LETTERS

SOCIAL NETWORKS AND PEER EDUCATION

By testing the social-network method of group assignment and peer leader selection in a randomized trial design with a large number of classrooms and schools, Valente et al.[1] made an important contribution to the field of peer-led adolescent tobacco use prevention. My colleagues and I recommended such a research design as a follow-up to our similar 2-year pilot research project[2–7] with 347 sixth-grade students in 7 schools in which we tested the effectiveness of using social-network analysis to select peer leaders and to form groups for instruction in a peer-led curriculum to prevent smoking.

We compared (1) peer-led education in groups formed by and with peer leaders selected through dendrograms based on a computer-algorithm cluster analysis of students' nominations on a sociometric questionnaire; (2) classmates taught by model students chosen by school teachers and principals; (3) students taught by adult teachers; and (4) a no-treatment comparison group. The report by Valente and colleagues supports our findings[2] suggesting that a curriculum taught by influential adolescent peer leaders within students' social networks could improve the effectiveness of peer-led school health education to prevent smoking. We also concluded, as Valente and colleagues pointed out, that there was a need to further study the informal diffusion of peer leaders' influence, gender influences, and the influence of peer leaders who practice the behavior a curriculum is aimed at preventing.[2,3,5]

In addition to replicating our social-network procedures through the use of a large, group-randomized design, Valente and colleagues might have further extended the field of social-network research and its application to the prevention of adolescent tobacco use had they also built upon our findings and recommendations. Considering the precedent established by our research, first presented 20 years ago[6,7] and published 13 years ago,[2] not only were Valente and colleagues remiss in failing to cite our study, but their statement that "there have been no studies to evaluate how these leaders should be assigned to groups"[1(p1837)] was incorrect and an unwarranted claim of primacy. ■

William H. Wiist, DHSc, MPH, MS

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LETTERS

VALENTE ET AL. RESPOND

We deeply regret failing to reference Wiist and colleagues' prior research on the use of social-network techniques for selecting leaders and creating work groups in a school-based study. We apologize to them and to the field for this omission.We are glad that our results confirmed their work and that we are following up on their call to further investigate this approach. Indeed, a small body of research is beginning to accumulate on the use of social-network techniques for designing and implementing health promotion interventions. Studies among substance users,[1,2] physicians,[3,4] and employees[5] also suggest that social network approaches to health promotion may be quite beneficial. Wiist and colleagues' early study was insightful, and we hope that our work further stimulates research into the many ways social network analysis can enhance the public's health. ■

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TOBACCO HARM REDUCTION INVOLVES MORE THAN CIGARETTE HARM REDUCTION

I contributed to the Institute of Medicine report *Clearing the Smoke: Assessing the Science Base for Tobacco Harm Reduction,*[1] and I am writing to correct misrepresentations made about it in 2 recent articles in the Journal.[2,3] The articles suggest that the report signals a rebirth of "safer cigarettes"[2] and that it was primarily about cigarette harm reduction and less hazardous cigarettes.[3] However, the report did not endorse any specific class of products. Rather, the Institute of Medicine committee addressed the feasibility of tobacco harm reduction (i.e., minimizing harm and decreasing total morbidity and mortality without completely eliminating tobacco or nicotine exposure) and addressed questions raised by the Food and Drug Administration about individual exposure and disease risk and the public health implications of potential reduced-exposure products (PREPs) that have been marketed.[1] The committee specifically warned against the use of the term "safer cigarette" and instead recommended the use of "PREP" to cover both tobacco and pharmaceutical products that might be incorporated into a potential harm reduction strategy.

Tobacco harm reduction does *not* require that modified cigarettes or cigarette-like products be used instead of conventional cigarettes. The tobacco control community is skeptical about the role of combusted products in harm reduction, while acknowledging a role for medicinal nicotine as a PREP.[4–6] The cigarette industry has been misleading the public for decades[1,7] and will likely market PREPs that would expose users to far greater concentrations of carcinogens and other toxicants than would medicinal nicotine.[1,8] Low-nitrosamine smokeless tobacco, a PREP that is being debated to a considerable extent,[9] will likely expose consumers to more carcinogens and other toxicants than medicinal nicotine, but far fewer than conventional or modified cigarettes.[1,8] Currently, smokers are inadequately informed about the constituents and risks of various nicotine-delivery devices.[10]

The committee recommended that a strong research initiative, comprehensive public health surveillance system, and regulatory framework be instituted to minimize the possibility of untoward events (e.g., products that claim to reduce exposure but actually don't, products that may reduce exposure but don't reduce harm, reduced-exposure messages that are misinterpreted by consumers to indicate reduced harm, increased initiation and relapse, and decreased quitting). Since the use of PREPs poses greater health risks than no tobacco exposure, the public health community should continue to emphasize prevention (i.e., harm avoidance), cessation (i.e., harm minimization), and protection from environmental tobacco smoke as it considers the role of tobacco harm reduction. ■

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FAIRCHILD AND COLGROVE RESPOND

We appreciate the thoughtful comments and concerns of Giovino, who was intimately involved in the Institute of Medicine's (IOM's) assessment of the scientific basis for tobacco harm reduction. We did not state, nor did we intend to imply, that the IOM report was primarily about less hazardous cigarettes. Further, we took care to describe the report as "endorsing harm reduction only 'as a *component* of a comprehensive national tobacco control program that emphasizes abstinence-oriented prevention and treatment.' "

We recognize that the term "safer cigarette" is problematic. But our purpose in the article was to analyze the historical evolution of public health thinking about "safer" products. The belief that such products were possible was central to that history, as was the use of the term "safer cigarettes."

We believe that others who, like us, are interested in how broadly the public health community defines harm reduction in the coming years and what place tobacco products will occupy within that framework will appropriately read the IOM report as stating the need to face squarely the challenge of tobacco-based products. ■

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UPDATING DERRYBERRY'S PRIORITIES AND THE ROLE OF HEALTH EDUCATION

I suggest that the priority health issue articulated by Derryberry[1] in 1954 needs expansion in consideration of contemporary world affairs. Derryberry saw chronic diseases as "[t]he health problems of greatest significance today" and says that "[h]ealth education and health educators [should] be expected to contribute to the reduction of the negative impact of such major health problems."[1(p368)]

In this age of violence and weapons of mass destruction, the health field with special reference to health education and health promotion (HEHP) should also give priority to reducing the premature mortality, unnecessary morbidity, and suffering associated with forms of inflicted or "horrendous death."[2–4] The umbrella term "horrendous death" comprises 2 types of death, both caused by people and thus preventable. One type is characterized by the motivation to kill others and include deaths resulting from war, terrorism, homicide, genocide, intentional starvation, poverty, and environmental assaults. In the second type, the motivation to kill others is absent; examples are unintentional injuries, environmental degradation, smoking (arguably), and other drug use.

At least 4 forms of horrendous death make its prevention of the greatest importance: war and terrorism using weapons of mass destruction, with special reference to thermonuclear devices; environmental assault and degradation; mass hunger and starvation; and genocide. Appropriate tasks for HEHP would be to educate students and others on the threat and risk of horrendous death, predisposing factors, and root causes. These root causes include economic deprivation and exploitation, such as joblessness, poor education, lack of human rights (with special reference to women), population growth, sense of hopelessness, and, most important, poor communication between and understanding of different cultures, particularly with regard to language and religion—and the negative, deadly effects of corporatism and aspects of globalization. Advocacy, along with education, should be part of HEHP's responsibility.

The prevention of horrendous death is not a goal that is foreign to the American Public Health Association (APHA). APHA's recent leadership (e.g., Barry Levy, Victor Sidel, Quentin Young), sections and caucuses (e.g., the International Health Section, the Peace Caucus, and the Socialist Caucus), and APHA policy statements reflect this view.[5,6] To my knowledge, the HEHP professional organizations have shown little leadership in recognizing horrendous death as a health problem of concern. ■

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ERRATA

In: Barbeau EM, Krieger N, and Soobader M-J. Working class matters: socioeconomic disadvantage, race/ethnicity, gender, and smoking in NHIS 2000. *Am J Public Health.* 2004;94:269–278.

The category of "former smokers" as defined in the text did not properly match the data presented in the tables. On page 270 under the subhead Definitions, "former smokers" should have been defined as the proportion of the total population who were former smokers, not the proportion of ever smokers who were former smokers.

ERRATA

In: Nelson DE, Naimi TS, Brewer RD, Bolen J, Wells HE. Metropolitan-area estimates of binge drinking in the United States. *Am J Public Health.* 2004;94:663–671.

A table was printed with incorrect data. In **TABLE 1—Binge-Drinking Prevalence and 95% Confidence Intervals for US Metropolitan Areas, by Region: 1997 and 1999**, pages 664–666, the correct figures for Reno, Nevada, are:

Metropolitan Area and Region	n	Binge Drinking, % (95% CI)
Reno, NV	1531	20 (17.2, 22.8)

Note. CI = confidence interval.

(Continued)

ERRATA—*Continued*

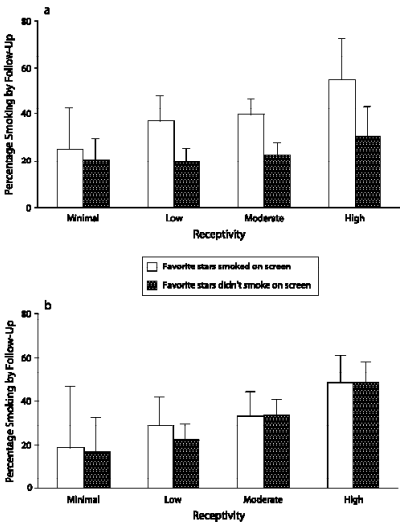
In: Bernier R, Midthun K. Getting the science right and doing the right science in vaccine safety. *Am J Public Health.* 2004;94:914–917.

An acknowledgment was printed that requires clarification. Permission for the published Acknowledgments was sought from each person acknowledged. In the case of Dr Robert Chen, the authors mistakenly thought permission had been granted when it had not. As was stated, the authors' intent was to thank Dr Chen for his helpful ideas and insights about the issues raised in the article, but not to imply his support for their point of view.

ERRATA—*Continued*

In: Distefan JM, Pierce JP, and Gilpin EA. Do favorite movie stars influence adolescent smoking initiation? *Am J Public Health.* 2004;94:1239–1244.

A figure was printed with a typographical error. In **FIGURE 1—Rates of smoking by the 1999 follow-up survey, by baseline (1996) receptivity to tobacco advertising and promotions and favorite stars' on-screen smoking status: California (a) adolescent female (n=1040) and (b) adolescent male (n=1044) never smokers**, page 1243, the key incorrectly repeated the white bar label for the black bar. The corrected figure appears below.



EDITOR'S CHOICE

Stalled on the Road to Reproductive Health

It is an unfortunate sign of the times that much of the current scholarly work in reproductive and sexual health is not about advancing understanding but about reacting to political and ideological challenges to the consensus forged at the 1994 International Conference on Population and Development held in Cairo. Over the past decade, governments, the organizations and agencies of the United Nations system, and nongovernmental organizations have adapted their discourse as well as their operations to more fully consider reproductive and sexual health and move beyond the confines of traditional family planning approaches. Not only has this brought new strength and resources to previously existing efforts, but projects now exist in all corners of the globe that demonstrate the value of this wider conceptualization.

Governments of the world reaffirmed a comprehensive approach to population and development at the 5-year review of the Cairo Program of Action held in 1999. Yet it was also clear that the Cairo agenda needed simplification and clarity, and more attention to how key actions and targets would be achieved in the short and long term. This year marks 10 years since the Cairo conference, and instead of building on the solid gains from the 1999 review, we find ourselves back to arguing for the very existence of many of the components understood through the Cairo consensus as key elements of reproductive health.

Take, for example, prevention and treatment of complications arising from pregnancy and childbirth, the leading causes of death and infirmity among women of reproductive age in resource-poor settings. The 1994 Cairo document recognized the provision of access to adequate health care information, counseling, and services as part of a government's responsibility for reproductive health. Yet in 2001, at the United Nations General Assembly Special Session on Children, access to this information was seriously challenged by a curious alliance: the United States, Sudan, Iran, and the Holy See. This challenge would vitiate the rights of adolescents to access appropriate and scientifically accurate reproductive and sexual health information and services, as had been agreed to in Cairo.

Then there are the United Nations Millennium Development Goals, arguably the development agenda for the coming decade if not the millennium, in which reproductive health is not explicitly mentioned even though at least 3 of the 8 goals—those dealing with maternal health, child health, and HIV/AIDS—can be understood to be directly linked to reproductive health concerns. What is at stake is not a matter of partisanship: commitment to ensuring access to information and services goes to the heart of a concern for reproductive health.

The majority of public health practitioners as well as the majority of countries in the world have reaffirmed the Cairo framework. The "Cairo plus 10" regional conferences in Latin American, the Caribbean, and the Asia/Pacific region have resulted in governments' reaffirming the Cairo principles and vowing to intensify their efforts toward implementation. This is reassuring but insufficient. Documenting and eventually improving the reproductive and sexual health needs of populations will require the sustained involvement of affected communities and the combined efforts of governments, intergovernmental and nongovernmental institutions, and the private sector. It is not enough only to organize to keep reproductive health alive. We have a responsibility to carry out the additional work of gathering and publishing the evidence needed to inform beliefs, policies, and practices. ■

Sofia Gruskin, JD, MIA
Associate Editor

EDITORIAL

Access Denied, Science Denied

It would be useful to be writing about ways to move forward creatively to tackle the daunting reproductive health problems that trouble the world. In the United States, these include rapidly rising rates of sexually transmitted HIV infection among young women and striking disparities between the many women experiencing unwanted pregnancies and those desperately pursuing quasi-experimental assisted reproductive technologies to achieve pregnancy. The developing world also confronts high rates of HIV and unwanted pregnancy, with the latter too often leading to deaths from illegal abortion. Lack of access to modern obstetric technology in parts of the developing world makes pregnancy a high-risk venture and contributes to maternal mortality rates at premodern levels. Yet here in the United States we are forced to keep our attention turned backward, to continue defending earlier advances from the unrelenting assault of the Bush administration on access to and correct information about abortion, contraception, and HIV prevention.

The articles in this issue of the Journal by Zavodny,[1] Ness et al.,[2] Kurth et al.,[3] Goldman et al.,[4] and Greene Foster et al.[5] underscore the need for vigilance and suggest some new angles of approach. Early in the American AIDS epidemic, condoms were identified as critically useful in preventing sexually transmitted infections. There were many creative efforts to promote their use by gay men and to persuade heterosexual couples that they were a necessary complement to nonbarrier contraceptive methods. Gratifyingly, these efforts showed success, and condom use rose in both groups.[6] However, such efforts were immediately challenged by those who asserted that such education served to promote promiscuity—despite numerous studies demonstrating that condom promotion did not encourage people to become sexually active but rather encouraged them to use condoms if they were already active.[7] The critics then turned to disparaging the efficacy of condoms and embarked on a series of misinformation campaigns claiming that condoms did not protect against sexually transmitted infections.[8,9]

It is in this context that the study by Ness et al. is so important. Ness and colleagues report on the relationship between condom use and pelvic inflammatory disease (PID)–related morbidity in a large multisite longitudinal study. The majority of women with PID were considered to be at high risk for adverse outcomes as they were young, poor, of minority status, and not well educated and, by definition, already had a sexually acquired infection. Use of condoms reduced risks for all the major sequelae of PID: recurrence, chronic pelvic pain, and infertility. Until we develop something new and easy to use that can simultaneously protect against pregnancy and infection, condoms remain a girl's best friend.

The efficacy and morality of other contraceptive methods have also been questioned. Recent efforts have been directed against requiring insurance companies to cover the cost of contraceptives and against ready access to emergency contraception over the counter and in emergency rooms for rape victims. Yet 2 studies reported in this issue demonstrate both the estimated public health impact of ready access and public appreciation of the import of contraception.

Greene Foster et al. used pharmacy and clinician claims and medical records to estimate contraceptive use and the number of pregnancies averted by California's Family PACT (Planning, Access, Care and Treatment) Program. They concluded that in the first year of this program, which was designed to provide family planning to low-income uninsured Californians, more than 100 000 unintended pregnancies were averted that would have resulted in 50 000 unintended births and 41 000 abortions. Kurth et al. surveyed a random sample of adults in the neighboring state of Washington and found that both men and women valued contraceptives highly and thought that insurance should cover them. In contrast to stereotypical predictions, both those past reproductive age and low-income men supported coverage of contraceptives.

The many-pronged attacks on abortion since its legalization in the United States 30 years ago have led to a grievously contracted provider pool, as institutional medicine has failed to embrace this service and abortion providers have endured marginalization, stigma, harassment, and murder. One response has been to widen the potential provider pool beyond obstetrician-gynecologists

and to enlist family practitioners and midlevel clinicians, such as advanced practice nurses, midwives, and physician assistants. Goldman et al. compared complication rates after surgical abortions performed by physician assistants with rates after abortions performed by physicians and found them to be similarly low. This study confirms previous work demonstrating the safety and efficacy of surgical abortion and offers reassurance that recruitment of midlevel clinicians as providers does not compromise this high level of performance.[10] Midlevel clinicians have been participating in provision of medical abortion since the Food and Drug Administration (FDA) approved the use of the medical abortifacient mifepristone in 2000.

The FDA's approval of mifepristone was unusually cumbersome, which makes prescribing it onerous even in comparison with known teratogens such as retinoic acid.[11] Nevertheless, mifepristone use has risen steadily in the United States. It is widely used throughout the world, with several million woman-years of experience in Europe and Asia.[12] While the advantage of medical abortion in the developing world is ease of administration in situations where technological resources are scarce, its significant advantage in the United States is the promise of privacy. Medical abortion can be provided by clinicians of varying backgrounds (as long as they undergo training and have obstetrical-gynecological backup) and within a regular office practice setting, as no equipment is necessary (although ultrasound is desirable). Therefore, potentially, an expanded pool of providers could integrate this service into the care they provide and patients could avoid the picketers and threats of violence currently obstructing their access to identifiable abortion clinics.

Access to the basic components of reproductive health care discussed in these articles—contraception, condoms for prevention of sexually transmitted infections as well as pregnancies, and legal abortion—remains limited and contested in many parts of the globe. In the United States, even as we move forward with medical abortion and emergency contraception and the widening of the provider pool, we spend too much of our time fighting rearguard actions, defending the basic premises of scientific inquiry and doctor–patient confidentiality.

Although the scientific advisory committee of the FDA overwhelmingly (23 to 4) supported changing emergency contraception from prescription-only to over-the-counter status, the commissioner has refused to do so.[13] Doctors are challenging the "partial birth abortion" ban, claiming that it is unconstitutional because it does not provide for exceptions for the woman's health and thus violates the framework established by *Roe v Wade,* which specifies the primacy of maternal health throughout pregnancy. The US attorney general, when preparing to defend the ban against this legal challenge, requested individual patient charts and demanded that the plaintiff physicians identify all those they had trained to perform this ill-defined procedure, as well as colleagues who perform it.[14] Thus in one move, the attorney general tried to turn doctors into informants against their colleagues as well as their patients and to violate the confidentiality guarantees governing medical care. Violations of these principles and of the scientific process have implications beyond the specifics of abortion and contraception that threaten the entire medical and public health enterprise.

The scientific evidence reported in these articles should lead us to refine treatments and policies so as to improve reproductive health. In reality, however, these data will contribute to improved health only if the public health community joins the effort to create a policy environment in which science and human need prevail over ideology. ■

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PIONEER

A Pioneer of Chemical Dependency Treatment

Dr Mondanaro Takes No Prisoners

| Eden E. Mondanaro

IN 1975, THE STATE OF California had few funds set aside to help drug-dependent women and their unborn children. Specialized services to treat perinatal and neonatal drug addiction were not available to most women. Aside from a few very dedicated volunteers, whose medical school colleagues gently but firmly warned them that working with individuals with drug addiction was tantamount to professional suicide, most physicians were not interested in treating what is now considered "chemical dependency." In fact, most doctors did not view addiction as a treatable disease.

Even fewer were knowledgeable about the effects that heroin, alcohol, and other substances were having on newborn babies, whose delicate systems were ill-equipped to deal with the effects of withdrawal. What became painfully clear to Dr Josette Mondanaro and her colleagues was that California, a state with considerable resources, was not dedicating any of those resources to developing effective chemical dependency treatment programs to help these babies and their mothers.

Over the past 3 decades, the problems of chemically dependent mothers and their children have been well documented. The relative costs of incarceration, prosecution, and law enforcement versus treatment are now well-known and may seem self-evident. However, in 1975 only those "in the trenches" saw what needed to be done. Society as a whole was still unwilling to take a close look at chemical dependency as a disease, rather than a moral deficiency. This generally

Dr Mondanaro with her adopted child.

scornful outlook was especially reserved for users of heroin and cocaine, resulting in many missed opportunities for treatment and prevention. The desire to better understand the science behind chemical dependency—that is, the chemical and behavioral roots of addiction—intersected with Dr Mondanaro's special passion, helping children who were too young to fend for themselves.

Prototypes is an organization that has developed some of the country's most successful treatment programs for women with substance abuse problems and their children. It has a training center in Pomona, Calif, named for Josette Mondanaro. Vivian Brown, PhD, who is the chief executive officer of Prototypes, began working with Dr Mondanaro in the late 1970s, as they both developed new models of treatment for women who were being kept out of traditional substance abuse treatment programs. In a recent interview, Dr Brown said, "We found that women who came into our treatment programs frequently had histories of physical and/or sexual abuse and often were in current battering relationships. We needed to develop programs where women and the children could be in a safe environment and be given enough time to recover.

"Dr Mondanaro was a powerful advocate for these women and children and an effective voice in the medical community for their special needs. She understood and made others aware of 3 critical points: that women should not be separated from their children in order to access treatment; that treatment needed to take these women's frequent victimization into account; and that their children were also vulnerable, not only because of the addiction but also because of the violence in their environment. As deputy director of California's Drug Abuse Treat-

"Although the true effect of her work is hard to quantify, tens of thousands of success stories are testimony to how the lives of many mothers, children, and now grandchildren have been quite literally saved over the years."

ment Department, Dr Mondanaro organized what would become a 20-year blueprint for treating and tackling this problem. The Northern and Southern California Alliances of Women's Treatment Programs was her brainchild. It gave birth to what are now hundreds of nonprofit treatment programs for women on the West Coast alone. These state and federally funded programs, which also received a healthy dose of generous private donations, are still functioning today."

Dr Mondanaro was an avid grant writer and would personally lobby her wealthier friends and political acquaintances to support her chemical dependency treatment programs for newborn and unborn babies.

Dr David Smith is now a White House panel advisor on science and medicine. As he explained at the 30th anniversary of the California Department of Alcohol and Drug Programs, "What we had then was a few free clinics run by Josette and myself on the Haight-Ashbury in the streets of San Francisco. Dr Mondanaro was a pioneer in the field, and she refused to take no for an answer. Back then, when you said you were going to treat heroin addicts your colleagues either urged you to take up a respectable urology practice or gazed at you sorrowfully. This is now mainstream stuff, and Josette was a big part of making that happen." Thirty years later, there is a large cadre of professionals who successfully treat substance abusers and their families. California recently passed Proposition 36, which authorizes voter-approved funding dedicated to channeling drug-related offenders into treatment facilities as opposed to prison.[1] The cost savings alone are staggering, and since most prison sentences in California are for drug- or alcohol-related offenses, the approach makes sense.[2]

It has often been said that "it takes as much to send a man to prison as it does to Stanford." Indeed, the facts bear this out: the average yearly cost per inmate in California is $30 929 and the annual tuition at Stanford is $25 917.[3,4] These numbers point out that an investment in treatment for women and their children makes good financial sense.

Dr Mondanaro's Career: Love Comes First

Josette Mondanaro attended Syracuse University in New York, receiving her undergraduate degree in 1967 and her medical degree in 1971. During her residency in New York, she worked a regular job in addition to performing (as many a practicing doctor can attest) the standard 80-hour-plus weekly regimen of the medical school resident. After moving to California, she faithfully served the State Department of Health and Human Services and then opened a small but thriving medical clinic dubbed Wingspread in Santa Cruz, Calif. The clinic had 10 beds and outpatient facilities to serve mostly low-income patients. Dr Mondanaro went into private practice and lectured at the University of California, Santa Cruz. Her obstetrics/gynecology classes were among the most sought-out on campus, and her students were known to appreciate her hallmark sense of humor and booming laugh. Many of her former students are practicing doctors today and remember her classes with fondness. She encouraged her students to challenge preconceived notions about both themselves and their patients. She was especially active in helping her female students navigate through what was at the time a profession dominated by men.

After leaving her teaching post to devote more time to teaching, research, and private practice, Dr Mondanaro lectured and treated patients from her home. She had just finished a series of training courses and "her book" (what she considered her seminal collection of strategies to treat and beat chemical addiction)[5] when she was diagnosed with a golf ball–sized brain tumor (astrocytoma) at the age of 41. The bundle of nerves that connects the 2 halves of the brain together was in grave jeopardy. After numerous surgeries, standard radiation treatment, many types of chemotherapy—some highly experimental—and a radioactive uranium implant, her ability to function as an effective physician was impaired. The effort to survive took all her strength over the next 16 years, but she never lost her compassion, her keen powers of observation, or her trademark sense of humor.

Epilogue

Dr Josette Mondanaro passed away Christmas Day, 2003, and, true to form, donated her body to science for medical students to learn from. Although the true effect of her work is hard to quantify, tens of thousands of success stories are testimony to how the lives of many mothers, children, and now grandchildren have been quite literally saved over the years. I am always honored and moved by the requests to appear and accept an award or dedication in her name. Total strangers, speaking in the most urgent tones, are constantly reminding me of the depth, courage, and love that this woman possessed. She was to me simply Mom, a single mother who, unbelievably, found the time, strength, and energy to raise me to the best of her abilities.

". . . For Those With No Voice of Their Own, She Will Be Sorely Missed," reads her epitaph. For in the final analysis, hers is a legacy of love, and her spirit will be alive for generations to come. ■

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Eden E. Mondanaro, a commercial art consultant based in Sacramento, Calif, is a founding member of the Spiritual Unity Conference. His upcoming compilation, The Art of Shaping the Mass Mind, *will be published by the Northern Empire Press in January 2005.*

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Tracking Gender-Based Human Rights Violations in Postwar Kosovo

Four years have passed since the institution of the cease-fire in Yugoslavia, and questions remain as to how Kosovar women are faring in the country's postwar reconstruction. Reports, albeit fragmented, suggest that violence against women began to increase in 1998 and 1999. This trend continued through 2001, even while rates of other major crimes decreased.

Despite considerable local efforts to address the conditions of women, there remains a lack of systematic data documenting the scope and frequency of violent acts committed against women. A centralized surveillance system focused on tracking human rights abuses needs to be established to address this critical need for empirically based reports and to ultimately guide reform efforts. (*Am J Public Health.* 2004;94:1304–1307)

Sapna Desai, MS, and Melissa J. Perry, ScD, MHS

IN 1999, THE NORTH AMERICAN Treaty Organization's bombing campaign in the Federal Republic of Yugoslavia brought Kosovo, a previously little known province, to world center stage. Amid reports of more than 800 000 refugees and more than 12 000 fatalities caused by the conflict, the international community learned of the plight of Kosovar women in particular.[1] While the bombing has stopped and the province is now working toward self-governance, questions have emerged in regard to how Kosovar women have recovered since the cease-fire 4 years ago and how they are faring in postwar reconstruction.

In the postconflict environment of continued interethnic tension and unstable economic conditions, women have emerged as particularly vulnerable to violence and other human rights violations. According to both women's rights organizations and an assessment conducted by the United Nations Development Fund for Women (UNIFEM), violence against women has increased since the end of the conflict. Furthermore, local police reports confirm that violence against women is on the rise and is at least as common as violence stemming from interethnic and political tensions.[2] Yet, international and local human rights data do not typically capture this trend.[3] Although political violence is methodically monitored, only anecdotal data are available to describe gender-based human rights violations. Despite considerable local efforts to address the issue, there remains a critical lack of systematic data documenting the scope and frequency of violent acts committed against women.

These systematic data are vital; from institution-building activities to training of health professionals, their absence may result in violence against women not being addressed in strategies and programming. Eliminating violence against women is critical to the growth of any society, whether it is rebuilding after conflict or at the height of development. However, in the absence of proper resource allocation or commitment, political declarations offer little potential for change.

The United Nations Interim Mission in Kosovo, more commonly known as UNMIK, functions as the main governing body in the region, with a joint interim administrative structure designed to incorporate local Kosovars into the transitional government.[4] In 2000, UNMIK established a policy advisory body, the Office of Gender Affairs (OGA), to address the needs of women. The OGA has declared violence against women as a key priority of its work.[5] As UNMIK builds efforts in this area, establishing sustainable, methodical data systems to track prevalence rates of gender-based violence emerges as a major challenge. It is in this context, as the postwar situation in Kosovo demonstrates, that public health and human rights professionals can develop concrete methods to monitor gender-based human rights violations and, ultimately, ensure that reform efforts are evidence based. Moreover, violence against women is a global phenomenon; the Kosovar experience can guide reconstruction efforts around the world.

VIOLENCE AGAINST WOMEN

The United Nations Declaration on the Elimination of Violence Against Women defines violence against women as "any act of gender-based violence that results in, or is likely to result in, physical, sexual or psychological harm or suffering to women."[6(p2)] A manifestation of gender inequality, gender-based violence encompasses a broad spectrum of acts, ranging from intimate partner abuse to trafficking of women with the intention of forced prostitution, directed at women solely because of their gender.[7] Violence against women is a pervasive public health problem, yet it is among the least recognized human rights violations. Largely as a result of lobbying efforts on the part of women's advocacy groups, eliminating gender-based violence has steadily emerged as a critical item on research, policy, and intervention agendas.

There are data, albeit piecemeal, suggesting that violence against women in Kosovo needs further attention. In UNIFEM's 2000 assessment of violence against the country's women, *No Safe Place*, the first study of its

kind conducted by an international organization in the region, researchers surveyed women representative of the demographic diversity in Kosovo, and results were adjusted for the population at risk.[8] The study revealed that almost 1 in 4 women (23%) reported experiencing domestic violence. Notably, 44% of women reported their first exposure to violence as occurring in 1998 or 1999, suggesting a temporal connection to the escalating conflict in Kosovo in 1998. In attempting to provide an understanding of the situation, UNIFEM consultant Rachel Wareham pointed out that in postwar periods, when societal structures are weakened and traditional systems altered—and women move into roles previously unoccupied—societies are likely to witness an increase in violence against women.[8]

In addition to domestic violence, Kosovar women may be experiencing increased levels of sexual assault: UNMIK police reports indicate that while serious crimes such as murder, abduction, and arson decreased during 2000 and 2001, sexual assault was the only major violation to exhibit an increase, from 115 to 133 reported cases.[3] Fear of stigmatization, compounded by a lack of support services, has been reported[8] as a major obstacle to disclosure; accordingly, these estimates probably underrepresent actual prevalence rates of sexual assault.

There is also considerable anecdotal evidence that trafficking in women for the purposes of forced prostitution is on the rise in Kosovo. Societal factors such as poverty, increased vulnerability of women, and gender discrimination—coupled with a huge influx of international aid workers—have contributed to creating a sustainable market for traffickers.[3] Reports of women forced or tricked into traveling to the region indicate that the area is primarily a destination point for women forced into prostitution, although there are also a few scattered reports of women being abducted out of the province.[9] Organizations addressing this issue report that a lack of systematic data collection, difficulty in investigation and enforcement, and limited social services available to victims of trafficking represent major obstacles to developing coordinated efforts.

ADDRESSING GENDER-BASED VIOLENCE

Although many urban women enjoy equality in education and professional life, the majority of Kosovar society is structured on a patriarchal, traditional system.[10] The extended family is the primary form of social support, and most women would not be inclined to threaten its cohesiveness by reporting violence. Male relatives are the primary protectors against violence; if this support does not exist, there is little expectation of intervention.[8] Moreover, male violence against women is generally unchallenged in Kosovar society, and victims who choose disclosure may be met with isolation or blame. Faced with a lack of economic opportunities outside of urban centers, female survivors of domestic violence may resist disclosure because, in many cases, they have little hope for an independent life apart from the family structure.

While a number of local and international organizations are working strenuously toward realizing women's equal societal status as well as safety, most women's organizations report that current efforts are far from adequate and that political will is considerably lacking. International observers have primarily acknowledged incidents that can be classified as war crimes. International recognition of gender-based violence in Kosovo has largely concerned incidents occurring during the conflict. Prominent local activists have outwardly voiced concerns that the OGA does not effectively incorporate the concerns of local women and may serve as more of an obstacle than a source of support.[11] Despite the lack of strong women's voices within current political structures, local and international women's activist groups and organizations are steadily gathering force to establish both a firm voice and a firm agenda in addressing gender-based violence.

In the postconflict climate, however, women's groups report feeling overwhelmed, and some do not feel qualified to provide specific services such as domestic violence counseling. The influx of foreign assistance has been critical in providing resources, but, according to some nongovernmental organizations (NGOs), it has resulted in underestimation or hindrance of local efforts. There is an impressive contingent of organizations working in the field of gender and women's rights, yet most appear to be involved in welfare rather than education or prevention.[8]

The legal system does contain fragmented codes that could be used to prosecute violence committed against women in the home, although marital rape is excluded. A uniform protocol for addressing domestic violence cases does not exist, but ongoing efforts on the part of local and international organizations to train police and attorneys represent a promising development. Despite the increasing number of reports of sexual violence outside the home, there is little evidence of coordinated efforts on the part of existing institutions and organizations to address or monitor prevalence rates.

Significant levels of resources have been allocated in the area of trafficking of women. In particular, the International Organization of Migration, along with the OGA and the Organization for Security and Cooperation in Europe, has instituted training and investigation programs. However, there is a considerable need for increased interagency coordination and response.[9]

THE NEED FOR SURVEILLANCE SYSTEMS

While the organizations just described undoubtedly are playing a critical role in addressing violence against women, the potential gains of their work will remain undocumented without adequate data. Currently, no tracking system exists to monitor progress in reducing gender-based human rights violations. Data sources are fragmented, and there is no formal mechanism available to coordinate data collection, analysis, or report distribution. Numerous local organizations have reported experiencing frustration with foreign NGOs and visitors who have repeatedly solicited preexisting public health and human service data with little attempt to follow up on or distribute the information collected.

Organizations that do collect data typically report raw numbers unadjusted for the popula-

tion at risk, increasing the perception that the data merely represent anecdotes with little proof to support them. Furthermore, data derived from police records, human rights organizations, and other civic groups have not been consolidated in a central database that can be shared and utilized by agencies in making priority assessments.

The Council for the Defense of Human Rights and Freedoms (CDHRF), a Kosovo NGO, and the Harvard School of Public Health are collaborating in an effort to establish a centralized system for collecting data on gender-based human rights violations. In a concentrated effort over the past year, CDHRF has been collecting anonymous incidence data on human rights abuses against women occurring during 2 target time periods: July 1999 through June 2001 and July 2001 through June 2003. As a result of the organization's long-term presence in human rights work, existing CDHRF networks have been included in data collection efforts. These networks include hundreds of medical, human service, and legal professionals, all of whom were working in Kosovo well before the ethnic strife in the province gained international attention.

In addition, CDHRF has established contact with the UNMIK administration and the many foreign NGOs that are relatively new to the province. In essence, any group or agency working toward women's rights and protection of women from violence is being asked to contribute to the data collection effort. Data on assorted human rights violations, including physical and sexual violence committed against any woman residing in the province, are being collected without personal identifiers via a standard 2-page data collection form used by all participating agencies. The 2 study periods (1999–2000 and 2001–2003) were targeted to allow retrospective and prospective comparisons, and population-at-risk estimates will be used for each period to compute incidence rates.

To the best of our knowledge, this is the first effort to establish a coordinated surveillance system designed to track gender-based human rights violations at the population level in Kosovo. We anticipate that this pilot effort will inevitably produce incomplete data, but its results will probably prove invaluable in terms of improving the system and planning a longer term effort. Critical to the longevity of this effort will be rapid distribution of the information collected, both to reinforce agencies' participation and to provide much needed (albeit incomplete) data to inform programmatic decisionmaking.

STRUCTURES AND ACTORS FOR EFFECTIVE MONITORING

Because the surveillance project just described originated from a research effort, it is all the more important that an infrastructure be established to maintain its continuity and longevity. To date, participation by existing agencies in recording and reporting the data has been solid, and at the moment it appears that these collaborations can be maintained over time. The critical elements that must be established are as follows: (1) linking the data-coordinating system to the efforts of the government authority to address gender-based violence and (2) identifying sustainable funding sources.

Given that the OGA has declared violence against women a priority area, and given that international human rights standards oblige governments to eliminate gender-based violence, there is a clear role for the Kosovo governmental authority in formally establishing and securing funding for the surveillance system. While establishing the data coordinating center outside the structure of the UNMIK may be preferable in terms of maintaining and further building collaborations at the community level, there will be a strong continued need for coordination and funding support from a central authority as well.

To ensure that future resources will be available to maintain the data collection system, the OGA might identify potential funding sources from varied donors such as multilateral and bilateral agencies and international NGOs and foundations. To determine where and how the data coordinating system will be permanently established, UNMIK also could distribute a "request for proposals" to all participating agencies. In this scenario, it would be important for both UNMIK and nongovernment professionals to be involved in reviewing the solicited proposals and making final decisions.

An additional responsibility of the OGA could be to ensure that the agency ultimately charged with coordinating the data center is responsible for maintaining the highest level of data security at all times, issuing regular reports to the other contributing data collection agencies, and making data available to outside agencies for programmatic purposes as needed. In regard to guaranteeing integration and maintenance of the centralized data-coordinating system over time, the involvement of the government authority will prove critical in further establishing these specific responsibilities, in accord with the authority's stated political commitment and obligation.

The strong presence in Kosovo of organizations working toward women's rights clearly demonstrates the potential to fill the obvious gaps in monitoring gender-based violations. Just as the international community systematically monitors cases of interethnic and political violence, current government structures must prioritize issues involving women and, accordingly, track and address violations of women's human rights. The development and administration of surveillance mechanisms has global ramifications as well. Reconstruction efforts throughout the world face similar challenges in developing interventions for violence against women and, in the absence of preestablished systems, probably lack the resources to initiate a data collection process.

Over time, the experience and monitoring mechanisms developed in Kosovo can serve as a basic model that can be adapted internationally. Professionals in the fields of human rights and public health can therefore productively work together to develop appropriate data collection systems in an effort to ensure that elimination of gender-based violence is accorded the global priority it deserves. ■

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A Cigarette Manufacturer and a Managed Care Company Collaborate to Censor Health Information Targeted at Employees

A review of internal tobacco company documents showed that the tobacco company Philip Morris and the insurance company CIGNA collaborated to censor accurate information on the harm of smoking and on environmental tobacco smoke exposure from CIGNA health newsletters sent to employees of Philip Morris and its affiliates. From 1996 to 1998, 5 of the 8 CIGNA newsletters discussed in the internal tobacco documents were censored.

We recommend that accrediting bodies mandate that health plans not censor employee-directed health information at the request of employers. (*Am J Public Health.* 2004;94:1307–1311)

Monique E. Muggli, MPH, and Richard D. Hurt, MD

AS A LEADING CAUSE OF numerous cancers and cardiovascular diseases, cigarette smoking kills more than 400 000 Americans each year.[1] Exposure to environmental tobacco smoke is estimated to cause 3700 lung cancer deaths and more than 50 000 deaths from heart disease in adults each year in the United States.[2] Environmental tobacco smoke is also causally associated with low birthweight and sudden infant death syndrome among infants and with acute lower respiratory infections, asthma attacks, and middle ear infections among children.[3]

In this article, we report an unusual agreement between the nation's largest cigarette manufacturer, Philip Morris, and the nation's third largest publicly traded managed care organization, CIGNA. Philip Morris benefits managers and CIGNA employees collaborated to censor accurate information about the harm of smoking and environmental tobacco smoke exposure from CIGNA newsletters sent to employees of the tobacco company and its affiliates.

REVIEW OF DOCUMENTS

In 1998, litigation brought by the Minnesota attorney general and BlueCross BlueShield of Minnesota against the tobacco industry ended in a settlement after a 4-month trial. The Minnesota settlement required that the tobacco companies make their millions of pages of previously unreleased documents publicly accessible in document depositories located in Minneapolis, Minn, and Guildford, England. The defendants also were ordered to deliver to the Minnesota Tobacco Document Depository hard copies of all documents produced in any subsequent smoking and health litigation in the United States.

We reviewed a subset of the documents produced from the litigation involved with *Blue Cross and Blue Shield of New Jersey et al. v Philip Morris et al.* located at the Minnesota Tobacco Document Depository in Box 20368 of the Philip Morris collection. After the initial discovery of documents detailing the arrangement between Philip Morris and CIGNA, we searched for additional documents at the indus-

try's document Web site, the Tobacco Archives (http://www.tobaccoarchives.com). We searched the files of a Philip Morris benefits manager, Lisa Halle, relating to CIGNA using the search strings "Area: Halle, L" and "Fname: CIGNA." This search generated 176 documents. "Area" referred to the source of the document at the time of its collection, and "Fname" was the file name from which the document originated.

In addition, we requested copies of the quarterly *Well-Being* newsletters distributed to Philip Morris employees from 1996 to 1998 that were not included in the files of the Minnesota Tobacco Document Depository. The CIGNA Healthcare Office informed us that the newsletters were "not available."

OVERVIEW OF THE ARRANGEMENT BETWEEN PHILIP MORRIS AND CIGNA

The documents we reviewed revealed that, from 1996 to 1998, CIGNA and Philip Morris worked together to censor information on smoking and health that was to be published in CIGNA's quarterly health newsletter *Well-Being*, sent to thousands of employees of Philip Morris USA and its affiliated companies, Miller Brewing Companies and Kraft General Foods. The arrangement between Philip Morris and CIGNA involved the active participation of employees from both the tobacco company and the health insurer.

Initially, employees of the Philip Morris Benefits Department reviewed editions of the newsletter in search of "objectionable" material.[4] If a problem was discovered, CIGNA gave Philip Morris 2 options: the tobacco company could either block the *Well-Being* issue from reaching its employees or could replace the article with alternate content.[4] "Local" articles (i.e., those targeted to specific geographic regions) that were found "offensive" would be replaced at no charge.[4] If problems were found in a "national" article (i.e., an article circulated to all regions of the United States), Philip Morris was required to pay CIGNA an extra $3000 to replace the article.[4] A Philip Morris Benefits Department employee described the editing process as follows:

> The process of reviewing articles and making a recommendation to send or skip a [*sic*] issue varies, depending on content. Typically, it is immediately clear if something is objectionable. Other times, it may require discussion with others and management. . . . Some smoking references may be minor and not blatantly offensive.[4]

CIGNA employees responsible for *Well-Being* assisted Philip Morris's censoring arrangement by highlighting articles or material contained within articles that they thought the tobacco company might find objectionable. For example, regarding an article titled "Breathe Easier: Four Ways to Help Your Child Manage Asthma," a CIGNA employee wrote to a Philip Morris employee: "Please take a look at page 7, the asthma piece. It mentions cigarette smoking as a possible trigger for an attack, I thought I should bring that to your attention."[5]

Similarly, another CIGNA employee wrote to the Philip Morris Benefits Department, "One article I want to bring your attention to is the national piece on high blood pressure. It advises those who have high blood pressure to quit. Other than that, I think everything should be appropriate for the Philip Morris employees."[6]

MATERIAL CENSORED

Five of the 8 CIGNA newsletters discussed in the internal tobacco documents published between 1996 and 1998[4,7,8] were censored by Philip Morris. For example, in 1996 the spring issue of *Well-Being* was sent to employees only after CIGNA had deleted an advertisement for a free Time-Life Video series. The 30 videos, developed and narrated by former US Surgeon General C. Everett Koop, addressed several health issues including asthma in children, breast cancer, high blood pressure, stroke, osteoporosis, skin cancer, and prostate cancer.[4] The members of the Philip Morris benefits team internally discussed their reservations in regard to making the tapes available to employees, citing C. Everett Koop as "an obvious concern."[9] One employee stated, "The sensitivity to this decision [of including the Time-Life videos in the newsletter] is Time-Life's selection of a spokesperson, Dr. C. Everett Koop. Because of Dr. Koop's stance against smoking, there is some reservation about the content with the videos."[10]

Philip Morris and CIGNA agreed that the Philip Morris Benefits Department would review the 30 videotapes and screen them for "sensitive/offensive" material.[10] If no such references existed, they would consider making the nonoffensive tapes available to employees in some way other than in the newsletters.[10] The subsequent *Well-Being* issue (summer 1996) was not sent to Philip Morris employees because "several articles contained anti-smoking references," and Philip Morris did not want its employees to see the Time-Life Video advertisement.[4] The documents we reviewed showed that the Time-Life videos were eventually offered in the fall 1996 newsletter, without complaints from employees.[11]

The director of employee benefits at Philip Morris, John Gavin, decided not to release the winter 1996 issue of *Well-Being* because the tobacco company did not want to pay $3000 to replace the article "A Breath of Fresh Air," which contained "objectionable content."[12] He wrote:

> It contains some objectionable content referencing smoking. Specifically, the article lists "cigarette smoking" as one of the irritants in the environment which can trigger an asthma attack. The article goes on to say "Do not allow smoking in your home or in any other environment that you can control." It will cost $3000 to replace this national article with a satisfactory alternative. It is my recommendation we forego the winter edition due to content, as I do not think the cost justifies this mailing.[12]

In 1997, the summer issue was not published because one of the national articles scheduled to be included contained "an objectionable reference to secondhand smoke."[13]

Two issues were censored in 1998 before being sent out to plan participants. Philip Morris benefits manager Halle told CIGNA to "delete reference to smoking in 3rd paragraph" in the article titled "Help Yourself to a Healthy Life" that appeared in the fall 1998 issue.[14]

In addition, in a spring 1998 article titled "Coping With Your Child's Ear Infection," Halle again asked CIGNA to edit, at no cost, a reference to environmental tobacco smoke: "[R]emove the

words 'and those who are exposed to secondhand smoke.' You had already pointed out that language. Removing this reference does not alter the integrity of the article and I'd feel better if this piece were removed."[15] The article, in the form seen by Philip Morris employees, noted 3 practices that may prevent middle ear infections: (1) teaching the child to blow his or her nose, (2) encouraging the child to sleep with a pillow, and (3) teaching the child good hand washing practices.[16] Advice to limit exposure to environmental tobacco smoke did not appear in the newsletter.

THE AGREEMENT'S END

The documents we reviewed showed that in the spring of 1999, Philip Morris, Kraft, and Miller decided to no longer send edited versions of the health newsletters to employees.[17] A Philip Morris benefits employee stated, "We really cannot censor anymore anyway, per the AG [attorney general] agreement."[18] Signed in November 1998, the Master Settlement Agreement between members of the tobacco industry and 46 US attorneys general prohibits suppression of information pertaining to the health hazards and consequences of tobacco use.[19]

SIGNIFICANCE OF FINDINGS

As we have reported, Philip Morris colluded with CIGNA over a period of at least 3 years to withhold accurate information about the health hazards of smoking and environmental tobacco smoke exposure from its employees. The number of people affected is potentially very large. Philip Morris USA employs approximately 9100 people,[20] while Miller and Kraft employ 8000 and 117 000, respectively.[21,22] Information is not available on numbers of dependents of direct employees or how many of these individuals were covered by CIGNA as opposed to another insurer.

Although this article reports in-depth document research on this issue, some of the details of the scheme were first reported in the *Minneapolis Star Tribune* in February 2000.[23] At that time, a Philip Morris spokeswoman explained that the company simply did not want to disseminate information that was "offensive or annoying to our employees."[23] New documents delivered to the Minnesota depository in 2003 detailed internal communications regarding contact made by the *Star Tribune* reporter. The documents show that the Philip Morris spokeswoman made the following statement:

> I said this decision [to censor the health newsletters] reflected both HR [human resources] and senior management's desire to be responsive to employee concerns over the prevalence of anti-tobacco sentiment. I also said that the health risks of smoking are very well-known and we believe that people should be educated on this topic, and, in fact, we dedicated significant space on our web site to the health risks of smoking.[24]

That the company would claim to advocate for public education on the health effects of smoking and yet withhold such information from its own employees is consistent with the corporate culture at Philip Morris. We suspect that, contrary to former Philip Morris CEO Geoffrey Bible's public statement—"First and foremost, the company wants the truth told"[25]—the real reason for the arrangement described here involved the fact that this truthful information was actually "offensive and annoying" in regard to Philip Morris's public relations strategy. Philip Morris USA believes in "operating with integrity, trust, and respect, both as individuals and as a company."[26] These values are impossible to reconcile with the unusual arrangement outlined here.

It may surprise few people in the public health community that a transnational tobacco company took steps to suppress information on the health consequences of smoking and environmental tobacco smoke exposure, but most would be surprised that a health care organization would cooperate in such an arrangement. Aside from the unethical, yet predictable, nature of such an endeavor, Philip Morris's actions also may be viewed as illegal according to the Employee Retirement Income Security Act of 1974, a federal law that protects individual health plan participants by setting minimum standards for a wide range of private-sector health plans (e.g., pension plans, health benefit plans). As a provider of health benefits, the company acts in a fiduciary capacity in regard to its employees. Philip Morris's censorship of important and accurate health information violates those duties. According to Employee Retirement Income Security Act of 1974 guidelines, fiduciaries must "avoid conflicts of interest," and "they may not engage in transactions on behalf of the plan that benefit parties related to the plan, such as other fiduciaries, services providers, or the plan sponsor."[27]

That a health insurer would collaborate with a tobacco company in suppressing important and accurate health advice from its beneficiaries is more surprising. CIGNA currently manages health plans that cover 14 million Americans, and it contracts with 3600 hospitals and 288 000 physicians.[28] CIGNA's agreement with Philip Morris not only violated the ethical obligation of a health care insurer to provide truthful information to patients but also undermined even the minimal assurances given to Philip Morris employees about the nature of their CIGNA plan. The director of employee benefits at Philip Morris wrote to workers that the company contracts with managed care plans that have an "emphasis on preventive care."[29] The reported censorship of *Well-Being* articles on the importance of quitting smoking for preventive health care or the hazards of environmental tobacco smoke exposure clearly undermines this principle.

