sunshine law, search records, including applications and search committee meetings, are open to the public. The University of South Florida is an Equal Opportunity, Affirmative Action, and Equal Access institution. Applicants who need disability accommodations in order to participate in the selection process should notify Mrs. Katherine Johnson at (813) 974-7452 (TDD 813/974-2218) at least five working days in advance of need.