CIGNA'S PARTICIPATION

There are several possibilities that could explain CIGNA's active role in this scheme. First, the entire agreement might have been an unfortunate error in judgment by a few employees. If this were true, then CIGNA would have distanced itself quickly from the agreement with Philip Morris and perhaps disciplined the employees involved. This apparently did not happen. When the joint censorship of the health newsletters with the tobacco company was reported in the press, CIGNA defended the arrangement. A spokesman said, "We work with our customers to try and help them meet their business needs."[23] Surely CIGNA leadership must have realized that such censorship, if made

public, would erode employee and public trust, yet the altering of newsletters continued until Philip Morris ended the practice.

A second possibility is that CIGNA's participation in the censorship was a means to provide service to its corporate client Philip Morris. An employer-based health care system creates an incentive for insurers to cater to employers more than to individual patients. The reason is simple: a dissatisfied employer can cost an insurer millions of dollars in revenue by choosing to contract with a different company, whereas a worker may have no such option. Approximately 2 in 5 workers who receive health benefits are not given a choice of insurer by their employer.[30] Yet, despite these incentives, it is difficult to imagine that many health plans would withhold information about the harm of smoking or environmental tobacco smoke at the request of a leading tobacco company.[31]

A third and related possibility is that, to maximize profits, CIGNA was willing to overlook this censorship of health information. CIGNA, whose corporate motto is "A Business of Caring," is an investor-owned health plan that does not have the same statutory obligations to act in the public interest as a not-for-profit plan. In fact, CIGNA profits when Philip Morris profits. According to published reports, the insurer owned at least $57 million in Philip Morris stock in 1995[32] and $38.6 million in 1999.[31] Some studies have shown that for-profit hospitals, health plans, nursing homes, and dialysis facilities provide lower quality care than not-for-profit plans.[33–36] CIGNA's actions in this case may provide an example of how a profit-seeking business culture might respond to profits rather than quality of care.

These hypotheses, as well as other alternative explanations, cannot be proven without additional information. We urge CIGNA to release all of its records regarding this censorship of health information.

CONCLUSION

Without accessibility to Philip Morris's internal documents, the public may never have learned of the deal between Philip Morris and CIGNA. However, there are several limitations inherent to articles based on these documents.[37–39] For example, in this report, based on a small subset of the 50 million or so documents currently available, we concentrated on files related to CIGNA, and we did not uncover any documents that contradicted our findings. When queried by the media, neither company publicly denied the arrangement.

The irony of the agreement between Philip Morris and CIGNA is that it was called off by the tobacco company, not by the health insurer. While this arrangement no longer exists, the potential for similar arrangements involving other industries is a matter of concern. Have paint manufacturers asked for censorship on the hazards of lead paint? Have gun makers asked that their employees not read about statistics on gun-related violence? Further research in this area might be illuminating.

At a minimum, we believe that national accrediting bodies such as the National Committee on Quality Assurance should mandate that health plans not censor employee-directed health information at the request of employers. This simple step, if enforced, should help US workers breathe a little easier. ■

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M.E. Muggli initiated the article's concept, conducted document research at the Minnesota depository, conducted a literature review, and contributed to subsequent revisions. R.D. Hurt contributed to revisions of the article.

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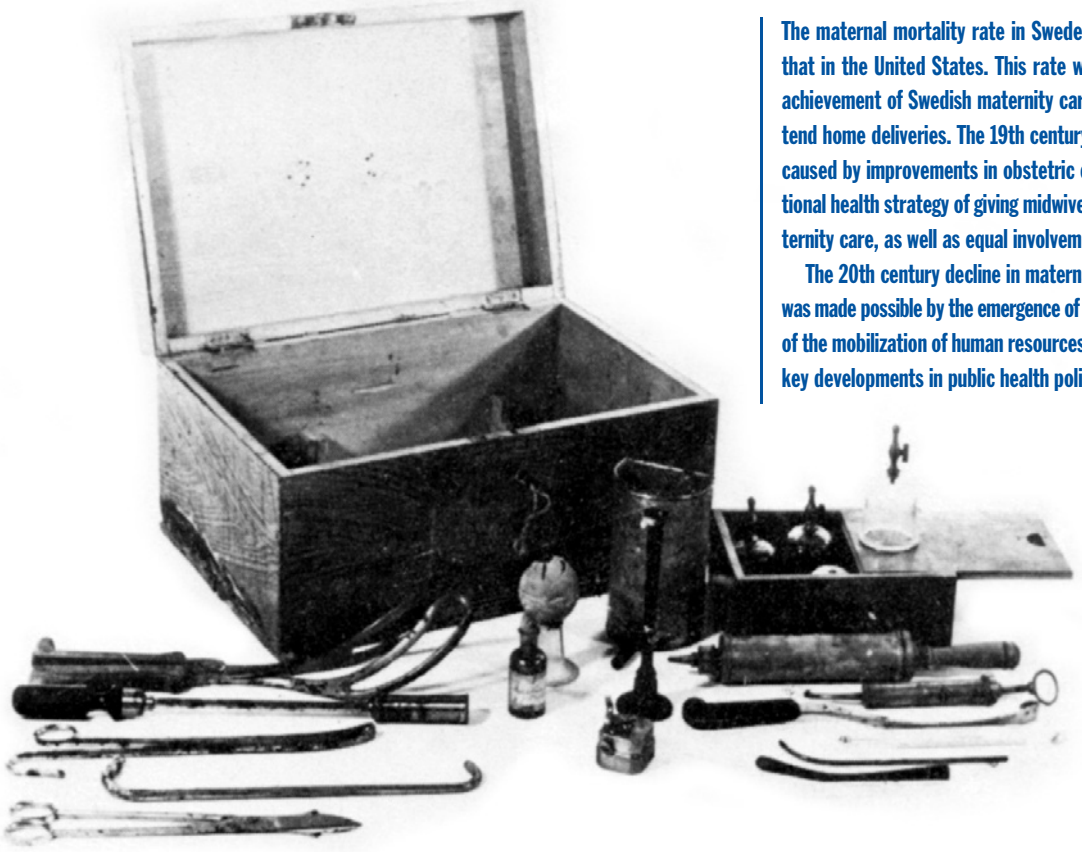
The Decline in Maternal Mortality in Sweden: The Role of Community Midwifery



The maternal mortality rate in Sweden in the early 20th century was one third that in the United States. This rate was recognized by American visitors as an achievement of Swedish maternity care, in which highly competent midwives attend home deliveries. The 19th century decline in maternal mortality was largely caused by improvements in obstetric care, but was also helped along by the national health strategy of giving midwives and doctors complementary roles in maternity care, as well as equal involvement in setting public health policy.

The 20th century decline in maternal mortality, seen in all Western countries, was made possible by the emergence of modern medicine. However, the contribution of the mobilization of human resources should not be underestimated, nor should key developments in public health policy.

| Ulf Högberg, MD, PhD

The equipment of a home-delivering midwife in early-20th-century Sweden.
***Source*: Jamtli Museum, Sweden**

THE DECLINE OF MATERNAL mortality in Western countries after the 1930s is believed to be associated mainly with the emergence of modern obstetric care, while it has been proposed that public health policy, poverty, and the malnutrition associated with poverty were of relatively minor importance.[1] But the maternal mortality pattern before the emergence of modern medical technology was not uniform in all Western countries. In The Netherlands, Norway, and Sweden, low maternal mortality rates were reported by the early 20th century and were believed to be a result of an extensive collaboration between physicians and highly competent, locally available midwives.[2] From 1900 through 1904, Sweden had an annual maternal mortality of 230 per 100 000 live births, while the rate for England and Wales was 440 per 100 000. For the year 1900, the United States reported 520 to 850 maternal deaths per 100 000 live births.[3] This very high maternal mortality rate, especially if compared with the lower rates achieved in several less prosperous European countries, caused some

American obstetricians to express concern.

Joseph B. DeLee, commemorated as a titan of 20th-century obstetrics, studied maternity services in Europe before he established the Chicago Lying-In Hospital and Dispensary in 1895. His aim was to provide delivery assistance to poor women by also offering them the option of having a safe and inexpensive home delivery.[4]

George W. Kosmak[5] visited Scandinavia in 1926 and was reported to have been very impressed with the medical systems in place there. In an address to the American Medical Association, Kosmak talked about the good results obtained in a carefully supervised system of midwife instruction and practice. He stated,

> To begin with, the midwife in Scandinavia is not regarded as pariah. . . . One sees, therefore, in the training schools for midwives, bright, healthy looking, intelligent young women of the type from whom our best class of trained nurses would be recruited in this country, who are proud of being associated with an important community work, and whose profession is recognized by medical men as an important factor in the art of obstetrics, with which they have no quarrel.

He concluded, "The results of this midwife training are evidently excellent because the mortality rates of these countries are remarkably low and likewise, the morbidity following childbirth."[5]

What, then, was the history of this system that turned out to be a good example for the United States before the emergence of modern medicine in the 1930s? The aim of this review is to depict the Swedish intervention against maternal mortality in the 18th and 19th centuries and the decline in maternal mortality in the Western countries in the 20th century.

HISTORICAL SETTING: SWEDEN

The history of maternity care in Sweden should be interpreted in light of the involvement of the state in public health. One important part of the emergence of the Swedish national state in the 16th century was the creation of the Lutheran State Church. In the 17th century, the Swedish clergy created an information system that included all individuals in their parishes older than 6 to 7 years. By the middle of the 18th century, this registration included the entire population. The information system was based on the annual catechetical examination of every household, where the clergy examined knowledge of the catechism as well as the reading ability of all household members. To this "church book," other types of records were linked: records of in- and outmigrations, births and baptisms, bans and marriages, and deaths and burials. The Office of the Registrar General (*Tabellverkskommissionen*), founded in 1749, compiled national statistics from the ecclesiastical registry. National vital statistics were therefore available in Sweden before they were available in any other European country.

The profession of physician was legalized in 1663 with the foundation of the Collegium Medicum. In the 17th and 18th centuries, many Swedish academics obtained their postdoctoral training from universities in Germany, France, Italy, England, and The Netherlands. By the beginning of the 18th century, Sweden had declined as a major power in northern Europe. Inside Sweden, the power of the Swedish parliament was enhanced; a so-called "Time of Freedom" was introduced that coincided with the Age of Enlightenment. There began an era of scientific blossoming. The two professors of medicine at Uppsala University, Carl von Linné (1707–1778) and Nils Rosén von Rosenstein (1706–1773), and the head of the Collegium Medicum, Abraham Bäck (1713–1795), were the initiators and promoters of health care and public health within the Commission of Health (*Sundhetskommissionen*) from 1737 to 1766. They presented programs for primary health care and preventive measures for communicable diseases and published pamphlets on health education, nutrition, and hygiene. From the start, the public health program had an equity perspective by reaching out to the poor rural population and making health care accessible to them. The policy fit in with the prevailing political ideology of the time, mercantilism, which de-

"In the Netherlands, Norway, and Sweden, low maternal mortality rates were reported by the early 20th century and were believed to be a result of an extensive collaboration between physicians and highly competent, locally available midwives."

> *"In 1711, the Collegium Medicum announced a decree of authorization for midwives that required a 2-year training period with an experienced midwife, followed by an examination given by the Collegium Medicum."*

fined the wealth of the nation by the number of its citizens.[6] The military need of the nation has also been proposed as an argument for investment in mothers' and children's health.[7]

The first national statistics on maternal mortality were presented in 1751, revealing a rate of almost 900 maternal deaths per 100 000 live births. In the same year, the Commission of Health stated, "Out of 651 women dying in childbirth, at least 400 could have been saved if only there had been enough midwives." This became the starting point for the Swedish authorities to campaign for improvements in obstetric care, mainly by improving training for physicians and midwives and implementing a system of surveillance of midwives, both at the county and national level. What they did not know at the time was that it would take 150 years to achieve their goal.[6]

LICENSED MIDWIVES

The professionalization of birth assistance in Sweden began in the early 18th century. Pioneering this was Johan von Hoorn (1662–1724), who trained in obstetrics at the Hotel Dieu Hospital in Paris before returning to Sweden. In 1697, von Hoorn published a textbook titled *The Well-Trained Swedish Midwife (Den Swenska wäl-öfwade Jord-Gumman)* intended for use by both midwives and the public. In 1711, the Collegium Medicum announced a decree of authorization for midwives that required a 2-year training period with an experienced midwife, followed by an examination given by the Collegium Medicum. In 1715, von Hoorn published a textbook for midwifery training with Soranus, the famous Roman gynecologist (50–129 AD), as a source of inspiration; in it, he stressed the importance of surveillance of the delivery by internal examination—that is, the noninterventionist approach emphasizing patience and waiting. He also described the mouth-to-mouth resuscitation method for reviving an apparently dead newborn. Soon the need for licensed midwives became apparent and the Collegium Medicum urged Sweden's parliament to push for a national midwifery school. However, it was not until the end of the century that such a school was started.

In 1757, the Collegium Medicum's proposal for a national training program for midwives covering all parishes was finally approved. Each parish was expected to pay for its students' allowance in Stockholm. The first professor in obstetrics was appointed in 1761, and the first lying-in hospital, Allmänna Barnbördshuset in Stockholm, was founded in 1775.

The founding of Stockholm's Karolinska Institute in 1810 led to a further improvement of obstetric care at a national level. A new government decree stated in 1819 that every parish was required to employ a licensed midwife, and that the parishes were also responsible for variola (smallpox) vaccinations. The midwife's formal education was extended to 6 months, and the government paid allowances for 12 students each year. This meant that instead of limiting the training program to the women sent by the parishes, the profession was opened up to all interested women.

The professor of obstetrics at the time, Pehr Gustaf Cederschiöld (1782–1848), pushed hard to increase the competence of midwives. By 1829, health reform brought new regulations authorizing midwives, after an extended training period, to use forceps, sharp hooks, and perforators, in addition to their ability to perform manual removal of the placenta and extraction in breech presentation. This reform was opposed by contemporary international medical societies[7] but was motivated by the long tradition of community midwives who assisted at home deliveries. The widely scattered rural Swedish population made it a necessity for midwives to be capable of acting in emergencies when physicians could not be reached. Cederschiöld argued that the reform would strengthen the authority and acceptance of the midwife in the parishes.[8] Cederschiöld then wrote the textbooks *Manual for Midwives (Handbok för Barnmorskor)* and *Guide to Instrumental Obstetrics (Utkast till Handbok i den Instrumentala Förlossningskonsten)* in support of his ambition to increase the competence of midwives.

By the government decree of 1819, midwives were required to ensure that every newborn child had his or her own bed to prevent suffocation, although little observance of this rule was reported.[9] In the mid-19th century,

the authorities added more regulations for midwives. It was decided that their duties should not be limited only to childbirth, but should also include subsequent care of the infant. Consequently, education in basic neonatal care at the midwifery school was improved, with an emphasis on warmth, neonatal resuscitation with tactile stimuli for asphyctic children, daily care of the umbilicus, and early breastfeeding. Many mothers fed their newborns cows' milk, and doctors and midwives began informing young mothers and mothers-to-be about the benefits of breastfeeding. This strategy soon had the desired effect, and infant mortality was reduced by 20%.[10]

The antiseptic technique was introduced in the lying-in hospitals during the late 1870s and, by law, to midwives in rural districts in 1881. Also, the Credé prophylaxis to prevent neonatal blennorrhea became one of the midwife's duties.

COMPLEMENTARY ROLES OF MIDWIVES AND DOCTORS

The professionalization of birth attendance was not a smooth process. Historian Christina Romlid describes the antagonism, struggles, and conflicts that arose between the medical profession and traditional birth attendants until the late 19th century.[8] In the Swedish parliament, the peasantry protested against the midwife regulation of 1777. This rule contained a "quackery paragraph" that banned traditional birth attendants, whom the peasants viewed as experienced and skilled, not as dangerous and harmful as stated in the regulation. Subsequently, the Crown withdrew the paragraph and reinstated the right of district medical officers and licensed midwives to train women locally. The paragraph was reinstated in 1819 in a milder form, allowing traditional birth attendants when a licensed midwife could not attend or arrive in time. However, during the 19th century, several traditional birth attendants were prosecuted and found guilty of unauthorized help during childbirth.[8] Not until the late 19th century did professional midwifery become fully established and legitimized in the rural areas of Sweden.

Whereas during the 18th century midwives were recruited from among farming families, by the 19th century the profession of midwife had become a legitimate occupation for women from all walks of life, and it carried as much weight and respect as that of primary school teacher.[11] Consequently, the community midwife became a central figure and was often the only person representing health care at the parish level. Over time, any technical constraints were overcome and there was good social representation among midwives, thus ensuring a successful implementation of obstetric services within the specific cultural context of rural Sweden.

The professionalization of birth assistance can be interpreted from a gender theory perspective as a successive subordination of women consequent to the appearance of male obstetricians. Birthing is a natural event, yet female traditional birth attendants were pushed aside with the medicalization of childbirth. The American and British experience of conflicts between doctors and midwives is a recurrent theme, and Swedish historians have reported parallels in Sweden, although more in Stockholm than in the rural areas.[8,12] However, studies addressing the professionalization of Swedish midwives in relation to the theories of sociology, modernity, gender, and the evolution toward scientifically based obstetric care have found few conflicts between doctors and midwives.[11] There was a gender division in the professionalization process; however, since doctors and midwives were disseminators of the same discourse and worked toward the same goal, they complemented rather than competed against each other, unlike in the US urban setting.[11]

> *"Community midwifery was based on a system of close supervision and retraining. In each county, each midwife was required to report to the county general practitioner."*

These complementary roles were facilitated by the conditions of health care in Sweden. As recently as the late 19th century, only 10% of the Swedish population lived in urban areas. Obstetricians were in office only in the lying-in hospitals of Stockholm and, from 1865, also in Gothenburg and Lund. Otherwise, general practitioners in the counties and towns were the medical counterparts of the midwives assisting at home deliveries. In practice, no system of referral was available in the 19th century. In medical emergencies, the midwife called for the doctor, but this rarely happened. This setting

facilitated a more noninterventionist attitude, manifesting fairly low rates of assisted delivery throughout Swedish history and strengthening the midwife in her role as the indisputable birth attendant, in contrast to the more doctor-oriented obstetrics emerging in the United States by the 20th century.[11]

The Swedish model of maternity services was distinct even from the European perspective. In 1870, the ratio was 3.1 midwives for every doctor for Sweden, while it was 1.4 in Denmark and Norway[7] and 1.2 in France.[13]

Community midwifery was based on a system of very close supervision and retraining. In each county, each midwife was required to report to the county general practitioner. Her report had to be detailed and include the actual record, in diary form, of all deliveries she had attended, with information on the identity of the parturient, complications, the sex of the child, birthweight, and outcome for the mother and child. Also, review courses for midwives were obligatory on a regular basis. A standardized protocol was necessary when midwives used forceps, sharp hooks, or perforators, giving the reasons for the intervention and the outcome. This protocol had to be signed by the county physician and was registered at the National Health Bureau.

MATERNAL MORTALITY IN THE 17TH TO 19TH CENTURIES

In the 17th century, maternal deaths accounted for 10% of all female deaths between the ages of 15 and 49 years.[14] In women aged between 20 and 34 years, 40% to 45% of deaths among married women were caused by complications of pregnancy or delivery. Among married women, 1 of 14 died during childbirth.[15]

Maternal mortality declined from 900 per 100 000 live births to 230 per 100 000 from 1751 to 1900. The general trend toward a decline was interrupted during the years 1850 to 1880, when the recorded septic maternal mortality coincided with an increase in total mortality due to communicable diseases. During the 19th century, areas of high maternal mortality were not restricted to the urban environments, where there was a known high death rate due to puerperal sepsis.[14]

During the 19th century, the decline in maternal mortality was far greater than that in infant mortality, or in mortality due to tuberculosis. The decline in maternal mortality was especially pronounced between 1861 and 1900, when the percent reduction dropped from 59% to 24%, while the female mortality reduction leveled out.[16]

In the 19th century, two thirds of maternal deaths had direct obstetrical causes, such as difficult labor, eclampsia, hemorrhage, and sepsis, while one third were indirect obstetric deaths due to diseases such as pneumonia, tuberculosis, dysentery, heart disease, and malnutrition.[15,17] In the lying-in hospitals, before antiseptic techniques became known most maternal deaths were caused by puerperal sepsis.[18] However, the epidemics of puerperal sepsis in the lying-in hospitals did not dramatically alter the national maternal mortality rates. Between 1775 and 1900, a total of 1720 parturients were recorded to have died from puerperal sepsis in the lying-in hospitals, which represents 2.2% of all maternal deaths during the period. It was during the second half of the 19th century, when the national statistics recorded puerperal sepsis separately, that the nationwide problem became obvious. Between 1861 and 1900, 54% of maternal deaths were caused by puerperal sepsis, most of them following home deliveries. This percentage was even higher for home deliveries before the introduction of antiseptic technique,[18] possibly also caused by an increased virulence of the dominant strain of streptococcus at the time.[1] The diagnosis of puerperal sepsis was probably not confounded by septic abortions during the 19th century.[16]

The adverse effects of medical technology were predisposing, positive risk factors. Before the introduction of antiseptic techniques, lying-in hospitals were a positive risk factor in the transmission of puerperal sepsis. As can be seen by extrapolating from the mortality rate of puerperal sepsis between 1881 and 1895 (after the introduction of antiseptic techniques), if such techniques had been available from 1776 through 1900, the number of puerperal deaths in lying-in hospitals would have been 119 instead of 1720. The difference, 1601 deaths, is a measure of the potentially adverse effects that the lying-in hospitals had on the number of maternal deaths nationwide from 1776 through 1900 (n=76 776). However, the protective effect of these hospitals as educational centers for midwives and physicians practicing

in rural areas has not been considered.[16]

IMPACT OF INTERVENTION

The impact of midwife-assisted delivery on maternal and child outcome is of major historical interest. At the beginning of the 19th century, almost 40% of deliveries were attended by a licensed midwife, while only a very small fraction of women gave birth in a lying-in hospital. By the end of the 19th century, 78% of parturients were attended by a licensed midwife, while only 2.8% gave birth at a lying-in hospital (Figure 1).[18] The mean annual number of deliveries per midwife in the rural areas was 37 during the second half of the 19th century. The midwives used forceps in only 1 of 133 to 180 deliveries, with a case fatality rate of 27 to 39 deaths per 1000 operations.[16]

The nonseptic maternal mortality was reduced from 414 per 100 000 live births to 122 per 100 000 when the proportion of deliveries assisted by midwives in the rural areas increased from 30% to 70%. The risk of nonseptic maternal death was reduced fivefold, with a relative risk of 0.2 for midwife-assisted home deliveries. By taking the percentage of midwife-assisted deliveries, the prevented fraction for nonseptic maternal deaths associated with midwife assistance can be estimated to be 46% for the years 1861 through 1900.[18]

The antiseptic decree for midwife-assisted home deliveries was implemented in 1881, although the technology was successively introduced in the lying-in hospitals during the 1870s. By defining 100% exposure of the

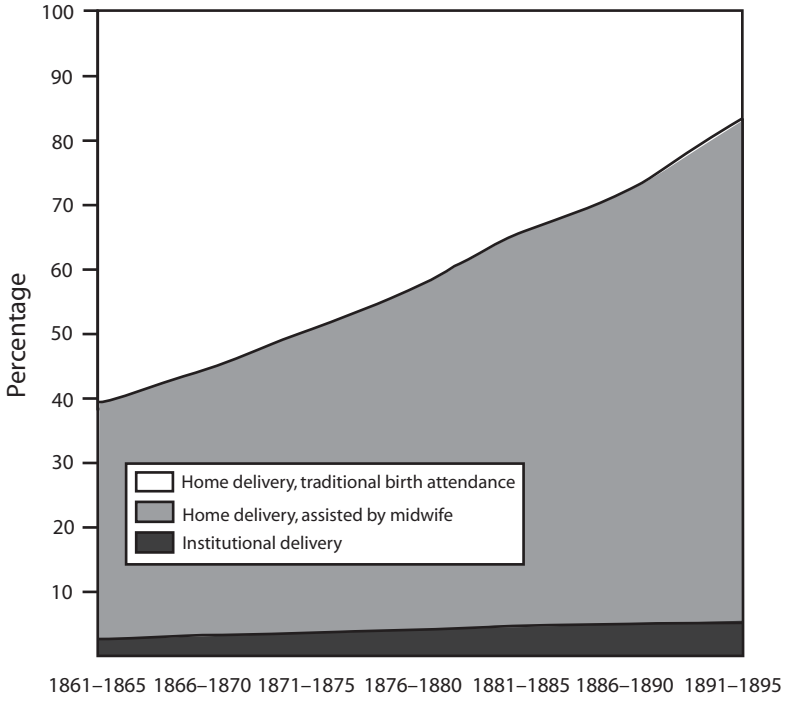


FIGURE 1—Percentage of parturients in Sweden delivered by traditional birth attendants, licensed midwives, and in lying-in hospitals during the years 1861 through 1895.

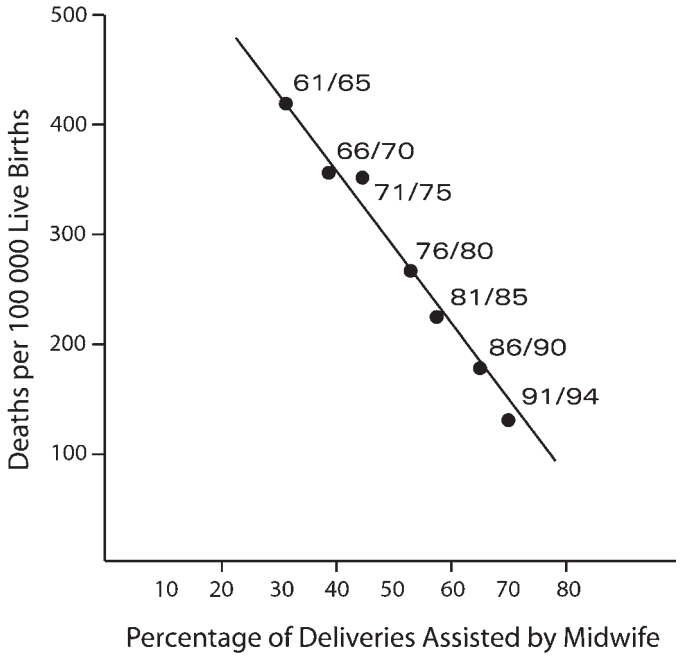


FIGURE 2—Midwifery service in rural areas in Sweden and maternal mortality (septic deaths excluded) for the years 1861 through 1894.

antiseptic technique, preventive fractions can be calculated. After the introduction of the antiseptic technique, the mortality rate for puerperal sepsis decreased 25-fold in the lying-in hospitals. The potential relative risk associated with the use of antiseptic technique was 0.04. This was not due to a reduced fatality of the diagnosed cases of puerperal sepsis, because half of the patients with puerperal sepsis still died, but rather to a diminished incidence of puerperal sepsis. The antiseptic technique was estimated to have "prevented" 96% of septic maternal deaths during the years 1881 through 1900, or 65% for the years 1861 through 1900.[18]

However, since only a minority of women at the time lived in urban areas, and since of these an even smaller proportion gave birth in lying-in hospitals, the introduction of the antiseptic technique did not prevent as many deaths in the lying-in hospitals as it did in home deliveries. The introduction of the antiseptic technique in home deliveries decreased the risk of death due to puerperal sepsis 2.7-fold (relative risk=0.37).[18] Consequently, it is estimated that 63% of the septic maternal deaths were prevented in noninstitutional deliveries in Sweden between 1881 and 1900. This result is strengthened by the steep decline of maternal mortality from the 1870s and the directly inverse association between the decline in nonseptic maternal deaths and the increase in deliveries assisted by midwives in rural areas from 1861 to 1894 (Figure 2).[18] After the introduction of the antiseptic technique, puerperal sepsis mortality did not decline further until the introduction of antibiotics during the 1930s.[19]

With the assumption that the two acted independently of each other, we can conclude that during the years 1861 through 1900, the antiseptic technique reduced mortality by puerperal sepsis by 49%, and that midwifery reduced nonseptic maternal mortality by 46% (Figure 3). The positive impact of this intervention could be interpreted in several ways. Naturally, the midwives' skill was important, but they used forceps in fewer than 1% of the deliveries and performed destructive operations very seldom, so other factors must have been of importance. The contribution could also be interpreted in more general terms as providing care for the parturient and her prolonged labor with morphine, an enema, catheterization of the bladder, and surveillance of the third stage of labor.[18] The importance of supporting the parturient is now evidence-based; continuous support during labor from caregivers reduces the likelihood of operative vaginal delivery as well as cesarean delivery and asphyxia of the child.[20]

A shift in the distribution of the parturients' age, with a smaller proportion of parturients of advanced age, contributed to only 2.9% of the decline in mortality between 1781 and 1911.[21]

The implementation of a Swedish midwifery service for home deliveries is probably one reason why in the early 20th century, Sweden had a lower maternal mortality rate than more prosperous countries such as Britain and the United States.

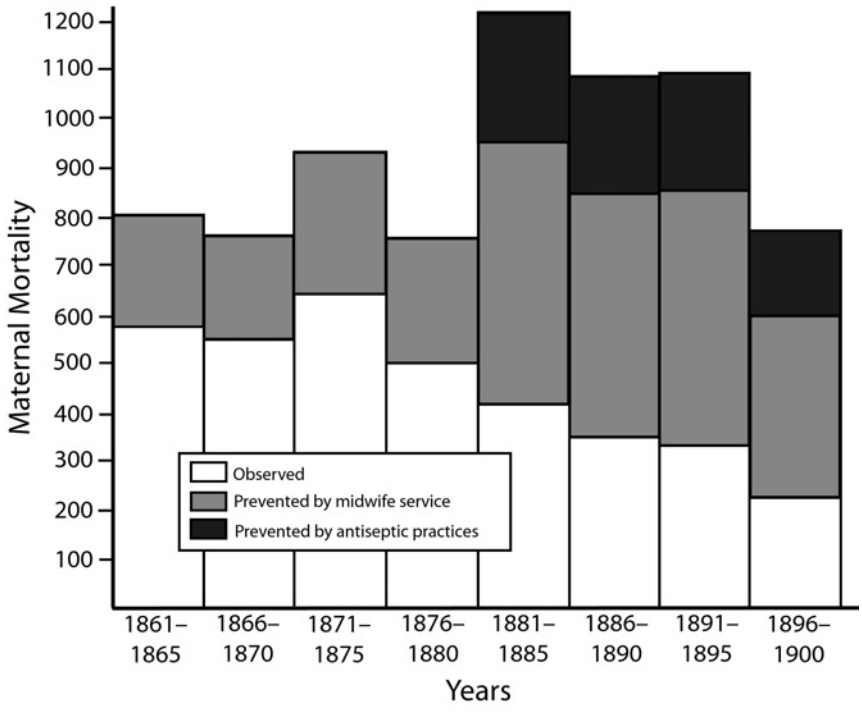


FIGURE 3—Observed number of maternal deaths per 100 000 live births and prevented number of maternal deaths by medical technology, midwifery service, and antiseptic technique in Sweden during the years 1861 through 1900 (5-year mean).

The fairly centralized public welfare system in Sweden at the time may have facilitated the intervention. Despite a relatively low gross domestic product, the homogeneity of the rural areas and a rather smooth socioeconomic national development may also have contributed to the successful implementation of the system. Difficult social circumstances could impede an intervention, as illustrated in the Sundsvall sawmill area in Sweden, called "Little America" at the time owing to its very high immigration rate and reported social turmoil; no decline in maternal mortality was recorded there.[17] Even so, the preventive fraction of midwifery on perinatal mortality in this area was 15% between 1881 and 1890, and 30% between 1891 and 1899.[22]

THE 20TH-CENTURY DECLINE IN MATERNAL MORTALITY

A phenomenon common to the industrialized countries during the first decades of the 20th century was that whereas total mortality declined, maternal mortality remained high or even increased. Maternal mortality declined exponentially and simultaneously in the Western countries from the 1930s onward, and this was indisputably due to modern obstetric care.[4,13] Furthermore, modern obstetrics has been proposed to have been the main contributor to the decline in mortality, while a rise caused by poverty and associated malnutrition was purportedly only of minor importance.[1]

However, the view that the steep decline in Western maternal mortality rates is due only to modern obstetrics, with its blood transfusions, antibiotics, and safe operations, could be confounded by the same factors that are now impeding a worldwide maternal mortality decline. A causal inference must also take into account the fact that socioeconomic deprivation is a major factor underlying maternal mortality. One oversight in the interpretation of the Western maternal mortality decline may be that a clinical perspective would underestimate a potential cohort effect of reduced poverty and subnutrition on secular trends of maternal mortality. Obstructed labor has been one of the leading causes of maternal deaths throughout history.[23] Evidently, the main reason for the reduced deaths due to obstructed labor during the 1940s in Sweden was safer deliveries. However, at the same time, a decrease in the incidence of obstructed labor was reported. This could be interpreted as an effect of the better nutritional status of infants born in the 1920s, who started having their own children during the 1940s[24]—the era when contracted pelvis (narrow birth canal due to nutritional deficiencies) disappeared almost entirely from obstetric practice in Western society.[23]

Vitamin A deficiency was a problem still affecting Swedish children in the 1930s and 1940s, and it may have created problems for parturients as well. Already in 1931, it was shown that vitamin A supplementation may reduce puerperal sepsis by as much as 70%.[25] The evidence that vitamin A supplementation for women may have reduced maternal mortality by 40% in a Nepalese community,[26] and a randomized trial of vitamin A supplementation in Indonesia showing a 50% reduction of puerperal fever[27]—probably through better resistance against infections—indicate the importance of women's nutritional status in relation to maternal mortality.

A cautious interpretation of the Western maternal mortality decline should also take into account the concept of medical technology. These include not only clinical and therapeutic improvements but also a mobilization of human resources with regard to clinical performance and community participation.

Maternal mortality became a public health issue of great concern in the early 20th century in both England and the United States.[3] The importance of the general understanding of the "road-to-death" and the introduction of the concept of "avoidability" that was presented by the British Health Ministry and White House conferences during the 1920s, as well as the establishment of confidential enquiries and maternal mortality committees with community involvement, should not be underestimated.

Regarding medical technology and reproductive health, the society's and the larger population's involvement should be considered as a prerequisite. Neither secondary nor tertiary prevention, nor early detection, referral, or audit procedures, would have worked in the Western countries without the socioeconomic progress of public health efforts that have taken place since the 1940s. In this respect, the decrease in maternal mortality would not have been as significant without the establishment of the welfare state in the Western countries.

CONCLUSION

The successful maternity care intervention in Sweden in the 19th century was dependent on the public health system, which was based in turn on equity and an alliance between midwives and doctors in a system of close supervision and surveillance. Even though the potential importance of community midwives was originally outlined in 1751, successful implementation had to wait until the late 19th century owing to the population's slow acceptance of professional birth assistance, the lack of economic possibilities to subsidize a midwife in every rural county, and the absence of antiseptic technology.

The decline in Sweden's maternal mortality rate since the 1930s parallels that in other Western countries. Medical technology was certainly a major factor, but its success was dependent on the emergence of the Western welfare state. ■

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The Control of Rickets

Excerpted from Martha May Eliot, MD. The control of rickets: preliminary discussion of the demonstration in New Haven. *Journal of the American Medical Association.* 1925;85:656–663.

THAT ANIMALS CAN BE protected against rickets by the use of cod liver oil and ultraviolet rays is an established fact. It has also been clearly shown that cod liver oil and sunlight exert a great influence in the cure of rickets. Whether these measures are sufficient to prevent rickets in infants in a community is the problem on which we are working in the demonstration in New Haven. It is my purpose to set forth briefly the plan of the study and to offer a preliminary discussion of the results.

The demonstration was started in October, 1923, for a three year period by the United States Children's Bureau in conjunction with the Pediatric Department of the Yale School of Medicine and with the active cooperation of the local health organizations. A district of the city was selected having a population of approximately 13 500, one third of which were negroes, and two thirds a mixed population composed of Italians, Irish, Polish, and Americans. The office of the demonstration is known in New Haven as the "Children's Bureau." The staff consists of three physicians, three public health nurses, two social investigators, a roentgen-ray technician and a secretary. The staff is necessarily large in order that the records may be complete and accurate.

The main problem of the investigation was to show whether rickets could be prevented in a community by the intensive use of cod liver oil and sunlight. The infants born within the selected district during the first two years of the study are examined and started on cod liver oil and sunbaths, if possible, before the end of the first month of life. They are brought to the Children's Bureau once a month for physical and roentgen-ray examinations in order that rickets may be discovered as early as possible and intensive treatment instituted if necessary. The nurses visit the homes frequently to see whether the instructions are being carried out. In order to provide control material for the investigation, it was necessary to take for examination the children under 5 years of age living in the district at the time when the demonstration started. Later, however, it became clear that it was even more important to have for comparison a group of infants who were born during the period of the demonstration, but who had received no cod liver oil and concerning whom no instructions regarding sunlight had been given. Examination of such a control group was begun at the end of the first year of the demonstration and has continued throughout the past winter. The infants of this group correspond in age to those in the district who are being given antirachitic treatment.

The daily routine in the demonstration is comparatively simple. The birth certificates of babies born in the district are sent to the Children's Bureau office by the board of health. If the certificate is signed by a local physician, a call is made by one of the Children's Bureau physicians, to explain to him the purpose of the demonstration and to ask his cooperation. If the physician has already been seen, a letter is written telling him that the birth certificate has been sent to the Children's Bureau, and that the mother will be urged to bring the baby for examination. No new baby is brought to be examined without the knowledge and consent of the family physician. When the nurse takes the birth certificate to the mother, she has an opportunity to tell the mother about the Children's Bureau, and to make an appointment for the baby to be examined as soon as the mother is able. At the first visit the baby is weighed, measured and examined thoroughly. At this visit, also, a roentgenogram is taken of the bones of both forearms. A uniform technic [*sic*] in taking the roentgenograms is used for all babies, so that the films may be compared satisfactorily with one another. Before leaving, the mother is given general advice by the physician with regard to routine feeding and care of the baby. She is instructed to give both cod liver oil and sunbaths to the baby, and is asked to bring him back once a month for physical and roentgen-ray examinations.

The importance of teaching the mother how to give the cod liver oil to the baby cannot be overemphasized. Success in the administration of cod liver oil to babies depends on two things: the method used, and the ability of the physician or nurse to convince the mother of the value of the cod liver oil. An actual demonstration of the best method of administration is given to each mother by one of the nurses. With the baby lying across her lap, the nurse pours out the proper dose in a spoon held in her right hand. With her left hand she opens the baby's mouth by pressing the cheeks together between her thumb and fingers. The oil may then be poured little by little into the baby's mouth. If the mouth is not held open until the oil entirely disappears, the baby will spit out what is left. When this happens, the mother very frequently reports that the baby has vomited the oil. It is frequent for infants to spit out oil not yet swallowed, but in only a few instances have we found that the infant actually vomits it.

Demonstrations of the sunbaths are given by the nurses at their visits to the homes. If the baby is fortunate enough to have been born between the first of March and the first of September, sunbaths are started outdoors before the end of the first month of life. If the baby is born in the winter months, the sunbaths frequently must be given indoors inside an open sunny window. At whatever season the baby is born, however, the mother is impressed with the importance of direct sunbaths. She is taught that the full value of the sun's rays is obtained only when they reach

Martha May Eliot: "Spinster in Steel Specs, Adviser on Maternity"

PEDIATRICIAN MARTHA MAY ELIOT was associated with the Children's Bureau for over 20 years. When criticizing her role and the influence of the Children's Bureau, and even when noting Eliot's remarkable achievements, commentators frequently questioned her authority as an "unmarried expert" on child health. Despite the rather hostile environment in which she worked, Eliot went on to receive many well-deserved honors. The American Pediatric Society gave her its highest award, the John Howland Medal, in 1967.

Martha May Eliot was born in Dorchester, Mass, in 1891, to Christopher Rhodes Eliot, a Unitarian minister, and Mary Jackson May. She was a first cousin of the poet T.S. Eliot. Her grandfather, William G. Eliot, was the first chancellor of Washington University in St. Louis. Eliot majored in classical literature at Radcliffe College and also completed premedical training. During a year's study at Bryn Mawr College she met Ethel Collins Dunham, who was to become her life partner.[1] After completing their undergraduate education, the two enrolled at Johns Hopkins University School of Medicine in 1914.

Eliot and Dunham planned to take medical internships together, but only Dunham was accepted at Hopkins, making her the first female intern in the Pediatrics Department. The department chair, John Howland, refused to admit more than one woman. Eliot instead

went to Peter Bent Brigham Hospital, Boston, and then completed a residency in pediatrics at St. Louis Children's Hospital from 1919 to 1920.[2]

In 1921, Eliot was invited to become the first chief resident in Edwards A. Park's new Department of Pediatrics at Yale Medical School, working at New Haven Hospital. In 1924, she was named director of the Children's Bureau's Division of Child and Maternal Health. Park encouraged her to commute to Washington for one week a month while continuing her duties at New Haven. Eliot and Park also began a 3-year study of the prevention of rickets and presented their preliminary results, excerpted in this selection, to the American Medical Association in 1925. As a result of this study, they recommended cod-liver oil and sunlight as effective measures to prevent this deforming disease of childhood. As a consequence, rickets, once prevalent, became much less common in America. When Eliot was appointed assistant chief of the Children's Bureau in 1934, she moved to Washington full-time, and a year later left her position as associate professor at Yale Medical School. Dunham also joined the bureau in 1935, as director of child development.[2(p174)]

During World War II, Eliot traveled to England to study the impact of wartime evacuation on young children. She published her report *Civil Defense Measures for the Protection of Children* in 1942. She was also a leading figure in war work at home and ran the Emergency Maternity and Infant Care Program, providing medical assistance to the families of 1.5 million American soldiers. Eliot received the Lasker Award for this work in 1948.

After World War II, Eliot served on the US delegation to the first-ever World Health Assembly, and she was the only woman to sign the founding document of the World Health Organization (WHO). In 1949, she moved to Geneva to serve as assistant director general of the WHO. As one of few women ever to hold such high office in a public health agency, she faced intense scrutiny of her professional qualifications as well as her personal circumstances; a newspaper headline announcing the appointment described her as a "spinster in steel specs, adviser on maternity."[3(p 25)] Two years later, she returned to the Children's Bureau as its chief.

Eliot left the Children's Bureau in 1956, and in 1957 she became chair of the Department of Child and Maternal Health at the Harvard School of Public Health. After retiring in 1960, she continued her work for the WHO and UNICEF, reporting on medical education in Asia and Africa. In 1947, she was the first woman to be elected president of the American Public Health Association (APHA). In 1964, the APHA established the Martha May Eliot Award to recognize outstanding achievements in the field of maternal and child health care. Eliot died in Cambridge, Mass, on February 14, 1978, nine years after the death of her partner.

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the skin without the intervention of clothing or window glass.

When outdoor sunbaths are given, the hands and face are exposed first for ten or fifteen minutes only. After the first few days other parts of the body, at first the arms and a little later the legs, are in turn exposed to the sun. The period of exposure is increased two or three minutes daily. The increase for infants with dark skins may be more rapid than for infants with fair skins. As the weather gets warmer, the arms and legs and in time the whole body may be exposed together. As the baby becomes accustomed to the sunbath, the period is lengthened to one hour twice daily. Care must be taken to increase the length of the sunbath gradually, so as not to burn the skin. Sufficient exposure daily to produce slight reddening will gradually tan the skin. Pigmentation is the outward evidence that the ultraviolet rays of the sunlight are effective. It is important, too, in the intense heat of July and August, that the sunbaths should be given before 10 o'clock in the morning and after 3 o'clock in the afternoon. The baby's head at this season should be protected from the sun between these hours. Graduated outdoor sunbaths, such as are here described, may be given to any baby 3 or 4 weeks old who is born in the spring and summer.

In our northern climate it is possible to give outdoor sunbaths to healthy infants even in the winter. Feeble and premature infants cannot, of course, be exposed outdoors in winter. It is well known that the temperature on a cold day may be 40 or 50 degrees higher in the direct sunlight than it is in the shade. The heat of the sunlight, which we would so gladly dispense with in July and August, must be utilized in winter to its greatest extent. The baby born in the fall or winter may be given outdoor sunbaths except on days when the temperature is below freezing. . . . Increase in the amount of skin surface exposed and the length of exposure should be gradual; but, in time, the face, arms and legs may be slightly tanned, even in winter. It may not be possible to expose the whole body. Babies who are given indoor sunbaths in winter may begin outdoor sunbaths early in the spring, so that they will be well tanned by the end of April. . . .

A preliminary report may be given at this time of the group of babies born in the first year of the demonstration, from Aug. 15, 1923, to Aug. 15, 1924. It has been possible to follow a series of 216 babies with more or less regularity. These babies range in age at the present time from 8 to 18 months. . . . [Our study found] an extremely early incidence of rickets by roentgen-ray examination. . . . Twenty-three, or 11 per cent of the 216 infants, showed no rickets at any time by roentgen-ray examination. One hundred and seventy-nine, or 83 per cent, showed evidence of mild rickets by roentgen-ray examination before eight months of age. The remaining fourteen, or 6 per cent, showed rickets by roentgen-ray examination after eight months. . . .

None of the infants of the demonstration developed marked rickets, and only 4.3 per cent developed moderate rickets shown by roentgen ray, whereas 23 per cent of the first and 34 per cent of the second control groups showed both moderate and marked rickets. The antirachitic treatment given to the infants in the series of the demonstration has been successful in keeping them from developing advanced rickets. . . .

The extraordinary chronicity of rickets has been striking in our series of roentgenograms. The evidences of rickets first seen in the second or third months of life may be followed month after month even to the end of the first year or later. If the infant is under treatment, evidence of lime salt deposit as well as the evidence of active rickets may be seen; the process finally becomes low grade and sluggish and, though constantly present, is controlled. If the infant is not under treatment, the roentgen ray shows increasing and accumulating evidence of disease month after month, until the well known picture of marked rickets is seen. . . .

The importance of the fact that definite clinical signs of rickets do not appear until after the roentgen-ray evidence cannot be overemphasized when considering the problem of prevention. It is well known that the curative effect of cod liver oil and light are not marked until from the third to the sixth week of treatment. It may be supposed, therefore, that the preventive effect of these measures will not be well established for at least a month. If 65 per cent of infants with rickets show the roentgen-ray evidences before the end of the fourth month, prophylactic treatment should certainly be begun by the end of the first month, if not sooner. Our figures indicate that even larger doses of cod liver oil than we have given and longer exposure to direct sunlight should be recommended, if the disease is to be entirely prevented. . . .

WIC Participation, Breastfeeding Practices, and Well-Child Care Among Unmarried, Low-Income Mothers

Pinka Chatterji, PhD, and Jeanne Brooks-Gunn, PhD

We estimated the effect of Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) participation in 1999 to 2000 on breastfeeding initiation and duration and well-child care. We applied multivariate regression to a sample of 2136 unmarried, low-income, urban mothers from the Fragile Families and Child Wellbeing Study. WIC participation was associated with small increases in the probabilities of initiating breastfeeding and having had at least 4 well-child visits since birth—behaviors that benefit infants beyond the newborn period—but not with breastfeeding duration. (*Am J Public Health.* 2004;94:1324–1327)

The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) provides low-income, nutritionally vulnerable pregnant and postpartum women, infants, and young children with nutrient-dense food packages, nutritional counseling (including breastfeeding support), and linkage to medical and social services. Numerous studies indicate that WIC participation during pregnancy is associated with better birth outcomes.[1–10] However, with the notable exception of the Rush et al.[11] evaluation, little research has focused on the benefits of WIC participation that extend beyond the newborn period.[12]

We estimated the association between WIC participation and 2 maternal health behaviors that benefit infants—breastfeeding and well-child care. The study used 1999 to 2000 survey data on low-income, unmarried, urban mothers from the Fragile Families and Child Wellbeing Study. WIC participation may have mixed effects on breastfeeding because of the competing effects of activities that promote breastfeeding and the valuable infant formula provided in food packages. However, we expect that WIC participation is associated with greater use of well-child care because of WIC's emphasis on medical referrals.

METHODS

Data were from a subsample of the Fragile Families and Child Wellbeing Study, a longitudinal survey of 3712 unmarried couples and 1186 married couples, all of whom had newborn infants at baseline. Respondents resided in 20 cities across the United States. We used data from the baseline survey, which was conducted between June 1999 and October 2000 in the hospital after the child's birth, and from the first follow-up survey, which was conducted in person or by telephone approximately 12 to 15 months after the birth. To limit the analysis to mothers who were most likely eligible for WIC participation, we limited the sample to 2136 mothers who were unmarried and living at or below 250% of the federal poverty line at the time of the child's birth.

Our sample included women who were most likely eligible for WIC and who were able to provide fairly complete information for the study. We excluded from the original 4898 respondents: (1) mothers who did not respond to the follow-up survey (n=533), (2) mothers whose children were aged younger than 12 months or older than 24 months at the time of the follow-up survey (n=383), (3) mothers with incomes greater than 250% of the poverty line at the time of the child's birth (n=1173), (4) mothers married at the time of the birth (n=378), (5) mothers with multiple births or with missing information on the child's sex (n=49), and (6) mothers who were not living with their children by the time of the follow-up survey (n=65). We also excluded mothers with missing information on any dependent variable (n=181). However, we did include respondents with missing information on independent variables used in the analysis. For these respondents, missing information was replaced with sample means.

We used probit and ordinary least squares models to analyze the 3 outcomes: (1) whether the mother initiated breastfeeding; (2) the logarithm of the number of weeks the mother breastfed, among those who initiated breastfeeding; and (3) whether the child received at least 4 well-child evaluations during his or her first year. We measured maternal WIC status with a dummy variable indicating whether the mother participated in WIC since the child was born; mothers were not asked about prenatal participation. The models also included detailed information about the child (e.g., age in weeks, low birthweight), the mother (e.g., race/ethnicity, education, age, living arrangements, health behaviors), and the household (e.g., size, health insurance, income, city of residence).

We estimated parsimonious models (which included only demographic covariates) and more fully specified models (which included all of the covariates) to gauge the sensitivity of the WIC participation coefficient to the inclusion of additional factors. Compared with the national data sets used in previous work, our sample included a fairly homogeneous sample of mothers. Nevertheless, we lacked information on the timing of WIC participation, and it is still possible that mothers may have self-selected into WIC along unobserved factors that also affect health investments, which may have led to biased estimates.

RESULTS

About half of the mothers reported breastfeeding initiation, and the average duration of breastfeeding was about 18 weeks among mothers who initiated (Table 1). Breastfeeding initiation rates in the analysis samples were similar to those in other recent national surveys of low-income women.[13,14] Approximately 91% of the mothers reported that their child had at least 4 well-child evaluations since birth, and 86% of the mothers reported WIC participation, which is consistent with WIC's high participation rate among eligible persons.

In both the parsimonious model (Table 2, column 1) and the larger model (Table 2, column 2), WIC participation was associated with a statistically significant increased probability of breastfeeding initiation of about 0.07 at the sample means (i.e., approximately 52% WIC vs 45% comparison, $P<.05$). The magnitude of the estimate was almost identical in the parsimonious model and the larger model. We did not find any evidence that WIC participation was associated with breastfeeding duration

TABLE 1—Sample Characteristics (N = 2136)

	Percentage	Mean (SD)
Outcomes		
Initiated breastfeeding	50.2	
Number of weeks of breastfeeding among those who initiated		18.2 (18.0)
Child had at least 4 well-child evaluations	91.4	
Maternal characteristics		
Participated in WIC after child's birth	86.0	
Moved since child's birth	51.8	
Had another baby since child's birth	15.8	
Lives in own apartment or house	64.3	
Enrolled in Medicaid	73.7	
Smoked during past 30 days	30.4	
Enrolled in school	21.3	
Has worked since child's birth	79.1	
Age at 12-month interview		24.8 (5.5)
Lives with at least 1 parent	31.4	
Number of children in household		1.5 (1.4)
Foreign born	14.5	
Hispanic	31.3	
African American	56.2	
White	23.9	
Asian	1.4	
Other race	18.4	
Native American	5.6	
< High school	45.3	
High school graduate	34.1	
Some college completed	19.5	
College graduate	1.1	
Household income, $		16 222 (11 661)
Smoked during pregnancy	22.9	
Prenatal care during first trimester	77.4	
Child characteristics		
Age at 12-month interview, weeks		64.3 (12.6)
Low birthweight	11.2	
Physically disabled	2.7	

Note. WIC = Special Supplemental Nutrition Program for Women, Infants, and Children. Hispanic ethnicity was asked independently of race (e.g., a respondent could report White race and Hispanic ethnicity).

among mothers who initiated breastfeeding (Table 2, columns 3–4), but WIC participation had a statistically significant positive association with the receipt of at least 4 well-child visits (Table 2, columns 5–6). Including additional covariates did not reduce this estimate, and the increase in probability was about 0.06 at the sample means (i.e., approximately 93% WIC vs 87% comparison, $P<.05$).

The positive association between WIC participation and well-child care and breastfeeding initiation is consistent with the WIC goals of linking participants to medical services and promoting breastfeeding, a health behavior that is associated with numerous benefits for infants.[15–19] Previous WIC evaluations indicated that participation improves pregnancy outcomes. These findings add to existing research by suggesting that WIC participation also may be associated with health behaviors that benefit infants beyond the newborn period. ■

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Contributors

Both authors developed the study hypotheses, analyzed the data, and wrote the brief.

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Human Participant Protection

The Fragile Families and Child Wellbeing Study was reviewed and approved by the Princeton University and the Columbia University internal review boards.

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TABLE 2—Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) Participation and Health Investments

	Initiated Breastfeeding Probit Model Marginal Effects (*P*)		Logarithm of Weeks of Breastfeeding Ordinary Least Squares Model Coefficients (*P*)[a]		At Least 4 Well-Child Visits Probit Model Marginal Effects (*P*)[b]	
	Parsimonious Model	Larger Model	Parsimonious Model	Larger Model	Parsimonious Model	Larger Model
Participated in WIC	0.071 (.022)	0.074 (.026)	−0.154 (.135)	−0.113 (.290)	0.054 (.005)	0.060 (.002)
Child's age	−0.001 (.599)	−0.001 (.497)	−0.002 (.539)	−0.002 (.585)	−0.001 (.257)	−0.001 (.298)
Mother is foreign born	0.396 (.000)	0.384 (.000)	0.808 (.000)	0.715 (.000)	−0.015 (.374)	−0.023 (.222)
Mother is Hispanic	0.074 (.294)	0.058 (.392)	−0.015 (.885)	−0.073 (.461)	−0.024 (.239)	−0.030 (.094)
Mother is African American	−0.087 (.054)	−0.102 (.013)	0.205 (.027)	0.159 (.096)	−0.062 (.000)	−0.061 (.000)
Mother is Asian	−0.097 (.368)	−0.079 (.473)	−0.496 (.107)	−0.461 (.143)	0.008 (.903)	0.012 (.858)
Mother is Native American	−0.015 (.825)	−0.011 (.859)	0.007 (.938)	−0.017 (.843)	0.012 (.654)	0.010 (.721)
Mother is other race	−0.064 (.239)	−0.059 (.284)	−0.110 (.303)	−0.082 (.290)	−0.037 (.069)	−0.033 (.114)
Mother is high school graduate	0.110 (.000)	0.106 (.000)	0.022 (.775)	0.001 (.990)	0.048 (.000)	0.043 (.000)
Mother completed some college	0.270 (.000)	0.254 (.000)	0.134 (.224)	0.135 (.233)	0.056 (.000)	0.045 (.014)
Mother is college graduate	0.377 (.004)	0.350 (.004)	0.794 (.000)	0.865 (.001)	0.027 (.578)	0.011 (.806)
Log household income	0.011 (.147)	0.012 (.123)	−0.019 (.433)	−0.011 (0.646)	0.000 (.967)	0.000 (.999)
Mother's age	−0.009 (.000)	−0.007 (.000)	0.016 (.048)	0.005 (.544)	−0.002 (.108)	−0.002 (.112)
Mother moved since child's birth		0.041 (.128)		−0.059 (.373)		−0.002 (.894)
Mother had another baby since child's birth		−0.015 (.631)		−0.277 (.002)		−0.010 (.482)
Mother lives in own apartment or house		−0.015 (.570)		−0.002 (.970)		0.003 (.781)
Mother is enrolled in Medicaid		0.007 (.820)		−0.000 (.999)		−0.025 (.063)
Mother smoked in past 30 days		−0.027 (.492)		−0.283 (.089)		−0.022 (.202)
Mother is enrolled in school		0.098 (.000)		−0.037 (.627)		0.009 (.533)
Mother has worked since child's birth		−0.020 (.501)		−0.146 (.158)		−0.006 (.513)
Child is low birthweight		−0.020 (.590)		−0.390 (.003)		−0.019 (.272)
Mother lives with at least 1 parent		−0.040 (.023)		−0.248 (.020)		−0.014 (.319)
Number of children in household		0.002 (.976)		0.065 (.015)		−0.003 (.589)
Mother smoked during pregnancy		−0.043 (.190)		0.023 (.879)		0.000 (.988)
Mother had prenatal care during first trimester		0.044 (.134)		−0.006 (.940)		0.010 (.599)
Child is physically disabled		−0.103 (.276)		0.335 (.074)		0.036 (.377)
N	2136	2136	1063	1063	2107	2107

Note. All models included 19 dummy variables representing the city of residence at baseline. The coefficients on the 19 dummy variables representing city of residence and the coefficients on the intercepts in each model are not shown. Omitted category: nonparticipant, White, high school dropout, born in United States. We present Huber-adjusted *P* values with an additional adjustment for clustering at the city level. These *P* values are obtained from robust variance estimates that also account for the possibility that observations from the same city are not independent of each other. Marginal effects should be interpreted as the change in the probability of the outcome associated with a small change in the independent variable (for a continuous variable) or a discrete change from 0 to 1 (for a dummy variable).

[a]Logarithm of weeks of breastfeeding model is limited to the 1036 mothers of 2136 who initiated breastfeeding.

[b]Sample size is 2107 instead of 2136 in well-child visits model because all observations of living in 1 city (n = 29) were associated with at least 4 well-child visits. These observations were dropped.

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Condom Use and the Risk of Recurrent Pelvic Inflammatory Disease, Chronic Pelvic Pain, or Infertility Following an Episode of Pelvic Inflammatory Disease

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Among 684 sexually active women with pelvic inflammatory disease (PID) followed up for a mean of 35 months, we related contraceptive use to self-reported PID recurrence, chronic pelvic pain, and infertility. Persistent use of condoms during the study reduced the risk of recurrent PID, chronic pelvic pain, and infertility. Consistent condom use (about 60% of encounters) at baseline also reduced these risks, after adjustment for confounders, by 30% to 60%. Self-reported persistent and consistent condom use was associated with lower rates of PID sequelae. (*Am J Public Health.* 2004;94:1327–1329)

Pelvic inflammatory disease (PID), the clinical condition representing inflammation of the pelvic organs, is common[1] and can result in PID recurrence, chronic pelvic pain, and infertility.[2,3] Prevention of the bacterial sexually transmitted diseases (STDs) that cause PID is a cornerstone of efforts to reduce morbidity from PID and its sequelae.[4,5]

Condom use prevents acquisition of viral STDs, including HIV. However, because no prospective data show that condoms are effective against transmission of bacterial STDs,[6] controversy surrounds their use in primary prevention.[7,8]

Within the PID Evaluation and Clinical Health Study, a multicenter, follow-up study of women with PID,[9] we assessed the relation between condom use and PID-related morbidity.

METHODS

The methods of subject recruitment, data collection, and follow-up have been reported elsewhere.[9,10] In brief, women aged 14 to 37 years were recruited from 13 US sites between March 1996 and February 1999. Enrolled women met clinical criteria for suspected PID, including pelvic discomfort, pelvic organ tenderness, leukorrhea, mucopurulent cervicitis, and untreated gonococcal or chlamydial cervicitis. This analysis includes the 684 women who were sexually active at baseline and who had at least 1 follow-up visit.

In a standardized in-person interview, we asked about the use of oral contraceptives, hormonal implants or injections, intrauterine devices (used by only 15 women and thus not reported), diaphragms, spermicides, cervical caps, female condoms, and male condoms by a partner. More than 1 method could be selected. About half (53%) of the women reported baseline use of barrier methods of contraception, 92% of which was condom use. Condom use was considered to be consistent if a woman reported use with at least 6 of the last 10 sexual encounters.

Every 3 to 4 months, telephone interviews were repeated. Follow-up information was available for 85% of the cohort after a mean of 35 months. Outcomes included (1) self-reported recurrent PID (subsequent to the baseline episode), with medical record verification (in 68% of cases); (2) chronic pelvic pain, defined as consistent self-reports of at least 6 months' duration; and (3) infertility, defined as the proportion of women without a β–human chorionic gonadotropin–confirmed pregnancy among the subgroup of women who reported no effective contraception (no contraception, natural family planning, or rhythm method) or rare use of barrier contraception for an aggregate of at least 12 months.

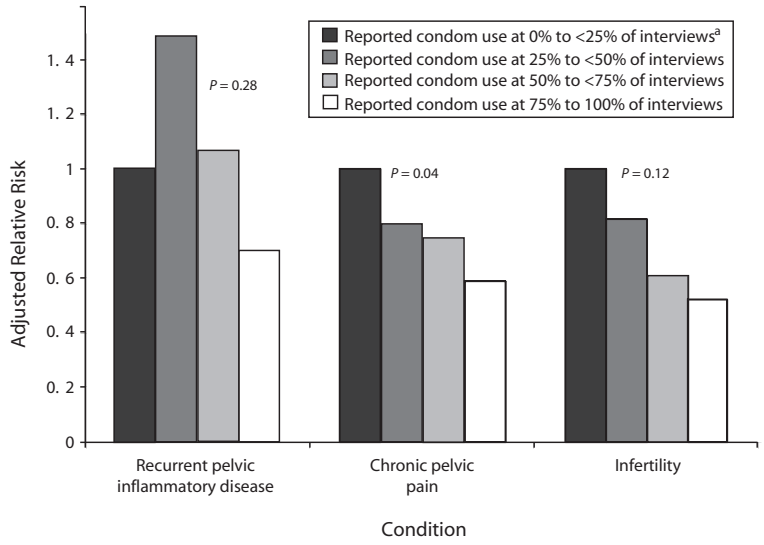
Baseline differences between groups were analyzed with χ^2 tests. Frequencies and unadjusted relative risks of recurrent PID, chronic pelvic pain, and infertility were calculated by comparing use with nonuse of condoms and consistent with nonconsistent use of condoms at each follow-up time point. Persistence (the percentage of all interviews in which condoms were used) was divided into quartiles. Analyses were repeated to compare women reporting use of condoms alone (without concurrent use of another method) with those reporting use of no effective method (including withdrawal, natural family planning, and none). Finally, we calculated the risks of outcomes among users and nonusers of other methods of contraception.

Separate logistic regression models for each outcome adjusted for age (continuous), number of live births (continuous), educational attainment (did not complete high school, high school graduate or equivalent, any education beyond high school), race (Black, White, other), nonmonogamy at baseline (yes or no), new partner in the past month at baseline (yes or no), gonococcal or chlamydial cervicitis at baseline (yes or no), number of study visits (continuous), and other methods of contraception. Adjusted odds ratios, derived from these models, estimated the adjusted relative risks.

RESULTS

Most of the women enrolled in the PID Evaluation and Clinical Health cohort were Black (74%), were aged 24 years or younger (66%), and had no more than a high school education (76%). Cervical infection with *Neisseria gonorrhoeae* was identified in 15% of the women, *Chlamydia trachomatis* was identified in 16%, and both were found in 6%.

Rates of recurrent PID, chronic pelvic pain, and infertility were highest among nonpersis-



Note. *P* values are for trend.
[a]Reference group.

FIGURE 1—Adjusted relative risks for each condition, by percentage of interviews at which condom use was reported.

tent condom users (25% to less than 50% of reports) and lowest among persistent condom users (75%–100% of reports) (Figure 1).

After adjustment for covariates, the relative risks for consistent condom users compared with nonusers were 0.5 (95% confidence interval [CI]=0.3, 0.9) for recurrent PID, 0.7 (95% CI=0.5, 1.2) for chronic pelvic pain, and 0.4 (95% CI=0.2, 0.9) for infertility (Table 1). Users of other barrier methods were at reduced risk, albeit nonsignificant, for developing recurrent PID. Use of oral contraceptives or medroxyprogesterone was not associated with significantly elevated or reduced risks of the PID sequelae studied.

Similar associations were found when comparing women who, at baseline, reported use of only a single method of contraception with women who reported use of no effective contraceptive method (data not shown). For example, adjusted relative risks for consistent condom use compared with use of ineffective methods were 0.6 for recurrent PID, 0.6 for chronic pelvic pain, and 0.3 for infertility. Excluding women who reported a history of PID at baseline, restricting our analysis to women with baseline evidence of endometritis or gonococcal or chlamydial upper genital tract infection, and including only recurrent PID based on verified medical record reports had little effect on these estimates.

DISCUSSION

A limited number of cross-sectional and case–control studies have examined the effectiveness of condoms in preventing the acquisition of *N gonorrhoeae* or *C trachomatis* among women, with mixed results.[11–19] An additional 2 case–control studies and 1 cross-sectional study reported reductions in the occurrence of PID and tubal infertility among condom users, but this was significant in only 1 study.[20–22]

This analysis of the PID Evaluation and Clinical Health cohort lends strength to the literature on condom use and the prevention of PID and its sequelae. This study had several strengths: reports of condom use preceded the occurrence of outcomes, sample size was large, adjustment for confounding was made, a geographically diverse cohort was enrolled, and outcomes were validated.

The greatest weakness of this analysis was the reliance on self-report for contraceptive use, which may have resulted in an underestimation of the true association.[16,23] Concurrent use of spermicides also may have reduced the observed protective effect because nonoxynol 9–containing spermicides may facilitate the risk for acquisition of STDs.[24]

These prospective data support the use of condoms for the prevention of PID sequelae. ■

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R.B. Ness conceived the study and supervised all aspects of its implementation. H. Randall, H.E. Richter, J.F. Peipert, A. Montagno, D.E. Soper, R.L. Sweet, D.B. Nelson, D. Schubeck, and S.L. Hendrix supervised and conducted study implementation. D.C. Bass and K.E. Kip completed analyses and assisted with the study. All authors helped to conceptualize ideas and interpret findings and reviewed drafts of the brief.

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Human Participant Protection

Human subjects approval was obtained at each participating institution, and all women gave informed consent.

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TABLE 1—Percentages of and Relative Risks (RRs) for Recurrent Pelvic Inflammatory Disease (PID), Chronic Pelvic Pain, and Infertility After an Episode of PID, by Contraceptive Method Use in the 4 Weeks Prior to Baseline: 1996–1999

	Condition											
	Recurrent PID				Chronic Pelvic Pain				Infertility			
	n	%	RR	Adjusted RR[a] (95% CI)	n	%	RR	Adjusted RR[a] (95% CI)	n	%	RR	Adjusted RR[a] (95% CI)
Condoms												
No	324	16.7		1.0	300	36.7		1.0	132	54.5		1.0
≤5-10 times	156	16.0	1.0	0.8 (0.5, 1.5)	142	31.0	0.9	0.8 (0.5, 1.3)	59	45.8	0.8	0.7 (0.4, 1.5)
≤6-10 times	204	8.8	0.5	0.5 (0.3, 0.9)	187	26.7	0.7	0.7 (0.5, 1.2)	46	34.8	0.6	0.4 (0.2, 0.9)
Other barrier[b]												
No	650	14.8		1.0	597	32.7		1.0	226	48.7		1.0
Yes	34	2.9	0.2	0.2 (0.02, 1.1)	32	28.1	0.9	0.8 (0.3, 1.7)	11	45.5	0.9	1.2 (0.3, 4.8)
Oral contraceptives												
No	606	14.4		1.0	556	33.1		1.0	217	47.0		1.0
Yes	78	12.8	0.9	0.9 (0.4, 1.8)	73	27.4	0.8	0.8 (0.4, 1.4)	20	65.0	1.4	3.2 (1.1, 9.4)
Medroxyprogesterone												
No	605	14.5		1.0	556	33.3		1.0	214	50.9		1.0
Yes	79	11.4	0.8	0.6 (0.3, 1.2)	73	26.0	0.8	0.5 (0.3, 0.9)	23	26.1	0.5	0.5 (0.2, 1.4)
No effective method[c]												
No	453	12.1		1.0	416	26.8		1.0	134	41.8		1.0
Yes	231	18.2	1.5	1.4 (0.5, 3.6)	213	39.9	1.4	1.7 (0.8, 3.6)	103	57.3	1.4	2.3 (0.6, 8.3)

Note. CI = confidence interval.
[a]Adjusted for age, number of live births, race, nonmonogamy at baseline, new partner at baseline, gonococcal or chlamydial cervicitis at baseline, education, number of study visits, and all other forms of contraception other than that under consideration.
[b]Diaphragms, spermicides, cervical cap, or female condom.
[c]No contraception, natural family planning, or withdrawal.

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The Benefit of Health Insurance Coverage of Contraceptives in a Population-Based Sample

Ann Kurth, PhD, CNM, Marcia Weaver, PhD, David Lockhart, BA, and Lori Bielinski, LMP

This study estimated the value of contraceptives, through a random-digit-dialed survey of willingness to pay for health insurance coverage of contraceptives among 659 Washington State adults. People valued contraceptives at 5 times the actuarial cost; in general, women and reproductive-aged persons were willing to pay more, but low-income men highly valued contraceptives. Most respondents (85%) said that contraceptives should be covered by health insurance plans. The full benefit of contraceptives exceeds their cost. (*Am J Public Health.* 2004; 94:1330–1332)

Unintended pregnancy[1] and sexually transmitted infections[2] remain considerable public health problems in the United States. Contraceptive methods save more money than they cost, by reducing these adverse outcomes.[3–6] Although more than 20 states have passed contraceptive coverage mandates, many health insurance plans continue to exclude contraceptives and safer-sex methods such as condoms.[7]

In this brief, we report public opinion regarding insurance coverage of contraceptives and estimates of the full economic benefit of contraceptives. Benefit was measured by contingent valuation methods[8,9] and included the value to current contraceptive users, future users (option value[10]), and nonusers such as gay men, lesbians, and people beyond reproductive age (social altruism value).

METHODS

We conducted a random-digit-dialed telephone survey of 659 Washington State household respondents aged 18 years or older in fall 2000. The response rate was 48%,[11] comparable to that of other telephone[12] and contingent valuation[9] studies.

The opinion question asked whether insurers should cover contraceptives. For willingness to pay, we used an insurance perspective[10] and a bidding game format,[13] in which respondents were asked a sequence of possible prices to determine their final willingness-to-pay amount. We designed the willingness-to-pay questions to minimize strategic bias,[9] which is the potential for a respondent to misrepresent his or her willingness to pay.

We had 3 validity tests: unit framing, scale, and starting point biases.[14] Respondents gave their monthly and annual willingness to pay. Half of the respondents were told that contraceptives reduced pregnancy probability to 1%, and the other half were told that contraceptives reduced the probability to 12%.[15] In addition, for half of the respondents, the starting bid was $2 per month (the estimated 2000 actuarial cost[16] for contraceptive coverage was $1.93), and for the other half, the starting bid was $10. To test theoretical validity, we regressed willingness to pay against income,[17] gender, age, and other key variables. We also assessed reasons for protest ($0) responses.[15]

Analysis

We used Stata 7.0 (Stata Corp, College Station, Tex). The opinion question was analyzed with a multiple logistic regression. We report the mean willingness to pay, which is the appropriate statistic for cost–benefit analysis, for the full sample and by starting bid. Associations with the mean log-transformed willingness to pay were tested by using tobit regression with robust variance estimators.[18,19] We tested for interaction with a Wald test. All analyses tested the ratio between 2 willingness-to-pay amounts rather than the absolute difference. Results were transformed back onto the original scale and presented as a ratio of dollar values (willingness to pay per $1 willingness to pay in the reference group).

RESULTS

Respondent demographics are summarized in Table 1. The sample characteristics were comparable to 2000 census data for Washington State adults, with some significant differences across age and ethnic groups.[20] In particular, the percentage of respondents aged 18 to 24 years was lower in our sample than in the census data, which is generally true of telephone surveys as compared with mail surveys.

Most respondents with an opinion (85%; 537 of 630) said that contraceptives should be covered by health insurance plans. Women were more likely to favor coverage than were men (adjusted odds ratio=4.95; 95% confidence interval=2.83, 8.67).

The unadjusted mean willingness to pay was $9.59 per month (SD=$9.38). The willingness to pay of nearly all (94%) respondents was higher than the actuarial cost. We saw no evidence of unit price framing bias when the mean monthly willingness to pay was compared with the annual willingness to pay (P=.21).

The multivariate tobit regression model included gender, income, reproductive age, sterilization status, contraceptive effectiveness scenario, willingness to pay bid starting point, and an interaction term (Table 2). For example, men earning less than $10 000 per year were willing to pay 2.35 times as much as men earning $20 001 to $50 000 per year (reference group). People of reproductive age (women 4 4 years, men 54 y ears) were willing to pay 2.12 times as much as respondents no longer of reproductive age.

Respondents were willing to pay more for methods presented as being more effective for preventing pregnancy (P=.049). Individuals who were presented with an effectiveness scenario of 99% were willing to pay 1.24 times as much as those given an 88% effectiveness scenario. Willingness to pay varied by whether respondents received an initial bid of $2 or $10 ($P$<.001). Respondents given a $10 starting bid were willing to pay 1.63 times as much as individuals given a $2 starting bid. Equivalent proportions of respondents were unwilling to pay anything ($0 willingness to pay: 14.1% in $2 initial bid group, 16.8% in $10 group). Reasons for this $0 willingness to pay likewise were similar between the 2 groups.

DISCUSSION

This study found that insurance coverage of contraceptives was widely supported and

TABLE 1—Demographic Characteristics of a Random-Digit-Dialed Sample: Washington State, 2000 (N = 659)

	Total n (%)		Total n (%)
Age, y		Relationship status*	
18–24	53 (8.0)	Legally married	382 (58.0)
25–34	122 (18.5)	Living with partner	53 (8.0)
35–44	149 (22.6)	Dating, not cohabiting	78 (11.8)
45–54	160 (24.3)	Widowed	43 (6.5)
55–64	75 (11.4)	No main relationship	100 (15.2)
65–74	57 (8.6)	Children	
75	33 (5.0)	0	172 (26.1)
Race		1	92 (14.0)
African American	21 (3.2)	2	192 (29.1)
Asian	13 (2.0)	3	108 (16.4)
White	564 (85.6)	4	91 (13.8)
American Indian	18 (2.7)	Insurance status**	
Alaska Native	1 (0.2)	Private, through employer	308 (46.7)
Native Hawaiian or Pacific Islander	7 (1.1)	Private, through spouse's employer, dependent, self	182 (27.6)
Other	28 (4.2)	Public, Medicare	76 (11.5)
Ethnicity: Latino/a	25 (3.8)	Public, Medicaid, Basic Health Plan	33 (5.0)
Education		Something else	22 (3.3)
8th grade	2 (0.3)	No insurance	34 (5.2)
Some high school	31 (4.7)	Employment**	
High school graduate/general equivalency diploma	151 (22.9)	Self-employed	114 (17.3)
Vocational/trade or some college	219 (33.2)	Working for employer	343 (52.0)
College graduate	147 (22.3)	Not currently working	119 (18.1)
Some graduate school	42 (6.4)	Retired	83 (12.6)
Completed graduate school	64 (9.7)	Hours/week worked, among n = 457 employed**	
Yearly income, $**		40	333 (50.5)
< 10 000	35 (5.3)	20–39	83 (12.6)
10 000–20 000	68 (10.3)	< 20	28 (4.2)
20 001–50 000	216 (32.8)	Ever changed method or use because of cost concern*	
50 001–100 000	202 (30.7)	Yes	41 (6.2)
100 001–250 000	34 (5.2)	No	605 (91.8)
> 250 000	13 (2.0)	Unsure	9 (1.4)

Note. Percentages may not add to 100 because of missing data (refusal to answer).
*Difference by gender, $P < .01$.
**Difference by gender, $P < .001$.

valued by women and men, regardless of whether they used contraceptives.

Respondents were willing to pay on average $9.59 for contraceptive coverage that cost $1.93 per month, yielding a favorable cost–benefit ratio of 4.97. These results reassure payers, policymakers, and employers that adding this coverage is a valuable benefit to consumers.

One limitation was that we saw evidence of starting point bias; the cost–benefit ratio was 3.43 for the subsample with a starting bid of $2 and 5.84 for those with a starting bid of $10. However, mean willingness to pay increased by only 70% when the starting bid increased by 400%. Another limitation was that the choice of starting bid levels may have biased the cost–benefit ratio to be greater than 1.0.

Two of the 3 validity tests supported the validity of the estimates. No evidence of framing bias was seen, and the contraceptive effectiveness scale effect was in the expected direction. Additional strengths of the study included the population-based sample, a narrow range in the willingness-to-pay measure, and theoretical validity of data in the direction expected.

Cost–benefit analyses should consider the full value of contraceptives, and insurance products should cover the cost of contraceptive goods and services. ■

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Contributors

A. Kurth conceived the study, oversaw its implementation, oversaw the analyses, and led the writing of the brief. M. Weaver assisted with the study design, instrument development, analyses, and writing. D. Lockhart conducted the analyses and assisted with the writing. L. Bielinski helped supervise study implementation and data collection. All authors helped to conceptualize ideas, interpret findings, and approve the brief.

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Human Participant Protection

The study was approved by the University of Washington Human Subjects Division. All participants gave verbal informed consent.

TABLE 2—Factors Independently Associated With Willingness to Pay (WTP) for a Contraceptive Coverage Insurance Benefit: Washington State, 2000 (N = 624)

	WTP, $, per $1 WTP in Reference Group	95% Confidence Interval	*P*
Gender[a]–annual income interaction			
Males	.005		
< $10 000	2.35	1.47, 3.78	<.001
$10 000–20 000	0.84	0.41, 1.70	.62
$20 001–50 000	Reference		
$50 001–100 000	1.06	0.72, 1.56	.76
> $100 000	1.59	0.95, 2.68	.08
Refused	0.26	0.12, 0.53	
Females	<.001		
< $10 000	1.14	0.51, 2.54	.75
$10 000–20 000	1.10	0.67, 1.84	.62
$20 001–50 000	2.11	1.45, 3.08	<.001
$50 001–100 000	1.91	1.30, 2.81	.001
> $100 000	3.01	1.91, 4.75	<.001
Refused	1.27	0.73, 2.19	.40
Age (women 44, men 54)	2.12	1.66, 2.70	<.001
(reference = women 45, men 55)			
1% contraceptive failure scenario[a]	1.24	1.00, 1.54	.049
(reference = 12% failure scenario)			
$10 bid starting point (reference = $2)	1.63	1.32, 2.03	<.001
Sterilized (reference = not sterilized)	1.12	0.90, 1.40	.30

Note. Tobit regression model with robust variance estimators, adjusted for gender, income, age, contraceptive effectiveness scenario, and bid starting point, and including a gender-by-income interaction.
[a]Contraceptive effectiveness rates were based on weighted average typical user pregnancy probability profiles for surgical and hormonal methods compared with barrier methods.

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Young Males' Sexual Education and Health Services

Marion Howard, PhD, Jackie Davis, MPH, Donnie Evans-Ray, MA, Marie Mitchell, RN, and Marian Apomah, AA

This study examined the basis for one hospital's decision to restructure its teen family planning clinical services. We examined results of surveys conducted from 1998 to 2003 with more than 2000 mostly African American eighth-grade boys. Most young males wanted to postpone sexual intercourse, but an even greater percentage were willing to use a method of protection. The hospital determined that it needed to give the same in-hospital clinical and counseling support to young males as it gives to young females. (*Am J Public Health.* 2004;94:1332–1335)

Since 1985, a publicly funded hospital in a large southern city has carried out a sustained effort to reach eighth-grade adolescents in middle school (those aged 13 and 14 years) with information about abstinence and methods of protection against

TABLE 1—Changes Leading to Male Health Services

Decade	Time Frame	Hospital Motivation to Create Changes	System Changes Made
1960s	Beginning	A publicly funded teaching hospital of a large southern university delivers 80% of area adolescents giving birth, which increases hospital's poor pregnancy outcome data.	Categorically all pregnant adolescents aged 16 and younger are made eligible for comprehensive high-risk prenatal care at hospital.
	Early	University and hospital staff recognize that excluding pregnant girls from remaining in school contributes to school dropouts and repeat pregnancies.	University and hospital develop school-based prenatal care teen support program. Leads school board to change policy—becomes first major school system in nation to allow pregnant girls to remain in regular school classes.
	Mid	Data indicate high rate of repeat pregnancies among those giving birth at age 16 and younger at hospital and that subsequent pregnancy outcomes are poorer than first ones.	Hospital interconceptional care services established to provide 1-year follow-up for teenagers giving birth at age 16 and younger at hospital.
	Late	Data indicate high rate of repeat pregnancies among those giving birth at age 16 and younger not sufficiently reduced.	Interconceptional care services for teenagers giving birth at age 16 and younger at hospital extended to 2-year follow-up.
1970s	Early	Although repeat pregnancies reduced, teenage pregnancy rates still too high; hospital decides to intensify outreach.	Staff gives presentations about teenage pregnancy prevention to youths in community on agency or school request. Never-pregnant girls seek care.
	Mid	Increased understanding that the best way to prevent a second pregnancy among teenagers is to prevent the first.	Clinic emphasis changed from secondary pregnancy prevention to primary pregnancy prevention—becomes teen services family planning clinic.
	Late	Girls often first come to teen services because they think they are pregnant or have a sexually transmitted disease; hospital decides to take systemwide outreach preventive education approach in schools.	School board approves agreement to allow hospital to provide 5 prevention-oriented reproductive health sessions to all eighth-grade students.
1980s	Early	Evaluation of outreach program shows that increasing knowledge of teenagers is necessary but not sufficient to change behavior and by itself will not reduce teenage pregnancy and sexually transmitted diseases.	Hospital seeks foundation funds for developing and field testing a skill-building program to postpone sexual involvement, which is to be based on social influence theories.
	Mid–Late	Literature provides a successful social influence model that shows helpfulness of male and female peer educators regarding reductions in teenage smoking.	Hospital implements revised version of reproductive health program in middle schools and adds 5 field-tested skill-building sessions led by trained male and female high school teenagers.
1990s	Early	Initial 5-year evaluation shows that addition of teenager-led skill-building program affects rate of sexual involvement and hospital births to teenagers.	Schools formally integrate hospital program into middle school health education curriculum (total 10 prevention sessions in eighth grade, half of which are teenager-led and equally targeted at young males).
	Mid	Data from eighth-grade program indicate decreasing age of sexually involved youths at first intercourse.	Hospital creates teacher-led skill-building program for use with preteenagers at elementary-school level. Schools send fifth-grade teachers to preteenager program training.
	Late	Pregnancy rates decline for 16 and younger age group, but rates for older teenagers do not show similar decline.	Hospital creates multiple prevention programs for use with teenagers at the high-school level.
2000s	Early	Data collected from eighth-grade boys over a 5-year period support recognition that further reduction of pregnancy and sexually transmitted diseases requires equalizing services for young males.	Hospital relocates teen services to new teen-friendly space and expands educational and medical reproductive health services to include young males, complementing services offered to young females.

pregnancy and sexually transmitted diseases (Table 1). This outreach effort has been supported by the provision of family planning clinical services for teenagers (more than 1500 girls each year) at the hospital. By stretching its health education net across the schools at one level, over time, the hospital has ensured that all 13- to 19-year-olds (almost 20 000 teenagers) who currently attend or have attended city schools in its primary catchment area have been given such important information.

An earlier 5-year study (1985–1990) showed that the outreach educational program held promise.[1] More recent data may indicate that the hospital is making progress. The county where the schools and hospital are located has shown a decline in teenage pregnancy (1997–2000) nearly twice that of a similar neighboring county where hospital staffing and funding have not permitted a similar effort.[2]

However, continuing needs for improvement recently motivated the hospital's teen services program to try to better define the value of its programs to young males. The notion was that adding clinical reproductive health services for young males in support of its outreach education might produce even greater gains. To help make the deci-

sion about offering clinical services to teenaged males, data were gathered from more than 2000 eighth-grade boys representative of the 7000 mostly African American male students in the outreach education program during the period from 1998 to 2003 (89% of the studied males were African American).

Half of the teen services program's presentation time in the public schools is spent on building the skills of youths to resist social and peer pressures toward sexual involvement. The goal of the effort is to provide reinforcement and support for continuing to postpone sexual involvement among those who have not had sexual intercourse and to give those who have had sexual intercourse an opportunity to rethink their behavior. (At pretest, the studied eighth-grade boys were fairly evenly split, with 52% stating that they have not had sexual intercourse and 48% stating that they have.) Role modeling by male high-school-aged leaders who coteach this part of the course is core to the effort. The teenaged leaders show younger boys that males can be popular and successful in the teenage world without becoming sexually involved.[3]

Over the last 5 years—postprogram—data showed that a consistent 83% of the young males stated that they gained new information about how to resist social and peer pressures, and two thirds thought that it would actually be easier to say "no" to sexual intercourse in the future. Moreover, following the program, data indicated that among those who have had sexual intercourse, the proportion who will continue to have sexual intercourse will significantly decrease (preprogram, 37% indicated that they would continue, whereas that was true for only 24% postprogram). Among those who have not had sexual intercourse, data did not significantly change (preprogram, 9% indicated that they intended to begin having sexual intercourse, compared with 7% postprogram).

The other half of the presentation time in the schools is spent discussing male and female reproductive systems, potential negative consequences of sexual involvement, where to obtain methods of protection, and how to use them. Postprogram, a fairly consistent 92% of all young males affirmed that they received new information about teenage pregnancy, sexually transmitted infections, and the risks of sexual intercourse. Over the 5 years studied, postprogram, 94% of all teenaged males said that they would be more likely to use protection the next time they have sexual intercourse because of what they have learned. Cross-year data suggest that this result rests not only on improved knowledge and attitudes postprogram (Table 2) but also on a consistent preexisting notion among 4 out of 5 young males that teenage pregnancy could negatively interfere with their future plans and limit how they might be able to live their lives in the future.

The survey information, especially the data indicating each year that 94% of the young males stated that they were willing to use protection, ultimately led the teen services program to increase its efforts to assist young males in being safer by providing more support. Recently, a new hospital clinic site that is "teen-friendly" for both males and females opened for use. A major goal is to be able to give more personal assistance to young males in handling their sexual behaviors positively over time (both abstinence and use of protection). The added services also have an important potential for better meeting the needs of homosexual young males as well as young men who have been sexually abused.[4,5]

Nationwide, the trends among young people are toward less sexual risk taking through both increased use of condoms and more delay in sexual involvement; as a result, adolescent pregnancy and childbearing have declined.[6,7] Through its long-term practice of investing in the health education of young African Americans, in addition to the current increased emphasis on young males by offering clinical services to them, the hospital hopes to continue to add to that trend. ■

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Contributors

M. Howard conceived the study and focus group, developed questionnaires, synthesized data, and drafted the brief. J. Davis assisted with all phases of the study and managed data entry and data analysis. D. Evans-Ray assisted in questionnaire development, supervised outreach staff who collected data, and selected focus group participants. M. Mitchell assisted in questionnaire development, arranged for data collection in schools, conceptualized the makeup of focus groups, assigned staff to contact potential youth participants, coordinated arrangements for focus groups, and reviewed and approved content for discussion. M. Apomah was responsible for data entry and management. All authors helped to conceptualize ideas, interpret findings, and review drafts of the brief.

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Human Participant Protection

Data collection for this study was approved by Emory University's institutional review board.

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TABLE 2—Gains in Positive Knowledge, Attitudes, and Intended Behaviors, 5-Year Data Set: Eighth-Grade Adolescent Boys

	Year 1		Year 2		Year 3		Year 4		Year 5		Total: All Years	
	Agree, %		Agree, %		Agree, %		Agree, %		Agree, %		Agree, %	
Knowledge	Preprogram	Postprogram	Preprogram	Postprogram	Preprogram	Postprogram	Preprogram	Postprogram	Preprogram	Postprogram	Preprogram	Postprogram
A girl can get pregnant the first time she has sexual intercourse	76	90	80	92	79	92	80	92	73	89	78	91
Some sexually transmitted diseases have no symptoms	67	86	81	89	88	91*	. . .	. . .	. . .	. . .	81	89
Teenagers can get birth control without parental consent in Georgia	43	83	51	86	49	86	49	88	29	75	46	84
Most young teenagers are not having sexual intercourse	31	55	31	58	12	33	16	39	8	21	21	44
Attitudes	Preprogram	Postprogram	Preprogram	Postprogram	Preprogram	Postprogram	Preprogram	Postprogram	Preprogram	Postprogram	Preprogram	Postprogram
The media does not give teenagers an accurate picture of the consequences of having sexual intercourse	67	83	69	81	63	79	71	86	63	75	67	80
Advertisements can influence the sexual behavior of teenagers	65	74*	65	77	64	72	77	85	. . .	. . .	67	77
Young teenagers are not ready to handle all the problems that could come from having sexual intercourse	74	89	73	81	69	81	77	87	65	78	71	82
Boys should be given the same support for saying "no" as are girls	. . .	. . .	71	85	67	81	77	91	64	79	70	84
It is appropriate for young teenagers (ages 13–15y) to have sexual intercourse	15	13*	18	10	21	10	15	7	17	11	17	10
Intended behaviors	Preprogram	Postprogram	Preprogram	Postprogram	Preprogram	Postprogram	Preprogram	Postprogram	Preprogram	Postprogram	Preprogram	Postprogram
Will begin to have sexual intercourse (males who have not had sexual intercourse)	. . .	. . .	7	6*	7	8*	13	5	11	11*	9	7*
Will continue to have sexual intercourse (males who have had sexual intercourse)	. . .	. . .	33	22	37	24	43	24	43	29	37	24

Note. Individual year and 5-year combined responses are all significant at $P < .05$ unless followed by an asterisk.
Ellipses indicate that question was not asked or asked differently that year.

Do Men Know That They Have Had a Prostate-Specific Antigen Test? Accuracy of Self-Reports of Testing at 2 Sites

Evelyn C. Y. Chan, MD, Sally W. Vernon, PhD, Chul Ahn, PhD, and Anthony Greisinger, PhD

This study determined the accuracy of self-reports of prostate-specific antigen (PSA) testing. Men (N = 402) attending 2 outpatient clinics were asked: "Did you have a PSA test today?" and their medical records were checked. Concordance, sensitivity, and false-negative values were 65%, 67%, and 33%, respectively, at 1 clinic site and 88%, 64%, and 36% at the other. The accuracy of self-reports of PSA testing should be interpreted with caution. (*Am J Public Health*. 2004;94:1336–1338)

Screening for prostate cancer with prostate-specific antigen (PSA) is controversial because it is not clear whether regular testing reduces mortality.[1–5] Therefore, professional organizations recommend informed decisionmaking for PSA testing.[6–10] To promote educational efforts for informed decisionmaking and to determine screening prevalence, which often relies on self-reported data, investigators need data on the accuracy of self-reports of PSA testing. We hypothesized that the accuracy of self-reports of PSA testing would be high if patients were asked about testing on the same day as their clinic visit. We determined whether any demographic, knowledge, or experience variables predicted accurate self-reports.

METHODS

Study participants were enrolled in another study[11] and attended the general internal medicine outpatient clinics at Kelsey-Seybold Clinic in Houston, Tex, and the University of Texas–Houston. Men attending Kelsey-Seybold Clinic were scheduled for an annual health maintenance examination. Men attending the University of Texas–Houston were scheduled for nonurgent care visits.

From April to July 2001, we approached 677 men aged 50 years or older on-site after they had visited with their physician. To be eligible, men had to have no history of prostate cancer and at least a sixth-grade education. Ninety men were ineligible, and 157 refused to participate, resulting in a sample of 430 men. Each participant was paid $10 to complete a self-administered survey. A medical record review between January and March 2002 by an internal medicine physician was used as the gold standard to determine whether men had received a PSA test with their visit. After participants with unavailable records were excluded, 265 men from Kelsey-Seybold Clinic and 137 men from the University of Texas–Houston remained.

We used sections of a survey from another study.[11] The main dependent variable was concordance[12] of patient self-reports of PSA testing to the following question: "Did you have a PSA test today?" Independent variables were demographic, knowledge, and experience variables.

We excluded from our analysis 46 men at Kelsey-Seybold Clinic (17%) and 7 men from the University of Texas–Houston (5%) who responded "don't know" to "Did you have a PSA test today?"

We conducted χ^2 tests to describe the demographic characteristics of the respondents and to assess the accuracy of PSA self-reports for independent variables. Variables significant at $P \leq .25$ were entered into a stepwise logistic regression model to identify the predictors of accurate self-reports at each site.[11,12]

RESULTS

Respondents at the Kelsey-Seybold Clinic had a higher annual household income than

TABLE 1—Demographic and Background Characteristics of Respondents

	Kelsey-Seybold Clinic[a]		The University of Texas–Houston[a]	
	n	%	n	%
Age, y				
50–59	150	57	65	47
60–69	80	30	50	37
≤ 70	35	13	22	16
Race/Ethnicity				
White	145	55	88	64
Hispanic	24	9	9	7
African American	81	31	37	27
Other	13	5	2	1
No response	2	1	1	1
Marital status				
Married	214	81	105	77
Not married	49	18	31	23
No response	2	1	1	1
Education				
< High school	18	7	15	11
Completed high school/general equivalency diploma	27	10	19	14
Some college or trade school	60	23	35	26
Bachelor's degree	75	28	28	20
Master's degree or beyond	84	32	39	28
No response	1	0.4	1	1
Annual household income,* $				
< 15 000	5	2	13	9
15 000–99 999	180	68	73	53
≥ 100 000	65	25	45	33
No response	15	6	6	4
Family history of prostate cancer				
Yes	39	15	17	12
No	217	82	117	85
No response	9	3	3	2
PSA test with clinic visit as documented in medical record**				
Yes	238	90	38	28
No	27	10	99	72

[a]There were 402 study participants: 265 at Kelsey-Seybold Clinic and 137 at the University of Texas–Houston.
*$P < .001$ by χ^2 test across sites.
**$P < .001$ by χ^2 test across sites. This is the only variable that was based on the medical record review.

TABLE 2—Accuracy of Self-Reports of Prostate-Specific Antigen (PSA) Testing Across Experience Variables at 2 Sites

Experience Variables (Response Categories = Yes or No)[a]	Kelsey-Seybold Clinic		University of Texas–Houston	
	Self-Report of PSA Matched Chart, %	Total Group N	Self-Report of PSA Matched Chart, %	Total Group N
Have you ever heard of a PSA test?				
Yes	71*	182	88	104
No	32	28	100	1
Have you ever been told by a doctor that you should have a PSA blood test?				
Yes	75*	174	87	94
No	27	33	93	29
Have you ever had a PSA test?				
Yes	77*	163	88	86
No	28	40	88	34
Did your doctor recommend a PSA test to you today?				
Yes	76*	162	89	87
No	33	48	85	34
Did your doctor discuss the advantages and disadvantages of the PSA test with you?				
Yes	72	88	82	44
No	62	117	93	83

[a]Respondents could respond "yes," "no," or "don't know" to the experience variables shown. "Don't know" responses were omitted.
*$P \leq .001$ by χ^2 test between "yes" and "no" responses for a variable at that site only.

did respondents at the University of Texas–Houston but otherwise had similar demographic characteristics (Table 1).

In response to the question "Did you have a PSA test today?" at Kelsey-Seybold Clinic, 145 men responded "yes" and 74 men responded "no." At the University of Texas–Houston, 25 men responded "yes" and 105 men responded "no." The concordance was 65% at Kelsey-Seybold Clinic and 88% at the University of Texas–Houston. The sensitivity and false-negative values were 67% and 33%, respectively, at Kelsey-Seybold Clinic and 64% and 36%, respectively, at the University of Texas–Houston. The specificity and false-positive values were 43% and 57%, respectively, at Kelsey-Seybold Clinic and 98% and 2%, respectively, at the University of Texas–Houston.

At Kelsey-Seybold Clinic, 5 variables were significantly associated with accurate self-reports of PSA testing: (1) more education, (2) "ever heard of a PSA," (3) "ever been told to have a PSA," (4) "ever had a PSA," and (5) "doctor recommended a PSA today" (Table 2).

The prevalence of PSA testing was 90% at Kelsey-Seybold Clinic and 28% at the University of Texas–Houston by medical record review. Among the 53 men who responded "don't know" to the question "Did you have a PSA test today?", the prevalence of PSA testing was 91% at Kelsey-Seybold Clinic and 28% at the University of Texas–Houston. Among the 220 men who responded "yes" to the question "Did your doctor recommend a PSA test today?", the prevalence of PSA testing was 93% at Kelsey-Seybold Clinic and 64% at the University of Texas–Houston. Among the 146 men who responded "yes" to the question "Did your doctor discuss the advantages and disadvantages of the PSA test with you?", the prevalence of PSA testing was 88% at Kelsey-Seybold Clinic and 38% at the University of Texas–Houston.

DISCUSSION

Our findings and those of others[13,14] suggest that the sensitivity of asking a man whether he had completed a PSA test is relatively low, regardless of the time frame for self-reporting a test. We found a false-negative response rate of one third, which is of concern because of the potential harm that may arise when men must cope with the consequences of a test that they did not even realize they had taken. Because professional organizations recommend informed decisionmaking before PSA testing, future studies should focus on improving physician–patient communication. We recommend caution when interpreting the accuracy of self-reports of PSA testing. ■

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Contributors

E. C. Y. Chan supervised the study and with S. W. Vernon conceived the study design and collected and analyzed the data. C. Ahn analyzed the data. A. Greisinger assisted with data collection. All authors contributed to revisions of the brief and approved the final version.

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Human Participant Protection

The study was approved by the institutional review board of The University of Texas–Houston Health Sciences Center.

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Insurance Coverage of Smoking Cessation Treatment for State Employees

Marguerite E. Burns, MA, Timothy W. Bosworth, PhD, and Michael C. Fiore, MD, MPH

Public health experts recommend that health insurance include coverage for smoking cessation treatment as an evidence-based strategy to reduce smoking. As employers, states can implement this policy for more than 5 million individuals nationwide. This study identified the extent to which states require smoking cessation treatment insurance coverage for their employees; of 45 states, 29 required coverage for at least 1 US Public Health Service (PHS)–recommended treatment, and only 17 of 45 provided coverage that was fully consistent with PHS recommendations. (*Am J Public Health.* 2004;94:1338–1340)

Public health experts recommend that health insurance products include coverage for evidence-based smoking cessation treatment.[1–3] Among the entities with the authority to effect this health policy change, employers are especially promising agents of change. Employers have shown increasingly significant influence on the design and delivery of health care.[4,5] As employers, states purchase health insurance for more than 5 million employees and retirees nationwide.[6] In many markets, states and other public employers serve as leaders and influence both what insurers offer employers and what employers offer employees.[7] By including coverage for smoking cessation treatment in health insurance benefits, states can encourage smoking cessation among state employees while also serving as a model for other local and regional employers and insurers.

METHODS

We describe the extent to which states use their purchasing power to buy insurance coverage for smoking cessation treatment for their employees. For each state, we identified and surveyed the agency responsible for state employee health care purchasing between September 2002 and February 2003. The agency was identified through an Internet search, and telephone follow-up was used to identify its administrator. We asked the administrator to nominate an employee health benefits staff person to provide information on health insurance coverage for state employees. Forty-five state agency administrators nominated staff persons to participate. We asked each nominee to complete a faxed survey describing the current insurance coverage for smoking cessation treatment that the agency required for state employees. Staff persons in 45 states completed the survey.

Survey questions assessed the presence of insurance coverage for smoking cessation treatment recommended in the US Public Health Service (PHS) *Treating Tobacco Use and Dependence: Clinical Practice Guideline,*[3] including the following: over-the-counter nicotine gum, over-the-counter nicotine patch, prescription nicotine patch, prescription nicotine nasal spray, prescription nicotine inhaler, Zyban (GlaxoSmithKline, Middlesex, UK), group counseling, face-to-face individual counseling, and telephone counseling. The survey also assessed whether insurance coverage for smoking cessation treatment applied to all or some state employees because states may negotiate different benefits from the various insurers serving state employees.[8]

RESULTS

For analytic purposes, we mapped each treatment to 1 of 3 categories: (1) counseling, (2) prescription medications, or (3) over-the-counter medications. Just 7 states required smoking cessation treatment coverage that was fully consistent with the US PHS guideline recommendations for *all* state employees (Table 1). That is, they required coverage for some form of group or individual counseling *and* 1 or more of the 5 Food and

TABLE 1—Number of States[a] That Require Insurance Coverage of US Public Health Service (PHS)–Recommended Smoking Cessation Treatment for State Employees

	All Employees	Some Employees	No Employees
Any US PHS-recommended treatment	20	9	16
Counseling	9	13	23
Prescription medication	15	8	22
Over-the-counter medication	9	3	33
Consistent with US PHS guideline (i.e., counseling and medication)	7	10	28

[a]Five states did not participate in this survey: Connecticut, Hawaii, Michigan, Minnesota, and New Hampshire.

Drug Administration–approved medications for smoking cessation treatment. An additional 10 states required US PHS consistent coverage for at least *some* of their state employees. A total of 29 states required insurance coverage for 1 or more of the US PHS guideline–recommended treatments for at least some state employees. Smoking cessation treatment coverage was not required for any state employees in 16 states (Table 2).

DISCUSSION

Our study had some limitations. The study data were self-reported. We attempted to validate survey responses against state employee health insurance materials that were collected before the survey. However, as a whole, these materials lacked sufficient detail to allow validation of the survey data.

In the study, we considered only the role of the state employer as health care purchaser in providing insurance coverage for smoking cessation treatment. That is, we addressed the extent to which the state agencies required insurance coverage for smoking cessation treatment for their employees. We did not catalog the general availability of smoking cessation treatment to state employees. Treatment may have been available to employees through other employee benefits (e.g., wellness programs) or through health insurers that provided this coverage in addition to the benefits package negotiated for state employees. For agencies that reported requiring insurance coverage of smoking cessation treatment for "some" employees, the study design did not allow us to ascertain the exact percentage of employees subject to this coverage. Finally, the survey did not capture the degree to which employees shared the cost of smoking cessation treatment when coverage was provided (e.g., copayments, deductibles).

Our results echo those of previous studies in other populations. The purchase and provision of insurance coverage for smoking cessation treatment remain uneven.[9–14] The content of that coverage, among states, is also highly variable despite the publication of evidence-based treatment recommendations in the US PHS *Clinical Practice Guideline.* Although research findings are not conclusive, insurance coverage for smoking cessation treatment holds promise as a means of reducing smoking rates in insured populations.[15–17] States have yet to use fully their health care purchasing power to realize that promise. ■

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Contributors

M.E. Burns, the coprincipal investigator, designed the study and survey, conducted the analyses, and wrote the brief. T.W. Bosworth, the study coordinator, conducted the survey. M.C. Fiore, the principal investigator, designed the study and oversaw study implementation and data analysis. All authors contributed to the writing and revision of several drafts.

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Human Participant Protection

This study was approved by the University of Wisconsin–Madison Health Sciences Human Subjects Committee (HSC protocol 2002-055). Written informed consent was obtained from the chief administrator of each agency for study participation. Verbal consent was then obtained from the survey respondents, if different from the chief administrators.

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TABLE 2—State-Required Insurance Coverage of Smoking Cessation Treatment for *Any* State Employees

State[a]	Any US PHS–Recommended Treatment	Counseling	Prescription Medication	Over-the-Counter Medication	Consistent With US PHS Guideline
Alaska	Yes	[b]	Yes	[b]	[b]
Alabama	Yes	Yes	Yes	[c]	Yes
Arkansas	Yes	Yes	Yes	Yes	Yes
Arizona	[b]	[b]	[b]	[b]	[b]
California	Yes	Yes	Yes	Yes	Yes
Colorado	Yes	[b]	Yes	[b]	[b]
Delaware	Yes	[b]	Yes	[b]	[b]
Florida	[b]	[b]	[b]	[b]	[b]
Georgia	[b]	[b]	[b]	[b]	[b]
Iowa	[b]	[b]	[b]	[b]	[b]
Idaho	[b]	[b]	[b]	[b]	[b]
Illinois	[b]	[b]	[b]	[b]	[b]
Indiana	Yes	Yes	Yes	[b]	Yes
Kansas	[b]	[b]	[b]	[b]	[b]
Kentucky	[b]	[b]	[b]	[b]	[b]
Louisiana	[b]	[b]	[b]	[b]	[b]
Massachusetts	Yes	[b]	Yes	[b]	[b]
Maryland	Yes	[b]	Yes	Yes	[b]
Maine	Yes	Yes	Yes	Yes	Yes
Missouri	Yes	Yes	Yes	[b]	Yes
Mississippi	Yes	Yes	[b]	[b]	[b]
Montana	Yes	Yes	[b]	[b]	[b]
North Carolina	Yes	Yes	Yes	[b]	Yes
North Dakota	[b]	[b]	[b]	[b]	[b]
Nebraska	Yes	Yes	[b]	[b]	[b]
New Jersey	Yes	Yes	Yes	Yes	Yes
New Mexico	Yes	Yes	Yes	Yes	Yes
Nevada	[b]	[b]	[b]	[b]	[b]
New York	Yes	[b]	Yes	[b]	[b]
Ohio	Yes	Yes	[b]	[b]	[b]
Oklahoma	Yes	Yes	Yes	Yes	Yes
Oregon	Yes	Yes	[b]	[b]	[b]
Pennsylvania	[b]	[b]	[b]	[b]	[b]
Rhode Island	[b]	[b]	[b]	[b]	[b]
South Carolina	Yes	[b]	Yes	[b]	[b]
South Dakota	Yes	Yes	Yes	[b]	Yes
Tennessee	Yes	Yes	Yes	Yes	Yes
Texas	[b]	[b]	[b]	[b]	[b]
Utah	[b]	[b]	[b]	[b]	[b]
Virginia	Yes	Yes	[b]	Yes	Yes
Vermont	Yes	Yes	Yes	Yes	Yes
Washington	Yes	Yes	Yes	Yes	Yes
Wisconsin	Yes	Yes	Yes	[b]	Yes
West Virginia	Yes	Yes	Yes	Yes	Yes
Wyoming	[b]	[b]	[b]	[b]	[b]

Note. PHS = Public Health Service.
[a]Five states did not participate in this survey: Connecticut, Hawaii, Michigan, Minnesota, and New Hampshire.
[b]Not required.
[c]Missing data.

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experience in a 12-month period. If all pregnancies ended in abortion, a woman could become pregnant several times in a year, whereas if all pregnancies were carried to term, the woman's chance of becoming pregnant twice in the same year would be small. The time during which each pregnancy outcome removes a woman from the risk of an additional pregnancy affects the total number of pregnancies the woman could experience. For this analysis, we assumed that all births would occur at 9 months and would be followed by 2 months of postpartum amenorrhea. We assumed that induced abortions would have occurred at month 3, followed by a 1-month period of amenorrhea, and that spontaneous abortions would have occurred at month 3, followed by 1 month of infecundity. Ectopic pregnancies would remove women from the risk of pregnancy for 11 months.

We modeled risk of pregnancy as a Markov process because in each month, the risk of pregnancy depends on the probability of being infertile as the result of a pregnancy in a previous month. A Markov process is an algorithm that produces estimates for discrete time periods by assigning probability on the basis of previous values. We assumed that the probability of pregnancy in a given month depended on the probability of pregnancy in previous months. We estimated a woman's chance of conception in a given month as the monthly method failure rate multiplied by the probability that she did not become pregnant in the previous 4 months and did not carry to term a pregnancy that began 5–11 months before. Thus, the probability of pregnancy in a given month is

$$(1)\quad p_n = f\{1-(1-b)[1-\prod_{j=1}^{a}(1-p_{n-j})]-b[1-\prod_{k=1}^{i}(1-p_{n-k})]\},$$

where p_n is the probability of pregnancy in month n, b is the probability that a pregnancy will be brought to term, f is the monthly contraception method failure rate, a is the gestational age at the time of induced or spontaneous abortion, and i is 9 months plus the duration of postpartum infecundity.

To model pregnancies under the hypothetical situation of the absence of Family PACT, we predicted the number of pregnancies that would be expected if women continued to use the array of methods that they were using before their first visit under Family PACT.

For this analysis, we used paid claims data to identify contraceptive services provided by the Family PACT Program. Pregnancies averted were estimated for 491 569 female clients who received contraception methods through the Family PACT Program from July 1997 to June 1998. These women included women for whom the pharmacy billed for prescription or over-the-counter contraception methods or for whom a clinician billed for contraceptive supplies or medications or for a medical procedure (e.g., female sterilization, intrauterine contraceptive, and Norplant insertion [Wyeth Pharmaceuticals, Madison, NJ]). Pregnancies among women who received natural family planning methods under Family PACT were not included, because we could not determine from our data who received this information. The effect of excluding natural family planning methods is negligible, given that the failure rate of these methods is very close to what we assume women would experience in the absence of Family PACT.

A review of client medical records, abstracted from providers in 11 out of 58 California counties, provided data on pregnancy risk and contraceptive methods used before program enrollment. Client data from abstracted medical records were similar to client data from the overall Family PACT population; however, the medical record review contained slightly more Hispanic adults and fewer White teenagers. To predict what contraception methods women would have used in the absence of Family PACT, we examined a subset of charts from a medical record review of new Family PACT clients who were neither pregnant nor seeking pregnancy. Women who were established clients were excluded because they may have been seen by providers under the previous state program that was replaced by Family PACT. For the 1429 women who were neither pregnant nor seeking pregnancy, we identified the primary contraception method used before their first Family PACT visit.

Probability of Pregnancy by Contraception Method Used

The probabilities of pregnancy by method were based on reported first-year pregnancy rate estimates from Hatcher et al.[2] and Trussell et al.[3] (Table 1). The monthly proba-

TABLE 1—Contraceptive Failure Rate and Pregnancy Outcome Values Used for Model of Pregnancies Averted

	Adults (Aged ≥ 20 Years), %	Adolescents (Aged < 20 Years), %
Contraceptive failure rates[a]		
Tubal ligation	0.40	0.40
Intrauterine contraceptives	0.80	0.80
Implants (Norplant)	0.30	0.30
Injectables (Depo Provera)	0.28	0.40
Oral contraceptives	4.78	5.90
Diaphragm/cervical cap	19.00	23.70
Condoms	14.00	16.60
Spermicide	25.00	30.70
Pregnancy outcomes[b]		
Spontaneous abortion	15	14
Induced abortion	39	36
Ectopic pregnancy	1	1
Birth	45	49
Total	100	100

[a]Percentage pregnant at 1 year (Hatcher et al.[2]).
[b]Modified from Saraiya et al.[5] and Henshaw.[4]

bility of pregnancy can be formulated as $1-(1-\text{percentage pregnant at 1 year})^{1/13}$.

Pregnancy Outcomes

Table 1 shows the pregnancy outcomes we assumed for adolescents and adults. We used estimates by Henshaw[4] for the percentage of unintended pregnancies that end in abortion or birth. To estimate the number ending in spontaneous abortion, we applied the technique specified in Henshaw's article, in which spontaneous abortions accounted for 20% of births and 10% of induced abortions. This technique did not include ectopic pregnancies, so we used 1% for ectopic pregnancies, as reported by Saraiya et al.[5] and Trussell et al.[3]

Months of Contraceptive Coverage Under Family PACT

The number of months of contraceptive coverage provided under the Family PACT Program was derived from the type and quantity of contraceptives dispensed according to paid claims data. The contraceptive methods adopted during the first year of the Family PACT Program may prevent pregnancies for many years. The fertility effect for long-term methods was capped at 2 years to avoid predicting pregnancies more than 2 years ahead. Months of coverage for a long-term method were calculated to be the number of months between the provision date and June 30, 1999 (1 year after the end of the fiscal year). For example, a woman receiving a sterilization procedure on July 1, 1997, was assumed to have 24 months of coverage. A woman receiving that procedure on June 30, 1998, was assumed to have 12 months of coverage. Although the June 1999 cutoff date was arbitrary, it was useful for determining the short-term fertility effect of the Family PACT Program. The number of women receiving long-term contraceptive services was relatively small (<4% of all women receiving contraception), so excluding the full duration of contraceptive benefit did not have a major effect on our estimate of the program's effect on fertility.

For short-term methods such as condoms and oral contraceptives, we adjusted the months of contraceptive coverage to get a conservative estimate of pregnancies averted and to account for method discontinuation, because women do not necessarily use all of the supplies dispensed to them. For oral contraceptives, we assumed that a woman who did not return for refills used half of the supply of contraceptives, measured in months, that she was dispensed. For condoms and barrier method supplies, clinic dispensing was assumed to provide 2 months of contraceptive coverage, on the basis of findings of the medical record review. In the case of pharmacy dispensing, the exact quantity of supplies dispensed was available; we assumed a month of protection for every 12 condoms dispensed. Each Depo Provera injection (Upjohn, Kalamazoo, Mich) was assumed to provide 3 months of contraceptive coverage.

TABLE 2—Primary Contraceptive Method Used Before First Visit by Women Who Were Neither Pregnant nor Seeking Pregnancy: California Family Planning, Access, Care, and Treatment Program Medical Record Review, 1997–1998

	Adults (Aged ≥20 Years), No. (%)	Adolescents (Aged <20 Years), No. (%)
No method	351 (29)	71 (33)
Natural family planning	46 (4)	10 (5)
Condoms	304 (25)	68 (31)
Oral contraceptives	288 (24)	42 (19)
Injectables (Depo Provera)	142 (12)	23 (11)
Implants (Norplant)	20 (2)	1 (0)
Intrauterine contraceptives	61 (5)	2 (1)
Total	1212 (100)	217 (100)

RESULTS

Contraceptive Use in the Absence of Family PACT

The medical record review found that nonuse of contraception before enrollment in Family PACT was quite common. Among 1429 new Family PACT clients, more than one third were using no method or a low-efficacy method before their first visit. Low-efficacy methods include natural family planning and use of spermicides without a barrier method. We used the method distribution for 1429 new clients in the medical record review who were neither pregnant nor seeking pregnancy as the basis for modeling the methods that clients would have used if Family PACT services had not been available (Table 2). For adults, the mix of methods reported by women before enrollment corresponds to a 45.5% probability of pregnancy within 1 year. For adolescents, this mix of methods would correspond to a 57.7% probability of pregnancy within 1 year, assuming the contraceptive failure rates shown in Table 1.

Adoption of Contraception Methods at First Visit

Women enrolling in Family PACT were likely to leave their first visit with a more effective contraception method than they used before the visit. Medical records for the 1429 visits by women who were new to Family PACT revealed that 39% of clients left with a more reliable method than the one they had been using before the visit. Nearly 23% of clients left their first Family PACT visit with a highly effective, long-acting method of contraception.

Among the nearly one third of clients (29%) who were using no method when they first visited a Family PACT provider, 95% had adopted a method by the end of their visit. Among previous nonusers, 39% adopted barrier methods (male or female condom, diaphragm, cervical cap), or spermicide; 32% adopted oral contraceptives; and 16% adopted a long-acting method, such as contraceptive injections, intrauterine contraceptives, contraceptive implants, or sterilization.

Contraceptives Dispensed and Months of Contraceptive Coverage

Program claims included payment for oral contraceptives for more than 285 000 clients, barrier methods for 147 000, inject-

TABLE 3—Dispensing of Contraceptives During First Year of Family Planning, Access, Care, and Treatment Program: Fiscal Year 1997–1998

	No. of Women Adopting Method[a]			Average Woman-Months of Protection[b]		
	Adults	Adolescents	Total	Adults	Adolescents	Total
Tubal ligation	3640	13	3653	18.13	17.77	18.13
Intrauterine contraceptives	9995	516	10 511	16.94	16.89	16.94
Implants (Norplant)	2619	498	3117	16.72	16.57	16.7
Injectables (Depo Provera)	79 651	21 917	101 568	6.22	5.63	6.09
Oral contraceptives	229 077	56 235	285 312	8.25	7.05	8.01
Diaphragm/cervical cap	1302	85	1387	2.08	2.09	2.09
Condoms	115 817	31 571	147 388	2.64	2.53	2.61
Foam/gel	18 528	2783	21 311	2.42	2.29	2.4
Intrauterine contraceptive/implant removal[c]	5083	199	5282	0.38	0.41	0.38
Total clients	393 665	97 904	491 569	7.67	6.37	7.41

[a]Total number of clients is less than the column totals because women were counted once for each type of contraceptive they were dispensed.
[b]Duration of protection was capped at 2 years for tubal ligations, intrauterine contraceptives, and Norplant.
[c]For the removal of intrauterine contraceptives and implants, months of contraceptive coverage began at first visit and continued until removal of the device.

able contraceptives for more than 100 000, and long-term methods (tubal ligations, intrauterine contraceptives, and implants) for 17 000 clients. Claims data indicated that many women received more than 1 type of contraception either for dual use or because they switched methods during the year (Table 3).

During fiscal year 1997–1998, the contraceptives claimed for female clients would have provided each woman with an average of 7.4 months of coverage. According to claims data, adolescents received 1.3 fewer months of contraceptive coverage than did adults. Part of the difference between adolescents and adults can be attributed to adolescents' greater reliance on short-acting contraception methods. However, even among clients receiving short-acting methods, adolescents still received fewer months of contraceptive coverage. Compared with adult women, adolescent women received 1.2 fewer months of oral and injectable contraceptives and 0.11 fewer months of barrier-method supplies.

More than 3.6 million woman-months of contraception were dispensed through Family PACT during the year, according to paid claims data. Oral contraception accounted for 63% of the woman-months dispensed, injectable contraception for 17%, barrier methods 10%, and long-term methods 10%. The months of coverage from long-term methods was underestimated because of the 2-year cap.

Pregnancies Averted

On the basis of the quantity and type of methods dispensed according to the claims data, we estimated that women participating in Family PACT had almost 11 000 pregnancies during the time they were "covered" by contraception owing to method failure and noncompliance. If these women had continued with the same method array used by women new to the Family PACT program, they would have had 119 000 pregnancies. The difference, 108 000 pregnancies, is an estimate of the pregnancies averted through Family PACT services during the first year of the program. Among adolescents, more than 24 000 pregnancies—which would have resulted in 12 000 teen births, 9000 abortions, 3000 spontaneous abortions, and 200 ectopic pregnancies—were averted. Among adults, 84 000 pregnancies—which would have resulted in 38 000 unintended births, 32 000 abortions, 13 000 spontaneous abortions, and 800 ectopic pregnancies—were averted (Table 4).

DISCUSSION

Policy Implications

The Family PACT program had a significant effect on fertility in California. The California Department of Finance estimated that 519 000 births occurred among all California women in fiscal year 1998–1999.[6] Therefore, Family PACT contraceptive services provided in fiscal year 1997–1998 are estimated to have reduced the total number of births in California by 7% to 8% in the fiscal year 1998–1999 (Note that not all births averted would have occurred during fiscal year 1998–1999. This estimate includes only the 81% to 83% that are projected to have occurred in fiscal year 1998–1999.) The reduction in births also reduced public expenditures for health care, social services, and education for these women and for their children. A cost–benefit analysis by Jasik et al. (unpublished data, 2000) estimated that averting 108 000 pregnancies saved the federal, state, and local governments more than $500 million at a ratio of $4.48 saved to every dollar expended on family planning services.

Unintended pregnancy is costly in terms of publicly funded health care and social service expenditures and family and personal costs. The reduction of unintended pregnancy that results from extending family planning services to low-income women and men is likely to be of interest to other states as well as to national policymakers. Provision of contraceptive services to women and men who do not have health care coverage has the potential to significantly reduce the adverse effects of unintended pregnancy.

Preventing births to adolescents involves its own challenges. Adolescents generally are more fertile than adults and experience higher rates of contraceptive failure. During a year of family planning services, we have found that adolescents receive fewer months worth of contraceptive protection than do adults—perhaps because they do not fill or refill prescriptions. Yet because adolescents are less likely than adults to be using an effective contraception method, or any method, at their initial family planning visits, they are especially likely to benefit from provision of contraception. We estimate that 1 pregnancy was averted for every 4 adolescents receiving

TABLE 4—Impact of Family Planning, Access, Care, and Treatment Program (Family PACT Program) Contraceptive Services on Unintended Pregnancies, by Age Group: Fiscal Year 1997–1998

	Without Family PACT Program Contraceptive Services	With Family PACT Program Contraceptive Services	Pregnancies Averted
Adolescents (aged < 20 years)			
Pregnancies	26 193	2160	24 033
Births	12 835	1059	11 776
Induced abortions	9430	778	8652
Spontaneous abortions	3667	302	3365
Ectopic pregnancies	262	22	240
Adults (aged ≥ 20 years)			
Pregnancies	92 799	8687	84 112
Births	41 759	3909	37 850
Induced abortions	36 192	3388	32 804
Spontaneous abortions	13 920	1303	12 617
Ectopic pregnancies	928	87	841
Total clients			
Pregnancies	118 992	10 848	108 144
Births	54 594	4968	49 626
Induced abortions	45 621	4166	41 455
Spontaneous abortions	17 587	1606	15 981
Ectopic pregnancies	1190	108	1081

contraceptives, compared with 1 pregnancy for every 5 adult women.

Methodology

The detailed claims information about the contraceptives that were provided at initial and return visits in the Family PACT Program made it possible for us to refine our methodology for estimating the number of pregnancies expected for women participating in a family planning program. Having only less-detailed information available, previous approaches to estimating the fertility effect of family planning services assumed a year of contraceptive benefit to all women participating and have applied annual contraceptive failure rates to estimate pregnancies.[7–11] Cost-effectiveness comparisons of contraception methods also have been based on this annual rate methodology.[12]

There are 3 advantages in calculating pregnancy risk by month for the duration of contraceptive coverage. First, not all women participating in a family planning program are seeking to avoid pregnancy. By basing our estimates only on paid claims for women who adopted contraception methods and including only those months for which they received contraceptive protection, we avoid overestimating the fertility effect. Two thirds of the 722 000 female clients served during the first full year of Family PACT adopted contraception methods, according to paid claims data. The remaining one third may have been pregnant or seeking pregnancy, may have been using a long-acting method or a method not requiring supplies or free samples, or may have been seeking other reproductive health services. In this analysis, we assumed that women whose care included a claim for contraception methods did not intend to become pregnant and, hence, that any pregnancies they experienced were unintended. For women who received contraception, an average of 7.4 months of contraceptive protection was billed and paid. Assuming 1 year of program benefit for all women participating in the program would have overstated the magnitude and duration of the program effect.

The second methodological advantage is that calculating pregnancy risk on a monthly rather than yearly basis is a more realistic approach, because women can become pregnant more than once in a year, especially if they are using no method of contraception and have pregnancies that end in abortion. Calculating pregnancy risk on a monthly basis avoids underestimating the fertility effect by including repeat pregnancies. Among 100 women who use no method of contraception for a year (associated with an 85% probability of pregnancy), 15 will not become pregnant, 67 will experience 1 pregnancy, 17 will experience 2 pregnancies, and 1 will experience 3 pregnancies. Together, these women will have more than 104 pregnancies during the year (if 62% of pregnancies end in births, and abortions remove women from risk for 4 months), a figure substantially higher than the 85 pregnancies predicted with a standard methodology that calculates pregnancy risk on an annual basis. Use of annual rates of pregnancy yields fairly accurate estimates of pregnancy rates when contraceptive failure rates are low, such as is the case with the use of highly effective contraception methods. The standard methodology, however, significantly underestimates the number of pregnancies that would occur with the use of less-effective contraceptives. The fertility effect of family planning services would, therefore, be underestimated with the standard methodology if the "before program" method array were to include many women using less-effective methods.

The third advantage in calculating the probability of pregnancy only for the months for the duration of contraceptive coverage is that it allows us to use all available data on the type and quantity of contraceptives dispensed, the duration of contraceptive coverage, and the likelihood of contraceptive failure. The superior effect of a program that offers women more effective methods, achieves high continuation rates, and dispenses a sufficient quantity of supplies will be captured by this methodology.

Assumptions and Limitations

It was our intention to provide a conservative estimate of pregnancies averted. Because the Family PACT Program does not cover abortion services or prenatal care, Family PACT claims information does not provide

precise information about the outcomes of pregnancies actually experienced by program participants. In the absence of pregnancy data for Family PACT clients, we relied on a calculation of pregnancies expected according to contraceptive dispensing.

Low-income women often experience contraceptive failure rates that are higher than average.[13] We may have underestimated pregnancies because of contraceptive failure both in the presence and the absence of Family PACT services by using national average contraceptive failure rates. Because contraceptive use was higher in the presence of the program, use of higher contraceptive failure rates might have resulted in a lower estimate of pregnancies averted. Contraception method failure rates specific to low-income California women were not available.

In all other ways, our estimate of pregnancies averted has been conservative. Our model of pregnancy risk relied on months of contraceptive coverage. We assumed that women used the contraceptives they were given if claims data indicated that they returned for a refill before running out of supplies. For women who did not return for a refill, we assumed that half of the supplies received were used. (Although national discontinuation rates are available, we did not have estimates of months used out of months of supplies dispensed.) Our assumptions of use were conservative because a month dispensed was not assumed to be a month used.

For long-acting methods of contraception, the fertility effect is probably underestimated for 2 reasons. First, we capped the duration of long-term method effect so that the fertility effect was limited in time. A cap of 2 years was placed on the duration of pregnancy protection from tubal ligation, intrauterine contraceptives, and implants. Second, we included only women who received long-acting contraception during the year and not those who entered the program with a long-term contraceptive method already in place and received maintenance services under Family PACT.

We modeled the hypothetical situation of what would happen in the absence of Family PACT on what we know about method use before a first visit among a sample of medical records from new Family PACT clients. We chose this scenario because it is more conservative, and more realistic, than assuming that women would use no method of contraception in the absence of a family planning program.

One would expect that providing contraceptives to sexually active women who do not wish to become pregnant would result in pregnancies averted, given the low levels of contraceptive use before program enrollment and the clients' history of pregnancy (85% of the adults and nearly half of the adolescents had already experienced a pregnancy). However, estimating the number of pregnancies averted relies on assumptions about contraceptive use and failure rates. To obtain these estimates, we have accessed data on methods of contraception used before program enrollment and quantities of contraceptive supplies provided through the program. We believe that our estimate of pregnancies averted is conservative. More detailed data about method continuation and long-term method use, had such been available, would likely have shown a greater effect of contraceptive services on pregnancies averted. ■

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Contributors

D.G. Foster designed the model, carried out the analysis, and drafted the article. C.M. Klaisle aided with clinical interpretation of medical record data. M. Blum and M.E. Bradsberry aided with data collection and interpretation. C.D. Brindis and F.H. Stewart oversaw the project and provided key advice and editing. All authors reviewed and assisted with the article.

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Human Participant Protection

The medical record review and analysis of Family PACT claims data were approved by the University of California, San Francisco, institutional review board.

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Fertility and Parental Consent for Minors to Receive Contraceptives

Madeline Zavodny, PhD

Objectives. I examined the effect of imposing a requirement for parental consent before minors can receive medical contraceptives.

Methods. Birth and abortions among teens, relative to adults, in a suburban Illinois county that imposed a parental consent requirement in 1998 were compared with births and abortions in nearby counties during the period 1997–2000.

Results. The relative proportion of births to women under age 19 years in the county rose significantly compared with nearby counties, whereas the relative proportion of abortions to women under age 20 years declined insignificantly, with a relative increase in the proportion of pregnancies (births and abortions) to young women in the county.

Conclusions. Imposing a parental consent requirement for contraceptives, but not abortions, appears to raise the frequency of pregnancies and births among young women. (*Am J Public Health.* 2004;94:1347–1351)

Family planning clinics that receive federal funds under Title X of the Public Health Service Act are required to provide services without regard to age or marital status.[1] Several court decisions during the 1970s and 1980s affirmed that no clinic receiving such funds may require parental consent or notification before providing birth control services to unmarried minors.[2] However, in recent years Congress and several state legislatures have considered requiring publicly funded clinics to involve parents before providing contraceptives to minors. This study examined the effect on births and abortions among minors of 1 such parental involvement requirement.

In April 1998, McHenry County, Illinois, began requiring parental consent before providing minors with contraceptives at the only public health clinic in the county. Because the policy violates Title X, the county now uses its own funds to pay for contraceptives services at the clinic for eligible adults and minors who have parental consent. The clinic refers teens who do not wish to involve their parents to facilities in nearby counties. McHenry County is the first county known to have ended its involvement with Title X to impose a parental consent requirement for contraceptives. The fertility effects of such a policy are unknown, as no previous study has examined the effects of a parental involvement requirement for contraceptives on minors' pregnancy rates in the United States. Related literature about the effect of requiring parental involvement for minors seeking abortions has reached mixed conclusions about the effects on birth and abortion rates.[3,4]

The expected effects of such a parental consent requirement on minors' pregnancy, birth, and abortion rates are ambiguous. Pregnancy rates would rise if some individuals who would have used medical contraceptives, absent the parental consent requirement, would now use less-effective means of birth control, or no contraception at all, but continue to have sex. Abortions, birth rates, or both would then rise as well. Alternatively, pregnancy, abortion, and birth rates would be unaffected if all teens who would have used medical contraceptives in the absence of the requirement were to obtain parental consent and there were no changes in sexual and contraceptive behavior among other teens. Pregnancy, abortion, and birth rates might even decline if imposing a parental consent requirement for contraceptives caused some minors to abstain from intercourse.

Surveys of minors indicate that many would change their behavior if parental consent for contraceptives were required. A substantial fraction of young women—nearly half—said they would stop visiting family planning clinics if a parental consent requirement were imposed. The majority of these minors indicate they would switch to condoms or other nonprescription forms of birth control, but some said that they would stop using any form of contraception though continuing to have intercourse.[5–7] In addition, a small fraction of teens indicate they would not have sex if faced with a parental consent requirement for medical contraceptives.[6,7]

This study applies quasi-experimental methods to estimate the effect of the parental consent requirement for medical contraceptives imposed in McHenry County. The analysis compares the change in the percentage of abortions and births to young women in that county with the corresponding change in nearby counties. The results indicate that, in the 2 years after the parental consent requirement, the percentage of births to women under age 19 years in the county rose by 0.69 percentage points relative to other counties, and that the relative percentage of pregnancies (births and abortions) to women under age 20 years in the county rose by 0.76 percentage points. The findings imply that the parental consent requirement for contraceptives raised pregnancy and birth rates among minors but did not significantly affect abortion rates.

METHODS

This study uses natality data from the National Center for Health Statistics and abortion data from the State of Illinois Department of Public Health to examine the effect of the parental consent requirement in McHenry County. The National Center for Health Statistics natality data, which are at the individual level, are a near census of births and include women's age at birth and their county of residence. Illinois does not make available individual-level data on abor-

tions but does report the annual number of abortions by county of residence and age within certain age categories for cells that have at least 50 abortions.

This analysis compares McHenry County with 3 counties that are large enough to have abortion data available and that also are near McHenry County: DuPage, Kane, and Lake. McHenry County is a suburban community located about 50 miles northwest of Chicago; DuPage, Kane, and Lake Counties are also north or western suburbs of Chicago. McHenry County is predominately white (94%, according to the 2000 census) and had a median household income of $64 826 in 1999; about 3.7% of individuals had incomes below the poverty level in 1999. The nearby comparison counties are also majority white (95%) and had about 4.8% of individuals living below the poverty threshold in 1999. In 1997, Title X–funded clinics in the 3 comparison counties served a slightly higher proportion (9.1%) of women under age 20 years in need of publicly funded contraceptive services than did the clinic in McHenry (7.3%).[8] Data for Cook County, which includes the city of Chicago, are also available but are not used here because Cook County is considerably poorer, more minority, and more urban than McHenry County. Data for several other large counties in Illinois are also available but are not used here because these counties are not near McHenry and therefore may not be comparable.

Figure 1 shows the number of births among women aged 18 years and younger as a percentage of all births in McHenry County and in 3 nearby comparison counties during 1997–2000. The proportion of births to young women increased during this period in McHenry County. In the comparison counties, the percentage of births to young women rose from 1997 to 1998 and then declined; from 1999–2000 the parental consent law was in effect in McHenry County but not in the other counties.

Figure 2 shows abortions among women under age 20 years (the only available age group that includes minors) relative to all abortions for McHenry and the nearby comparison counties. The percentage of abortions that were undergone by teenaged women in McHenry County fell between 1997 and 1999 and then increased. In the comparison counties, the proportion of abortions that were undergone by teenaged women rose slightly during 1997–1998 and then declined. The percentage of abortions undergone by young women (< 20) may be more volatile in McHenry than in the other counties because the numbers are small, averaging only 117 abortions per year to teenaged women in McHenry County during 1997–2000 compared with over 700 in the 3-county comparison area.

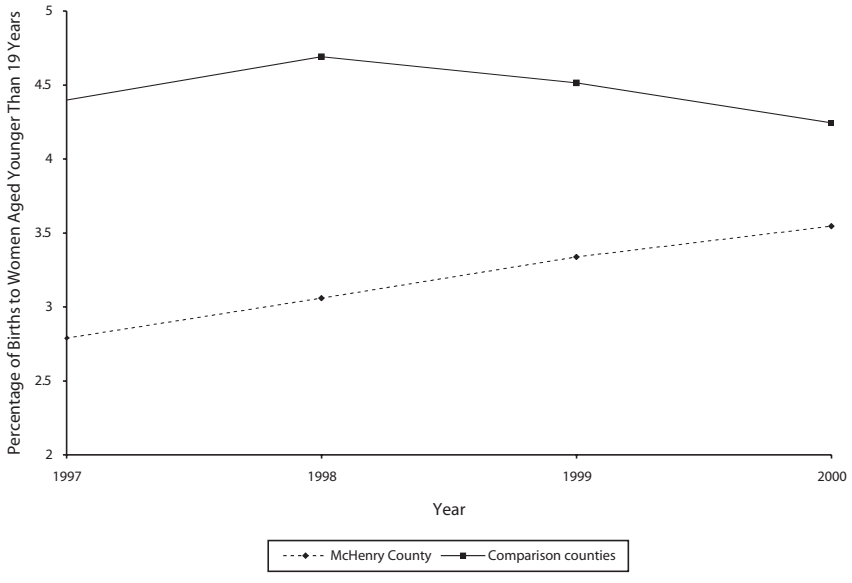

FIGURE 1—Percentage of births that were to women younger than 19 years in McHenry County and in nearby counties, 1997–2000.

Difference-in-Differences Analysis

The remainder of this analysis uses a difference-in-differences technique to examine the effect of the parental consent requirement for contraceptives on births and abortions.[9] This technique involves comparing the change in births and abortions for the affected group (the treatment group) with an unaffected group. Here, the affected group is minors who reside in McHenry County. These young women are compared with older women who live in the same county by measuring births and abortions among young women as a percentage of all births and abortions. The first difference in the difference-in-differences analysis is the change in the proportion of births and abortions to young women before and after the parental consent policy went into effect. This difference is then compared with the corresponding change in the other counties. The statistical significance of the differences is calculated using standard *t* tests on the standard errors of the differences. The percentage of births and abortions to young women, rather than to the population at risk, is examined because intercensal population estimates by age group are not available at the county level.

The period 1997–1998 is the "before" period, and 1999–2000 the "after" period, in the difference-in-differences analysis. The parental consent requirement went into effect in April 1998, so any effect on births should begin in 1999. Any effect on abortions would likely begin to occur in 1998, but only annual data on abortions are available. Another concern about the abortion data are that ages 0–19 years are the only age group for minors available in the abortion data, but 19-year-old women were not directly affected by the parental consent requirement. In the births data, females aged 18 years and younger serve as the treatment group here because many

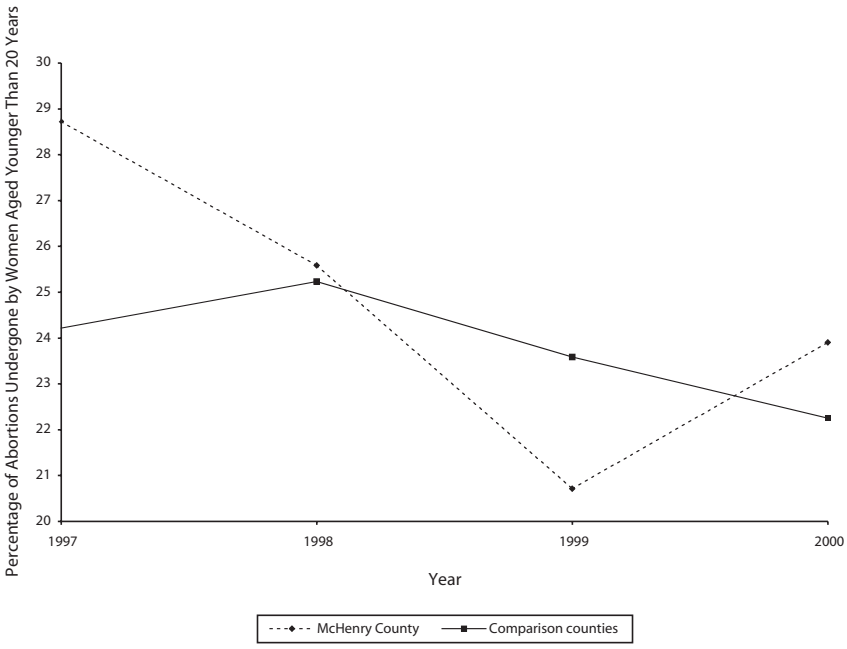

FIGURE 2—Percentage of abortions that were undergone by women younger than 20 years in McHenry County and in nearby comparison counties, 1997–2000.

women aged 18 years at birth were minors when they became pregnant.

The difference-in-differences approach has several advantages. First, it compares births and abortions before and after the parental consent policy within McHenry County. The methodology also controls for changes in underlying conditions that would have the same effect on the number of births and abortions across all age groups in 1 county—such as a change in the number of abortion providers in McHenry County—by comparing across age groups within a county. In addition, the methodology controls for differential changes in births and abortions between young women and all women by comparing McHenry County with other counties. The only requirement for the difference-in-difference method to be properly identified is that there not be different changes in fertility behavior of young women relative to older women in McHenry County relative to other counties during the sample period other than the changes caused by the parental consent requirement. During the 1997–2000 sample period, there were no changes in policies regarding parental involvement for minors to receive an abortion or minors' right to consent to pregnancy care in the counties examined here or in the state as a whole. Illinois did not have a parental involvement requirement for minors seeking abortions. Some teens may have misunderstood the policy in McHenry County as restricting access to abortions, which would lead to an increase in births but not necessarily in pregnancies; focus groups conducted with US teens indicate that few know whether their state requires parental involvement for a minor to have an abortion.[10]

Difference-in-Differences Results

The percentage of births to women under age 19 years rose in McHenry County after the parental consent policy relative to the nearby comparison counties. As the first row of Table 1 indicates, the percentage of births to young women rose by 0.52 percentage points in McHenry County between 1997–1998 and 1999–2000 but declined by 0.16 percentage

TABLE 1—Change in Percentage of Births to and Abortions Undergone by Young Women in McHenry County Compared with Nearby Counties

	"Before" Period (1997–1998)		"After" Period (1999–2000)		Difference		DD	
	Percentage	SE	Percentage	SE	Percentage	SE	Percentage	SE
Births to women aged younger than 19 y								
McHenry County	2.92	.19	3.44	.20	.52	.28	–	–
Comparison counties[a]	4.54	.08	4.38	.08	-.16	.12	.69	.30
Abortions undergone by aged women younger than 20 y								
McHenry County	27.07	1.55	22.29	1.25	-4.78	1.97		
Comparison counties[a]	24.73	.60	22.86	.51	-1.86	.78	-2.92	2.12
Births to and abortions undergone by aged women younger than 20 y								
McHenry County	4.50	.23	5.07	.23	.57	.32	–	–
Comparison counties[a]	6.53	.10	6.34	.09	-.19	.13	.76	.35

Note. DD = difference-in-difference. Shown are the differences between the percentage of births or abortions to young women in McHenry and the comparison counties in each year, relative to the corresponding differences in the baseline year of 1997, expressed in percentage terms.
[a]The comparison counties are DuPage, Kane, and Lake.

points in the comparison counties, giving a relative increase of 0.69 percentage points in McHenry County. The difference-in-differences result is statistically significant, with a *P* value below .05. In results not shown in the table, the increase in the fraction of births to women under age 19 years in McHenry County is significant relative to DuPage and Kane Counties separately (each with a *P* value below .03), as well as in comparison with the 3-county area.

The percentage of abortions to women under age 20 years declined in McHenry County after the parental consent policy, both absolutely and relative to the comparison counties. As the middle section of Table 1 shows, the percentage of abortions to teenaged women fell by 4.78 percentage points in McHenry County and by 1.86 percentage points in the 3-county comparison group. The relative decline in abortions to young women in McHenry County is therefore 2.92%, but it is not significant at conventional levels ($P=.17$). In results not shown in the table, the decline in the proportion of abortions to young women in McHenry is significant relative to Lake County separately ($P<.05$), but not relative to either DuPage or Kane County.

The effect of McHenry County's parental consent requirement may have increased over time because the accumulated risk of pregnancy rose over time among minors who switched to less effective means of contraception or stopped using any birth control while continuing to have intercourse; in other words, not all persons would become pregnant soon after the policy went into effect, but over time the probability of pregnancy would increase. Alternatively, the effect may have decreased over time as minors who did not obtain parental consent found other means of getting medical contraceptives, such as visiting a private provider or a clinic in another county, or as minors received parental consent. If the policy discouraged teens not yet sexually active from having intercourse, the effect also might be to reduce birth and abortion rates over time.

The first row in Table 2 shows the change in the percentage of births to women under age 19 years in McHenry County compared with nearby counties, relative to the 1997 baseline. The relative proportion of births to young women was 0.43 percentage points higher in McHenry County in 1999 than in 1997 compared with the corresponding change in the 3-county area, but the change was insignificant ($P=.37$). In 2000, the relative difference increased to 0.91 percentage points ($P=.06$) compared with 1997. This indicates that the effect of the parental consent requirement increased over time. In addition, the relative change in 1998 was −0.02 percentage points and was not significant ($P=.97$), indicating that the rise in births to young women in McHenry County did not begin before the policy could have affected births.

The percentage of abortions to young women in McHenry County declined in all 3 years, relative to 1997, in comparison with the nearby counties. Row 2 in Table 2 reports the comparisons, which indicate that the relative decline in abortions to teenaged women in McHenry was largest in 1999 and was insignificant in 1998 and in 2000.

Taken together, the births and abortions data indicate that teen pregnancies rose after McHenry County imposed a parental consent requirement. Combining the data on abortions and pregnancies, the proportion of pregnancies, measured as births plus abortions, to women under age 20 years was 0.76 percentage points ($P=.05$) higher during 1999–2000 than in 1997–1998 in McHenry County relative to the nearby comparison counties, as the bottom row of Table 1 indicates. The positive effect appears to be concentrated during 2000, as shown in the last row of Table 2. However, it should be recognized that all teens under age 20 years are not the most relevant group to examine because women aged 18 and 19 years are not directly affected by the parental consent policy.

One potential concern about our results is that the policy could have had effects in 1998. Any such effect is likely to be concentrated on abortions because terminations occur in pregnancy, but births also could have been affected if some teens anticipated that the policy would be enacted. Assigning 1996–1997 as the "before" period would avoid capturing any effects that occurred soon after the policy went into effect. In results not shown in the tables, the relative decline in births to women under age 19 years was 0.63 percentage points ($P=.09$) if 1996–1997 is used as the "before" period. The relative change in abortions was −4.46 percentage points ($P=.03$), and the relative change in pregnancies was 0.32 percentage points ($P=.41$). Similar to the results that used 1997–1998 as the "before" period, these findings indicate that the policy had a positive effect on births; however, they also indicate a negative effect on abortions and no significant effect on pregnancies.

Another concern about the findings is that defining all women as an implicit control group may be inappropriate because older women's fertility behavior may differ considerably from that of minors. Women slightly above age 18 years may be a better comparison group. If the births analysis is repeated with only births to women under age 25 years used, the percentage of births to women under age 19 years in McHenry County increased by 2.81 percentage points ($P=.06$) from 1997–1998 to 1999–2000 compared with the 3 nearby counties. The percentage of abortions to women under age

TABLE 2—Percentage Change in Births to and Abortions Undergone by Young Women in McHenry County Compared With Nearby Counties[a], Relative to Difference in 1997

	1998		1999		2000	
	Percentage	SE	Percentage	SE	Percentage	SE
Births to women aged younger than 19 y	−.02	.49	.43	.49	.91	.49
Abortions undergone by women aged younger than 20 y	−4.15	3.20	−7.38	3.02	−2.85	3.02
Births to and abortions undergone by women aged younger than 20 y	−.48	.49	.12	.48	.76	.48

[a] The nearby counties are DuPage, Kane, and Lake.

20 years among all women under age 25 years declined by 1.89 percentage points in McHenry County relative to the nearby comparison counties; as in Table 1, the relative change is statistically insignificant ($P=.58$). Pregnancies to women under age 20 years as a proportion of all pregnancies to women under age 25 years rose by 3.02 percentage points ($P=.05$) in McHenry County relative to the nearby comparison counties. Comparing teens with only slightly older women therefore gives results qualitatively similar to those when comparing teens to all women.

DISCUSSION

Proponents offer several reasons why parental involvement should be required before minors may receive contraceptives. Parents may wish to be aware of their children's sexual activity and may want to discuss with their children the potential health risks associated with some prescription contraceptives. Some proponents argue that requiring parental notification would increase minors' use of condoms, thereby reducing the prevalence of sexually transmitted diseases, or their use of abstinence, which would also reduce teenaged pregnancy rates. Opponents of such requirements frequently argue that such policies will increase teen pregnancy rates because some minors will switch to less effective contraceptives or continue having intercourse but not use any birth control.

This study indicates that pregnancies and births among young women increased in a county that imposed a parental consent requirement for contraceptives. In the 2 years after McHenry County, Illinois, enacted a parental consent requirement, the percentage of births to women under age 19 rose by 0.69 percentage points relative to other counties, and the percentage of births plus abortions to women under age 20 years rose by 0.76 percentage points. The proportion of abortions to teenaged women declined but was statistically insignificant. The true effect of the policy on abortions among women young enough to have been affected by the policy is difficult to ascertain because data on abortions specifically among women aged 18 years and younger are not available. The abortion data used here are for women aged 0–19 years, which includes women too old to have been directly affected by the policy.

It should also be noted that this study examines only 1 suburban, predominately White community, and that the results may not be generalizable to other areas. In particular, contraceptive clients at publicly funded family planning clinics are disproportionately from low-income and minority groups.[11,12] This indicates that the effect of a parental involvement requirement might be greater in more urban areas than in the suburban area investigated here. However, 1 study found that Black minors were less likely than Whites to say that they would stop using family planning clinic services if their parents were notified, so such a policy could instead have less of an effect in other areas.[5]

Title X is believed to have substantially reduced teen pregnancy rates by making free or low-cost family planning services available to teens on a confidential basis. One analysis concluded that, without Title X, the number of teenaged pregnancies would have been 20% higher during the 1980s and 1990s.[13] A significant number of minors seek family planning services at Title X clinics; in 1991, for example, about 14% of patients—over 580 000 individuals—were minors.[14] This study examined the 1 area known to have imposed a parental consent requirement for minors to receive medical contraceptives and found that teen pregnancies, particularly teen births, appear to increase after such a requirement. This suggests that policymakers should consider the possibility of such unintended consequences before requiring parental involvement for teens to receive contraceptives.

A parental consent policy may also affect other aspects of teens' sexual health, such as pregnancy testing and treatment for sexually transmitted diseases. One recent study conducted among minors at Planned Parenthood clinics in Wisconsin found that 47% of minors said that they would stop using all family planning clinic services if their parents were notified that they were seeking birth control pills or other contraceptive devices, and another 12% would delay testing or treatment of sexually transmitted diseases, pregnancy testing, or other services.[5] These are important areas for further research. ■

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Human Participant Protection

No protocol approval was needed for this study.

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Physician Assistants as Providers of Surgically Induced Abortion Services

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Objectives. We compared complication rates after surgical abortions performed by physician assistants with rates after abortions performed by physicians.

Methods. A 2-year prospective cohort study of women undergoing surgically induced abortion was conducted. Ninety-one percent of eligible women (1363) were enrolled.

Results. Total complication rates were 22.0 per 1000 procedures (95% confidence interval [CI] = 11.9, 39.2) performed by physician assistants and 23.3 per 1000 procedures (95% CI = 14.5, 36.8) performed by physicians ($P = .88$). The most common complication that occurred during physician assistant–performed procedures was incomplete abortion; during physician-performed procedures the most common complication was infection not requiring hospitalization. A history of pelvic inflammatory disease was associated with an increased risk of total complications (odds ratio = 2.1; 95% CI = 1.1, 4.1).

Conclusions. Surgical abortion services provided by experienced physician assistants were comparable in safety and efficacy to those provided by physicians. (*Am J Public Health.* 2004;94:1352–1357)

The legal induced abortion rate rose during the 1970s, stabilized between 1980 and 1992, and has declined in the years since.[1,2] In 1997, 1 186 039 legal induced abortions were reported to the Centers for Disease Control and Prevention from all 52 US reporting areas, making abortion one of the most common surgical procedures for women of reproductive age.[1–3] The 1997 abortion rate of 20 abortions per 1000 women aged 15 to 44 years is the lowest recorded since 1975.[1] The majority of abortions are first-trimester procedures performed by physicians in an outpatient setting.[2]

Soon after its legalization, abortion became a safer procedure as a result of increased provider experience and training; improvements in the type of procedure used, including a change from sharp curettage to suction curettage; and improved access to services, enabling women to seek abortions at earlier gestational ages.[2,4,5] However, during the past 15 years the climate of controversy and episodes of violence directed toward women seeking abortions and the clinics that perform them have compromised the availability of competent care, and safe abortion has again become a critical public health issue.[6] One restrictive factor is the decreasing number of trained physicians who are willing to perform abortions.[7] For example, in 1996, 86% of counties had no abortion facilities, and 32% of US women aged 15 to 44 years resided in a county without an abortion provider.[8] According to a 1991–1992 survey of US obstetrics and gynecology residency programs, routine training in first-trimester abortion practice was provided by only 12% of programs (a decrease from 23% of residency programs in 1985), with 30% of programs providing no training in first-trimester abortions as part of their curricula.[9–11] However, in 1996, abortion training requirements were included as part of the Accreditation Council for Graduate Medical Education guidelines as a standard part of obstetrics and gynecology residency training. Perhaps as a result, a recent survey reported that 46% of programs now offer routine training.[12]

When access to safe abortion services declines and the number of trained physicians willing to perform abortions decreases, public health practitioners are faced with the prospect of an increase in morbidity and mortality from both legal and illegal abortion procedures. One solution to address limited access to services is to expand abortion practice to include provision by midlevel clinicians—that is physician assistants, nurse practitioners, and certified nurse midwives.[13–16] Physician assistants are licensed by each state to practice medicine with physician supervision. On graduation from an accredited physician assistant program, physician assistants take a national certification examination developed by the National Commission on Certification of Physician Assistants in conjunction with the National Board of Medical Examiners. Physician assistants complete 100 hours of continuing medical education every 2 years and take a recertification examination every 6 years. The scope of physician assistant practice varies, depending on the supervising physician and state law. In contrast with bachelor's-level nursing training, physician assistants are trained to conduct physical examinations, diagnose and treat illnesses, order and interpret medical tests, assist in surgical procedures, and, in many states, write prescriptions.[17,18]

The goal of the 2-year prospective study described here was to compare the frequency and type of complications after surgical abortion procedures performed at 2 clinics, 1 at which abortions were performed by physician assistants and 1 at which abortions were performed by physicians. The study also addressed access to abortion services, patients' and practitioners' experiences of care, and practitioners' conformance to clinical guidelines. The results of those analyses are reported elsewhere.[19]

METHODS

Study Population and Sites

All women who underwent an outpatient surgical abortion performed by a physician at the Feminist Health Center of Portsmouth, New Hampshire, or by a physician assistant at the Vermont Women's Health Center in Burlington, Vermont, between July 1996 and

October 1997 were eligible to participate (n=1505). Both clinics offered a broad range of reproductive health services in addition to surgical and nonsurgical abortions. Their physical settings, administrative procedures, staffing, back-up plans in case of serious complications, and interaction with their respective communities were similar.

In Vermont, women seeking surgical abortions were seen on the same or a different day as the procedure for a preprocedure appointment that included counseling, laboratory testing, and giving consent; after the procedure, a follow-up visit was scheduled for 2 weeks later. At the procedure appointment, the client received a written report with follow-up instructions should she choose to see another practitioner for her follow-up visit. All procedures were performed by physician assistants.

In New Hampshire, the client chose either 1 appointment of 3 hours' duration or two 1.5-hour appointments on consecutive days. The client met individually with a counselor to give a medical history and discuss the pregnancy termination decision. She then participated in either an individual or a small-group discussion of the benefits and risks of the procedure, received follow-up information, and had the opportunity to ask questions. A consent form was then signed. Physicians performed all procedures.

During the study, procedures were performed by 3 physician assistants in Vermont and 3 physicians in New Hampshire; all had a minimum of 5 years of experience in surgical abortion procedures.

Type of Abortion Procedure

The physicians at the New Hampshire clinic conducted all abortion procedures with suction curettage with an electric pump as the vacuum source (standard vacuum curettage). At the Vermont clinic, the physician assistants performed abortions with either suction curettage with a manual syringe as the vacuum source (manual vacuum curettage, often called manual vacuum aspiration, or MVA) or standard vacuum curettage. On occasion, the physician assistants supplemented the MVA procedure with limited aspiration from a vacuum pump; we have called such procedures "mini-vacs." The choice of method was made by the clinician and was based on gestational age. Sharp curettage was used infrequently and at the discretion of the clinician. Both clinics selectively used laminaria for cervical dilation for women at 12 or more weeks of gestation. Abortions were usually performed through the twelfth week of gestation by the physicians at the New Hampshire clinic and through the fourteenth week of gestation by the physician assistants at the Vermont clinic. Gestational age was calculated by the examining clinician on the basis of the date of the last menstrual period, pelvic estimation, and, if appropriate, ultrasound. It was standard practice for the providers at both clinics to perform gross inspection of all aspirated tissue to identify women at risk for an ectopic pregnancy.

Both clinics screened for preexisting conditions, took an extensive reproductive history including histories of sexually transmitted diseases and contraceptive use, and performed procedures under local anesthesia only. The Vermont clinic conducted preprocedure gonorrhea and chlamydia screening and administered 100 mg of doxycycline and 5 mg of diazepam preoperatively. Discharge instructions addressed medication, aftercare, and symptoms of possible complications and included referral recommendations in the event that a complication was suspected. In Vermont, a postprocedure course of doxycycline was dispensed (100 mg twice a day for 7 days); in New Hampshire, a course of doxycycline was either prescribed or dispensed (100 mg twice a day for 5 days). Each woman was instructed to return to the clinic in 2 weeks for a postprocedure examination (included in the cost of the abortion) or to seek follow-up care elsewhere.

At both clinics, similar emergency protocols were in place. On-site emergency services in case of serious complications (e.g., laceration, significant bleeding) included supportive measures and transfer to emergency facilities at nearby hospitals.

Definition of Complications

Complications were defined according to National Abortion Federation guidelines[20] as follows:

- incomplete abortion, in which tissue from the pregnancy remains in the uterus, requiring a repeat abortion
- failed abortion (continued pregnancy), in which the abortion does not end the pregnancy, requiring a repeat abortion
- ectopic/extrauterine pregnancy, in which the signs and symptoms of pregnancy continue after abortion but no intrauterine pregnancy is detected
- perforation, a condition in which a puncture or tear in the wall of the uterus or other organ is present
- cervical laceration, a condition in which a tear in the cervix is present, requiring either sutures or vaginal packing
- infection, which is detected by a temperature elevated to 100.4°F or 38.0°C, lower abdominal pain or tenderness, and abnormal cervical discharge
- hemorrhage, defined as blood loss estimated as 500 cc or greater (defined as bleeding that was heavier than the heaviest day of a normal menstrual period or that soaked through more than 1 sanitary pad per hour) that is caused by failure of the uterus to contract and may require a blood transfusion
- other complications, including shock, coma, amniotic fluid embolism, anesthesia-related difficulties, and death.

Complications were further classified as either immediate or delayed. Immediate complications were defined as those that occurred during the procedure or before discharge from the clinic. Delayed complications were those that occurred up to 2 weeks after discharge. Complication categories are not mutually exclusive, since more than 1 complication could occur per procedure. The occurrence of a complication was documented in the medical record, including the follow-up report and the postabortion mail survey.

Data Collection and Statistical Analysis

For all participants, extensive demographic, medical, reproductive, contraceptive, operative, and follow-up data, including information on complications, was abstracted from the clinic medical record by trained researchers and directly entered into a Microsoft Access (Redmond, Wash) database. In addition, a self-administered questionnaire that gathered information on satisfaction with and access to care, postabortion sequelae, and fol-

low-up care was distributed at discharge with instructions to complete and return it within 3 weeks. Participants who gave permission to contact them and who had not returned the completed survey or an "opt-out" postcard within 4 weeks of the abortion were contacted by telephone or mail. Surveys were returned to the Harvard School of Public Health, where they were entered into the database. We conducted weekly reviews of recruiting and data entry procedures, with retraining of personnel to ensure the integrity of the study protocol. A 5% random sample of medical record abstracts was reviewed for systematic errors. The Access database was converted into SAS (SAS Institute Inc, Cary, NC) data sets for statistical analysis. Logistic regression analyses were conducted with the SAS CATMOD procedure to calculate odds ratios (ORs) and 95% confidence intervals (CIs).[21] Significant differences among proportions were evaluated with χ^2 analyses.[22] Statistical significance was set at $P \leq .05$. The study protocol was reviewed and approved by the Harvard School of Public Health human subjects committee.

RESULTS

Recruitment and Follow-Up

Of the 1505 women at both clinics who underwent a surgical abortion during the study period, 69 were not recruited and 73 declined to participate, resulting in a study population of 1363 women (90.6%) who were eligible and agreed to participate. At the Vermont clinic, where all abortions were performed by physician assistants, 96.7% of eligible clients were asked to participate, and of these, 97.9% agreed to do so. At the New Hampshire clinic, where abortions were performed by physicians, 94.6% of eligible clients were asked to participate and 93.1% of these agreed. Of the 1363 participating women, 1125 (82.5%) agreed to take home a questionnaire and return it in 3 weeks; 797 completed surveys were received (70.8%). The 566 participants who did not complete a survey were more likely to be younger ($P=.01$) and to use Medicaid or Medicare as their primary or only insurance ($P=.001$), but they were similar to respondents in terms of clinic site, state of residence, number of prior pregnancies, number of prior births, number of previous induced abortions, gestational age, and abortion method.

Twelve women in Vermont and 21 women in New Hampshire underwent more than 1 surgical abortion during the study period; only information from the first abortion procedure was included. Information on delayed complications and follow-up care was available from the survey questionnaire or the follow-up visit, as recorded in the medical record, for 71.5% of the study participants (75.1% in Vermont and 69.2% in New Hampshire). Thirty-one percent of women seeking abortions in Vermont and 17% of women seeking abortions in New Hampshire were established patients. Fifty percent of the Vermont clients and 36% of the New Hampshire clients returned to the clinic for a postabortion examination.

Demographic and Reproductive Characteristics

On average, the New Hampshire clients were more likely than the Vermont clients to self-pay, to reside out of state, to be nulliparous, and to have had no previous induced abortions (Table 1). The majority of procedures at both clinics were performed within the first 12 weeks of gestation (86.6% in Vermont, 97.2% in New Hampshire), but the physician assistants at the Vermont clinic performed more second-trimester procedures than did the physicians at the New Hampshire clinic. All procedures performed by the physicians in New Hampshire were standard vacuum curettage, whereas more than half of the physician assistant procedures (virtually all of those performed at 8 weeks' gestation or earlier) were manual vacuum curettage. The cannula sizes used by the 2 clinics differed. In Vermont, 95% of the manual vacuum curettage procedures performed at 8 weeks' gestation or earlier were performed with a 5- or 6-mm cannula. By contrast, in New Hampshire 96% of the standard vacuum curettage procedures performed at 8 weeks' gestation or earlier were performed with a 7-, 8-, or 9-mm cannula.

Complication Rates

A total of 37 complications were reported from 31 procedures (12 by Vermont physician assistants and 19 by New Hampshire physicians) (Table 2). Five Vermont women and 1 New Hampshire woman experienced more than 1 complication. The proportion of procedures with 1 or more complication in Vermont was 2.2% and was 2.3% in New Hampshire. The most common complication in Vermont was incomplete abortion (41% of all complications; 6 of 7 instances occurred during an MVA procedure), and in New Hampshire the most common complication was infection not requiring hospitalization (80% of all complications). One perforation during an MVA procedure at 8 weeks' gestation was observed in a procedure performed by a physician assistant. No cervical lacerations or infections requiring hospitalization were observed at either clinic.

The total rate of complications in Vermont was 22.0 per 1000 physician assistant procedures (95% CI=11.9, 39.2); in New Hampshire the rate was 23.3 per 1000 physician procedures (95% CI=14.5, 36.8), a difference that was not statistically significant ($P=.88$) (Table 3). The rates for immediate and delayed complications were similar at both clinics.

No statistically significant differences in complications were noted between the 2 clinics with respect to gestational age, although data were very limited because of the small number of complications observed at both sites (Table 4). In Vermont, 8 physician assistant procedures performed at 8 weeks' gestation or earlier resulted in a complication (2.8% of all physician assistant procedures at 8 weeks' gestation or earlier). Seven of these procedures were MVA procedures, and 1 was a mini-vac procedure. Five of these complications were incomplete abortions, 2 of which were accompanied by hemorrhaging; the sixth was delayed hemorrhaging, the seventh was a perforation accompanied by hemorrhage, and the eighth was a failed abortion (the mini-vac). The only procedure performed at 9 to 10 weeks' gestation in which the patient experienced a complication was an MVA procedure that resulted in an incomplete abortion. In New Hampshire, infections were reported in 12 of the 14 standard vacuum curettage procedures performed by physicians at 10 weeks of gestation or earlier that had a complication.

In multivariate analyses, after we controlled for clinic, abortion method, and patient characteristics at the 2 clinics (gestational age, parity, number of prior induced

TABLE 1—Demographic and Reproductive Characteristics of Study Participants, by Clinic Site and Type of Service (N = 1363): 1996–1997

Characteristic	Vermont—Physician Assistants (n = 546), No.[a] (%)	New Hampshire—Physicians (n = 817), No.[a] (%)	*P*
Age, y			
< 20	118 (21.4)	205 (25.1)	
20–24	129 (23.8)	188 (23.0)	
25–29	121 (22.2)	171 (20.9)	
30–34	76 (13.9)	122 (14.9)	
35–39	62 (11.4)	93 (11.4)	
40–44	36 (6.6)	35 (4.3)	
≥ 45	4 (0.7)	3 (0.4)	.381
Pay status			
Self-pay	241 (45.7)	679 (84.5)	
Insurance	155 (29.4)	125 (15.5)	
Medicaid/Medicare[b]	131 (24.9)	–	.001
State resident			
Yes	462 (84.9)	558 (68.4)	
No	82 (15.1)	258 (31.6)	.001
Gravidity			
1	176 (32.1)	340 (41.6)	
2	110 (20.2)	174 (21.3)	
3	95 (17.4)	119 (14.6)	
≥ 4	165 (30.3)	184 (22.5)	.001
Parity			
0	271 (49.5)	492 (60.4)	
1	131 (24.0)	139 (17.1)	
2	103 (18.9)	124 (15.2)	
3	28 (5.1)	44 (5.4)	
≥ 4	13 (2.4)	16 (2.0)	.001
No. of previous induced abortions			
0	311 (56.9)	524 (64.3)	
1	132 (24.2)	216 (26.5)	
2	55 (10.1)	52 (6.4)	
≥ 3	48 (8.8)	23 (2.8)	.001
Gestational age at procedure, weeks			
≤ 8	288 (52.8)	417 (51.3)	
9–10	118 (21.6)	263 (32.3)	
11–12	67 (12.3)	114 (14.0)	
13–15	68 (12.4)	19 (2.3)	
≥ 16	1 (0.2)	0 (0)	.001
Type of procedure			
Manual vacuum curettage	275 (51.2)	0 (0)	
Standard vacuum curettage	186[c] (34.8)	808 (99.1)	
Standard vacuum curettage with laminaria	75 (14.0)	7 (0.9)	.001

[a]Numbers may not add to totals because of missing values.
[b]Available in Vermont only.
[c]Includes 14 mini-vac procedures.

abortions, and history of bladder or kidney infection), women with a history of pelvic inflammatory disease had an increased risk of total complications, compared with women with no history of pelvic inflammatory disease (OR = 2.1; 95% CI = 1.1, 4.1).

DISCUSSION

We used National Abortion Federation criteria to compare rates of complications in surgical abortions performed by physician assistants in Vermont and by physicians in New Hampshire. We found that at both clinics the rate of complication was very low, with only 2% of procedures affected by complications. No statistically significant differences between procedures performed by physicians and those performed by physician assistants were observed, either in total complications or by timing of the complication. A slightly lower total complication rate was observed for physician assistant procedures, even though physician assistants performed more second-trimester procedures than did physicians. The type of complication observed differed. At early gestational ages, the manual vacuum curettage procedures with 5- or 6-mm cannulas performed by the physician assistants resulted in a greater number of incomplete abortions than did the standard vacuum curettage procedures with larger cannulas, which were conducted by the physicians. However, the physician-performed procedures resulted in more instances of infection. Adopting the physician assistant protocol of preprocedure screening for gonorrhea and chlamydia, administering a preoperative dose of doxycycline, extending the postprocedure antibiotic regimen to 7 days, and dispensing the prescribed pills at the clinic may reduce the occurrence of infection.

The low occurrence of complications raises the question of adequate power to detect a difference, even in a study as large as this one. However, the complication rates observed were consistent with those reported in previous studies. In the only other study to compare physician assistant and physician abortion practice, Freedman et al.[23] reported 29.1 complications per 1000 procedures, 27.4 for abortions performed by physician as-

TABLE 2—Abortion Complications, by Clinic Site and Time of Occurrence: 1996–1997

Complication	Vermont—Physician Assistants, No. (%)			New Hampshire—Physicians, No. (%)		
	Immediate	Delayed	Total	Immediate	Delayed	Total
Incomplete abortion	1	6	7 (1.3)	1	2	3 (0.4)
Continued pregnancy[a]	–	1	1 (0.2)	–	0	0
Ectopic pregnancy[a]	–	1	1 (0.2)	–	0	0
Perforation[b]	1	–	1 (0.2)	0	–	0
Cervical laceration	0	0	0	0	0	0
Infection, with hospitalization[a]	–	0	0	–	0	0
Infection, outpatient treatment[a]	–	2	2 (0.4)	–	16	16 (2.0)
Hemorrhage	1	4	5 (0.9)	0	1	1 (0.1)
Seizure, shock, death	0	0	0	0	0	0

Note. Five Vermont women and 1 New Hampshire woman experienced more than 1 complication. Percentages are based on 546 procedures in Vermont and 817 in New Hampshire.
[a]By definition, considered a delayed complication only.
[b]By definition, considered an immediate complication only.

TABLE 3—Complications per 1000 Procedures, by Time of Occurrence and Clinic Site: 1996–1997

Time of Complication	Complication Rate (95% Confidence Interval)		
	Vermont—Physician Assistants	New Hampshire—Physicians	Difference (Physician Assistants – Physicians)
Immediate	3.7 (0.6, 14.7)	1.2 (0.1, 7.9)	2.4 (–3.2, 8.0)
Delayed	18.3 (9.3, 34.6)	22.0 (13.5, 35.3)	–3.7 (–18.8, 11.4)
Total	22.0 (11.9, 39.2)	23.3 (14.5, 36.8)	–1.3 (–17.3, 14.8)

TABLE 4—Procedures With Complications, by Gestational Age and Abortion Method: 1996–1997

Gestational Age at Procedure, weeks	Vermont—Physician Assistants, No. (%)	New Hampshire—Physicians, No. (%)
Manual vacuum curettage[a]		
≤8	7 (2.7)	–
9–10	1 (6.7)	–
11–12	0	–
13–15	–	–
≥16	–	–
Standard vacuum curettage		
≤8	1[b] (3.8)	8 (1.9)
9–10	0	6 (2.3)
11–12	2[c] (3.1)	4[c] (3.5)
13–15	1[c] (1.5)	0
≥16	0	0
Total	12 (2.2)	19[d] (2.3)

Note. Percentages are based on 546 procedures in Vermont and 817 in New Hampshire.
[a]Manual vacuum curettage was not performed in New Hampshire. Vermont performed this procedure only at less than 12 weeks' gestation.
[b]Mini-vac procedure.
[c]Includes 1 standard vacuum curettage with laminaria in New Hampshire and 2 in Vermont.
[d]Gestational age was missing for 1 New Hampshire procedure with a complication.

sistants, and 30.8 for procedures by physicians. Comparable proportions in this study were 22.0 per 1000 physician assistant procedures (95% CI=11.9, 39.2) and 23.3 per 1000 procedures performed by physicians (95% CI=14.5, 36.8). The rate of immediate complications in a 1996 Canadian study was 6.8 complications per 1000 procedures, compared with 2.2 per 1000 procedures overall (95% CI=0.6, 7.0) in our study.[24] The Canadian study included procedures performed in an inpatient setting and at later gestational ages, 2 factors reported to increase the risk of complications.[25]

Strengths of our investigation were that all clients were enrolled at the time they visited the clinic, permitting information to be collected prospectively; that there were high enrollment and response rates, minimizing the opportunity for biases related to selection factors or differential information gathering; and that a comparison clinic similar in many respects except for the clinicians' training was available. However, although it is unlikely that information on immediate complications was missed, some underreporting of delayed complications was possible, because not all women returned to the clinic for follow-up care or completed a follow-up survey. It should be noted, however, that we observed lower rates of infection in Vermont, where follow-up was more complete.

These results indicate that surgically induced abortion is safe, with only relatively minor complications reported in almost 1400 procedures. An experienced physician assistant service provided abortion services comparable in safety and efficacy to those of a physician service. These results support the idea that a potential solution to the shortage of providers would be to expand the training of physician assistants to include surgical abortion, thereby enhancing the ability of the medical community to provide needed reproductive health services to women. ■

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Contributors

M.B. Goldman and R.H. Palmer developed the study and obtained funding support. M.B. Goldman supervised all aspects of study implementation, conducted the data analysis, and wrote the article. J.S. Occhiuto and L.E. Peterson supervised field operations and conducted data analyses. J.G. Zapka contributed to the design and conception of the study. All authors helped formulate the study objectives, contributed to the analysis and interpretation of the data, and reviewed drafts of the article.

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Human Participant Protection

This research project was reviewed and approved by the Human Subjects Committee at the Harvard School of Public Health.

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Psychosocial Factors and Preterm Birth Among African American and White Women in Central North Carolina

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Objectives. We assessed associations between psychosocial factors and preterm birth, stratified by race in a prospective cohort study.

Methods. We surveyed 1898 women who used university and public health prenatal clinics regarding various psychosocial factors.

Results. African Americans were at higher risk of preterm birth if they used distancing from problems as a coping mechanism or reported racial discrimination. Whites were at higher risk if they had high counts of negative life events or were not living with a partner. The association of pregnancy-related anxiety with preterm birth weakened when medical comorbidities were taken into account. No association with preterm birth was found for depression, general social support, or church attendance.

Conclusions. Some associations between psychosocial variables and preterm birth differed by race. (*Am J Public Health.* 2004;94:1358–1365)

In the United States, African American women experience a higher level of preterm singleton birth compared with White women.[1] In perinatal research, race is often included in explanatory models, even though no known or postulated genetic or physiological factors linked to skin color have been identified that increase risk for preterm birth. Furthermore, racial groups in the United States tend to contain a highly heterogeneous mix of genetic traits,[2] which suggests that socioeconomic, environmental, and behavioral factors underlie racial disparities. Studies that have examined racial differences in low birthweight or in preterm birth often have focused on differences in income, education, health behaviors, and access to prenatal care as possible explanatory mechanisms[3–11]; however, these models have not completely explained the higher risk experienced by African Americans.

Some researchers have postulated that increased risk for preterm birth among African American women may be attributable to psychosocial or environmental stressors that are specific to race or that differ in prevalence by race.[3,5,10–16] Only a few studies have examined levels of stress, social support, or racial discrimination or other psychosocial factors as potential influences on preterm birth among African American and White women.

To test the hypotheses that the effect of psychosocial factors might vary by race, we examined the association between an array of psychosocial factors and preterm birth in a cohort of pregnant women in central North Carolina. We considered both differing levels of stress and differing associations between stress and preterm birth across racial groups.

METHODS

The Pregnancy, Infection, and Nutrition (PIN) Study was conducted in central North Carolina at 2 prenatal care sites. Clinics at the Wake County Department of Human Services and the Wake Area Health Education Center in Raleigh primarily serve low-income women who are eligible for publicly subsidized prenatal care. The University of North Carolina Hospital clinics serve both women eligible for publicly subsidized services and privately insured patients. We recruited a cohort of women prospectively between gestational weeks 24 and 29 (the recruitment method is described in Savitz et al.[17] and Dole et al.[18]). Women were excluded if they did not speak English, were younger than 16 years of age, were pregnant with multiples, did not plan to continue prenatal care or to deliver at the study site, or lacked access to a telephone for interviews. To be included in the PIN Study, women were required to provide genital tract specimens (swabs of vaginal and cervical fluids and cells). They were also asked to provide blood and urine samples; to participate in a telephone interview assessing sociodemographic characteristics, health behaviors, and reproductive history; and to complete a self-administered questionnaire assessing several psychosocial factors.

To be included in this analysis, a woman had to complete the psychosocial instrument, be self-described as White or African American, have a known delivery date, and have a pregnancy that began between April 1996 and August 2000. During that period, 3962 women were eligible to be recruited; of the 2444 (62%) women recruited, 2029 (83%) completed the psychosocial questionnaire (75% of African Americans and 89% of Whites). Limitation of this group to African American and White women with delivery information resulted in 1898 pregnancies available for analysis, including 8 stillbirth deliveries.

Preterm birth was defined as delivery before 37 weeks of completed gestation, with gestational age determined by an algorithm that used last menstrual period and the earliest ultrasound assessment before 20 weeks. Last menstrual period was used if the discrepancy in the estimated date of delivery involved 14 or fewer days; otherwise, ultrasound was used. In this sample, 82% of the women had both last menstrual period and ultrasound data, with 80% of these pregnancies dated by last menstrual period and 20% by ultrasound. Ultrasound dating was slightly more common among African Americans (24%) than among Whites (18%). Among African American women, 12.0% delivered preterm, whereas 11.5% of

White women delivered preterm. Delivery date information was missing for 1% of women.

According to a conceptual model, this analysis focused on 7 psychosocial areas: external stressors, measured by number of life events the woman had experienced since she became pregnant that she rated as negative as defined by the Life Experiences Survey[19]; enhancers of stress, with the focus on depression as defined by the CES-D scale[20]; buffers of stress, which included social support as defined by the MOS Social Support Survey,[21] living with the baby's father, and religiosity; coping styles, including use of strategies involving distancing or detaching from a problem and escape–avoidance of a problem as defined by the Ways of Coping Questionaire (only 2 of 8 subscales were presented in this article because the other 6 showed no association with preterm birth in either race)[22] and characteristic modes of reaction to unfair treatment as defined by Krieger and Sidney's work[23,24]; perceived stress from racial and gender discrimination, modified slightly from the original scales developed by Krieger and Sidney[23,24] (some questions were modified to focus on discrimination in getting medical care *for this pregnancy* and others were dropped because of space limitations); perceived neighborhood safety[25]; and perceived stressors, including the negative impact of adverse life events as defined by the Life Experiences Survey[19] and the negative impact of pregnancy-related anxiety (based on a subset of the Orr et al. Prenatal Social Inventory Scale[26]). In the perceived stressors category, negative impact was assessed according to a woman's assignment of a rating of −1 to −3 to the life events or anxiety. Life events as defined by the Life Experience Survey[19] were scaled 2 different ways—as external stressors indicated by the count of the events the woman experienced, and as perceived stressors indicated by the impact the woman assigned to those events she experienced.

Ninety-four percent of the women self-reported race during the telephone interview; race was abstracted from the self-reported section of the medical charts for the 6% of women for whom no telephone interview was available.

A variety of potential confounders were assessed, including participant's age, parity, education, marital status, economic status (i.e., annual household income as a percentage of the federal poverty threshold, taking into consideration the number of adults and children in the household), prepregnancy body mass index, and prenatal care site; also assessed was the presence of bacterial vaginosis at 24–29 weeks of gestation. Adjustment was made when the crude risk ratio differed from the adjusted risk ratio for each confounder by 10% or more.[27] Log-linear modeling, by means of the SAS GENMOD procedure,[28] was used for stratified analyses by race to generate adjusted risk ratios.

RESULTS

In comparison with White women in this sample, African American women were somewhat less educated, younger, much less likely to be married, more likely to be obese, and more likely to be living in poverty (Table 1). African American women had a slightly higher risk for preterm birth than White women when their prenatal care was provided at the university care site but had no difference in risk when care was provided at a public health clinic. Few women of either race reported heavy alcohol use during pregnancy, but White women were more likely to smoke, although the smoking-related risk for preterm birth was modest (Table 1). Notable associations between psychosocial measures and bacterial vaginosis were found among White women who had low social support, who used escape–avoidance as a coping mechanism, or who perceived their neighborhoods as unsafe, and among African American women who did not find religion important or who used escape–avoidance as a coping mechanism.

African American women reported a greater number of negative life events, had slightly higher levels of depression, and were less likely to be living with a partner compared with White women (Table 2). They also had higher levels of acceptance of unfair treatment, perceived racial discrimination, and perceptions that their neighborhood was unsafe. White women were less likely than African American women to rate religion as very important in their lives and to use an escape–avoidance coping style to deal with problems.

To examine the associations between psychosocial factors and preterm birth, we evaluated the variables listed in Table 1 as confounders and made adjustments as needed. Among African American women, little difference in risk of preterm birth was associated with the count of negative life events, whereas among White women, we found almost a 2-fold increased risk for preterm birth among women with high levels of stress (Table 3).

In the examination of factors that might enhance or buffer stress, neither depression nor general social support showed an association with preterm birth in either race. African American women were much less likely than White women to be living with a partner, although they did not appear to be at increased risk for preterm birth compared with women living with a partner (relative risk [RR]=1.2; 95% confidence interval [CI]=0.8, 1.8). White women had a greater risk of preterm birth if they were not living with a partner (RR=1.8; 95% CI=1.2, 2.7). There was virtually no difference between races in the risk of preterm birth when stratified by level of importance of religion as measured by frequency of church attendance.

We found little evidence of an association between coping style and preterm birth (data not shown); however, African American women who reported high use of distancing from problems as a coping strategy had a risk ratio of 1.8 (95% CI=1.0, 3.2) for preterm birth compared with women with low use of this strategy; this association did not hold for White women. White women had an increased risk for preterm birth when they were either moderately or very likely to cope with problems through escape or avoidance (RR=1.5, 95% CI=1.0, 2.2).

A substantial proportion of women of both races reported that they did not feel that they had been subjected to unfair treatment (36% of African Americans and 32% of Whites). Among White women who did report experiencing unfair treatment, the association with preterm birth was highest for women who reacted not by talking to others about the expe-

TABLE 1—Characteristics of African American and White Women and Risk Ratios (RRs) for Preterm Birth: Women With Pregnancies Initiated April 1996–August 2000

	African American Women (n = 724)			White Women (n = 1174)		
	No.	% Preterm	RR (95% CI)	No.	% Preterm	RR (95% CI)
Mother's education, y						
<12	176	8.0	0.6 (0.3, 1.1)	166	14.5	1.0 (0.6, 1.6)
12[a]	277	13.4	1.0	276	14.9	1.0
>12	271	13.3	1.0 (0.6, 1.5)	732	9.6	0.6 (0.4, 0.9)
Mother's age at 24 weeks' gestation, y						
16–19	149	8.1	0.7 (0.4, 1.3)	112	11.6	1.0 (0.5, 1.7)
20–29[a]	434	11.1	1.0	568	12.5	1.0
≥30	141	19.2	1.7 (1.1, 2.7)	494	10.7	0.9 (0.6, 1.2)
Parity						
0[a]	328	10.1	1.0	562	9.1	1.0
1	213	13.2	1.3 (0.8, 2.1)	359	14.8	1.6 (1.1, 2.3)
≥2	178	14.0	1.4 (0.9, 2.3)	248	12.5	1.4 (0.9, 2.1)
Missing information	5			5		
Marital status						
Not married[a]	535	11.0	1.0	314	12.4	1.0
Married	186	14.5	1.3 (0.9, 2.0)	860	11.2	0.9 (0.6, 1.3)
Missing information	3			0		
Height, inches						
<62	71	14.1	1.2 (0.7, 2.3)	107	15.0	1.2 (0.8, 2.0)
62 to <68[a]	512	11.5	1.0	872	12.0	1.0
≥68	113	13.3	1.2 (0.7, 2.0)	172	7.6	0.6 (0.4, 1.1)
Missing information	28			23		
Prepregnancy BMI						
Underweight (<19.8)	90	8.9	0.8 (0.4, 1.7)	190	11.1	1.0 (0.6, 1.5)
Normal weight (19.8–26.0)[a]	280	11.1	1.0	622	11.4	1.0
Overweight (>26.0–29.0)	80	8.8	0.8 (0.4, 1.7)	115	11.3	1.0 (0.6, 1.7)
Obese (>29.0)	229	14.9	1.3 (0.9, 2.1)	205	12.7	1.1 (0.7, 1.7)
Missing information	45			42		
Poverty index, % of federal poverty threshold						
<50	93	11.8	1.0 (0.5, 2.0)	33	12.1	1.1 (0.4, 2.8)
50 to <100	170	15.9	1.3 (0.7, 2.3)	137	13.9	1.2 (0.8, 2.0)
100 to <200	202	10.4	0.9 (0.5, 1.6)	235	11.5	1.0 (0.7, 1.5)
≥200[a]	141	12.1	1.0	678	11.2	1.0
Missing information	118			91		
BV						
No BV[a]	554	12.3	1.0	1026	11.3	1.0
BV detected	141	11.4	0.9 (0.6, 1.5)	87	11.5	1.0 (0.6, 1.9)
Missing information	29			61		
Clinic site						
University care site	335	16.4	2.0 (1.3, 3.0)	900	12.6	1.6 (1.0, 2.4)
Public health department[a]	389	8.2	1.0	274	8.0	1.0
Alcohol use during pregnancy, drinks/week						
<5 drinks/week[a]	660	11.7	1.0	1111	11.5	1.0
≥5 drinks/week	5	40.0	3.4 (1.1, 10.2)	11	0	. . .[b]
Missing information	59			52		

Continued

rience but by attempting to do something about it (RR=1.9; 95% CI=0.9, 3.7). Among African American women who reported experiencing higher levels of racial discrimination versus those reporting lower levels, there was an increased risk for preterm birth (RR=1.8; 95% CI=1.1, 2.9). The African American women surveyed had a risk ratio of 1.6 (95% CI=0.9, 2.6) for a high level of gender discrimination, whereas White women showed no association. Whereas African Americans were more likely than Whites to report low perceived neighborhood safety, they had no increased risk associated with this exposure. White women who reported living in a neighborhood perceived as unsafe were at a slightly increased risk compared with White women who did not report this perception for preterm birth (RR=1.4; 95% CI=0.9, 2.3).

White women with high perceived stress from the negative impact of adverse life events had a risk ratio of 2.2 (95% CI= 1.3, 3.5) for preterm birth; there was no association present among African Americans.

Among women who reported high pregnancy-related anxiety levels, we found an increased risk of preterm birth for African American women (RR=2.0; 95% CI=1.3, 3.2) and a somewhat lower risk for White women (RR=1.6; 95% CI=1.1, 2.3). Because the observed association between pregnancy-related anxiety and preterm birth may reflect increased medical risks that induce anxiety rather than a causal link between anxiety and preterm birth, we reran this model, restricting it to the 699 White and 390 African American women who experienced no bleeding during the pregnancy and were not put on bed rest. The risk ratios were reduced to 1.3 (95% CI=0.6, 2.6) among African Americans and 1.2 (95% CI=0.7, 1.9) among Whites, which suggests that at least some of this association may have resulted from underlying medical conditions that contribute to the woman's anxiety.

To examine whether the associations between the psychosocial variables and preterm birth held for women who had spontaneous preterm deliveries, we reran all models, this time excluding women who underwent medically indicated preterm deliveries as assessed by study obstetricians, and

TABLE 1—*Continued*

Smoked during months 1–6 of pregnancy, cigarettes/day						
None[a]	541	11.5	1.0	807	10.8	1.0
1–9 cigarettes/day	86	14.0	1.2 (0.7, 2.2)	147	13.6	1.3 (0.8, 2.0)
10–19 cigarettes/day	19	15.8	1.4 (0.5, 4.0)	99	16.2	1.5 (0.9, 2.4)
≥20 cigarettes/day	7	14.3	1.2 (0.2, 7.8)	43	11.6	1.1 (0.5, 2.5)
Missing information	71			78		

Notes. CI = confidence interval; BMI = body mass index; BV = bacterial vaginosis.
[a]Reference category.
[b]Too few cases to calculate risk ratio.

examined the 108 spontaneous preterm cases and 1676 term births. Among African American women with a spontaneous preterm birth, several psychosocial variables were associated with higher risk ratios for preterm birth. These variables included women who reported: the highest number of negative life events experienced (RR changed from 1.3 to 1.6 [95% CI=0.8, 3.5]); the highest level of perceived gender discrimination (RR changed from 1.6 to 2.1 [95% CI: 1.0, 4.3]); the highest life events sum of negative impacts (RR changed from 1.4 to 1.9 [95% CI: 0.8, 4.7]); and high pregnancy-related anxiety (RR changed from 2.0 to 3.0 [95% CI: 1.5, 6.2]). Among White women, risk ratios changed only minimally (data not shown).

DISCUSSION

In this prospective cohort study, the prevalence of several psychosocial variables differed by race. The associations between stratum-specific psychosocial variables and preterm birth were also different for African American and White women for several variables, although not all. Because our sample had sufficient numbers of African American and White women, we were able to examine some factors that have been postulated to be differentially distributed or associated with preterm birth by race: measures of discrimination, reaction to unfair treatment, perception of neighborhood safety, and potential benefits from living with a partner or involvement with religion.

African American women who reported high levels of perceived racial or gender discrimination were more likely than those who reported lower levels to deliver preterm. Neither of these discrimination measures was associated with increased risk among White women. Whereas a number of researchers have developed extensive historical bases and theoretical models supporting an association between racism or other forms of discrimination and adverse birth outcomes,[2,12,13,16] only a few studies have examined the association of discrimination with pregnancy outcomes. In an analysis of 147 African American women, no association with birthweight or gestational age was found for stress, self-esteem, or racism, although higher perceived racism was associated with a higher level of stress, and higher self-esteem was associated with decreased levels of stress.[29] An exploratory study of 94 African American women found that neither life events nor perception of living in an unsafe neighborhood was associated with perceived stress; however, racial discrimination was related to perceived stress.[25] Our findings provide support for an association between racial discrimination and preterm birth; further empirical exploration is warranted.

In developing the John Henryism scale, James[30] began with the hypothesis that African Americans of lower socioeconomic status were exposed to psychosocial stressors. These stressors induced different coping responses that in turn are predictors for hypertension. Our examination of several coping subscales indicated a modestly increased risk for preterm birth among African American women when their coping style involved distancing from problems, but no such association was seen among White women. Among African American women, those whose coping styles involved a high level of escape–avoidance showed modest increases in the risk of preterm birth compared with women reporting low levels of escape–avoidance coping. Among White women, there was also a modest increased risk among those who reported medium or high levels of escape–avoidance coping.

Previous research has examined community and neighborhood factors as a possible explanation for racial differences in birth outcomes.[31,32] Collins et al.[33] asked 80 African American women to rate their residential environments and 24 stressful life events to assess any association with very low birthweight (<1500 g). The investigators reported an odds ratio of 3.2 (95% CI=1.2, 8.8) for the overall rating of the neighborhood and an odds ratio of 3.1 (95% CI=1.2, 8.2) for 3 or more stressful events during pregnancy, which indicated that women who lived in unfavorable neighborhoods or who experienced more stress in their lives were more likely to deliver low birthweight infants. (The variables Collins et al. used to define an unfavorable neighborhood included: police protection, protection of property, personal safety, friendliness, delivery of municipal services, cleanliness, quietness, and schools.) The data from our survey, in which women were asked to assess neighborhood safety, do not support an association of adverse residential environments with preterm birth among African Americans; however, among White women who rated their neighborhoods as unsafe, an increased risk for preterm birth was found.

Although the psychosocial measures just mentioned were of particular interest for examining racial differences in risk, we also looked at psychosocial factors that have been examined in other studies that did not examine race. Although African American women in our sample reported more depressive symptoms, we found no association between depression and preterm birth among either African American or White women and no benefit for general social support, although White women who lacked the support presumably derived from living with a partner were at increased risk for preterm birth. These findings are somewhat consistent with those of other studies.[34–36]

In our cohort, pregnancy-related anxiety was associated with the highest risk for pre-

TABLE 2—Distribution of Psychosocial Factors Among African American and White Women: Women With Pregnancies Initiated April 1996–August 2000

Model	African American Women Mean (SD) or %	African American Women Range from 10th to 90th percentile	White Women Mean (SD) or %	White Women Range from 10th to 90th percentile
External stressors: life events, sum of negative count [0–41][a]	4.2 (3.3)	0–9	3.4 (3.0)	0–8
Enhancers of stress: depression [0–60][b]	19.8 (11.8)	6–37	14.8 (11.1)	4–32
Buffers of stress				
Social support, sum of scale [19–95][c]	72.9 (18.4)	44–94	78.2 (15.3)	57–95
Living with a partner	48.3		87.8	
Religion very important	64.8		46.2	
Church attendance, times per year [0–365]	30.7 (40.5)	0–52	22.2 (32.0)	0–52
Coping style				
Coping, distancing from problem [0–100][d,e]	11.7 (4.5)	6.3–16.6	10.3 (4.7)	4.6–16.0
Coping, escape–avoidance [0–100][d,f]	11.3 (4.9)	5.6–16.9	8.6 (5.1)	2.5–14.8
Accept unfair treatment (vs do something)[g]	30.8		22.3	
Talk about unfair treatment (vs keep it to self)[g]	79.9		89.4	
Discrimination				
Perceived racial discrimination [0–6][h]	1.1 (1.4)	0–3	0.2 (0.6)	0–1
Perceived gender discrimination [0–4][i]	0.6 (0.9)	0–2	0.5 (0.8)	0–2
Perceived neighborhood safety [7–33][j]	13.2 (5.8)	7–22	10.1 (3.6)	7–15
Perceived stress from life events and pregnancy anxiety				
Life events, sum of negative impact [–123–0][k]	–8.3 (7.9)	–19–0	–6.1 (6.5)	–15–0
Pregnancy anxiety, sum of negative impact [–18–0][l]	–3.8 (3.8)	–9–0	–3.9 (3.2)	–8–0

[a]The external stressors scale summed 39 life events from the Life Experiences Survey[19] that the woman indicated she had experienced since she got pregnant and considered to have had a negative impact on her life. Cutpoints of 0–2, 3–5, 6–8, and >8 events were used.
[b]The Center for Epidemiologic Studies Depression Scale[20] was used to assess depression symptoms using a 20-item scale with Likert response categories about feelings and activities the respondent experienced during the past week. A sum was calculated and cutpoints of 0–16, 17–24, >24 were used.
[c]The MOS Social Support Scale[21] assessed the participant's perception of the availability of social support using a five-category Likert response for 19 items. Responses were summed and cutpoints of >89, 79–88, 65–78, and 19–64 were used.
[d]The 66-item Ways of Coping Questionnaire[22] uses four-point Likert response categories. Participants were asked to indicate, since they got pregnant, how often they used each coping approach when they "had a problem."
[e]The distancing from a problem subscale included six items to assess cognitive efforts to be detached or minimize the significance of a situation. Quartile cutpoints for the entire cohort were used.
[f]The escape-avoidance subscale used eight items that assess wishful thinking and behaviors to escape or avoid a problem. Quartile cutpoints for the entire cohort were used.
[g]Questions developed by Krieger and Sidney[23,24] assessed whether individuals felt they had been treated unfairly, and if so, their responses to that treatment.
[h]Based on discrimination questions developed by Krieger and Sidney[23,24] each participant was asked whether she felt she had been discriminated against because of her race or color at school, when trying to get a job, at home, when trying to get medical care for this pregnancy, when she tried to get housing, or in her dealings with the police or in a court. Sums of yes responses were calculated and cutpoints of 0, 1, or >1 were used.
[i]Based on discrimination questions developed by Krieger and Sidney[23,24] each participant was asked whether she felt she had been discriminated against because she was women at school, when trying to get a job, at home, or when trying to get medical care for this pregnancy. Sums of yes responses were calculated and cutpoints of 0, 1, or >1 were used.
[j]Participants were asked about perceived safety of the neighborhood at night, during the day, frequency of property crimes, personal crimes, shootings, police arrests, and drug dealing. These items were used to assess how stressful they perceived their contextual environment to be.[25]
[k]Life events from the Life Experiences Survey[19] allowed women to assign any of the 39 events an impact level from –3 to +3. A sum of the negative impacts (–1 to –3) was calculated and used to measure perceived stress from life events. Cutpoints of absolute values were 0–4, 5–8, 9–15, and >15.
[l]Six items from the Prenatal Social Environment Inventory[26] were used to assess the participant's anxiety about the pregnancy and becoming a parent. A sum of the negative impacts (–1 to –3) was calculated and used to measure perceived stress from pregnancy-related anxiety. Cutpoints of absolute values were 0–2 and >2.

term birth out of all psychosocial measures for African American women, with an increased risk among White women who reported pregnancy-related anxiety that was not as strong as that for African American women. This finding was consistent with previous research involving anxiety and pregnancy outcomes,[37,38] although not all previous research found an association between trait anxiety and preterm birth.[34] However, the etiological importance of anxiety in the context of actual pregnancy problems is difficult to ascertain; anxiety may well result from concern about medical problems and reflect a form of confounding by indication. ("Confounding by indication is a term used when a variable is a risk factor for a disease among nonexposed persons and is associated with the exposure of interest in the population from which the cases derive, without being an intermediate step in the causal pathway between the exposure and the disease."[39]) When we restricted the analysis to women with no bleeding or prescribed bed rest, the association weakened considerably. Pregnancy-related anxiety may act through a causal pathway linking anxiety with a stress-hormone response to preterm birth; however, our data indicate that the role of anxiety may not be substantial in the absence of medical complications. Further explorations of self-reported anxiety or stress, measures of stress hormones, and measures of potential causes of anxiety, including medical comorbidities, are required to elucidate this relationship.

Measurement of psychosocial factors involves asking respondents to report perceptions of the existence of stressors and their positive or negative impact on the respondents' lives. Prevalence of some of these stressors differed by race, as did association with preterm birth. Additionally, when the association between specific strata of the psychosocial measures and preterm birth was examined, we saw an increased risk for preterm birth for African American women but not White women for certain psychosocial measures (e.g., distancing from a problem, racial discrimination), and an increased risk for Whites only for different measures (e.g., life-events counts and impacts, living with a partner). Within racial groups, there may be a difference in how the questions concerning

TABLE 3—Psychosocial Factors and Preterm Births Among African American and White Women: Women With Pregnancies Initiated April 1996–August 2000

Model	African American Women			White Women		
	No. Term	No. Preterm	Adjusted RR (95% CI)	No. Term	No. Preterm	Adjusted RR (95% CI)
External stressors: life events, sum of negative count[a,b]						
Low stress[c]	152	17	1.0	338	36	1.0
Medium-low stress	164	20	1.1 (0.6, 2.0)	273	33	1.3 (0.8, 2.0)
Medium-high stress	116	17	1.3 (0.7, 2.4)	201	26	1.3 (0.8, 2.1)
High stress	188	29	1.3 (0.8, 2.3)	219	39	1.8 (1.2, 2.8)
Enhancers of stress: depression[b,d]						
Low level of symptoms[c]	298	41	1.0	669	84	1.0
Medium level of symptoms	137	16	0.9 (0.5, 1.5)	172	23	1.1 (0.7, 1.6)
High level of symptoms	196	29	1.1 (0.7, 1.7)	191	28	1.1 (0.8, 1.7)
Buffers of stress						
Social support, sum of scale[b,e]						
High[c]	138	27	1.0	320	49	1.0
Medium-high	166	17	0.6 (0.3, 1.1)	257	36	0.9 (0.6, 1.4)
Medium-low	145	15	0.7 (0.4, 1.2)	277	28	0.7 (0.4, 1.1)
Low	183	28	0.8 (0.5, 1.4)	180	22	0.8 (0.5, 1.3)
Living with a partner[b,f]						
Yes[c]	284	37	1.0	874	105	1.0
No	301	42	1.2 (0.8, 1.8)	113	23	1.8 (1.2, 2.7)
Importance of religion[b,g]						
Very important[c]	378	52	1.0	455	63	1.0
Fairly important	89	15	1.2 (0.7, 2.1)	296	34	0.9 (0.6, 1.3)
Fairly unimportant	8	2	. . .[h]	75	12	1.3 (0.7, 2.2)
Not at all important	110	10	0.8 (0.4, 1.5)	165	20	0.9 (0.6, 1.5)
Church attendance[b,i]						
≥49 times/year[c]	172	26	1.0	228	32	1.0
13–48 times/year	144	24	1.1 (0.6, 1.8)	158	27	1.2 (0.8, 2.0)
1–12 times/year	120	13	0.7 (0.4, 1.4)	274	32	0.9 (0.6, 1.5)
None	151	16	0.7 (0.4, 1.3)	333	38	0.9 (0.6, 1.5)
Coping style						
Distancing from a problem[b,j]						
Low[c]	153	15	1.0	411	51	1.0
Medium	224	28	1.3 (0.7, 2.3)	318	42	1.1 (0.7, 1.6)
High	248	42	1.8 (1.0, 3.2)	297	41	1.1 (0.7, 1.6)
Escape–avoidance of a problem[b,k]						
Low[c]	131	15	1.0	478	48	1.0
Medium	224	29	1.2 (0.6, 2.1)	306	49	1.5 (1.0, 2.2)
High	270	41	1.4 (0.8, 2.5)	242	37	1.5 (1.0, 2.2)
Response to unfair treatment[b,l]						
Talk about it, act on it[c]	226	35	1.0	512	57	1.0
Talk about it, accept it	72	12	1.0 (0.6, 1.9)	109	14	1.0 (0.5, 1.7)
Don't talk about it, act on it	30	7	1.2 (0.5, 2.6)	27	7	1.9 (0.9, 3.7)
Don't talk about it, accept it	47	3	. . .[h]	41	8	1.6 (0.8, 3.1)
Discrimination						
Perceived racial discrimination[b,m]						
None[c]	310	33	1.0	880	119	1.0
Some	133	15	1.1 (0.6, 2.1)	98	10	0.8 (0.4, 1.4)
High	181	35	1.8 (1.1, 2.9)	51	4	. . .[h]

Continued

psychosocial factors are interpreted. Also, women may be responding to these measures from different perspectives according to lifelong cultural and environmental exposures that influence their interpretation of longstanding background stress that may or may not result in an increased risk for adverse birth outcome.

The African American women in this study who reported being subjected to racism had an increased risk for preterm birth. Development of new methods for measuring these underlying stressors may improve our understanding of the role of stress in pregnancy outcomes among African American women.

Study Limitations

Limitations in our data must temper any conclusions. Because our study population was recruited at a small number of clinical settings that included a university hospital—which had both an above-average number of women at high risk for preterm births and publicly funded prenatal care—the generalizability of our results is limited. This limitation is illustrated by the unusually high risk of preterm birth among Whites and the low risk among African Americans in our study. The psychosocial profiles of women in this sample may have differed in important ways from those of women in the general population, especially with regard to previous medical problems with their pregnancies or medical comorbidities and associated stressors. The requirement that the women be in prenatal care by early in the third trimester of pregnancy resulted in exclusion of women who received no prenatal care or received it very late. However, North Carolina vital records for 1998 births in the 3 counties in which most study participants lived indicate that only 2% of the women initiated prenatal care after the sixth month of pregnancy. Because of the extensive protocols of the PIN Study, refusal rates were not trivial.

Nonresponse to the self-administered psychosocial questionnaire was also a concern, especially among African American women. An examination of the women who participated in the PIN Study but who did not return the psychosocial instrument showed that the nonrespondents among both racial groups were at increased risk for preterm birth (19.0% among Whites, 17.3% among African

TABLE 3—*Continued*

Perceived gender discrimination[b,m]						
None[c]	396	48	1.0	661	93	1.0
Some	139	16	1.0 (0.5, 1.7)	231	26	0.8 (0.5, 1.2)
High	92	19	1.6 (0.9, 2.6)	139	15	0.8 (0.5, 1.3)
Perceived neighborhood safety[b,n]						
Safe[c]	154	23	1.0	470	60	1.0
Medium safe	120	16	0.9 (0.5, 1.6)	228	24	0.8 (0.5, 1.3)
Unsafe	176	22	0.9 (0.5, 1.5)	105	20	1.4 (0.9, 2.3)
Perceived stress from life events and pregnancy anxiety						
Life events, sum of negative impact[b,o]						
Low stress[c]	123	12	1.0	284	27	1.0
Medium-low stress	144	20	1.4 (0.7, 2.7)	271	36	1.5 (0.9, 2.5)
Medium-high stress	171	25	1.4 (0.7, 2.8)	281	34	1.5 (0.9, 2.4)
High stress	182	26	1.4 (0.7, 2.7)	195	37	2.2 (1.3, 3.5)
Pregnancy-related anxiety, sum of negative impact[b,p]						
Low anxiety[c]	273	23	1.0	393	37	1.0
High anxiety	293	55	2.0 (1.3, 3.2)	578	90	1.6 (1.1, 2.3)

Notes. BMI = body mass index; CI = confidence interval; RR = relative risk.

[a]African Americans: *none;* Whites: *prenatal care site, BMI.* The external stressors scale summed 39 life events from the Life Experiences Survey[19] that the woman indicated she had experienced since she got pregnant and considered to have had a negative impact on her life. Cutpoints of 0–2, 3–5, 6–8, and > 8 events were used.

[b]Confounder for the model. See other footnote for factors (in italics).

[c]Referent.

[d]African Americans: *none;* Whites: *none.* The Center for Epidemiologic Studies Depression Scale[20] was used to assess depression symptoms using a 20-item scale with Likert response categories about feelings and activities the respondent experienced during the past week. A sum was calculated and cutpoints of 0–16, 17–24, > 24 were used.

[e]African Americans: *BMI;* Whites: *none.* The MOS Social Support Scale[21] assessed the participant's perception of the availability of social support using a five-category Likert response for 19 items. Responses were summed and cutpoints of > 89, 79–88, 65–78, and 19–64 were used.

[f]African Americans: *maternal age;* Whites: *parity, BMI.*

[g]African Americans: *maternal education;* Whites: *BMI.*

[h]There were too few cases to calculate a risk ratio.

[i]African Americans: *none;* Whites: *BMI.*

[j]African Americans: *maternal education;* Whites: *none.* The 66-item Ways of Coping Questionnaire[22] uses four-point Likert response categories. Participants were asked to indicate, since they got pregnant, how often they used each coping approach when they "had a problem." The distancing from a problem subscale included six items to assess cognitive efforts to be detached or minimize the significance of a situation. Quartile cutpoints for the entire cohort were used.

[k]African Americans: *maternal age, parity;* Whites: *none.* The 66-item Ways of Coping Questionnaire[22] uses four-point Likert response categories. Participants were asked to indicate, since they got pregnant, how often they used each coping approach when they "had a problem." The escape-avoidance subscale used eight items that assess wishful thinking and behaviors to escape or avoid a problem. Quartile cutpoints for the entire cohort were used.

[l]African Americans: *height, parity, marital status;* Whites: *parity, BMI.* Asked only if respondent also said she felt she had been treated unfairly. Questions developed by Krieger and Sidney[23,24] assessed whether individuals felt they had been treated unfairly, and if so, their responses to that treatment.

[m]African Americans: *height, BMI;* Whites: *none.* Based on discrimination questions developed by Krieger and Sidney[23,24] each participant was asked whether she felt she had been discriminated against because of her race or color at school, when trying to get a job, at home, when trying to get medical care for this pregnancy, when she tried to get housing, or in her dealings with the police or in a court. Sums of yes responses were calculated and cutpoints of 0, 1, or > 1 were used. Additionally, each participant was asked whether she felt she had been discriminated against because she was women at school, when trying to get a job, at home, or when trying to get medical care for this pregnancy. Sums of yes responses were calculated and cutpoints of 0, 1, or > 1 were used.

[n]Participants were asked about perceived safety of the neighborhood at night, during the day, frequency of property crimes, personal crimes, shootings, police arrests, and drug dealing. These items were used to assess how stressful they perceived their contextual environment to be.

[o]African Americans: *none;* Whites: *prenatal care site, BMI.* Life events from the Life Experiences Survey[19] allowed women to assign any of the 39 events an impact level from –3 to +3. A sum of the negative impacts (–1 to –3) was calculated and used to measure perceived stress from life events. Cutpoints of absolute values were 0–4, 5–8, 9–15, and > 15.

[p]Six items from the Prenatal Social Environment Inventory[26] were used to assess the participant's anxiety about the pregnancy and becoming a parent. A sum of the negative impacts (–1 to –3) was calculated and used to measure perceived stress from pregnancy-related anxiety. Cutpoints of absolute values were 0–2 and > 2.

Americans). Because the psychosocial questionnaire was a self-administered, mail-back instrument, reduced response rates might be expected from women whose pregnancies ended early, since these women presumably had less time to return the instrument. Additionally, although we had substantial numbers of women of each race, racial differences in the association between psychosocial measures and preterm birth were assessed imprecisely (the numbers were not large enough to narrow the confidence intervals further).

Our sample of White women was at increased risk for preterm birth compared with the general population of White women in the geographic area of the study, which perhaps was a reflection of the greater number of medically high-risk White women recruited from the university referral hospital. However, we excluded women referred to the clinic who did not plan to continue their prenatal care or to deliver at the hospital, reducing the number of high-risk referrals who were in the study. By contrast, our sample of African American women had a lower risk of adverse pregnancy outcomes compared with the general population, despite a less favorable social and demographic profile. The African American women in our study had risks similar to those of the White women rather than the 2-fold increased risk seen in vital records data for the general African American population in the area. This unusual pattern was not a result of refusal to participate; in fact, it was apparent among all eligible women. A higher proportion of White women attended the university clinic where there was a higher rate of preterm birth, while a higher proportion of African American women attended the health department clinic. The differences in risk for preterm birth may reflect (1) higher-risk White women selecting the university clinic for their prenatal care and (2) a beneficial influence of the prenatal care at the health department lowering the risk of the African American women who attended. The small difference in preterm birth rates by race makes problematic any assessment of the causes of racial disparities in risk, but within each racial group, patterns of risk for preterm birth associated with different levels of psychosocial variables can be adequately assessed. Our study allowed examination of many factors that may be distributed differen-

tially by race, resulting in an increased ability to assess different explanations for racial differences and, ultimately, the targeted interventions that may be needed to lower the preterm birth rate. Our data lend support to the idea that the prevalence among populations and the impact on individuals of psychosocial factors differ by race. ■

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At the time of the study, Nancy Dole, David A. Savitz, Anna Maria Siega-Riz, Irva Hertz-Picciotto, and Pierre Buekens were with the Carolina Population Center, University of North Carolina at Chapel Hill. Nancy Dole, David A. Savitz, and Irva Hertz-Picciotto also were with, and Michael J. McMahon was with, the Department of Epidemiology, School of Public Health, University of North Carolina at Chapel Hill. Anna Maria Siega-Riz and Pierre Buekens were also with the Department of Maternal and Child Health, School of Public Health, University of North Carolina at Chapel Hill. Anna Maria Siega-Riz also was with the Department of Nutrition, School of Public Health, University of North Carolina at Chapel Hill. Michael J. McMahon also was with the Department of Obstetrics and Gynecology, School of Medicine, University of North Carolina at Chapel Hill.

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Contributors

N. Dole planned the study, analyzed the data, and wrote the article. D.A. Savitz oversaw the study on which this analysis was based. He, along with A.M. Siega-Riz, I. Hertz-Picciotto, M.J. McMahon, and P. Buekens, assisted with conceptualization of the study questions and analysis and contributed to the writing and editing of the article.

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Human Participant Protection

All study protocols were approved by the University of North Carolina at Chapel Hill School of Medicine and the WakeMed institutional review committee.

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Trends in Prenatal Care Use and Low Birthweight in Southeast Brazil

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Objectives. We investigated trends in prenatal care use and its association with low birthweight in a developing country.

Methods. We examined data from 2 southeast Brazilian cohort surveys, 1 conducted in 1978–1979 and the other in 1994.

Results. Socioeconomic inequalities in prenatal care use increased during the 15-year period of 1979–1994. Although prenatal care use increases paralleled increases in low birthweight rate during this period, having no prenatal care was associated with higher risk of low birthweight in both surveys. Inadequate prenatal care use was also associated with higher risk of low birthweight in 1978–1979 only.

Conclusions. Increasing low birthweight rates among women who adequately used prenatal care may be causing a bias by reducing the estimates of the effect of inadequate prenatal care use on low birthweight rates. (*Am J Public Health.* 2004; 94:1366–1371)

Because prenatal care has been considered a cost-effective way of improving birth outcomes,[1,2] access to adequate prenatal care has been one of the most important goals of women's health programs. In Brazil, in 1989, a new program was established to reduce inequalities in access to women's health care, with a new emphasis on prenatal care. The Health Ministry recommended that all pregnant women initiate prenatal care during the first trimester of pregnancy and be examined by an obstetrician on at least 6 occasions.[3] Because socioeconomic barriers are strongly related to access to adequate prenatal care,[4–6] increasing the provision of services to underprivileged women was one of the goals of this new strategy. Following the sanitary reform in the 1980s, which established free and universal access to all public services under the new Brazilian Unified Health System, few studies have evaluated trends in the provision of and inequalities in access to prenatal care use.[7]

In some places, increasing provision of prenatal care has not been accompanied by the expected reductions in low birthweight.[8–11] More recently, observational studies have obtained conflicting results related to the effect of prenatal care on birth outcomes, particularly in relation to low birthweight.[8,9,12–14] Most of these studies have been carried out in developed countries. Little information is available in developing countries, whose populations may have higher rates of modifiable risk factors potentially reducible by prenatal care interventions.

Ideally, evaluation of the effect of prenatal care on birth outcomes would be performed with randomized controlled trials. However, randomizing subjects into no-care or inadequate-care groups would be considered unethical, because prenatal care is widely assumed to be beneficial. Therefore, evaluation of the effect of prenatal care on birth outcomes must rely on observational studies.[8,10] This undertaking is difficult, because of the methodological problems presented. Prenatal care is not a single intervention: it is a nonstandardized, multifaceted endeavor. Because prenatal care is difficult to measure, measurement error may be present in any study. Because women who already had a preterm birth usually attended fewer prenatal visits, preterm delivery bias will tend to overestimate the association between prenatal care and birth outcomes. Conversely, intensive use of prenatal care by high-risk women may contribute to an underestimate of the association between prenatal care and birth outcomes. Because women who are more health conscious are more likely to use adequate prenatal care and to be at lower risk of adverse birth outcomes, selection bias is a limitation that tends to overestimate the effect of prenatal care on birth outcomes. Confounding is yet another problem.[8,10,14]

Comparison of adequate use with inadequate use tends to underestimate the possible benefits of prenatal care.[10] In our study, we attempted to explain this possible source of bias by assessing the association between prenatal care use and low birthweight. We compared the effect on low birthweight of adequate prenatal care use with both inadequate use and no prenatal care use.

We used survey data from 2 birth cohorts: one in 1978–1979 before the Brazilian Health Ministry program was launched and another in 1994, 5 years after the new strategy's 1989 implementation. Both cohorts are from Ribeirão Preto, São Paulo state, southeast Brazil. Our study was designed to (1) estimate trends in prenatal care use, (2) identify social and biological factors associated with failing to receive the recommended level of prenatal care, (3) assess trends in socioeconomic inequalities in prenatal care over a 15-year period, and (4) evaluate whether inadequate prenatal care use is associated with lower low birthweight rates than with receiving no prenatal care and whether these associations changed between the time of the 2 surveys.

METHODS

In 1978, Ribeirão Preto had a population of 318 496 inhabitants; by 1994, the population had increased by 45%, to 461 427 inhabitants. All 8 maternity hospitals existing in 1978–1979 and all 10 existing in 1994 participated in the surveys. Deliveries occurring in a hospital accounted for more than 98% of all births in both surveys.

The first survey was conducted from June 1978 through May 1979. All singleton live

births to resident families, totaling 6750 mother–child pairs, were included in the analysis. Because no seasonal effects were found in the first survey,[15] the 1994 survey was conducted within only a 4-month period. All singleton live births occurring from May through August 1994 to resident families were included, yielding a sample of 2846 mother–child pairs.

The same methodology was used in both surveys and has been described elsewhere.[15,16] Shortly after delivery, the newborn's weight was measured and the mother answered a standardized questionnaire administered by trained personnel on the maternity ward. In 1978–1979, 2.5% of mothers were discharged from the hospital before they could be interviewed; in 1994, this figure was 3.2%. In both surveys, less than 1.0% of mothers refused to be interviewed. In the first survey, mothers provided oral consent to conduct the interviews, and in the second survey, they provided written consent. Hospital directors gave us permission to access medical records.

A new index of adequacy of prenatal care use based on Brazilian Health Ministry recommendations was used.[3] In this index, prenatal care was determined by self-report and was considered to be adequate when a woman attended at least 6 visits for a term gestation, 5 visits for a gestation ending between 33 and 36 weeks, 4 visits for a gestation ending between 29 and 32 weeks, 3 visits for a gestation ending between 24 and 28 weeks, and 2 visits for a gestation lasting fewer than 24 weeks. Although early initiation of care was also an important part of prenatal care evaluation, it was not possible to incorporate this dimension into the analysis because a large proportion of the 1978–1979 cohort was missing data regarding the time of initiation of prenatal care. However, including this dimension in the index for the 1994 cohort did not substantially change the proportion of mothers receiving adequate care. Gestational age was estimated according to the last normal menstrual period. Subjects who experienced a gestation of fewer than 20 or more than 50 weeks (10 subjects in 1978–1979) or reported implausible gestational ages (27 and 23 subjects in 1978–1979 and 1994, respectively) were recorded as having missing gestational age. Records with missing data on prenatal care (869 in 1978–1979 and 249 in 1994) and gestational age (1001 in 1978–1979 and 393 in 1994) were excluded from some analyses. The category "missing information on gestational age" refers to women who attended at least 1 prenatal examination but for whom it was not possible to clarify prenatal care use as adequate or inadequate on the basis of number of visits in relation to gestational age. Women with missing information were significantly more likely to be younger or older (aged <20 or >34 years), to be multiparous, to be single, to have fewer years of schooling, and to have public insurance (all significant at the .05 level).

We used the following independent variables: maternal age (<20, 20–34, or ≥ 35 years); maternal education (≤ 4, 5–11, or ≥ 12 years); maternal marital status (noncohabiting, cohabiting, or married); parity, including the current pregnancy (primiparity, 2–4 pregnancies, or ≥ 5 pregnancies); type of health insurance (public or private); and maternal smoking during pregnancy (yes or no). A "not known" category was added to the regression models for all variables.

Crude and adjusted prevalence risk ratios were estimated by a Cox regression model using Breslow modification for a cross-sectional design (assuming equal and complete follow-up duration for all subjects). Because the standard errors of the coefficients tend to be overestimated when Cox regression is applied to sectional studies, the robust method of calculating the variance matrix[17] was used instead of the conventional inverse-matrix-of-second-derivatives method. The regression models identified factors associated with inadequate prenatal care use. These models were adjusted for all independent variables under analysis, and subjects with missing information about prenatal care or gestational age were excluded. To examine the association between prenatal care use and low birthweight, prenatal care use was classified as adequate (reference category), inadequate, no prenatal care, or missing. This classification allowed us to assess whether adequate prenatal care produced better birth outcomes than no prenatal care. Because continued smoking during pregnancy may be a consequence of poor prenatal care, separate models were estimated with and without adjustment for maternal smoking.

RESULTS

Adequacy of prenatal care use increased over the study period, from 39.4% in 1978–1979 to 64.0% in 1994, whereas low birthweight rate increased, from 7.2% to 10.7% (Table 1).

Risk Factors for Inadequacy of Prenatal Care Use

Unadjusted analysis. In both the 1978–1979 and 1994 surveys, women aged younger than 20 years, those beyond their fourth pregnancy, smokers, single women (including those cohabiting with a partner), women who had less than

TABLE 1—Percentages of Adequate Prenatal Care Use and Low Birthweight: Ribeirão Preto, Brazil, 1978–1979 and 1994

	1978–1979, No. (%)	1994, No. (%)
Adequacy of prenatal care use*		
Inadequate	1712 (25.4)	309 (10.9)
Adequate	2657 (39.4)	1820 (64.0)
No prenatal care	490 (7.3)	75 (2.6)
Missing information on gestational age	1022 (15.1)	393 (13.8)
Missing information on prenatal care	869 (12.9)	249 (8.8)
Birthweight, g*		
<2500	483 (7.2)	303 (10.7)
≥ 2500	6235 (92.3)	2536 (89.1)
Not known	32 (0.5)	7 (0.2)
Total	6750 (100.0)	2846 (100.0)

*$P<.001$.

TABLE 2—Crude Risk Factors for Inadequacy of Prenatal Care Use, Ribeirão Preto, Brazil, 1978–1979 and 1994

	1978–1979 (n = 4859)			1994 (n = 2204)		
	No.	Inadequate Use, %	Crude Risk Ratio (95% Confidence Interval)	No.	Inadequate Use, %	Crude Risk Ratio (95% Confidence Interval)
Maternal age, y						
<20	656	59.0	1.39 (1.29, 1.49)	386	29.8	1.99 (1.65, 2.42)
20–34	3826	42.5	1.00	1607	14.9	1.00
≤35	373	49.9	1.17 (1.05, 1.31)	209	13.9	0.93 (0.65, 1.33)
Not known	4	0				
Parity						
1	1825	37.5	0.81 (0.75, 0.87)	948	14.0	0.78 (0.64, 0.96)
2–4	2513	46.5	1.00	1142	18.0	1.00
≥5	508	67.3	1.45 (1.34, 1.56)	111	40.5	2.26 (1.75, 2.92)
Not known	13	0				
Marital status						
Married	4075	40.2	1.00	1392	8.9	1.00
Cohabiting	486	71.4	1.78 (1.66, 1.90)	527	36.8	4.13 (3.37, 5.06)
Single	297	72.7	1.81 (1.67, 1.96)	254	24.8	2.78 (2.12, 3.66)
Not known	1	31				
Maternal education, y						
≤4	1085	63.8	2.62 (2.25, 3.07)	264	39.4	15.07 (7.48, 30.35)
5–11	3228	42.5	1.75 (1.50, 2.04)	1497	16.3	6.23 (3.12, 12.47)
≥12	535	24.3	1.00	306	2.6	1.00
Not known	11	137				
Type of insurance						
Private	332	26.2	1.00	874	2.5	1.00
Public	4317	47.7	1.82 (1.52, 2.19)	1290	27.9	11.09 (7.27, 16.91)
Not known	210	40				
Maternal smoking						
No	3424	42.9	1.00	1749	14.0	1.00
Yes	1406	50.8	1.18 (1.11, 1.26)	453	30.5	2.17 (1.81, 2.61)
Not known	29	2				

Note. Subjects with missing information about gestational age and prenatal care were excluded from this analysis.

12 years of schooling, and women who had public insurance were more likely to have inadequate prenatal care use. Conversely, primiparous mothers were more likely to have adequate prenatal care use. Only women aged 35 years or older from the 1978–1979 cohort were also more likely than mothers aged 20 to 34 years to have fewer than the recommended number of prenatal visits. Inequalities in prenatal care increased from 1979 to 1994: among mothers with fewer years of schooling, the risk of attending less than the recommended number of prenatal visits was much higher in 1994 (15.07) than in 1978–1979 (2.62) (Table 2).

Adjusted analysis. After we controlled for various confounders, adjusted risks were reduced for most variables. Young maternal age (<20 years), multiparity (≥5 children), being single or cohabiting with a partner, public insurance, and maternal smoking were independently associated with inadequacy of prenatal care use. Primiparity protected from an inadequate use of prenatal care. The higher risk of inadequate use among mothers with fewer years of schooling was not completely explained by differences in maternal age, parity, marital status, type of insurance, and maternal smoking, because this risk remained significant after adjustment. Among mothers with public insurance, the risk of failing to attend the recommended number of prenatal visits increased from 1978–1979 to 1994. In 1994 the risk was approximately 5-fold higher than in 1978–1979 (Table 2).

Association Between Prenatal Care Use and low birthweight

In both surveys, pregnant women who failed to attend prenatal care visits had a significantly higher unadjusted risk of low birthweight. This association was reduced but remained significant after adjustment for maternal age, parity, marital status, maternal education, and type of insurance. In 1978–1979, women who attended fewer than the recommended number of prenatal visits had a significantly higher risk of low birthweight compared with those who attended the recommended number of visits. After adjustment, the association remained at a confidence limit very close to 1. However, in 1994, the association between inadequate prenatal care use and low birthweight was no longer detected. A linear *P* value for trend was significant in both years (Table 3). Additional adjustment for maternal smoking decreased the estimates slightly (data not shown).

DISCUSSION

Despite an overall increase in the adequacy of prenatal care use, low birthweight and socioeconomic inequalities in prenatal care use increased between 1978–1979 and 1994. Socioeconomic barriers were strong predictors of an inadequate number of prenatal care visits.

In previous studies, women of lower socioeconomic status (low education, low income) were found to have received less than adequate prenatal care both in Brazil[18,19] and in developed countries.[20] Adolescent mothers (aged 10–19 years) showed a considerably greater risk of inadequate prenatal care use,[4,21] as did single or cohabiting mothers[4,21–23] and multiparous women.[4,20] Our results corroborate these findings. Maternal smoking was associated with low prenatal care attendance, a finding also reported in other studies.[24,25] Lack of adequate prenatal care attendance for all of these groups decreases opportunities for identifying and reducing the effects of modifiable risk factors for poor birth outcomes, especially factors related to lifestyle counseling, such as smoking cessation and reproductive health counseling.[22]

Compared to groups who experienced good birth outcomes, groups more likely to

TABLE 3—Adjusted Risk Factors for Inadequacy of Prenatal Care Use: Ribeirão Preto, Brazil, 1978–1979 and 1994

	Adjusted Risk Ratio (95% Confidence Interval)[a]	
	1978–1979	1994
Maternal age, y		
<20	1.36 (1.26, 1.48)	1.56 (1.27, 1.92)
20–34	1.00	1.00
≥35	0.89 (0.80, 1.00)	0.78 (0.55, 1.10)
Parity		
1	0.75 (0.70, 0.81)	0.74 (0.60, 0.91)
2–4	1.00	1.00
≥5	1.33 (1.22, 1.44)	1.56 (1.19, 2.04)
Marital status		
Married	1.00	1.00
Cohabiting	1.44 (1.34, 1.55)	1.85 (1.50, 2.29)
Single	1.67 (1.54, 1.82)	1.77 (1.36, 2.32)
Maternal education, y		
≤4	1.69 (1.43, 2.00)	2.23 (1.07, 4.63)
5–11	1.35 (1.15, 1.59)	1.64 (0.81, 3.32)
≥12	1.00	1.00
Type of insurance		
Private	1.00	1.00
Public	1.31 (1.09, 1.58)	5.96 (3.75, 9.45)
Maternal smoking		
No	1.00	1.00
Yes	1.31 (1.00, 1.14)	1.39 (1.17, 1.65)

Note. Subjects with missing information on gestational age and prenatal care were excluded from this analysis.
[a]Cox regression was used to adjust risk ratios for all factors shown in table assuming equal duration of follow-up for all subjects and robust estimates of standard error would occur.

TABLE 4—Prenatal Care Use in Relation to Low Birthweight: Ribeirão Preto, Brazil, 1978–1979 and 1994

	n	Percentage Low Birthweight	Crude Risk Ratio (95% Confidence Interval)	*P*	Adjusted Risk Ratio[a] (95% Confidence Interval)	*P*
1978–1979				<.001		<.001
Adequate	2651	5.2				
Inadequate	1705	7.5	1.43 (1.13, 1.81)		1.26 (0.99, 1.60)	
No prenatal care	488	13.7	2.64 (2.00, 3.47)		1.88 (1.38, 2.56)	
1994				<.001		.020
Adequate	1818	9.5				
Inadequate	309	10.7	1.12 (0.79, 1.60)		0.98 (0.68, 1.42)	
No prenatal care	75	26.7	2.80 (1.88, 4.19)		2.21 (1.42, 3.42)	

Note. A category denoting missing gestational age and prenatal care data was included in this analysis but is not shown. *P* values for trend were calculated after exclusion of subjects with missing information on gestational age and prenatal care.
[a]Cox regression was used to adjust risk ratios for maternal age, parity, marital status, maternal education, and type of insurance with the assumption of equal duration of follow-up for all subjects and robust estimates of standard error.

experience poor birth outcomes showed fewer improvements in prenatal care use, resulting in increasing poor birth outcomes in terms of low birthweight over the study period, even after universal access was granted in 1989. These results are in contrast with 1981–1998 observations from the United States, where prenatal care use improved and inequalities were markedly reduced.[26]

Some observational studies have shown that adequate prenatal care use is associated with reductions in either low birthweight or preterm birth after various confounders are controlled.[22,27] Another recent study also found that prenatal care use (1 or more visits) was associated with a reduced risk of preterm birth[28] after adjustment for various confounders. However, other studies either failed to identify any association between prenatal care and low birthweight[23] or were able to detect only small differences in mean birthweight between women with adequate and with less-than-adequate prenatal care.[11] In our study, lack of prenatal care was associated with an increased risk of low birthweight in both surveys, whereas inadequate prenatal care use was only marginally associated with an increased risk of low birthweight in the first survey.

Variations among study findings may be the result of differential effects of prenatal care in different populations, differences in prenatal program characteristics, and adjustment for different confounders. Unknown confounders also pose a difficult problem, because most risk factors for low birthweight remain unknown.[10] Differences in measurement of prenatal care use also may explain discrepant findings. Several indices have been proposed to overcome the problem of controlling for gestational age bias[6,8]; however, none of these indices has completely solved this problem.[8,9](Indices are measures used to examine the adequacy of prenatal care or prenatal utilization. These indices usually take into account the number of prenatal care visits, the time of the first prenatal care visit and the gestational age.)

In the United States, Medicaid expansion has led to greater access to prenatal care. It also has resulted in improved birth outcomes in Florida[29] and Washington State.[30] However, in Florida, rates of low birthweight for low-income women with private insurance have remained unchanged.[29] In this study, lack of prenatal

care was associated with a higher risk of low birthweight in both survey periods, whereas, prenatal care use increased in parallel to the increase in low birthweight over the study period. Evaluation of the association between prenatal care and low birthweight, when rates are compared over time, may be misleading because of ecological fallacy.

Prenatal Care and Low Birthweight

We might ask why it is that, in our study, lack of prenatal care was associated with lower low birthweight rates in 1994 but inadequate prenatal care use was not. It is possible that factors other than prenatal care may have increased low birthweight rates among better-off women with adequate prenatal care. Improvement of vital statistic reporting, increasing use of obstetrical interventions, and increasing use of assisted reproductive techniques seem to be associated with increasing preterm birth and low birthweight rates, especially among women of higher socioeconomic status.[31] Increased prenatal care use, especially intensive use (number of visits greater than the recommended number according to gestational age), is associated with both a greater use of medical interventions and preterm birth.[6,20,32] In some instances, increases in preterm birth may reflect advances in perinatal care, because decreases in fetal death rates may occur more often among women receiving adequate care, thus reducing possible associations between prenatal care use and low birthweight.[8] In Ribeirão Preto, increases in prenatal care use and cesarean delivery paralleled increases in low birthweight[33] and preterm birth.[34] Cesarean delivery was more common among more socially privileged women with an adequate number of prenatal care visits.[35] Increases in use of obstetrical interventions such as cesarean delivery could potentially explain the disappearance of the association between inadequate prenatal care use and low birthweight in 1994.

Another possible explanation for no significant association between prenatal care use and low birthweight is variation in measurement error of gestational age estimation[8] and of the number of prenatal care visits. In fact, the frequency of missing data on gestational age was higher in 1978–1979 than in 1994. Changes in measurement error of the number of prenatal visits could have resulted in attenuation bias, which may have underestimated the effect of prenatal care on low birthweight.[14] The association between no prenatal care and low birthweight may have remained relatively stable, possibly because lack of prenatal care is a more objective measure and does not use gestational age data or the number of visits, both of which are more prone to measurement error.

If prenatal care use and low birthweight are causally related, another possibility is that the occurrence of low birthweight in 1999 was less amenable to prenatal care interventions. Preterm delivery accounted for 48% of low birthweight cases in Ribeirão Preto in 1978–1979 and for 55% in 1994.[33] Because preterm birth is less reducible by medical interventions, an increase in preterm birth may explain why low birthweight seems less responsive to the medical interventions included in prenatal care—a finding that has been replicated in both developing and developed countries.[11,36,37] Today, most low birthweight babies are born preterm instead of growth-restricted (i.e., small-for-gestational-age babies) because of conditions less amenable to prenatal care interventions, such as spontaneous idiopathic preterm delivery or bacterial vaginosis.[8,12] The potential benefits of prenatal care on birth outcomes may become less pronounced as the reproductive health of a population improves.[11]

A possible protective effect of prenatal care on low birthweight may have resulted from prevention of small-for-gestational-age births. Better nutrition during pregnancy and decreases in maternal smoking rates may have been the mechanisms by which prenatal care interventions exerted their effects in reducing low birthweight rates.[8,10] We have no data regarding body mass index or prepregnancy maternal weight with which to test this possibility. Adjustment for maternal smoking decreased our estimates only slightly, indicating that smoking was not an important mediator of a possible prenatal care effect.

Another possible explanation as to why inadequate prenatal care use was not associated with lower birthweights in 1994 is the increased intensive use of prenatal care by high-risk women. Because women with poor birth outcomes may have had better access to prenatal care in 1994 than in 1978–1979, comparison of inadequate versus adequate care use may be more biased toward the null value in the latter survey.[21,23]

Study Limitations and Strengths

Our study had some limitations. Because of the possibility of selection bias and confounding as a result of unaccounted for or unknown factors, the association identified in our study between prenatal care use and low birthweight may not be causal. We were unable to adjust for drug and alcohol use, urogenital infections, psychosocial stress, pregnancy complications, and body mass index, all of which are possible confounders of the association between prenatal care and low birthweight. Recall bias also could have attenuated the associations. Information regarding gestational age was unavailable for nearly 24% of the subjects in 1978–1979 and for 19% in 1994. Exclusion of records with missing values may have resulted in an underestimation of the association, because such records are positively associated with inadequate prenatal care use. Only the number of prenatal visits was taken into account; the content and quality of prenatal care was not examined. The use of number of visits relative to gestational age as a prenatal use index has been criticized for failing to discriminate the timing of care initiation, because early initiation of care has been a recommended goal for many prenatal programs.[9] It was not possible to distinguish a category of intensive use to identify women who attended more than the recommended number of visits. Such a category has been considered an important component of recent prenatal care evaluations.[28]

On the other hand, our study had several strengths. First, it was a population-based study, a framework which reduced possible selection bias, mainly considering differences imposed by socioeconomic variables. Second, because this study was based on prospective surveys, we had a high level of data consistency between dependent and independent variables. Third, the study was carried out in a city with high standards of health care for Brazil, confirming the presence of the barriers of access to prenatal care and its impact on birthweight in an ideal scenario.

In summary, inequalities in prenatal care use increased between 1979 and 1994. Although adequacy of prenatal care use improved, women with more need because of social and

biological risk factors continue to receive proportionally less prenatal care than do those with fewer health demands. Although increasing prenatal use paralleled ascending low birthweight rate over time, lack of prenatal care was associated with a higher risk of low birthweight in both survey periods. Although inadequate prenatal care use was associated with low birthweight in 1978–1979, this association disappeared in 1994. Increasing low birthweight rates among women with adequate prenatal care use may be causing a bias by reducing the estimated association between prenatal care use and low birthweight downward. Low birthweight may have been less amenable to prenatal care interventions in the last survey because most low birthweight children were born preterm. Maybe increasing the number of visits for prenatal care as it currently stands would not actually improve low birthweight substantially among certain subgroups in the population. Policymakers need to work to increase prenatal care use among underprivileged women, who are faced with a higher chance of not getting the attention they need compared to women of higher socioeconomic status. ■

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Contributors

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Human Participant Protection

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Implications of Family Income Dynamics for Women's Depressive Symptoms During the First 3 Years After Childbirth

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Objectives. We examined within-person associations between changes in family income and women's depressive symptoms during the first 3 years after childbirth.

Methods. Data were analyzed for 1351 women (mean baseline age = 28.13 years) who participated in the National Institute of Child Health and Human Development Study of Early Child Care. Nineteen percent of these women belonged to an ethnic minority, and 35% were poor at some time during the study.

Results. Changes in income and poverty status were significantly associated with changes in depressive symptoms. Effects were greatest for chronically poor women and for women who perceived fewer costs associated with their employment.

Conclusions. Given that women head most poor households in the United States, our findings indicate that reductions in poverty would have mental health benefits for women and families. (*Am J Public Health.* 2004;94:1372–1377)

Researchers interested in links between poverty and depression have begun using longitudinal data to account for volatility in family income.[1–4] For example, it has been demonstrated that adults who are chronically poor are at greater risk for developing depression later in life than those who are transiently poor, when researchers control for current psychological functioning.[4] Because longitudinal studies have generally relied on between-person comparisons (e.g., rates of depression for chronically poor vs transiently poor populations), it remains unclear whether economic resource changes are associated with depressive symptom changes *within* individuals. If a person's income rises, then do depressive symptoms diminish? Conversely, if income falls, then do depressive symptoms increase? Longitudinal analyses of within-person associations between income and depressive symptoms would answer these questions by estimating whether individuals' income and depressive symptoms covary over time.

In our study, within-person associations between changes in family income and changes in women's depressive symptoms were examined periodically from 1 to 36 months after giving birth. A large body of literature has documented an increased risk of depression among women compared with men.[5] The postpartum period is a time of heightened vulnerability, in part because of hormonal changes that increase women's psychological reactivity to high-stress conditions.[6,7] In fact, approximately 10% of postpartum women experience clinical levels of depressive symptoms within the first few weeks after delivery, with the majority of these episodes lasting 6 months or less.[8] However, postpartum depression appears similar to depressive disorders occurring at other times in life with regard to both symptoms and precursors.[9]

In general, depressive episodes may be transient, lasting a period of days, or chronic, lasting years.[7,10] Life stressors such as financial strain and marital discord, as well as previous depressive episodes, are associated with an increased risk for depression, regardless of timing.[10] Yet the public health relevance of women's depression during the first 3 years after childbirth is exceptional, primarily because maternal depression during infancy and early childhood has been well documented as a risk factor for children's social-emotional development.[11–13]

Not surprisingly, women living in low-income families are more likely than other women to be exposed to high-stress living conditions such as overcrowding, noise, and violent communities.[14] Thus, we predicted that changes in family income would be associated with changes in women's depressive symptoms throughout the first 3 years after childbirth, such that increases in income would be linked with decreases in depressive symptoms. We also predicted that changes in poverty status would be associated with changes in depressive symptoms, such that moving out of poverty would be associated with decreases in depressive symptoms, above and beyond the effects of the corresponding income changes.

Although reciprocal causation between income and depressive symptoms is possible, examining the role of employment offers the opportunity to test the direction of effect. Employment changes are, in fact, the most common reason for income gains and losses among poor families.[15] If income directly influences depression, then changes in hours of employment should be indirectly related to symptom changes. That is, associations between employment and depression should be due to income gains or losses resulting from work changes. However, if depression influences income, then events that affect earnings, such as hours of employment, should mediate the link. We examined 2 pathways linking changes in hours of employment, income, and depressive symptoms: (1) changes in hours of employment → changes in income → changes in depressive symptoms, and (2) changes in depressive symptoms → changes in hours of employment → changes in income. We predicted that our results would be consistent with the first pathway. Thus, we expected our results to be more consistent with social causation theories in which economic status is hypothesized to causally influence mental health rather than health selection theories in which mental health is

hypothesized to causally influence economic status.[16–17]

Interactions between income changes and characteristics of women, their children, and their families were also examined to determine whether the association between changes in income and depressive symptoms varied across women. We expected the association between income and depressive symptoms to be larger for poor women than for nonpoor women, primarily because income gains and losses would have greater relative impacts on the economic resources of poor families (e.g., a $10 000 increase in income would be a 100% gain for families earning $10 000 per year and a 20% gain for families earning $50 000 per year).[18] We also expected the association to be larger for women who believed that the costs (i.e., detrimental effects) of maternal employment were low for their children compared with women who believed these costs were high. That is, we predicted that the positive psychological impact of income gains and the negative psychological impact of income losses would be limited by the belief that maternal employment is harmful to children, a belief that has been associated with low rates of maternal employment.[19] Thus, the goal of the present study was to examine pathways linking within-person changes in income and women's depressive symptoms during the first 3 years after childbirth, as well as variations in the association between income and depressive symptoms across demographic and psychological characteristics of women.

TABLE 1—Sample Demographics of National Institute of Child Health and Human Development Study of Early Child Care: United States, 1991

	No. (%)	Mean (SD)
Maternal characteristics		
Age[a]		28.13 (5.62)
African American	176 (13)	
European American	1095 (81)	
Latino American	81 (6)	
Education, y[a]		14.23 (2.51)
Hours of employment[b]		16.81 (14.04)
Partnered[c]	1050 (77)	
Family characteristics		
Number of children[b]		1.98 (1.00)
Partner's hours of employment[b]		36.76 (17.87)
Annual income[b]		$46 679.48 ($36 174.24)
Child characteristics		
Male	649 (48)	

[a]Age and education descriptive statistics represent baseline values at 1 month after childbirth.
[b]Values represent the mean and standard deviation for the variable across the 5 study assessment points.
[c]Number and percentage of women who had partners at all 5 study assessment points.

METHODS

Sample

Data from the first phase of the National Institute of Child Health and Human Development Study of Early Child Care (SECC) were used in this investigation. Shortly after giving birth in 1991, 1364 women living in or near 10 urban and suburban sites in the United States were recruited to participate in this study; a conditional random sampling method was used (recruitment and sampling details have been published by the Early Child Care Research Network).[20–22] Of this group, 99% (1351) had sufficient nonmissing data for analysis. Designed to study the developmental implications of early child care, the first phase of the SECC includes longitudinal data (collected at 1, 6, 15, 24, and 36 months postpartum) on family economic and psychological well-being. Sample demographics are presented in Table 1.

Measures

Demographics. At 1 month postpartum, women reported their age, ethnicity, years of education, and child's gender. At all 5 measurement occasions, mothers reported their partner status and number of children living in the home. Ethnicity (African American vs Other and Latino American vs Other), child's gender, and partner status were coded as dummy variables.

Family Income and Hours of Employment. At all 5 measurement occasions, women reported their total household income, which for purposes of analysis was divided by $10 000. At these time points, women also reported their own and their partner's weekly hours of employment from all jobs. The ratio of family income to family needs, an index often used by poverty researchers, was computed by dividing total family income by the poverty threshold for the appropriate family size.[23,24] Women with income-to-needs ratios less than 1 at 3 or more assessments were coded as chronically poor (15% of sample). Women with income-to-needs ratios less than 1 at only 1 or 2 assessments were coded as transiently poor (20% of sample).

Maternal Depressive Symptoms. At all 5 measurement occasions, women completed the Center for Epidemiological Studies Depression Scale (CES-D), one of the most widely used measures of depressive symptoms. The 20-item checklist measures the presence and frequency of depressive symptoms during the previous week.[25] Note that scores on the CES-D can range from 0 to 60, and scores of 16 or higher are generally associated with clinical depression. In standardization samples, reliabilities ranged from 0.84 to 0.90.[25] Validity has been established by means of correlations with clinical diagnoses.[26] In the SECC sample, reliability ranged from 0.85 to 0.90.

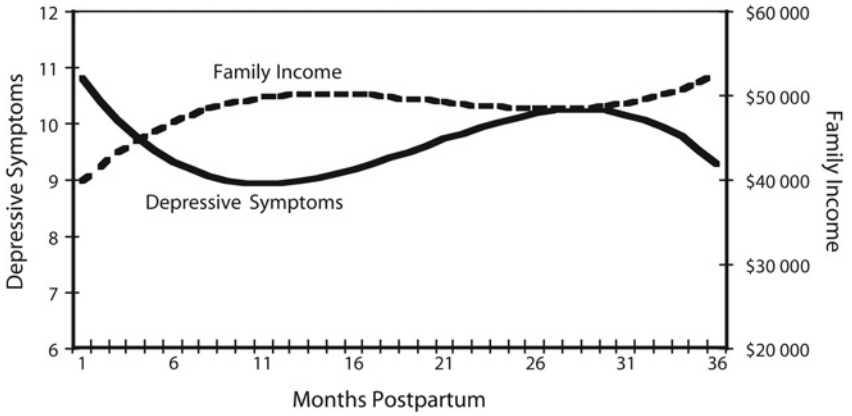
Costs of Maternal Employment. At 1 month, women completed the Beliefs About the Consequences of Maternal Employment for Children, an 11-item scale.[27] Items were summed so that higher scores reflected greater perceived costs to children (mean = 34.14, SD = 7.13). The scale's validity has

been established by means of significant associations with women's employment status and gender-role traditionalism.[19,28] In the SECC sample, this measure was internally consistent ($\alpha = .94$).

Statistical Analyses

Hierarchical linear modeling is an extension of repeated measures analysis of variance, with the advantage that change at the level of the individual is estimated directly rather than by means of the interaction of time by subject.[29] Considering the longitudinal design of the SECC and our study questions regarding within-person change, hierarchical linear modeling is an ideal method for analyzing these data. Two-level hierarchical linear modeling was used to estimate trajectories of depressive symptoms from 1 to 36 months postpartum and within-person associations between changes in family income and changes in depressive symptoms. In the first level of analysis, linear and nonlinear changes in depressive symptoms were estimated, as well as associations between time-varying predictors (e.g., changes in income) and changes in depressive symptoms. In this first level of analysis, predictors were centered around their group means so that associations between predictors and outcomes were within-person estimates. In the second level of analysis, a set of time-invariant predictors of changes in depressive symptoms was estimated. These predictors were used to examine cross-level interactions. For example, we estimated variations in the association between changes in income and changes in depressive symptoms as a function of whether women had been chronically, transiently, or never poor.

Because the meaningfulness of changes in CES-D scores may not be intuitive when coded as a continuous scale, a conditional (i.e., fixed-effects) logistic regression model was used to estimate the likelihood of within-person changes in clinical depression status (a dichotomous indicator) as a function of changes in income and poverty status.[30] Recall that CES-D scores of 16 or higher are indicative of clinical depression. Two aspects of this analysis are important to highlight. First, the outcome variable was a dummy variable (i.e., depressive symptoms below the clinical threshold vs depressive symptoms above the clinical threshold). Thus, the estimated conditional logistic regression model coefficients were interpreted as associations between changes in the predictor variables (e.g., income) and changes in the odds of experiencing an episode of clinical depression. Second, conditional logistic regression model estimates were interpreted correctly as average, within-person estimates (e.g., the average within-person association between changes in income and changes in the odds of experiencing clinical depression).



Note. On average, women experienced increases of approximately $12 100 (SD = $15 850) in their annualized income and decreases of approximately 1.7 points (SD = 2.98) in their depressive symptoms between 1 and 36 months postpartum.

FIGURE 1—Average within-person patterns of change in women's depressive symptoms and family income in the National Institute of Child Health and Human Development Study of Early Child Care.

RESULTS

Time-Varying Predictors of Depressive Symptoms: Mediation Pathways

To provide a descriptive account of change in income and change in depressive symptoms from 1 to 36 months postpartum, 2 hierarchical linear models were estimated. The first estimated patterns of change in income, and the second estimated patterns of change in depressive symptoms. Both income and depressive symptoms significantly varied between 1 and 36 months postpartum, such that there were significant linear, quadratic, and cubic time trends. Sample averages for these time trends are illustrated in Figure 1. Note that depressive symptoms and family income covaried negatively over time. In fact, the 2 curves appear to be mirror images. In addition to significant group averages, patterns of change in both depressive symptoms and income significantly varied across women (e.g., for linear change in income, $\chi^2 = 2285.09$, $P < .001$, and for linear change in depressive symptoms, $\chi^2 = 1603.52$, $P < .001$). Some women, for example, experienced greater gains in income than the sample average, and others experienced losses.

Next, a series of hierarchical linear models was estimated that examined 2 possible pathways linking income, hours of employment, and depressive symptoms. Pathways were estimated using the product of the coefficients approach to testing mediation.[31] To test the first pathway (i.e., hours of employment → family income → depressive symptoms), 2 models were specified: (specification 1) women's and their partner's hours of employment were estimated as time-varying predictors of family income, and (specification 2) family income and hours of employment (both women's and partner's) were simultaneously estimated as time-varying predictors of depressive symptoms. The products of the coefficients for maternal and partner hours of employment in specification 1 and income in specifica-

TABLE 2—Hierarchical Linear Models for Family Income and Depressive Symptoms

Time-Varying Predictor	Specification 1: Predicting Income		Specification 2: Predicting Depressive Symptoms	
	Coefficient (SE)	*P*	Coefficient (SE)	*P*
Average status	4.67 (0.10)	<.001	9.84 (0.19)	<.001
Linear trend	0.08 (0.02)	<.001	–0.47 (0.06)	<.001
Quadratic trend	–0.004 (0.001)	<.001	0.03 (0.004)	<.001
Cubic trend	0.0006 (0.00002)	<.001	–0.0005 (0.0001)	<.001
Number of children	0.12 (0.07)	.06	0.05 (0.20)	.81
Partner's status	1.20 (0.15)	<.001	–1.06 (0.47)	.02
Woman's hours of employment	0.04 (0.002)	<.001	0.00 (0.01)	.52
Partner's hours of employment	0.02 (0.002)	<.001	–0.00 (0.01)	.61
Family income			–0.14 (0.04)	.001

TABLE 3—Conditional Logistic Model: Changes in Clinical Depression Status

Time-Varying Predictor	Conditional Logistic Model (n = 1351)[a]	
	Odds Ratio (95% Confidence Interval)	*P*
Linear trend	0.82 (0.77, 0.88)	<.001
Quadratic trend	1.01 (1.00, 1.02)	<.001
Cubic trend	1.00 (0.99, 1.00)	<.001
Number of children	1.15 (0.95, 1.40)	.15
Partner's status	0.61 (0.37, 1.00)	.05
Mother's hours of employment	1.00 (0.99, 1.01)	.20
Partner's hours of employment	1.00 (0.99, 1.00)	.34
Family income	0.95 (0.90, 1.01)	.03
Poverty status	1.48 (1.01, 2.15)	.04

[a]The conditional logistic model considers only those individuals whose clinical depression status changed over the sample period. Thus, individuals with no variation in clinical status were removed from the maximal-likelihood estimation, leaving 507 women who experienced some change in clinical status. The income means and poverty rates for the 765 women who were never clinically depressed and the 79 women who were always clinically depressed were significantly different such that women who were always clinically depressed had lower incomes ($P < .001$) and were more likely to be poor ($P < .001$).

tion 2 were estimated using the Sobel test of indirect effects (i.e., *ab* divided by the square root of $b^2s_a^2 + a^2s_b^2 - s_a^2s_b^2$, where a represents the association between hours of employment and family income, b represents the association between family income and depressive symptoms, s_a represents the standard error of a, and s_b represents the standard error of b; resulting values were treated as z-test statistics).[31]

Coefficients, standard errors, and P values from specifications 1 and 2 are displayed in Table 2. Note that changes in partner status, changes in number of children in the home, and time parameters were included in these models as time-varying covariates. With respect to interpretation, the estimated coefficients for hours of employment represent the average change in depressive symptoms resulting from a 1-hour-per-week increase in employment; the estimated coefficient for income represents the average change in depressive symptoms resulting from a $10 000 increase in annualized income.

In specification 1, increases in both mothers' and partners' hours of employment were significantly associated with increases in family income (i.e., coefficients of 0.04 and 0.02). In specification 2, increases in family income were significantly associated with decreases in depressive symptoms (coefficient of –0.14). Note, however, that when we controlled for family income, neither maternal nor partners' hours of employment were significantly associated with depressive symptoms in specification 2. These results were consistent with the first pathway: change in hours of employment → change in family income → change in depressive symptoms. In fact, the products of the coefficients for employment (specification 1) and income (specification 2) were significantly different from zero (i.e., for maternal employment, $z = -3.45$, $P < .001$; for partner's employment, $z = -3.30$, $P = .001$). In other words, the path from hours of employment to income and the path from income to depressive symptoms were estimated to be *jointly* significant, providing evidence that family income mediates the link between hours of employment and depressive symptoms.[31]

To test the second pathway (i.e., change in depressive symptoms → change in hours of employment → change in family income), 2 models were specified: (1) depressive symptoms as a time-varying predictor of hours of employment, and (2) depressive symptoms and hours of employment simultaneously estimated as time-varying predictors of family income. Family income was a significant predictor of depressive symptoms, even when we controlled for maternal and partners' hours of employment. Further, the path from depressive symptoms to hours of employment and the path from hours of employment to family income were *not* jointly significant. Therefore, these results were not consistent with the second pathway.

Poverty Status. To determine whether changes in poverty status were associated with changes in depressive symptoms above and beyond the effects of hours of employment and family income, change in poverty status was added to the 8 predictors from specification 2 in Table 2. Changes in poverty status were associated with changes in depressive symptoms (coefficient = 0.55, SE = 0.30), above and beyond accompanying changes in income and employment. However, this association was only marginally significant ($P = .07$).

Changes in Clinical Depression. To further investigate the public health significance of family economic changes, a conditional logistic model was used to estimate the likelihood of within-person changes in clinical depression status as a function of the time-varying predictors including family income and poverty status (Table 3). Increases in income were significantly associated with the odds of a change from clinical to nonclinical status. When we controlled for the effect of income, women who moved out of poverty were 1.48 times more likely to experience a shift from clinical to nonclinical depression status than if they had remained in poverty. Thus, changes across the poverty threshold increased the

probability of within-person changes across the clinical depression threshold.

A 2-level Hierarchical Linear Model: Interaction Effects

As a final step, a 2-level hierarchical linear model of depressive symptoms was estimated to examine interactions between time-varying and time-invariant predictors (i.e., chronic poverty, transient poverty, maternal education, costs of maternal employment, maternal age, maternal ethnicity, and child's gender). The magnitude of the association between changes in family income and depressive symptoms significantly varied by 2 time-invariant predictors: chronic poverty and costs of maternal employment. The negative association between changes in income and depressive symptoms was significantly larger for chronically poor women (i.e., estimated income coefficient=–0.70) compared with never-poor women (i.e., estimated income coefficient=–0.12), even when we controlled for the fact that both transiently and chronically poor women reported, on average, more depressive symptoms than never-poor women. Note, however, that for both groups, the association between changes in income and changes in depressive symptoms was significantly different from zero.

In addition, the association between changes in family income and depressive symptoms was significantly smaller for women who reported relatively high costs of maternal employment (estimated income coefficient=–0.11 for women who were 1 SD above the mean costs) compared with women who reported relatively low costs (estimated income coefficient=–0.29 for women who were 1 SD below the mean costs). However regardless of women's beliefs about employment, the association between changes in income and changes in depressive symptoms was statistically significant.

DISCUSSION

With approximately 17% of families in the United States living in poverty and most of these households headed by women, the mental health of poor women remains a pressing topic for both public health science and public health policy.[32] The present study extends previous work by demonstrating that changes in income and poverty status were associated with changes in women's depressive symptoms in the first 3 years after childbirth. Income gains resulted in the alleviation of symptoms, especially when these gains were substantial enough to lift families out of poverty. In fact, women were 1.48 times more likely to experience a shift from clinical to nonclinical status after transitions out of poverty. There is now between-person[1–4] and within-person evidence that changes in family economics are associated with changes in depression.

In the present study, changes in employment were indirectly associated with depressive symptoms by means of changes in income. These results were consistent with a path of influence leading from employment changes to income changes, and, in turn, to depressive symptom changes. There was no evidence that depressive symptom changes influenced income by means of employment changes. Therefore, our results were consistent with social causation hypotheses.[16,17] During the first 3 years after childbirth, women's economic well-being appeared to influence their psychological well-being, rather than the opposite.

Further, associations between income and depressive symptoms varied by demographic characteristics of women. Women who were chronically poor experienced the strongest effects of changes in income on their depressive symptoms, perhaps because income gains and losses for these women were associated with the largest *relative* changes in economic well-being. Policies that increase the economic resources of these women are likely to have the greatest mental health impacts. The associations between income and women's depressive symptoms also varied by women's concerns about the ramifications of maternal work. The belief that work was costly to children limited the ameliorative effects of income gains and the deleterious effects of income losses.

Although some researchers have failed to detect intervening effects of income between employment and depressive symptoms, their results were based on between-person residual change analyses (i.e., regressing depressive symptoms at time 2 on depressive symptoms at time 1 along with employment and income indicators).[3] The within-person analyses of change estimated in the present study are preferable, because they avoid statistical problems that plague residual estimates of change (i.e., biased, imprecise, and unreliable coefficients) and because changes in employment, income, and depressive symptoms have been linked within individuals rather than across individuals.[33]

However, within-person analyses that capture more of the life course may help further disentangle the links between income and depression for women with children. Data both before and after childbirth would be particularly helpful in this regard. In addition, inclusion of dynamic processes such as social support, marital quality, and partner's depression would be useful controls to the extent that changes in these variables may influence both income and women's depression. It is also important to note that postpartum depression, per se, was not uniquely identifiable in the present study, although past research has indicated that economic strain is associated with an increased risk of depression, regardless of timing.[10]

Taken together, the results of our study indicate that increasing the economic resources of women living in poverty would have substantial mental health benefits during the first few years after childbirth. These findings are of added relevance to public health considering that maternal depression poses a substantial risk to the psychological well-being of children during the first 3 years of life.[11–13] Intervention efforts that are sensitive to both demographic and psychological characteristics of individuals are likely to be most successful. More specifically, our results indicate that policies and interventions targeting chronically poor mothers will yield the greatest improvements in public health, especially if these efforts lead to financial gains without increased child-rearing anxieties. Future studies of the mechanisms by which changes in income and poverty status lead to changes in depressive symptoms could further inform intervention efforts. ■

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Contributors

E. Dearing had primary responsibility for data analysis and writing the article. B.A. Taylor also contributed to the data analysis and writing, particularly with regard to the conditional logistic models. K. McCartney contributed to writing the article.

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Human Participant Protection

This study was approved by the Judge Baker Children's Center institutional review board and was provided an exemption by the University of Wyoming institutional review board because it was secondary data analysis.

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Racial/Ethnic Differences in the Prevalence of Depressive Symptoms Among Middle-Aged Women: The Study of Women's Health Across the Nation (SWAN)

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Objectives. We examined racial/ethnic differences in significant depressive symptoms among middle-aged women before and after adjustment for socioeconomic, health-related, and psychosocial characteristics.

Methods. Racial/ethnic differences in unadjusted and adjusted prevalence of significant depressive symptoms (score ≥16 on the Center for Epidemiologic Studies Depression [CES-D] Scale) were assessed with univariate and multiple logistic regressions.

Results. Twenty-four percent of the sample had a CES-D score of 16 or higher. Unadjusted prevalence varied by race/ethnicity ($P<.0001$). After adjustment for covariates, racial/ethnic differences overall were no longer significant.

Conclusions. Hispanic and African American women had the highest odds, and Chinese and Japanese women had the lowest odds, for a CES-D score of 16 or higher. This variation is in part because of health-related and psychosocial factors that are linked to socioeconomic status. (*Am J Public Health.* 2004;94:1378–1385)

Recent epidemiological data show that 22% of middle-aged women report clinically significant depressive symptoms[1] and that women who have had previous depressive episodes are vulnerable to recurrences during the midlife years.[2,3] Thus, although first-onset major depressive episodes decrease after 45 years of age,[4] both major depression and elevated depressive symptoms are a significant problem for middle-aged women.

Studies of women during midlife have shown that low socioeconomic status (SES), financial strain, physical inactivity, low social support, stress, and poor physical health are each correlated with depressive symptoms.[5–10] These studies were limited by relatively small samples sizes (i.e., about 300 women or fewer),[7,10] wide age ranges,[8,10] or limited control of confounding factors.[6–10] None of these studies included all relevant socioeconomic, health-related, and psychosocial factors in a single study, and only 1 study included a substantial sample of minority women.[7] Inclusion of minority racial/ethnic groups in many community studies of depression also is limited. Available data suggest that rates of clinical depression and elevated depressive symptoms vary among racial/ethnic groups, but not consistently.[11–17]

The Study of Women's Health Across the Nation (SWAN)—a longitudinal, multiethnic, multisite community-based study—evaluated 3302 women aged 42 to 52 years who were approaching or experiencing menopause. One of SWAN's goals was to increase understanding of the risk factors for significant depressive symptoms among middle-aged women and whether the prevalence of these symptoms varies by race/ethnicity. There is growing evidence that multiple factors have a joint role in health and well-being.[18] Moreover, it is well documented that low SES is associated with poor health, stressful events, and inadequate social resources.[19,20] These factors may mediate the relationship between low SES and elevated depressive symptoms.

We used cross-sectional data from the SWAN baseline visit to (1) evaluate the prevalence of significant depressive symptoms, which is defined as a score of 16 or higher on the Center of Epidemiological Studies Depression Scale (CES-D),[21] among African American, White, Chinese, Hispanic, and Japanese women, (2) assess the effect of socioeconomic, health-related, and psychosocial factors on observed differences in these prevalences, and (3) identify the associations between socioeconomic, health-related, and psychosocial factors and significant depressive symptoms among middle-aged women. To our knowledge, this is the first community study that examined depressive symptoms among a large multiethnic group of middle-aged women and that concurrently evaluated the associations between socioeconomic, health-related, and psychosocial factors and depressive symptoms.

METHODS

Participants

We used data from the baseline evaluations of the women who participated in SWAN, a study designed to document changes in women's physical and mental health as they age and transition through menopause. The study's design has been described elsewhere.[22] Briefly, a screening survey was conducted between November 1995 and October 1997 to assess eligibility for enrollment in the cohort study and to collect health, reproductive, demographic, and lifestyle data. The women were randomly selected at 7 sites across the United States from a variety of lists, including a large managed health care plan, community census, utility households, and registered voters or by random-digit dialing. Eligibility criteria for inclusion in the screening survey included being aged 40 to 55 years, self-designation as a member of 1 of the site's targeted racial/ethnic groups, residence in the site's geographic area, use of English or 1 of the other selected languages (Spanish, Japanese, and Cantonese), and ability to give verbal consent to participate.

Approximately 450 women were recruited for the longitudinal cohort at each of the 7 clinical sites. In addition to White women, each site recruited women from 1 specified minority group (African Americans in Pittsburgh, Pa, Boston, Mass, Ann Arbor, Mich,

and Chicago, Ill; Japanese in Los Angeles; Chinese in the San Francisco, Calif, East Bay region; and Hispanic women in Newark, NJ). To be eligible for the longitudinal cohort, women had to be aged 42 to 52 years, have an intact uterus and have had at least 1 menstrual period in the previous 3 months, not have used reproductive hormones in the previous 3 months, and have self-identified with 1 of the site's designated racial/ethnic groups. Of the 16 065 women who participated in the screening survey, 3302 enrolled in the longitudinal cohort. Of these, 287 (8.7%) were excluded from our analysis because of missing data.

Assessments

The assessment protocol was the same across the 7 clinical sites. The baseline visit included interviewer-administered and self-administered questionnaires and measurements of height and weight.

Depressive symptoms were assessed during the baseline interview with the Center for Epidemiologic Studies Depression (CES-D) Scale, a 20-item measure that asks about the frequency of being bothered by depressive symptoms during the previous week on a scale of 0 (rarely) to 3 (most or all of the time).[21] The measure includes items such as "I felt sad," "I felt lonely," and "my sleep was restless." This scale was developed to screen for clinical depression in community samples, and a score of 16 or higher identifies potential clinical depression.[23,24] Community studies have demonstrated that about 65% of those who have a score 16 or higher meet the criteria for major depression.[23] We dichotomized the CES-D scores and used this cut-point to define our depressive symptoms outcome (yes/no), recognizing that we were not describing major depression. Many studies have demonstrated the measure's validity and high internal consistency and its test-retest reliability among diverse racial/ethnic populations, including African Americans, Chinese, Japanese, and Hispanics.[25–30] The CES-D and the other instruments used in our study were translated into Cantonese, Japanese, and Spanish and were offered in either English or the participant's native language.

Primary race/ethnicity was self-identified as Black or African American, non-Hispanic White, Chinese or Chinese American, Japanese or Japanese American, or Hispanic (Cuban American, Dominican, Puerto Rican, South American, or Spanish). By design, only women who self-identified in particular categories were included in the cohort. The categories were Black (African American, i.e., African origin or descent), Chinese or Chinese American, Japanese or Japanese American, White/non-Hispanic White (European descent), and Hispanic. The latter category of women was composed of 38.9% South Americans, Spanish, or other; 19.8% Puerto Ricans; 16.4% Cubans; 14.9% Dominicans; and 9.9% Central Americans. Because of the small numbers in many of these groups, we combined them into 1 category.

Data were collected on demographic, socioeconomic, health-related, and psychosocial factors (Table 1). The SES variables included age, educational attainment, level of difficulty paying for basic necessities,[31] employment status, and marital status. The numbers of women who had less than a high school education, had a very hard time paying for basic necessities, and were single or widowed among the Hispanic, Chinese, or Japanese groups were small. Therefore, for the multivariable analyses, levels of these variables were combined as high school or less versus post–high school, somewhat hard or very hard time paying for basic necessities versus not very hard time, and unmarried versus married.

Perceived health was a single question and was self-rated on a 5-category scale (excellent to poor) that was extracted from the Medical Outcome Study (MOS) 36-item short-form health survey (SF-36).[31] In the multivariable analyses, excellent, very good, and good were combined and were compared with fair or poor. Symptom data were obtained from a checklist of symptoms commonly included in studies of menopause.[32–34] Women were asked how frequently they had experienced each of 6 somatic and 3 vasomotor symptoms in the previous 2 weeks (not at all, 1–5 days, 6–8 days, 9–13 days, and every day). We defined presence of a symptom as reported occurrence for at least 6 days. Menstrual cycle pattern in the past 12 months was categorized as regular if women reported no change in the previous year in predictability of menses onset and irregular if menses had become less predictable. For a list of 23 illnesses/conditions, presence of the condition was defined as ever having been told by a health care professional that the participant had the condition. We included those for which the prevalence was at least 5%: anemia, high blood pressure/hypertension, migraine, and arthritis/osteoarthritis.

Psychosocial variables included social support, which was assessed with 4 items from the MOS Social Support Survey[35] that question how often each of 4 kinds of support was available, if needed. The total score was dichotomized into high and low support. Also included was the 4-item Perceived Stress Scale[36] and a checklist of stressful life events. We used the cumulative number of events identified as "very stressful."

Statistical Analysis

In our initial analyses, we used contingency tables to examine the relationships between race/ethnicity and a CES-D score of 16 or higher and each of the other variables and to examine the relationship between each independent variable and a CES-D score of 16 or higher. We used the Cronbach α to determine internal consistency of the CES-D for each racial/ethnic group. A series of logistic regressions were used to model the association between a CES-D score of 16 or higher and the 3 domains of predictors (demographic and socioeconomic, health-related, and psychosocial factors). Site and race/ethnicity were forced into all models because of the sampling design of the study and so that we could examine factors that might explain differences in prevalence among the 5 racial/ethnic groups. Age also was included as a covariate in all analyses. The base model included site, race/ethnicity, and age. Three additional logistic regression models were then constructed by adding a set of variables to the base model: first the SES variables, then the health-related variables, and finally the psychosocial variables. Stepwise selection (a modification of forward selection where all variables included in the model are reevaluated at each step) was used for each model except for the base model. Multivariable analyses for each racial/ethnic group and for the full sample were conducted with stepwise

TABLE 1—Characteristics of Sample, by Racial/Ethnic Group

	White		African American		Hispanic		Chinese		Japanese		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Depressive symptoms (CES-D score ≥16)	324	22.29	228	27.44	107	42.97	32	14.29	37	14.12	727	24.11
Demographic and socioeconomic factors												
Race/ethnicity	1449	48.06	831	27.56	249	8.26	224	7.43	262	8.69	3015	100.00
Age, y												
>44	364	25.12	216	25.99	63	25.30	50	22.32	54	20.61	747	24.78
44–46	370	25.53	208	25.03	61	24.50	49	21.88	59	22.52	747	24.78
46–48	328	22.64	192	23.10	67	26.91	70	31.25	65	24.81	722	23.95
>48	387	26.71	215	25.87	58	23.29	55	24.55	84	32.06	799	26.50
Education												
<High school diploma	19	1.31	43	5.17	112	44.98	28	12.50	2	0.76	204	6.77
High school diploma	215	14.84	178	21.42	67	26.91	34	15.18	43	16.41	537	17.81
Some college	449	30.99	341	41.03	46	18.47	49	21.88	89	33.97	974	32.31
Bachelor's degree	311	21.46	127	15.28	19	7.63	66	29.46	81	30.92	604	20.03
Some graduate school	455	31.40	142	17.09	5	2.01	47	20.98	47	17.94	696	23.08
Difficulty paying for basic necessities												
Not very hard	996	68.74	451	54.27	43	17.27	161	71.88	188	71.76	1839	61.00
Somewhat hard	375	25.88	280	33.69	140	56.22	50	22.32	66	25.19	911	30.22
Very hard	78	5.38	100	12.03	66	26.51	13	5.80	8	3.05	265	8.79
Employed	1241	85.65	656	78.94	136	54.62	199	88.84	195	74.43	2427	80.50
Marital status												
Married	1035	71.43	387	46.57	181	72.69	178	79.46	211	80.53	1992	66.07
Single	175	12.08	184	22.14	15	6.02	20	8.93	18	6.87	412	13.67
Seperated/widowed/divorced	239	16.49	260	31.29	53	21.29	26	11.61	33	12.60	611	20.27
Health-related factors												
Perceived health												
Excellent	426	29.40	125	15.04	13	5.22	40	17.86	50	19.08	654	21.69
Very good	612	42.24	272	32.73	51	20.48	64	28.57	102	38.93	1101	36.52
Good	319	22.02	296	35.62	118	47.39	72	32.14	69	26.34	874	28.99
Fair or poor	92	6.35	138	16.61	67	26.91	48	21.43	41	15.65	386	12.80
Number of physical symptoms												
0	815	56.25	488	58.72	155	62.25	154	68.75	164	62.60	1776	58.91
1	381	26.29	223	26.84	47	18.88	48	21.43	77	29.39	776	25.74
≥2	253	17.46	120	14.44	47	18.88	22	9.82	21	8.02	463	15.36
≥1 vasomotor symptoms	150	10.35	128	15.40	33	13.25	14	6.25	14	5.34	339	11.24
Irregular menstrual cycles	688	47.48	419	50.42	106	42.57	85	37.95	101	38.55	1399	46.40
Anemia	460	31.75	366	44.04	101	40.56	60	26.79	77	29.39	1064	35.29
High blood pressure	238	16.43	268	32.25	36	14.46	17	7.59	25	9.54	584	19.37
Migraine	267	18.43	135	16.25	45	18.07	13	5.80	25	9.54	485	16.09
Osteoarthritis	288	19.88	204	24.55	65	26.10	26	11.61	19	7.25	602	19.97
Psychosocial factors												
Social support												
High	481	33.20	252	30.32	76	30.52	50	22.32	100	38.17	959	31.81
Medium	554	38.23	270	32.49	58	23.29	83	37.05	106	40.46	1071	35.52
Low	414	28.57	309	37.18	115	46.18	91	40.63	56	21.37	985	32.67
Perceived stress												
Low	420	28.99	267	32.13	44	17.67	58	25.89	59	22.52	848	28.13
Medium	394	27.19	166	19.98	37	14.86	68	30.36	56	21.37	721	23.91
High	407	28.09	231	27.80	59	23.69	84	37.50	107	40.84	888	29.45
Very high	228	15.73	167	20.10	109	43.78	14	6.25	40	15.27	558	18.51
Number of very stressful events												
0	682	47.07	353	42.48	128	51.41	160	71.43	168	64.12	1491	49.45
1–2	486	33.54	268	32.25	77	30.92	51	22.77	64	24.43	946	31.38
≥3	281	19.39	210	25.27	44	17.67	13	5.80	30	11.45	578	19.17

Note. CES-D = Center for Epidemiologic Studies Depression Scale. For all variables, $P < .0001$, except age (.1737) and status (.0004).

selection from the entire set of candidate predictors (those variables significant at $P<.05$ in the 3 separate models). All results are shown as odds ratios with associated 95% confidence intervals. We used SAS[37] and S-Plus[38] software to conduct the analyses.

RESULTS

Of the 3015 women who were not missing data on any of the variables, 1449 were White, 831 were African American, 249 were Hispanic, 224 were Chinese, and 262 were Japanese (Table 1). The Hispanic group had the highest, and the Japanese group had the lowest, percentages of women who had low SES: 45% versus 0.8% had less than a high school education, and 26.3% versus 2.8% had a very hard time paying for basic necessities. Among the other groups, 1.3% of White women, 4.9% of African American women, and 12.7% of Chinese women had less than a high school education, and 5.4%, 11.8%, and 5.7%, respectively, had a very hard time paying for basic necessities. Except for age, all the socioeconomic, health-related, and psychosocial characteristics varied significantly among the racial/ethnic groups. The percentages of women who had less favorable health-related characteristics also varied by race/ethnicity (Table 1).

Overall, 24.1% of the sample had a CES-D score of 16 or higher (Table 1). Internal consistency of the CES-D items was very high overall (standardized $\alpha=0.90$) and for each racial/ethnic group (standardized α range= 0.88–0.90). Prevalence of CES-D scores of 16 or higher was highest among Hispanic women (43%) and lowest among Chinese (14.3%) and Japanese (14.1%) women (Table 2). Prevalence was associated with younger age, lower levels of education, and more difficulty paying for basic necessities. All health-related variables and all psychosocial variables were significantly associated with CES-D scores of 16 or higher in the expected directions: higher rates among women who had poor/fair perceived health, lower social support, or more stress.

Results from the logistic regression models of separate domains of predictors, all of which were adjusted for site and age, are shown in Table 3. In the base model, compared with White women, African American and Hispanic women had higher odds, and Chinese women had lower odds, for having CES-D scores of 16 or higher (Table 3). The addition of SES to the model attenuated the effect of race/ethnicity ($P=.09$). Of the 8 health-related variables we examined, all except high blood pressure were independently associated with CES-D scores of 16 or higher; however, race/ethnicity remained significant ($P=.03$), with the pattern of odds ratios similar to those in the base model. Compared with White women, there was no difference in the odds for CES-D scores of 16 or higher among African American women; however, among Hispanic women, the odds remained significantly elevated, and among Chinese women, the odds remained reduced. In the psychosocial model, low social support, perceived stress, and the

TABLE 2—Depressive Symptoms (CES-D Scores ≥16), by Demographic, Socioeconomic, Health-Related, and Psychosocial Characteristics

	Depressive Symptoms (n = 727), no. (%)
Demographic and socioeconomic factors	
Age, y	
≤44	201 (26.9)
44–46	207 (27.6)
46–48	160 (22.2)
>48	160 (20.0)
Education	
<High school diploma	83 (40.7)
High school diploma	175 (32.6)
Some college	240 (24.7)
Bachelor's degree	120 (20.0)
Some graduate school	110 (15.8)
Paying for basic necessities	
Not very hard	303 (16.5)
Somewhat hard	305 (33.4)
Very hard	119 (44.9)
Employed	
No	200 (34.0)
Yes	527 (21.7)
Marital status	
Married	420 (21.1)
Single	121 (29.1)
Separated/Widowed/Divorced	186 (30.4)
Health-related factors	
Perceived health	
Excellent	81 (12.4)
Very good	211 (19.2)
Good	257 (29.4)
Fair or poor	178 (46.1)
Number of physical symptoms	
0	306 (17.2)
1	208 (26.8)
≥2	213 (46.0)
Vasomotor symptoms	
0	578 (21.6)
≥1	150 (44.3)
Menstrual cycle in past 12 months	
Regular	338 (20.9)
Irregular	389 (27.8)
Anemia	
No	471 (21.4)
Yes	310 (29.1)
High blood pressure	
No	564 (23.2)
Yes	164 (28.1)
Migraine	
No	567 (22.4)
Yes	160 (33.0)
Osteoarthritis	
No	514 (21.3)
Yes	213 (35.4)
Psychosocial factors	
Social support	
High	122 (12.7)
Medium	206 (19.2)
Low	399 (40.5)
Perceived stress	
Low	76 (8.6)
Medium	111 (15.5)
High	225 (25.5)
Very high	315 (56.6)
Number of very stressful events	
0	225 (15.1)
1–2	258 (27.3)
≥3	244 (42.2)

Note. CES-D = Center for Epidemiologic Studies Depression Scale.
[a] The crude and age-adjusted prevalences were the same, because the age distributions among the racial/ethnic groups were similar.
P values are < .001 for all factors except high blood pressure (*P* = .01).

TABLE 3—Adjusted Odds Ratios (ORs) With 95% Confidence Intervals for Depressive Symptoms (CES-D Scores ≥ 16) in 4 Separate Models of 3015 Women Aged 42–52 Years

Model	Race/Ethnicity			
	African American	Hispanic	Chinese	Japanese
Base model*	1.31 (1.04, 1.63)	1.86 (1.17, 2.95)	0.59 (0.36, 0.97)	0.74 (0.45, 1.21)
Socioeconomic model[a]	1.03 (0.81, 1.30)	1.13 (0.69, 1.84)	0.54 (0.32, 0.90)	0.69 (0.42, 1.14)
Health-Related model[b]	1.22 (0.96, 1.55)	1.66 (1.02, 2.71)	0.59 (0.35, 1.00)	0.82 (0.49, 1.38)
Psychosocial model[c]	1.16 (0.90, 1.50)	1.66 (0.99, 2.78)	0.65 (0.37, 1.13)	0.65 (0.38, 1.12)

Note. CES-D = Center for Epidemiologic Studies Depression Scale; CI = confidence interval. All analyses are adjusted for site and age.
[a]Adjusted for education, difficulty paying for basics, employment status, and marital status ($P = .09$).
[b]Adjusted for perceived health, number of physical symptoms, vasomotor symptoms, menstrual cycle, anemia, arthritis/osteoporosis, and migraines ($P = .03$).
[c]Adjusted for social support, perceived stress, and number of very stressful events ($P = .04$).
*($P \leq .001$).

presence of distressing life events increased the odds for having a CES-D score of 16 or higher. Notably, in this model, the overall effect of race/ethnicity remained significant ($P = .04$), with higher odds among Hispanic women compared with White women.

Separate analyses stratified by race/ethnicity showed that high stress and low social support were significant predictors of CES-D scores of 16 or higher among all the groups (Table 4). However, there was considerable variation in the other predictors across the ethnic groups. Low education was a significant predictor only for White women, whose odds for a high CES-D score increased almost 50%. Four health factors were each associated with the doubling of odds for high CES-D scores among the Hispanic women, the only group for whom having arthritis/osteoarthritis and reporting irregular menstrual cycles increased the odds. Being unmarried only increased the odds for high CES-D scores (nearly tripling them) among the Chinese and Japanese women.

In the final multivariable regression model for the full sample, which included significant variables from each domain, neither ethnicity nor SES (with the exception of education) were significant, although the odds for Hispanic and Chinese women remained elevated and reduced, respectively (Table 4). In contrast, reporting fair/poor perceived health, 1 or more physical symptoms, vasomotor symptoms, anemia, low social support, 1 or more very stressful events, and high perceived

TABLE 4—Adjusted Odds Ratios (ORs) With Confidence Intervals for Depressive Symptoms (CES-D Scores ≥ 16) in Multivariate Analyses for Racial/Ethnic Groups and Total Sample

	White	African American	Hispanic	Chinese	Japanese	Total Sample
Racial/ethnic group[a]						
White (reference)	. . .	. . .	. . .	. . .	. . .	1.0
African American	. . .	. . .	. . .	. . .	. . .	.98 (.75, 1.28)
Hispanic	. . .	. . .	. . .	. . .	. . .	1.38 (.79, 2.38)
Chinese	. . .	. . .	. . .	. . .	. . .	.56 (.32, 1.00)
Japanese	. . .	. . .	. . .	. . .	. . .	.67 (.38, 1.16)
Age	.92 (.88, .98)	.89 (.84, .96)	.87 (.78, .98)	NS	NS	.91 (.89, .96)
Unmarried vs married	NS	NS	NS	3.0 (1.18, 7.55)	2.7 (1.06, 7.09)	NS
≤ High school diploma vs > high school	1.56 (1.04, 2.27)		NS	NS	NS	1.37 (1.08, 1.72)
Fair or poor perceived health vs very good or excellent perceived health	NS	1.97 (1.24, 3.14)	4.30 (2.14, 8.67)	NS	5.22 (2.06, 13.21)	1.95 (1.48, 2.56)
At least 1 physical symptom vs none	1.51 (1.12, 2.04)	NS	2.52 (1.36, 4.67)	4.71 (1.87, 11.85)	NS	1.53 (1.24, 1.88)
Vasomotor symptoms vs none	2.72 (1.78, 4.16)	NS	2.9 (1.16, 7.27)	NS	6.66 (1.64, 27.02)	2.06 (1.54, 2.75)
Irregular vs regular menstrual cycles	NS	NS	2.45 (1.32, 4.55)	NS	NS	1.22 (1.00, 1.50)
Anemia vs none	1.82 (1.35, 2.46)	NS	NS	NS	NS	1.40 (1.14, 1.77)
Arthritis/osteoarthritis vs none	NS	NS	2.41 (1.23, 4.73)	NS	NS	NS
Low vs high social support	1.91 (1.41, 2.59)	2.76 (1.91, 3.99)	3.15 (1.70, 5.85)	6.68 (2.45, 17.93)	4.14 (1.72, 9.95)	2.47 (2.02, 3.02)
Perceived stress per 1-point increase	1.37 (1.29, 1.45)	1.32 (1.24, 1.42)	NS	1.36 (1.13, 1.65)	1.39 (1.17, 1.66)	1.31 (1.26, 1.36)
Very stressful events vs none	2.06 (1.52, 2.80)	1.87 (1.26, 2.77)	2.22 (1.22, 4.06)	NS	3.17 (1.32, 7.63)	2.04 (1.66, 2.51)

Note. CES-D = Center for Epidemiologic Studies Depression Scale; CI = confidence interval, NS = nonsignificant ($P > .05$). All analyses were adjusted for study site.
[a]The analyses for total sample included racial/ethnic group ($P = .12$).

stress each independently increased the odds significantly for CES-D scores of 16 or higher relative to their respective comparison groups. Also of interest, menstrual cycle irregularity in the year before study entry was a marginally significant predictor, although the magnitude of the effect was smaller than that of other factors.

DISCUSSION

Prevalence of CES-D scores of 16 or higher among a large multiethnic sample of middle-aged women (aged 42 to 52 years) varied among the racial/ethnic groups. Importantly, the significance of the association between race/ethnicity overall and CES-D scores of 16 or higher was attenuated after we adjusted for SES, although the odds ratios remained lower for Chinese women compared with White women.

The crude prevalence of CES-D scores of 16 or higher was highest among African American and Hispanic women and lowest among Chinese and Japanese women. These relative frequencies are similar to those reported in some, but not all,[14,15,26,39] studies that have examined racial/ethnic differences in the prevalence of depression across a wide range of age groups. These studies used varying constructs of depression, including *Diagnostic and Statistical Manual of Mental Disorders, Third Edition,*[40] or *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition,*[41] major depression and depressive symptoms.[11,12,42] In the only other study of middle-aged women that included a substantial number of African American women, Freeman et al.[7] reported that African American women had significantly higher mean CES-D scores (16.4) than did White women(13.3).

Chinese women compared with White women in Oakland, Calif, were approximately 40% to 50% less likely to have significant depressive symptoms. Such differences between Chinese and White women are not inconsistent with the literature. In a community study of 1747 Chinese Americans in Los Angeles, Calif,[43] a structured diagnostic interview indicated that 6.9% had a lifetime history of a major depressive episode, which was more than 50% lower than the lifetime prevalence reported by the National Comorbidity Survey for the US population. The differences in symptom reports between White women and Chinese women may reflect culture-specific concepts of mental disorder. It has been suggested that Asian cultures tend to somatize psychological distress as part of cultural norms and the stigma attached to emotional illness.[44,45] On the other hand, the CES-D has frequently been used to assess depressive symptom levels among Chinese people both in the US and in China, and it shows good internal consistency.[46]

The high prevalence of significant depressive symptoms among Hispanic women is consistent with other studies.[11,13,14] However, the prevalence observed among Hispanic women in our study was particularly high, with 43% scoring 16 or higher on the CES-D. Our results indicate that the high prevalence may have been caused by the high percentage of women who had low SES (45% had less than a high school education) and who had health problems (27.5% with fair/poor perceived health).

Previous research has shown that SES indicators, such as education, income, and marital status, are associated with depressive symptoms[11,26,47,48] and, in some cases, may explain racial/ethnic differences in rates of depression. In our study, financial strain, not working, being unmarried, and younger age all were significantly associated with significant depressive symptoms when no other covariates were included. When we controlled for these variables, the odds for these symptoms were greatly reduced among both African American and Hispanic women.

In all separate racial/ethnic analyses, with the exception of education and marital status, SES indicators dropped out of the model; however, there was a differential effect of specific health-related and psychosocial factors on CES-D scores of 16 or higher. For example, health was a particularly important predictor among the Hispanic women. For them, vasomotor symptoms, physical symptoms, fair/poor perceived health, osteoarthritis, and irregular menstrual cycles each independently increased the odds for a CES-D score of 16 or higher by two- to threefold.

The final multivariable model showed that higher odds for CES-D scores of 16 or higher were associated with younger age, compromised health, low social support, greater perceived stress, and experiencing more stressful events. Most notably, when the health-related and psychosocial variables were included in a model with the SES indicators, with the exception of education, the latter were no longer statistically significant. This suggests that the SES indicators are associated with significant depressive symptoms through their association with health-related and psychosocial factors that may mediate the SES–depression relationship. In our data and in the extant literature, economic hardship was associated with stress, poor health, and inadequate social resources.[19,20] Low SES may lead to decreased probability of seeking health care or less access to health care, which may lead to more physical illness or impairment and, thus, to more depressive symptoms. Because of the cross-sectional nature of the data, we cannot exclude the alternative explanation that poor health leads to less ability to work, lower income, more financial strain, and ultimately lower SES, although Lynch et al.[19] did not find evidence of this alternative reverse causation.

Our results show the strong association between health-related and psychosocial factors and significant depressive symptoms among middle-aged women, irrespective of their race/ethnicity. These data are important for several reasons. They highlight the independent associations of physical health and stress with significant depressive symptoms among middle-aged women, and they indicate that these types of factors may be more important than gross indicators of SES. Race/ethnicity may be an important risk marker for depression in midlife precisely because many racial/ethnic groups have higher rates of conditions and stresses that are associated with risk for depression.

There are several limitations to our study. Because our analyses were based on cross-sectional data, it was not possible to determine whether the various factors examined were antecedents, correlates, or consequences of depression. It also should be noted that we were not measuring clinical depression. However, elevated depressive symptoms have the potential to affect func-

tioning,[49–51] and subsyndromal depression is associated with an increased risk for future major depression.[52,53] Although these data included a wide range of predictors, some variables associated with depression and differentially distributed among racial/ethnic groups were not included (e.g., substance abuse, history of sexual abuse).

We also recognize that our broad racial/ethnic groups were not homogeneous and included both different specific groups of women, such as Puerto Ricans and South Americans in the Hispanic group, and a mixture of women who had different degrees of acculturation. Having only 1 of the 3 minority groups at only 1 site may limit the generalizability of the findings. However, the White women at each of these 3 sites had significantly higher educational levels than the sites' minority women, which indicates that there are consistent White–racial/ethnic differences within sites. Finally, the results of the separate multivariable analyses of the Chinese and Japanese women may have been limited by the small numbers of women in some categories, such as those who had vasomotor symptoms and high blood pressure.

CONCLUSIONS

Although there has long been an interest in the prevalence and the characteristics of depression among middle-aged women, few studies have included the breadth and depth of potentially important risk factors in as large and diverse a community-based sample of middle-aged women as SWAN has. We found that approximately one quarter of middle-aged women may have potentially significant depressive symptoms, that the variation in the prevalence of these symptoms by race/ethnicity is largely because of SES, and that health-related factors and stress together may be the correlates of SES that are associated with the emergence of significant depressive symptoms.

Because of the longitudinal design of SWAN, which includes annual assessments similar to that of the baseline, we plan to develop more refined models of the associations among race/ethnicity, SES, physical health, and the psychological and social aspects of women and their life circumstances. Moreover, we will be able to integrate the influence of hormonal and psychosocial changes during the menopausal transition with these data. ■

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Contributors

All the authors contributed to the formulation of hypotheses and the review and interpretation of analyses, and they participated in the writing of the article. J.T. Bromberger helped design the study, planned the analyses, and wrote the overall initial draft and the final article. S. Harlow, N. Avis, and H.M. Kravitz edited revisions of the article.

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Human Participant Protection

Institutional review board approval was obtained at each study site.

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Association Between Childhood Socioeconomic Status and Coronary Heart Disease Risk Among Postmenopausal Women: Findings From the British Women's Heart and Health Study

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Objectives. We assessed the association between childhood socioeconomic status (SES) and coronary heart disease among postmenopausal women.

Methods. We conducted a cross-sectional analysis of 3444 women aged 60 to 79 years.

Results. There was an independent linear association between childhood and adult SES and coronary heart disease. The association between childhood SES and coronary heart disease was attenuated when we adjusted for insulin resistance syndrome, adult smoking, physical activity, biomarkers of childhood nutrition, and passive smoking.

Conclusions. The association between adverse childhood SES and coronary heart disease is in part mediated through insulin resistance, which may be influenced by poor childhood nutrition, and in part through the association between childhood SES and adult behavioral risk factors. (*Am J Public Health.* 2004; 94:1386–1392)

Most,[1–11] but not all,[12] studies that have assessed the association between childhood SES and adult coronary heart disease have found that adverse childhood SES is associated with increased risk of coronary heart disease and that this association is independent of adult SES. To develop effective policy interventions that abolish the link between childhood poverty and coronary heart disease, it is necessary to understand the causal pathways that link them. Adverse childhood SES may result in increased risk for coronary heart disease via an influence on known behavioral risk factors, such as smoking and poor diet. Childhood poverty may be associated with poor nutrition during the intrauterine period or childhood, which in turn may program insulin resistance and thus increase risk for coronary heart disease.[13,14] Finally, childhood poverty may lead to psychological distress, via a programming effect on cortisol secretion, and consequently increase risk for coronary heart disease.[15,16] These mechanisms are not necessarily mutually exclusive.

We assessed the association between childhood SES and coronary heart disease among a large cohort of postmenopausal women. We also assessed the role of components of the insulin resistance syndrome, adult behavioral risk factors, adult biomarkers of specific childhood exposures, and indicators of psychological distress in these associations.

METHODS

We used data from the British Women's Heart and Health Study; details about the participants and the measurements have been published elsewhere.[17,18] Women aged 60 to 79 years were randomly selected from general practitioner lists in 23 British towns. A total of 4286 women (60% of those invited) participated, and baseline data (self-reported questionnaire, research nurse interview, physical examination, and primary care medical record review) were collected between April 1999 and March 2001.

Prevalence of coronary heart disease was defined as any participant who had a primary care medical record of myocardial infarction or angina or who reported ever being diagnosed by a doctor with either of these conditions.[18] Details about the longest-held occupation of the participant's father and husband and her own longest-held occupation were obtained. Adult SES was derived from the longest-held occupation of the participant's husband for married women and from her own for single women; childhood SES was derived from the longest-held occupation of the participant's father. SES was categorized into 1 of 6 social classes on the basis of the Registrar General's occupational classification: professional (social class I), managerial and technical (social class II), nonmanual—skilled (social class III-NM), manual—skilled (social class III-M), partly skilled (social class IV), and unskilled (social class V). These social classes also are grouped into 2 broad categories of manual and nonmanual social classes.[19] Other indicators of childhood SES included self-reported childhood household amenities (e.g., house with a bathroom, house with a hot-water supply) and family access to a car. Other indicators of adult SES included housing status (i.e., own, rent, live in pubic housing, or live with family), car ownership, and pension arrangements.

Details about measurements of the components of insulin resistance syndrome have been reported elsewhere.[17,20] Leg length is a useful biomarker of prepubertal childhood exposures, because it reflects infant diet, childhood nutrition, and childhood infection.[21] Forced expiratory volume in 1 second (FEV_1) also is a biomarker of early-life environmental exposures, including intrauterine exposures, infant respiratory infections, childhood nutrition, and passive smoking.[22,23] Standing height and seated height were measured, and leg length was calculated as the total height minus "trunk" length, with trunk length defined as the seated height minus the height of the stool on which the individual was sitting (407mm).[20] FEV_1 was assessed with a digital-meter vitalograph (machine that measures indicators of lung function including FEV_1).

Participants were categorized as having never smoked, being an ex-smoker, or being a current smoker at 1 of 4 levels: 1 to 9, 10

to 19, 20 to 29, or 30 or more cigarettes per day. Participants were asked to indicate their usual duration of several types of activity in hours per week,[24] and they were categorized into 1 of 3 categories: less than 1 hour (inactive), 1 to 2 hours, or more than 2 hours per week of either moderate or vigorous physical activity.

Three indicators of psychological distress were used in our study: the Euroquol mood question,[25] history of a clinical diagnosis of depression, and current use of anxiolytic, hypnotic, or antidepressant medications. Participants whose response to the Euroquol mood question was that they were "today feeling either moderately or extremely anxious and/or depressed" were coded as currently anxious or depressed, and those who indicated that they had ever been diagnosed by a doctor with depression were coded as having a history of depression. Participants brought all of their medications to the research nurse interview, and a full treatment history was recorded. Medications were coded in accordance with the British National Formulary[26]; anxiolytics and hypnotics were any medication in section 4.1, and antidepressants were any medication in section 4.3.

Statistical Analysis

Age-adjusted prevalences and means, together with 95% confidence intervals (CI), of coronary heart disease and coronary heart disease risk factors are shown across the 6 social classes (Tables 1 and 2). The possibility of an interaction between childhood and adult SES was assessed with the likelihood ratio test. Multiple logistic regression was used to assess the association between childhood SES and prevalence of coronary heart disease and to assess the effect on this association after we adjusted for potential explanatory factors on the causal pathways: components of insulin resistance syndrome, behavioral risk factors, biomarkers of childhood nutrition, infection and passive smoking, and indicators of psychological distress. A decrease in the association of at least 10% indicated that these factors had an important role in the association. Robust standard errors (standard errors estimated using the variability of the data rather than model-based estimates of standard errors) were used to estimate 95% confidence intervals in all the models; all analyses were performed with Stata, Version 8.0, software (Stata Corp, College Station, Tex).

RESULTS

Complete data on both childhood and adulthood SES were available for 3444 (80%) of the women, 518 of whom had coronary heart disease, a prevalence of 15% (95% CI=13.8, 16.3). Only women who had complete data on SES at both times in the life course were included in our analyses. Compared with women who did not have complete SES data, those who did have complete data were slightly younger (68.8 years vs 69.2 years, $P=0.05$), had a lower prevalence of coronary heart disease (15% vs 19.5%, $P=0.004$), had smaller waist-hip ratios (0.818 vs 0.824, $P=0.02$), and were less likely to be current smokers (10.4% vs 16.8%, $P<0.001$). For all other risk factors, there were no substantial differences between participants who had complete SES data and those who did not have data ($P>0.2$ for all).

In a previous study, we showed that there was very little extreme mobility across social classes from childhood to adulthood; for example, only 24 of the 3444 women moved from Social Class I during childhood to Social Class V during adulthood, and just 4 moved from Social Class V during childhood to Social Class I during adulthood.[17] However, when broad categories were considered, there was a modest amount of upward mobility, with one third of the women moving from manual social classes during childhood to nonmanual social classes during adulthood. In total, 60% of the women remained in the same broad category of social class (44% of sample stayed in manual classes at both stages of the life course, and 16% stayed in nonmanual classes at both stages), and just 7% moved down from nonmanual classes during childhood to manual classes during adulthood.

The distributions for insulin resistance and the components of insulin resistance syndrome have been published elsewhere.[17] Linear associations between childhood and adult SES (each independent of social class at the other time in the life course) were found with insulin resistance, obesity, and adverse lipid profiles.[17] Table 1 shows the age-adjusted distributions of coronary heart disease, behavioral coronary heart disease risk factors, biomarkers of childhood exposures, and indicators of psychological distress by childhood social class. There were linear associations between childhood SES and coronary heart disease, current smoking, and physical inactivity, and those who were from the most adverse social classes during childhood had the worst outcomes.

Childhood SES was linearly associated with leg length and lower FEV_1; women who were from lower social classes as children had shorter legs and lower FEV_1 as adults. Among a subgroup of women (n=1605) who were lifelong nonsmokers and were either single or married to men who were lifelong nonsmokers, the linear association between childhood SES and FEV_1 remained: age- and adult-SES-adjusted difference per increase in 1 social class category among this subgroup was -0.05 (95% CI=-0.07, -0.03; $P<0.001$). There was a weak linear association between childhood SES and current anxiety or depression, and childhood SES was not associated with a history of clinical depression or with anxiolytic and antidepressant medication. Each increase in social class category was associated with a 14% increase in coronary heart disease after we adjusted for age and adult indicators of SES (social class, housing status, car ownership, and pension arrangements). When differences between broad categories of childhood SES were considered, the age- and adult-SES-adjusted odds ratio (95% confidence interval) for coronary heart disease among women who were in manual social classes compared with those who were in nonmanual social classes was 1.36 (95% CI=1.11, 1.69; $P<0.001$).

Adult SES was linearly associated with coronary heart disease, leg length, FEV_1, smoking, and indicators of psychological distress, and these associations were independent of childhood SES (Table 2). Just 162 of the women (4.7%) were single and were therefore classified by their own occupation. The age- and childhood-SES-adjusted association between adult SES among single women did not differ from that of women who were classified by their husband's occupation. The odds ratio for an increase in 1

TABLE 1—Age-Adjusted Means or Prevalences (95% Confidence Intervals) of Coronary Heart Disease and Coronary Heart Disease Risk Factors, by Childhood Social Class

	Registrar General's Occupational Classifications							
	Professional (I) (n = 110)	Managerial and Technical (II) (n = 308)	Nonmanual–Skilled (III-NM) (n = 398)	Manual–Skilled (III-M) (n = 1149)	Partly Skilled (IV) (n = 1056)	Unskilled (V) (n = 423)	Age-Adjusted Difference[a]	Age- and Adult-SES-Adjusted Difference[a]
Coronary heart disease, %	9.4	12.9	12.3	14.0	16.5	18.5	1.15	1.14
	(5.3, 16.3)	(9.6, 17.1)	(9.4, 15.9)	(12.1, 16.2)	(14.4, 18.9)	(14.4, 18.9)	(1.06, 1.24)	(1.04, 1.20)
Ever smoked, %	40.0	39.5	39.9	42.1	45.1	44.9	1.07	1.03
	(31.3, 49.4)	(34.2, 45.1)	(35.2, 44.8)	(39.3, 45.0)	(42.1, 48.1)	(40.2, 49.7)	(1.01, 1.13)	(0.97, 1.10)
Current smoker, %	5.3	7.6	7.8	9.0	12.8	11.8	1.20	1.17
	(2.4, 11.3)	(5.2, 11.2)	(5.6, 10.9)	(7.5, 10.8)	(10.9, 14.9)	(9.1, 15.2)	(1.09, 1.32)	(1.07, 1.29)
Physically inactive, %	11.7	14.4	14.0	15.2	23.1	18.0	1.17	1.15
	(6.9, 19.3)	(10.8, 18.9)	(10.9, 18.9)	(13.1, 17.5)	(20.5, 25.9)	(14.4, 22.1)	(1.08, 1.26)	(1.06, 1.25)
Leg length, mm	767.8	768.2	766.5	757.4	753.1	756.7	–3.68	–3.14
	(760.2, 775.3)	(763.6, 772.7)	(762.4, 770.5)	(755.0, 759.8)	(750.6, 759.8)	(752.7, 760.7)	(–4.80, –2.57)	(–4.30, –1.98)
FEV_1, l	2.12	2.12	2.09	1.98	1.94	1.94	–0.05	–0.03
	(2.03, 2.21)	(2.07, 2.18)	(2.05, 2.14)	(1.95, 2.01)	(1.91, 1.97)	(1.89, 1.99)	(–0.06, –0.04)	(–0.05, –0.02)
Anxious or depressed	21.8	22.5	21.3	22.7	25.6	28.1	1.09	1.04
	(15.1, 30.5)	(18.1, 27.5)	(17.6, 25.6)	(20.4, 25.2)	(23.1, 28.4)	(24.0, 32.6)	(1.02, 1.16)	(0.98, 1.11)
History of clinical depression	17.1	14.5	15.7	16.2	16.4	15.7	1.01	0.97
	(11.2, 25.3)	(11.0, 18.9)	(12.4, 19.6)	(14.2, 18.5)	(14.2, 18.7)	(12.5, 19.5)	(0.94, 1.09)	(0.91, 1.05)
Use of anxiolytic, hypnotic, or antidepressant	9.9	8.4	11.0	10.0	9.5	10.3	1.01	1.00
	(5.6, 17.1)	(5.8, 12.1)	(8.3, 14.5)	(8.4, 11.9)	(7.9, 11.4)	(7.8, 13.6)	(0.92, 1.10)	(0.92, 1.10)

Note. FEV_1 = forced expiratory volume in 1 second; SES = socioeconomic status.
[a]Difference = age (and adult social class, housing status, car ownership, and pension arrangements) adjusted regression coefficient per increase in social class category for continuous variables and odds ratio per increase in social class category for dichotomous variables.

category of adult social class for single women was 1.16 (95% CI=0.79, 1.72), and for women who were classified by their husband's occupation, the odds ratio was 1.17 (95% CI=1.09, 1.25).

The magnitude of the association between childhood SES and leg length was stronger than that between adult SES and leg length, which is consistent with the hypothesis that adult leg length is a useful biomarker of childhood nutrition and other adverse childhood exposures.[21] Among the subgroup of women who had little or no lifelong exposure to tobacco, the age- and childhood-SES-adjusted difference in FEV_1 per increase of 1 adult social class category was −0.02 (95% CI=-0.04, -0.01; P=0.004). This is lower than that between childhood SES and FEV_1 among this subgroup, which again supports the hypothesis that this is a useful biomarker of early-life exposures. The magnitudes of the associations between adult SES and smoking and physical activity were weaker than those between childhood SES and these same risk factors, whereas the associations between adult SES and indicators of psychological distress were stronger than those between childhood SES and these indicators. None of the differences in the magnitudes between childhood and adulthood SES among any of these associations were statistically significant at the conventional 5% level (P>0.25 for all).

There was no strong evidence of any interactions between childhood and adult SES among the associations with coronary heart disease and coronary heart disease risk factors (P>0.2 for all). There was a cumulative effect of SES across the life course such that the age-adjusted odds ratio for prevalence of coronary heart disease and most risk factors was greatest among women in manual social classes at both stages of the life course compared with those in nonmanual social classes at both stages, and it was intermediate among those who were in manual social classes at just 1 point in the life course (Table 3). Women who were upwardly mobile from manual social classes during childhood to nonmanual social classes during adulthood remained at increased risk for coronary heart disease, diabetes, components of the insulin resistance syndrome, smoking, and physical inactivity compared with women who were in nonmanual social classes at both stages of the life course. Women who were upwardly mobile were no more likely to be psychologically distressed than those who were in nonmanual social classes at both stages of the life course. Women who were downwardly mobile, from nonmanual to manual social classes, were at a particularly high risk compared with those who were in nonmanual social classes at both stages of the life course for prevalence of coronary heart disease, most coronary heart disease risk factors, and indicators of psychological distress. However, the numbers of women in this category were small, and the estimates were imprecise.

TABLE 2—Age-Adjusted Means or Prevalences (95% Confidence Intervals) of Coronary Heart Disease and Coronary Heart Disease Risk Factors, by Adult Social Class

	Registrar General's Occupational Classifications							
	Professional (I) (n = 305)	Managerial and Technical (II) (n = 769)	Nonmanual–Skilled (III-NM) (n = 612)	Manual–Skilled (III-M) (n = 954)	Partly Skilled (IV) (n = 481)	Unskilled (V) (n = 323)	Age-Adjusted Difference[a]	Age- and Childhood-SES-Adjusted Difference[a]
Coronary heart disease, %	10.4	11.0	12.9	17.4	20.3	16.6	1.18	1.17
	(7.4, 14.3)	(9.0, 13.4)	(10.5, 15.8)	(15.1, 20.0)	(16.9, 24.1)	(12.9, 21.0)	(1.11, 1.27)	(1.09, 1.26)
Ever smoked, %	36.2	41.0	42.6	44.5	42.8	48.9	1.08	1.07
	(31.0, 41.7)	(37.6, 44.5)	(38.7, 46.5)	(41.4, 47.7)	(38.5, 47.3)	(43.5, 54.4)	(1.03, 1.13)	(1.02, 1.12)
Current smoker, %	6.7	9.3	9.1	11.8	10.8	11.2	1.10	1.06
	(4.4, 10.1)	(7.5, 11.6)	(7.1, 11.6)	(9.9, 14.0)	(8.3, 13.9)	(8.2, 15.1)	(1.01, 1.18)	(0.98, 1.15)
Physically inactive, %	5.8	7.4	8.1	7.8	10.5	11.2	1.12	1.09
	(3.7, 9.0)	(5.7, 9.5)	(6.1, 11.6)	(6.2, 9.7)	(8.0, 13.9)	(8.2, 15.1)	(1.05, 1.19)	(1.02, 1.16)
Leg length, mm	761.1	761.1	759.4	755.8	752.9	756.2	–2.48	–1.78
	(758.2, 764.0)	(758.2, 764.0)	(756.1, 762.7)	(753.1, 758.4)	(749.1, 756.7)	(751.7, 760.8)	(–3.44, –1.51)	(–2.77, –0.78)
FEV_1, l	2.13	2.08	1.97	1.96	1.88	1.94	–0.05	–0.04
	(2.03, 2.19)	(2.04, 2.11)	(1.93, 2.01)	(1.93, 1.99)	(1.84, 1.93)	(1.89, 2.00)	(–0.06, –0.04)	(–0.05, –0.02)
Anxious or depressed	22.0	20.0	22.2	24.9	28.5	29.7	1.12	1.11
	(17.7, 27.0)	(17.5, 23.1)	(19.1, 25.7)	(22.3, 27.8)	(24.6, 32.7)	(25.0, 34.9)	(1.06, 1.18)	(1.05, 1.17)
History of clinical depression	18.0	12.4	12.8	18.6	16.9	20.0	1.10	1.10
	(14.1, 22.7)	(10.2, 14.9)	(10.4, 15.7)	(16.3, 21.2)	(13.8, 20.5)	(16.0, 24.7)	(1.03, 1.17)	(1.03, 1.17)
Use of anxiolytic, hypnotic, or antidepressant	8.5	10.1	8.9	11.2	8.3	11.1	1.03	1.02
	(5.8, 12.2)	(8.1, 12.4)	(6.9, 11.5)	(9.3, 13.3)	(6.1, 11.1)	(8.1, 15.0)	(0.95, 1.11)	(0.95, 1.11)

Note. FEV_1 = forced expiratory volume in 1 second; SES = socioeconomic status.
[a]Difference = age (and childhood social class, household bathroom, household hot-water supply, family access to a car) adjusted regression coefficient per increase in social class category for continuous variables and odds ratio per increase in social class category for dichotomous variables.

Table 4 shows the associations between childhood SES and prevalence of coronary heart disease, and it shows the effects on these associations after we adjusted for components of insulin resistance syndrome, behavioral risk factors, biomarkers of adverse childhood exposures, and indicators of psychological distress. Compared with women who were in nonmanual social classes during childhood, women who were in manual social classes had an age- and adult-SES-adjusted odds ratio for coronary heart disease of 1.35 (95% CI=1.08, 1.67). This was attenuated by 38% when we adjusted for components of insulin resistance syndrome, 29% when we adjusted for adult smoking and physical activity, and 50% when we adjusted for leg length and FEV_1. Adjustment for indicators of psychological distress had no substantive effect on this association. The fully adjusted (for age and all potential explanatory factors) odds ratio was 1.13 (95% CI=0.85, 1.49). Among the subgroup of lifelong nonsmokers, the age- and adult-SES-adjusted odds ratio for coronary heart disease when we compared women in manual social classes with women in nonmanual social classes during childhood was 1.45 (95% CI=1.01, 2.06). This was reduced by 22% to 1.34 (0.93, 1.94) when we further adjusted for FEV_1 alone.

To determine whether the association between childhood SES and adult coronary heart disease was related to intrauterine exposures, we examined the association among a subgroup of women who had self-reported birthweight data (1194 [34.7%] of the 3444 women who had complete SEP data).[20] Among this subgroup, the age- and adult-SES-adjusted odds ratio for coronary heart disease when we compared those in manual social classes with those in nonmanual childhood social classes was 1.28 (0.91, 1.83). When we adjusted for birthweight, this odds ratio was not substantively altered (1.26; 95% CI=0.90, 1.81).

DISCUSSION

Our findings indicate that adverse SES during childhood is associated with increased risk for coronary heart disease among women and that infant and childhood nutrition, insulin resistance, and adult behavioral risk factors each play a part in this association. There was a cumulative effect of disadvantage across the life course such that women who were in manual social classes during childhood remained at increased risk for coronary heart disease even if they moved up into nonmanual social classes during adulthood. Furthermore, those who were in manual social classes at both stages of the life course had a particular risk for coronary heart disease.

Link Between Childhood SES and Risk for Coronary Heart Disease

We found that childhood SES was associated with smoking status and physical activity during adulthood, and we found that adjust-

TABLE 3—Odds Ratios (95% Confidence Intervals) for Coronary Heart Disease and Coronary Heart Disease Risk Factors Comparing Various SES in Both Childhood and Adulthood With Baseline of Nonmanual Social Class in Both Childhood and Adulthood

	Child: Nonmanual Adult: Nonmanual (n = 565)	Child: Nonmanual Adult: Manual (n = 251)	Child: Manual Adult: Nonmanual (n = 1121)	Child: Manual Adult: Manual (n = 1507)
CHD	1.00	1.70 (1.16, 2.61)	1.23 (0.89, 1.69)	2.01 (1.50, 2.72)
High insulin resistance (top quartile HOMA ≥ 2.45)	1.00	1.29 (0.86, 1.93)	1.33 (1.01, 1.74)	1.58 (1.22, 2.05)
Diabetes (clinical diagnosis or fasting glucose ≥ 7.8mmol/l)	1.00	1.62 (0.79, 3.35)	1.55 (0.91, 2.63)	2.41 (1.46, 3.96)
Hypertensive (blood pressure ≥ 140/90mmHg or antidepressant medication)	1.00	1.29 (0.94, 1.77)	1.28 (1.04, 1.59)	1.34 (1.09, 1.65)
Dyslipidaemia (TG ≥ 1.7mmol/l or HDLc < 1.0 mmol/l)	1.00	1.36 (0.99, 1.89)	1.34 (1.08, 1.66)	1.72 (1.40, 2.12)
Obesity (BMI > 30kg/m^2 or WHR > 0.85)	1.00	1.50 (1.10, 2.05)	1.18 (0.95, 2.03)	1.65 (1.35, 2.03)
Current smoker	1.00	1.15 (0.66, 2.00)	1.38 (0.95, 2.01)	1.75 (1.23, 2.49)
Inactive	1.00	1.67 (1.09, 2.55)	1.55 (1.14, 2.10)	1.90 (1.14, 2.54)
Short legs (lowest quartile leg length ≤ 732 mm)	1.00	1.73 (1.18, 2.51)	1.68 (1.28, 2.19)	2.38 (1.84, 3.07)
Low FEV_1 (lowest quartile FEV_1 ≤ 1.66 l)	1.00	1.17 (0.78, 1.76)	1.60 (1.22, 2.11)	2.16 (1.67, 2.81)
Anxious or depressed	1.00	1.23 (0.86, 1.75)	1.05 (0.82, 1.35)	1.44 (1.14, 1.81)
History of clinical depression	1.00	1.33 (0.89, 1.98)	0.91 (0.68, 1.22)	1.34 (1.03, 1.76)
Use of anxiolytic, hypnotic, or antidepressant	1.00	1.37 (0.85, 2.21)	1.08 (0.76, 1.53)	1.15 (0.82, 1.60)

Note. SES = socioeconomic status; CHD = coronary heart disease; HOMA = homeostasis model assessment (of insulin resistance); TG = triglycerides; HDLc = high-density lipoprotein cholesterol; BMI = body mass index; WHR = waist-to-hip ratio; FEV_1 = forced expiratory volume in 1 second.

TABLE 4—Odds Ratios (95% Confidence Intervals) for Coronary Heart Disease Comparing Childhood Manual Social Class With Nonmanual Social Class

Variables Included in Fully Adjusted Model	Number With Complete Data on All Variables Included in Fully Adjusted Model	Age- and Adult-SES-Adjusted OR (95% CI)	Fully Adjusted OR (95% CI)	Percentage Decrease in OR With Full Adjustment
Components of the insulin resistance syndrome[a]	2986	1.34 (1.03, 1.75) *P* = .02	1.21 (0.92, 1.58) *P* = .18	38
Behavioral risk factors[b]	3410	1.35 (1.08, 1.68) *P* = .005	1.25 (0.98, 1.59) *P* = .07	29
Biomarkers of early-life environmental exposures[c]	3363	1.36 (1.08, 1.68) *P* = .005	1.18 (0.92, 1.48) *P* = .30	50
Indicators of anxiety/depression[d]	3414	1.36 (1.10, 1.69) *P* < .001	1.35 (1.10, 1.68) *P* = .002	2.8
All potential explanatory factors[e]	2842	1.34 (1.03, 1.74) *P* = .02	1.13 (0.85, 1.49) *P* = .41	62

Note. OR = odds ratio; CI = confidence interval; SES = socioeconomic status (adult SES factors adjusted for adult social class, adult housing status, car ownership, and pension arrangements); HOMA = homeostasis model assessment (of insulin resistance); FEV_1 = forced expiratory volume in 1 second.
[a]High-density lipoprotein cholesterol, triglycerides, systolic blood pressure, diastolic blood pressure, waist to hip ratio, body mass index (all continuous variables), HOMA score-type 2 diabetes categories (first 5 categories quintiles of HOMA score, sixth category type 2 diabetes).
[b]Smoking status (never, ex, or current at 1 of 4 levels: 1–9, 10–19, 20–29, or ≥ 30 cigarettes per day) and physical activity (none, < 1, 1–2, ≥ 2 hours per week of moderate or vigorous physical activity).
[c]Leg length, FEV_1 (continuous variables).
[d]Currently feel moderately or extremely anxious and/or depressed, ever been diagnosed by a doctor with depression, currently uses anxiolytics, hypnotics, or antidepressants (all binary).
[e]All variables included in models a–d.

ing for these risk factors attenuated the association between childhood SES and prevalence of coronary heart disease. In other studies, inconsistent results have been found for the association between childhood SES and smoking and physical activity in later life,[27–29] although among women, more consistent results between adverse childhood SES and adverse adult behavioral risk factors have been found.[1,30] It is perhaps not surprising that some association should exist. Parental SES will influence parental behaviors, and these behaviors are likely to influence children's smoking and physical activity levels during childhood and adolescence, and these behaviors are known to persist from childhood into adulthood.[31] The association between adverse childhood SES and coronary heart disease may therefore be explained in part by adverse behavioral risk factors that persist from childhood into adulthood among those who are from the poorest backgrounds.

Most investigators agree that the direct effects of poverty and material deprivation at an

individual level (e.g., inability to afford a healthy diet) and at a societal level (e.g., living in an area with little investment in housing, transport infrastructure, and community facilities) are important pathways in the association between SES and disease outcomes.[32,33] Poverty and material disadvantage may act in different ways at different stages of the life course. For example, poor intrauterine nutrition and childhood diet may lead to insulin resistance that persists into adulthood and increases the risk for coronary heart disease, whereas poor diet in adulthood may have an effect, via obesity, on coronary heart disease. The attenuation of the association between childhood SES and adult coronary heart disease after we adjusted for components of insulin resistance syndrome and biomarkers of childhood nutrition supports a role for early-life nutritional programming of insulin resistance as an intermediary in the causal pathway. The association between childhood SES and adult coronary heart disease was independent of birthweight, and these results are consistent with a previous prospective study.[4] Our findings indicate that intrauterine nutritional deprivation may be less important than postnatal nutritional effects in the association between childhood SES and risk for coronary heart disease.

The association between childhood SES and FEV_1 among a subgroup of women who had little or no lifetime exposure to tobacco, and the attenuation of the association between childhood SES and coronary heart disease after we adjusted for FEV_1 among this same subgroup, indicate that adverse childhood SES affects lung growth independently of smoking and that the childhood exposures that affect lung growth have a detrimental effect on risk for coronary heart disease. FEV_1 during adulthood is affected by exposure to maternal smoking in childhood,[23] and exposure to environmental tobacco smoke during childhood may therefore have a long-term effect on adult risk for coronary heart disease that is independent of whether the individual smokes.

In addition to the direct effects of poverty, it has been hypothesized that relative poverty leads to increased risk for coronary heart disease, because the emotional stress of recognizing relatively inferior SES leads to the neuroendocrine responses hypothesized to increase risk for coronary heart disease.[33] The graded association across the whole distribution between job grade and coronary heart disease mortality in the Whitehall study has been used to support the hypothesis that relative poverty in adulthood is important.[34,35] We found that the association between childhood SES and prevalence of adult coronary heart disease was graded across the childhood social classes. However, we found only weak and inconsistent associations between childhood SES and indicators of adult psychological distress, and adjustment for these indicators did not affect the association between childhood SES and coronary heart disease. Therefore, our findings do not support adult psychological distress as an important variable in the association between childhood SES and risk for coronary heart disease.

Study Limitations

Our response rate (60%) was moderate but consistent with other baseline data used in large epidemiological surveys.[37] Compared with those who did not respond, participants tended to be younger and less likely to have diabetes, although prevalence of coronary heart disease was similar among participants and nonresponders.[18] The possibility that our cohort was healthier than the general population of older British women should not have affected our results—it would only do so if the associations we examined were in the opposite direction or were markedly weaker among nonresponders, which is unlikely.

The women in our study who did not have data on childhood and adult SES were more likely to have coronary heart disease and to be smokers, and they had larger waist-hip ratios than those who did have these data. A large percentage of the women who did not have occupational data were likely to be those whose fathers and husbands were long-term unemployed—this would be consistent with the high prevalence of coronary heart disease and smoking among those who did not have these data. Including these women with those who were in manual social classes in our analysis slightly strengthened the association between adverse childhood SES and adult coronary heart disease (data not shown) and did not alter our overall conclusions. We relied upon self-report for occupational data, which may have been less accurate for father's than for husband's occupation, although any misclassification would weaken associations. All occupations were classified in accordance with the Registrar General's Classification of Occupations for 1980, which may have introduced inaccuracies in SES classification for fathers' occupations from the 1930s to 1950s. However, over the last century, very few occupations have substantially changed status, particularly jobs classified as manual or nonmanual, which have not changed between these broad categorizations.[38] Our study is cross-sectional, and although reverse causality as an explanation for the association between childhood SES and adult coronary heart disease is implausible, survivor bias could have been a problem. However, mortality caused by coronary heart disease among women before the age of 70 years (mean age of women in our study) is uncommon; therefore, survivor bias is an unlikely explanation for our results. Our results are consistent with a number of prospective studies.[1]

CONCLUSIONS

The participants in our study were born during a time of economic deprivation in Britain, and it could be argued that contemporary British children are unlikely to be exposed to such adverse circumstances. The association with coronary heart disease was linear across the distribution of childhood social classes, which indicates that increased risk does not only occur with extreme deprivation. Furthermore, among the 1946 British birth cohort—a group born into the post–World War II welfare state and greater prosperity—premature mortality was strongly influenced by adverse childhood SES,[39] and among a cohort aged 26 years from New Zealand, adverse childhood SES was associated with adverse coronary heart disease risk factors.[40] Randomized control trial evidence would provide the strongest evidence of the effectiveness of specific policies aimed at reducing the effects of childhood poverty on risk for coronary heart disease, but the pathways identified in our study show the types of intervention that might be most beneficial. ■

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Contributors

All the authors developed the study's objectives. S. Ebrahim and D.A. Lawlor managed the data collection and storage for the British Women's Heart and Health Study. D.A. Lawlor performed the analysis and coordinated the writing of the article. All the authors contributed to the article.

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Human Participant Protection

We obtained approval from the ethics committees of each of the 23 towns from which the study sample was drawn.

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Breast and Cervical Cancer Screening Among Latinas and Non-Latina Whites

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Objectives. We examined whether Latinas differ from non-Latinas in having undergone recent mammography, clinical breast examination, or Papanicolaou testing, as well as the contribution of sociodemographic and health care variables to screening.

Methods. We used data from the 1991 National Health Interview Survey Health Promotion and Disease Prevention supplement.

Results. Latinas were less likely than non-Latina Whites to have undergone mammography (odds ratio [OR] = 0.71; 95% confidence interval [CI] = 0.57, 0.88), but this difference was attenuated when we controlled for socioeconomic factors (OR = 0.90; 95% CI = 0.70, 1.15). Latinas did not differ from Whites on Papanicolaou tests or clinical breast examinations. Quality of and access to health care predicted screening.

Conclusions. Latina ethnicity does not predict breast and cervical cancer screening behavior independent of sociodemographic and structural factors. (*Am J Public Health.* 2004;94:1393–1398)

Various studies document disparities between Latina and non-Latina Whites in survival and mortality rates for breast and cervical cancer. Relative to non-Latina Whites, Latinas have a lower mortality rate from breast cancer (27.7 vs 15 deaths per 100 000) but a higher mortality rate from cervical cancer (2.5 vs 3.4 deaths per 100 000).[1] However, breast cancer is the leading cause of cancer death among Latinas. Moreover, the 5-year survival rate for breast cancer is 85% for non-Latina White women but only 76% for Latinas. Although the 5-year survival rate for cervical cancer is 94% for both populations, the cervical cancer incidence rate is twice as high among Latinas than among non-Latina Whites.[1]

Hypotheses concerning these disparities have centered on ethnic differences in risk factors, psychosocial and cultural factors, knowledge of cancer, and stage of cancer diagnosis.[1–4] A growing body of literature is focused on differences between the ethnic groups in use of cancer screening tests. Studies have found that compared with non-Latina Whites, Latinas are less likely to ever have had a Papanicolaou (Pap) test, clinical breast examination, or mammogram.[5–8] These findings are consistent with evidence that Latinos are diagnosed at later stages of cancer. For example, the percentages of breast and cervical cancer diagnosed in situ are lower among Latinas than among non-Latina Whites.[1,9]

Differences in screening rates between Latinas and non-Latina Whites may owe to a lack of access to or quality of preventive health care. Compared with non-Latina Whites, Latinas are less likely to be insured[10,11] or to have a regular health care provider,[12] both of which are strong predictors of breast and cervical cancer screening.[12,13] Relatively little is known about the extent to which other indexes of quality of preventive health care are associated with screening. High-quality medical care may translate into greater rates of screening through physician recommendations, increased duration and frequency of contact with patients, and better communication. In this study, the quality of preventive health care was assessed by examining the source of health care and by a proxy measure, the extent to which respondents received a comprehensive physical examination. Because a thorough physical examination is an indicator of good quality medical care, comprehensive examinations are hypothesized to be associated with a greater incidence of screening.

Less favorable cancer screening behaviors among Latinas than among non-Latinas are not found consistently and require further study. Some recent studies report no differences in screening between Latinas and non-Latina Whites.[12] A remaining empirical question is whether differences in screening correspond with disparities in socioeconomic status (SES), quality of care, and access to health care. This study examines the effects of these factors on 3 cancer screening behaviors: having had a Pap test in the past year, a clinical breast examination over the past year, and a mammogram over the past 2 years. The following research questions were addressed: (1) Are Latinas less likely than non-Latina Whites to receive cancer screening tests? (2) If so, do differences remain after control for SES and other demographic variables? (3) What is the additional impact of quality of health care on screening behaviors? (4) What is the effect of having private health insurance on screening behaviors?

METHODS

Data Source

We analyzed data from the 1991 Health Promotion and Disease Prevention (HPDP) supplement of the National Health Interview Survey (NHIS).[14] Conducted annually through the National Center for Health Statistics, the NHIS is a nationwide, personal interview, household survey, the sample of which is representative of the civilian, noninstitutionalized population of the United States. The NHIS uses a complex multistage design with oversampling for minority populations. Although the HPDP supplement is in English, bilingual NHIS interviewers are used by the National Center for Health Statistics. Areas that tend to need interviews administered in Spanish are very well known, and this is considered in making field assignments of bilingual interviewers. To ensure standardization, interviewers are provided with

a Spanish translation of core questions in the NHIS interview. However, in cases in which respondents speak only Spanish and the interviewer is not bilingual, other family members or neighbors are used as interpreters.

The sample for the 1991 NHIS-HPDP supplement consisted of 43 732 respondents. Some evidence suggests that, among Latinos, cancer mortality rates vary by race[15] (Latinos are an ethnic group, and may be of any race). To eliminate the potentially confounding effects of race, only White Latinas and non-Latinas were included in the analyses for the present study. (We performed the identical analyses using the full sample of Latinas, and results remained essentially unchanged.) The 1991 NHIS-HPDP supplement provided information on various health behaviors, including cancer screening. For the analyses on Pap test screening, the sample consisted of 20 379 women aged 18 years or older, of whom 1389 were Latinas (Mexican-American, 53.2%; Puerto Rican, 9.5%; Cuban, 9.2%; and Central/South American or other Latina, 27.7%). Breast cancer screening questions, which were only asked of women aged 40 years or older, included 11 744 women.

Dependent Variables

Outcome measures included Pap test, clinical breast examination, and mammogram screenings. Respondents aged 18 years and older were asked, "During the past 12 months, did you have a Pap smear or Pap test to check for cancer of the cervix?" Women aged 40 years and older were asked 2 questions regarding breast examinations: "During the past 12 months, have you had a breast physical exam in which a medical doctor or health professional checked your breasts for lumps?" and "During the past 2 years, have you had a mammogram?" Each of these 3 outcomes was coded as a dichotomous variable (0=no and 1=yes).

Independent Variables

Age was coded as a continuous variable. Socioeconomic status (SES) was assessed as family income and education, and both were treated as continuous variables in the analyses. Family income ranged from 0 (<$1000) to 26 (≥$50 000). Highest level of education completed had a possible range of 0 (no education or kindergarten only) to 6 (>bachelor's degree).

Race and ethnicity were based on respondents' self-reports. A dichotomous variable was created for Latina ethnicity. A code of 1 for Latina was assigned to respondents who listed their national origin or ancestry as Puerto Rican, Cuban, Mexican/Mexicana, Mexican American, Chicana, other Latin American, or other Spanish. All others were coded 0 for non-Latina.

Two variables were used to measure quality of health care: source of health care and extent of last physical examination. For the first measure, respondents were asked, "Is there a particular clinic, health center, doctor's office, or other place that you usually go to if you are sick or need advice about your health?" Respondents who answered yes were then asked to specify their usual place of health care. From these data, we created a source of health care variable, with higher scores approximating greater quality of care (i.e., 1=none, 2=emergency room, 3=hospital outpatient clinic, 4=health center or clinic, and 5=physician's office).

For the second quality of care measure, we created a 9-item scale to approximate the extent of the respondent's last physical examination. The 1991 NHIS-HPDP supplement included several questions regarding the respondent's last checkup: whether 5 routine tests were performed (cholesterol level, blood pressure, weight measured, blood test, and urine test) (1=no and 2=yes) and whether the patient was asked 4 questions about her health behaviors (diet/eating habits, amount of exercise, smoking, and alcohol use) (1=no and 2=yes). Responses to each of these 9 questions were summed, yielding a continuous scale with a possible range of 9 to 18. Those who never had a physical examination were coded as "no" for each of these items, rather than missing, to reflect their lack of health care. Both quality of health care variables were treated as continuous variables in the analyses.

Whether respondents had private insurance coverage was used as a proxy measure of access to health care. Although access to health care involves a broader range of issues than is encapsulated by private insurance coverage, these analyses were limited by the data available in the 1991 NHIS-HPDP public use data set. Respondents who reported being employed by a private company or federal, state, or local government were asked, "Not counting Medicare or Medicaid, are you now covered by a health insurance plan which pays any part of hospital or doctor bills?" Those respondents who were unemployed, self-employed, or insured through public programs were excluded. Although this limits the generalizability of our findings, the effect of private insurance on cancer screening nonetheless provides a useful assessment of health care access.

Statistical Analyses

To account for the NHIS survey design, we used Stata to adjust all analyses for clustering, stratification, and oversampling using survey estimation techniques.[16] Initial analyses of crude odds ratios were conducted to determine whether Latinas are less likely than non-Latina Whites to receive cancer screening tests. We use multivariate logistic regression analyses to examine cancer screening behaviors among Latinas compared with non-Latina Whites after controlling for age, education, and family income. The impact of quality of health care on screening was also assessed with logistic regression. Finally, among the subsample of employed women, we repeated the above analysis to examine the effect of private health insurance on screening. All analyses of crude and adjusted odds ratios (ORs) were conducted with survey procedures in Stata, which allow for sampling weights and multistage sampling adjustments.

RESULTS

Demographic and other data of the study respondents are shown in Table 1, stratified by screening and ethnicity. Analyses on Pap test screening included 1389 (6.8%) Latinas and 18 990 (93.2%) non-Latina Whites. The sample for the analyses of mammograms and clinical breast examinations consisted of 535 (4.6%) Latinas and 11 209 (95.4%) non-Latinas.

Table 2 displays the crude ORs for screening in relation to ethnicity. Latinas were less likely than non-Latina Whites to have had a mammogram (OR=0.71), but no differences

TABLE 1—Characteristics of Study Samples

	Pap Test, Women ≥18 Years of Age (n=20 379)		Mammogram and Clinical Breast Examination, Women ≥40 Years of Age (n=11 744)	
	Latina	Non-Latina	Latina	Non-Latina
No. (%)	1389 (6.8)	18 990 (93.2)	535 (4.6)	11 209 (95.4)
Mean age, y ±SD[a]	38.2 ±15.6	46.3 ±18.4	54.6 ±11.8	59.2 ±13.4
Education level (median)[a]	(HS graduate)	(HS graduate)	(Some HS)	(HS graduate)
Elementary or less, %	26.8	6.7	38.4	10.8
Some high school, %	17.8	10.8	13.0	12.6
HS graduate, %	30.0	40.9	26.8	41.6
Some college, %	16.5	22.3	11.9	18.4
Bachelor's degree or more, %	9.0	19.1	9.9	16.4
Median income, $5000 range, $[a]	20 000–25 000	30 000–35 000	20 000–25 000	30 000–35 000
Source of health care[a]				
None, %	25.4	12.4	19.6	9.3
Emergency room, %	0.7	0.3	0.9	0.3
Hospital outpatient clinic, %	7.2	2.8	5.4	2.4
Health center or company/industry clinic, %	5.0	2.9	3.0	2.0
Physician's office, %	61.7	81.5	71.1	86.0
Mean extent of last physical examination[a,b]	13.26	13.03	13.69	13.24

Source. National Center for Health Statistics, National Health Interview Survey, 1991.[14]
Note. HS = high school.
[a]The differences between Latinas and non-Latina Whites in age, education, income, source of care, and extent of last physical examination are significant at $P \geq .05$.
[b]Scale range is 9–18.

TABLE 2—Latinas' and Non-Latina Whites' Report of Cancer Screening Testing

Test	No. (%) Who Reported Having Obtained Test		Crude Odds Ratio (95% Confidence Interval)
	Latina	Non-Latina	
Pap test	796 (56.8)	10 360 (56.6)	1.01 (0.88, 1.14)
Mammogram	247 (47.4)	5980 (56.0)	0.71 (0.57, 0.88)
Clinical breast examination	314 (59.4)	6447 (59.7)	0.99 (0.79, 1.24)

Source. National Center for Health Statistics, National Health Interview Survey, 1991.[14]

by ethnicity were found for Pap tests (OR= 1.01) or clinical breast examinations (OR= 0.99). The adjusted odds of obtaining screening tests after control for age, education, and family income are shown in the top half of Table 3. As in the unadjusted analyses, the multivariate analyses showed no effect of ethnicity on having Pap tests or clinical breast examinations. For mammogram screening, Latinas were less likely than non-Latina Whites to have had a mammogram, but the difference was no longer significant after control for age, education, and family income.

We then assessed whether quality of health care had an effect on screening behaviors. A greater proportion of Latinas than non-Latina Whites reported not having a regular source of health care (Table 1). Although Latinas had slightly higher mean scores relative to non-Latinas on extent of the last physical examination, the differences were quite small. The lower half of Table 3 shows that adjusting for age, education, family income, and ethnicity, both source of care and extent of the last physical examination were related to greater odds of having undergone all 3 cancer screening tests. In these analyses, ethnicity was not associated with participation in screening tests after adjustment for the other factors.

We repeated the above analyses to examine the effect of having private health insurance on screening behaviors. In the 1991 NHIS-HPDP public use file, data on health insurance coverage were available for employed women only. Pap test analyses consisted of 598 (6.4%) Latinas and 8736 (93.6%) non-Latina Whites. Analyses of mammograms and clinical breast examinations of women aged 40 years and older included 208 (5.1%) Latinas and 3857 (94.9%) non-Latina Whites. Among this subsample of employed women, 72.8% of Latinas reported having private health insurance, compared with 86.1% of non-Latina Whites. Relative to non-Latina Whites, Latinas were significantly less likely to have private health insurance (OR=0.66; 95% confidence interval=0.51, 0.85) after adjustment for age, education, and family income.

As shown in Table 4, after adjustment for age, education, family income, quality of health care, and ethnicity, having private health insurance was associated with greater odds of having had all 3 screening tests. Most notably, employed women with private health insurance were more than twice as likely (OR=2.42) to have had a mammogram than their uninsured counterparts.

We also conducted analyses (results not shown) to assess the effects of possible confounders: marital status (married/not married), current employment status (currently employed/not currently employed), region of the United States (Northeast, West, Midwest, and South), and years lived in the United States (<15 years or ≥15 years in the United States or born in the United States). The findings regarding quality of care and health insurance were essentially unaffected with the inclusion of these confounders. (Analyses of potential confounders in the relationship between health insurance and screening did not include employment status because all respondents in these analyses were employed.) The ORs for source of health care, extent of

TABLE 3—Adjusted Odds Ratios (ORs) and 95% Confidence Intervals (CIs) for Having Obtained Cancer Screening Tests, Including Age and Socioeconomic Status (Model 1) and Effects of Source of Care and Extent of Last Physical Examination (Model 2)

	Pap Test, Adjusted OR (95% CI)	Mammogram, Adjusted OR (95% CI)	Clinical Breast Examination, Adjusted OR (95% CI)
Model 1			
Age[a]	0.98 (0.97, 0.98)	0.99 (0.99, 1.00)	1.00 (0.99, 1.00)
Education level[b]	1.19 (1.16, 1.23)	1.29 (1.25, 1.34)	1.21 (1.17, 1.26)
Family income[c]	1.02 (1.01, 1.03)	1.02 (1.02, 1.03)	1.02 (1.01, 1.02)
Latina ethnicity	1.02 (0.88, 1.17)	0.90 (0.70,1.15)	1.21 (0.94, 1.56)
Model 2			
Age[a]	0.97 (0.97, 0.98)	0.99 (0.99, 1.00)	0.99 (0.99, 1.00)
Education level[b]	1.18 (1.14, 1.22)	1.28 (1.23, 1.33)	1.19 (1.14, 1.24)
Family income[c]	1.02 (1.01, 1.03)	1.02 (1.02, 1.03)	1.02 (1.01, 1.02)
Latina ethnicity	1.10 (0.95, 1.27)	0.93 (0.69, 1.24)	1.28 (1.01, 1.63)
Source of health care[d]	1.22 (1.18, 1.25)	1.27 (1.22, 1.32)	1.33 (1.28, 1.39)
Extent of last physical examination[e]	1.14 (1.12, 1.17)	1.21 (1.18, 1.24)	1.21 (1.18, 1.24)

Source. National Center for Health Statistics, National Health Interview Survey, 1991.[14]
Note. Odds ratios for each variable are adjusted for all other variables in the model. Odds ratios for continuous independent variables denote change in the odds of screening per unit change in the independent variable.
[a]Age is a continuous variable, assessed in years.
[b]Education level range is 0 (no education or kindergarten only) to 6 (> bachelor's degree).
[c]Family income range is 0 (< $1000) to 26 (≥ $50 000).
[d]Source of health care range is 1 (none) to 5 (physician's office), with higher scores denoting greater quality of care.
[e]Extent of last physical examination range is 9–18.

TABLE 4—Adjusted Odds Ratios (ORs) and 95% Confidence Intervals (CIs) for Having Obtained Cancer Screening Tests, Including Effects of Private Health Insurance

	Pap Test, Adjusted OR (95% CI)	Mammogram, Adjusted OR (95% CI)	Clinical Breast Examination, Adjusted OR (95% CI)
Age[a]	0.98 (0.97, 0.98)	1.02 (1.00, 1.03)	1.01 (0.99, 1.02)
Education level[b]	1.16 (1.10, 1.21)	1.23 (1.14, 1.33)	1.18 (1.08, 1.27)
Family income[c]	1.02 (1.01, 1.03)	1.04 (1.02, 1.05)	1.03 (1.01, 1.05)
Latina ethnicity	1.10 (0.86, 1.40)	1.25 (0.83, 1.87)	1.56 (1.02, 2.36)
Source of health care[d]	1.20 (1.16, 1.25)	1.24 (1.16, 1.32)	1.27 (1.20, 1.34)
Extent of last physical examination[e]	1.12 (1.08, 1.15)	1.15 (1.09, 1.20)	1.14 (1.09, 1.19)
Private health insurance	1.27 (1.06, 1.51)	2.42 (1.84, 3.17)	1.39 (1.11, 1.74)

Source. National Center for Health Statistics, National Health Interview Survey, 1991.[14]
Note. Odds ratios for each variable are adjusted for all other variables in the model. Odds ratios for continuous independent variables denote change in the odds of screening per unit change in the independent variable.
[a]Age is a continuous variable, assessed in years.
[b]Education level range is 0 (no education or kindergarten only) to 6 (> bachelor's degree).
[c]Family income range is 0 (< $1000) to 26 (≥ $50 000).
[d]Source of health care range is 1 (none) to 5 (physician's office), with higher scores denoting greater quality of care.
[e]Extent of last physical examination range is 9–18.

physical examination, and health insurance either increased, remained unchanged, or decreased negligibly and remained significant for all screening outcomes.

DISCUSSION

We examined the effects of ethnicity, socioeconomic and demographic variables, and quality of and access to health care on breast and cervical cancer screening behaviors. In all analyses concerning having had a recent Pap test, Latinas did not differ from non-Latina Whites. Latinas were less likely than non-Latinas to have had a mammogram over the past 2 years. However, this difference attenuated after adjustment for age and socioeconomic factors. Notably, after adjusting for age, socioeconomic factors, and quality of care, Latinas were actually more likely than non-Latina Whites to have had a clinical breast examination during the past year.

Our findings are inconsistent with previous reports that Latinas are less likely than non-Latina Whites to undergo breast and cervical cancer screening tests.[5–8,17] Inconsistencies may result from methodological differences between studies, as several studies did not adjust for socioeconomic differences between Latinas and non-Latina Whites.[6,8,17] Our findings are consistent with a growing number of recent studies showing similar cancer screening rates between Latinas and non-Latina Whites, once adjustments are made for sociodemographic factors. Moreover, when adjusting for confounders, evidence suggests that the gap in screening rates between Latinas and non-Latina Whites narrows.[18] In an analysis of the 1987 and 1992 NHIS Cancer Control Supplements,[19] rates in 1987 adjusted for age, education, and income revealed various disparities between Latinas and non-Latina Whites in ever having had a Pap test, mammogram, and clinical breast examination. However, in 1992 there were fewer gaps. Recent studies of large community samples also report similar breast and cervical cancer screening rates between Latinas and non-Latina Whites,[12] especially after controlling for sociodemographic confounders,[20] and rates of recent screening that are similar to those found in the present study.[13] Combined, these results indicate that the gap in screening rates between Latinas and non-Latinas may be narrowing.

Results of the present study indicate that SES and other variables that are confounded with ethnicity predict screening. Education was associated with all 3 screening tests. With each unit increase in education, there was a nearly 30% increase in mammograms

and an approximately 20% increase in having had a Pap test and clinical breast examination, after control for age, income, and ethnicity.

Quality of health care was significantly associated with cancer screening behaviors. Both source of health care and extent of physical examination predicted a greater likelihood of having a recent mammogram, clinical breast examination, and Pap test. Previous research also indicates that the absence of quality health care, such as lacking a usual care provider, is associated with decreased cancer screening.[13,21,22] The findings concerning the extent of physical examination suggest that women receiving less than optimal care are not being screened for breast and cervical cancer. In other studies, women cite lack of physician recommendation as the major reason for not obtaining cancer screening tests.[6] Our findings concerning quality of health care suggest that factors in the health care setting predict cancer screening.

Having private health insurance was associated with an increased likelihood of obtaining cancer screening tests, especially mammograms. In this study, the health insurance variable was limited to employed women and excluded those receiving Medicaid and Medicare. Thus, the effect of health insurance on screening among *unemployed* women was not assessed, nor was the impact of "public" health insurance on screening. However, it is important to note that in a recent analysis of the 1998 NHIS, private health insurance—not Medicaid—predicted mammogram and Pap test screening among Latinas.[22] Furthermore, only about 20% of Latinos have public health insurance. A significant number of Latinos work for employers who do not provide health insurance coverage. Approximately 1 of every 3 employed Latinos (30%) works in a setting that does not offer health insurance. Furthermore, less than half of Latinos (43%) compared with almost three fourths of non-Latino Whites (73%) receive employer-sponsored health insurance.[10] Few studies have specifically examined the impact of lack of insurance on screening among employed Latinas and non-Latinas. Our findings, which complement recent evidence on the effect of private health insurance on screening,[22] indicate that even among employed women, private health insurance makes a difference.

Other limitations of the present study should be noted. Use of the NHIS is advantageous for generalizability of findings. However, analyses on national data may obscure regional differences in screening. Recent ecological analyses of the 1990 NHIS showed that areas characterized by high concentrations of Latinos and low SES have low rates of breast and cervical cancer screening.[23]

There is a pressing need to collect richer and more extensive data on Latinas. Despite the nature of the NHIS-HPDP, a large, nationally representative data set, stratification by age group or SES results in small sample sizes and large confidence intervals. As a consequence, there is a limited understanding of cancer screening behaviors among upper-SES minority women.[5,19] Analyzing cancer screening behaviors by birthplace, language use, or Latina subgroups using existing national surveys is also extremely difficult, as stratification results in limited sample sizes of proportionately smaller groups of Latinos (e.g., Cubans). These issues are important, as there are differences between Latino groups in sociodemographic factors and health insurance coverage.

A number of unanswered questions must be addressed in future research. First, the results of this study suggest that, after controlling for sociodemographic and other factors, Latinas and non-Latinas do not differ in screening behaviors. Whether this will result in the future elimination of disparities in cancer survival rates between the groups is unknown. Most likely, disparities will continue unless the underlying fundamental causes of health disparities between the groups,[24] such as differences in education and access to health care, are eliminated.

Second, there is limited research on delay in receiving diagnosis and treatment. Latinos are more likely than Whites to experience a longer delay in receiving a diagnosis after noticing symptoms,[25,26] but a hospital-based study found no evidence that this delay accounted for ethnic differences in survival.[26] Whether delay in receiving a diagnosis is attributable to limited access to health care or other factors remains unknown.[25]

Third, structural factors merit more research attention, as suggested by our findings on quality of health care. It is reasonable to hypothesize that, given an abnormal result from a cancer screening test, women may be lost to follow-up if they lack a regular health care provider or attend overcrowded clinics that are strained by the current health care crisis. There is limited research on ethnic differences in delay or failure to follow-up after receiving an abnormal test result, and studies on this issue have yielded inconsistent findings.[2]

Finally, we encourage future research to adopt a more theoretical approach toward understanding cancer screening behaviors among Latinas (and non-Latinas) (see, for example, the work of Stein et al.[27]). Obtaining screening tests encompasses a complex set of behaviors. Social, psychological, structural, and cultural factors may all play a role. The development of theoretical models that test the mechanisms by which these factors affect screening may greatly advance our understanding of breast and cervical cancer screening behaviors among Latinas.

Our analyses indicate that mammogram screening rates are lower among Latinas than among non-Latina Whites, a finding that may be attributable to between-group differences in SES and health care coverage. Findings on the effects of SES, quality of health care, and health insurance coverage have implications for health care policy. Social inequalities and lack of health insurance may create barriers to health care for Latinas,[28] and health care reform proposals have not adequately addressed the needs of Latinos and other people of color—especially women—who are disproportionately represented among the poor and working poor.[29] As Zambrana and colleagues have argued, there is a tendency to hold individuals accountable for behaviors that are greatly influenced by broader institutional and societal factors.[30] The percentage of breast cancer diagnosed in situ is lower among Latinas than among non-Latina Whites.[9,25,31,32] This difference in diagnosis of breast cancer—a disease that can be detected early—suggests that social inequalities and lack of health insurance coverage may be placing Latinas at a considerable disadvantage.[28,33] ■

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Contributors

A. Abraído-Lanza conceptualized the study and took the lead role in writing the article. M. Chao conducted the data analysis. All authors interpreted findings and assisted with manuscript preparation.

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Human Participant Protection

The institutional review board of the Columbia University Medical Center approved this research as exempt from review.

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Quality of Care for Women Undergoing a Hysterectomy: Effects of Insurance and Race/Ethnicity

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Objective. We assessed the quality of hospital care for women who underwent a hysterectomy to compare Medicaid-covered women with privately insured women and minority women with White women.

Methods. We evaluated medical decisions, inpatient care, quality of inpatient care, and outcomes.

Results. Quality of hospital care was equivalent for Medicaid-covered women compared with privately insured women and for non-Hispanic Black women compared with White women. Medicaid-covered women (40%) and Black women (68%) were more likely to have a complication compared with privately insured women and White women, respectively.

Conclusions. Increased complications after hysterectomy may result in increased economic burdens to Medicaid. Further studies of the racial/ethnic and sociodemographic issues are needed so that disparities may be adequately addressed. (*Am J Public Health.* 2004;94:1399–1405)

Although research has demonstrated that the Medicaid program has benefited low-income enrollees,[1,2] there is concern about the quality of care provided to Medicaid enrollees because of discrepancies between physician payments for services to Medicaid beneficiaries and payments for services to those who are privately insured.[3] During the mid-1980s, a time when there were no evaluations of quality of inpatient care for Medicaid beneficiaries, Congress mandated the Health Care Financing Administration (now called the Centers for Medicare and Medicaid Services) to evaluate the quality of care provided to Medicaid-covered patients.[4] Since then, a number of studies have hypothesized that hospitalized patients insured by Medicaid may receive care that is not equal to the care received by privately insured patients.[5,6] In response to the Congressional mandate, we studied 3 conditions that are common among patients covered by Medicaid: pediatric asthma, complicated labor and delivery, and hysterectomy. We report the results of our hysterectomy analysis; a study of quality of care provided to children hospitalized with asthma, which used the same methods, has been published elsewhere.[7]

We chose to analyze hysterectomy for 2 reasons: (1) it is one of the most costly procedures for nonpregnant women younger than 65 years and in the Medicaid program, and (2) it is a high-volume procedure and therefore of particular interest.[8] Our choice was further influenced by a concern about the appropriateness of hysterectomy versus uterus-preserving treatments among low-income women.

METHODS

Study Population

We included women who were younger than 65 years and who underwent a hysterectomy in 1991 California, Georgia, and Michigan. These states were selected because of their racial and geographic diversity and their relatively large populations of Medicaid-covered residents. We chose urban hospitals because Medicaid recipients are concentrated in cities. These hospitals were selected from a 1991 American Hospital Association Survey list that was sorted into terciles by number of Medicaid discharges. Within each tercile, women who had undergone a hysterectomy were sampled on the basis of information provided by each hospital about the number of hysterectomy cases treated in 1991 to ensure each hysterectomy patient had equal probability of being sampled. Approximately 400 Medicaid and 400 privately insured patients who had undergone a hysterectomy were randomly sampled from each state. Insurance status was verified by each hospital in the sample.

Quality Criteria

We developed indicators for 3 aspects of care—appropriateness of the decision to perform a hysterectomy, quality of the process of inpatient care, and clinical outcomes—to detect differences in the hospital care provided to Medicaid-covered women who underwent a hysterectomy compared with privately insured women. We used the Rand/UCLA method of having clinical experts develop the criteria.[9,10] A panel of 9 physicians—who represented medical societies such as the American Medical Association and the American College of Obstetricians and Gynecologists—scored clinical scenarios for appropriateness of the decision to perform a hysterectomy; created quality of inpatient care criteria to evaluate inpatient monitoring, treatment, and discharge planning; and identified adverse clinical outcomes hypothesized to reflect quality of care from information available in medical records. Trained registered nurses, medical-record administrators, and medical-record technicians abstracted the data. Missing data points vital to the decision tree resulted in missing appropriateness or inpatient care scores.

Clinical scenarios were presented to the panel and were scored 1 through 9. Scores of 1 through 3 were "appropriate," 4 through 6 were "uncertain," and 7 through 9 were "inappropriate" surgery. An appropriateness indicator was judged to be equivocal if the panelists considered the benefits and the risks of performing a hysterectomy to be about the same (a median rating of 4 to 6) or if they disagreed on the rating. A series of algorithms, which were created on the basis of criteria developed by the panel, translated information abstracted from medical records into appropriateness levels. These criteria were diagnosis upon admission; severity of

symptoms (anemia, amount of bleeding, pain, pressure, chronicity, incontinence); invasiveness (cancer or endometriosis); previous diagnostic procedures, medical interventions, and surgical treatments; menopausal status; and desire for children if the patient was premenopausal. When patients had more than 1 condition that led to a hysterectomy, the appropriateness algorithm was applied to the condition with the most severe symptoms. Examples of appropriateness ratings for hysterectomy are as follows:

1. Hysterectomy for asymptomatic fibroids with a 3-centimeter increase in uterine size in 1 year and a uterine size equivalent to a 12-week or longer pregnancy was rated 1 (appropriate) for postmenopausal women and 7 (inappropriate) for premenopausal women who desired a pregnancy in the future.
2. Hysterectomy for surgically diagnosed symptomatic endometriosis that was medically or surgically treated before the index procedure was rated 1 (appropriate) for postmenopausal women and 5 (equivocal) for premenopausal woman who desired a pregnancy in the future.

The panel developed inpatient care safety variables specific for hysterectomy and created 3 levels of urgency: (1) problems with care that led to a high potential for immediate harm, (2) problems with a high potential for delayed harm, and (3) care that when omitted had an uncertain or low potential for harm. For example, if the hysterectomy was not delayed when a women had a 100.4°F or higher fever, if she was discharged without discharge orders, or if she was not transfused for a hematocrit less than 20%, the care was given a rating of high potential for immediate harm. If the abdominal wound was not checked before discharge, the care was rated high potential for delayed harm. Finally, the panel identified a list of adverse outcomes of hysterectomy that ranged from mild to serious, including intraoperative complications (bladder/ureteral injury, bowel injury, hypertension, myocardial infarction, stroke, cardiopulmonary arrest, death, hemorrhage, fever, and nerve injury) and postoperative complications (vaginal cuff infection or hematoma, wound complications [including return to surgery], paralytic ileus or other bowel problem, cellulitis or phlebitis, deep vein thrombosis, urinary tract infection, pneumonia; sepsis, fever, drug or transfusion reaction, fall, myocardial infarction, stroke, cardiopulmonary arrest, death, blood transfusion, postoperative anemia, or unplanned intensive care unit admission).

Statistical Analysis

We pooled the 3 states on the basis of an earlier state-specific analysis in which differences in distribution of demographics, hospital characteristics, procedures, and other factors were found but overall outcomes were similar (we corrected for state- and hospital-clustered sampling in the regression). We evaluated inappropriate hysterectomy, high potential for immediate or delayed harm (inpatient care), and postoperative complications with a bivariate analysis that compared demographics and diagnostic characteristics with quality indicator differences between Medicaid-covered women and privately insured women. Multivariable logistic regressions identified factors associated with inappropriate hysterectomy, potential immediate or delayed harmful care, and complications. For the analysis of appropriateness, we included only risk factors that preceded the surgery: age, race/ethnicity, menopausal status, diagnoses that led to hysterectomy, number of conditions, severity level of the most severe condition, whether medical treatment was attempted, previous invasive diagnostic and treatment procedures (laparoscopy, cone biopsy, cervical biopsy, colposcopy, dilatation and curettage), comorbidities, and insurance status. Hospital variables (bed size and staffing) and state of residence, age, race/ethnicity, diagnosis, severity, and insurance status were used in the inpatient care analysis. Appropriateness, possibility of harmful care, age, race/ethnicity, menopausal status, diagnoses that led to hysterectomy, number of conditions, severity of the most severe condition, whether medical treatment was attempted, previous invasive diagnostic and treatment procedures (laparoscopy, cone biopsy, cervical biopsy, colposcopy, dilatation and curettage), obesity, comorbidities, type of hysterectomy, and insurance status were tested in the analysis of complications. In both models, variables were dropped that were not statistically significantly related to the outcome. We used the quasi-likelihood method of Zeger et al.[11] to correct for state and hospital clustering. Beta coefficients from the models were converted to odds ratios with confidence intervals derived from variances that were corrected for cluster sampling from within hospitals and states.

RESULTS

The final sample size of the hysterectomy group was 2425, with 1185 Medicaid-covered women (396 from California, 380 from Georgia, and 409 from Michigan) and 1240 privately insured women (415 from California, 424 from Georgia, and 401 from Michigan). The Medicaid-covered women were disproportionately selected from public hospitals (33.7% vs 13.9%), hospitals with high Medicaid shares (73.7% vs 23.2%), teaching hospitals (43.2% vs 29%), large hospitals with more than 400 beds (42.8% vs 28.2%), and hospitals with a favorable staff-to-bed ratio (74.4% vs 67.9%) (Table 1).

The Medicaid-covered women were younger than the privately insured women (on average 37.7 years vs 42.8 years), and fewer were postmenopausal (7.5% vs 12.3%). There were more African American (37% vs 14.4%) and Hispanic women (13.2% vs 4.8%) in the Medicaid group (Table 1). A single individual classified as both African American and Hispanic was grouped with the Hispanics in the Medicaid group throughout the analysis (there were no such individuals among the privately insured). Thus, the term African American refers to non-Hispanic African Americans in this analysis. Diagnostic profiles differed by payer group. For example, the privately insured women had more abnormal bleeding, endometriosis, pelvic-floor conditions (prolapse, incontinence, or rectocele), and endometrial hyperplasia. The Medicaid-covered women had more emergency hysterectomies, preinvasive cervical disease, and pelvic inflammatory disease. Although not shown in Table 1, more African American women overall were admitted with a diagnosis of fibroids (59.9% vs 23.8% among Whites, $P<.001$). When the number of conditions each woman had was summed, the Medicaid-covered women were diagnosed with slightly fewer conditions.

TABLE 1—Characteristics of Women Hospitalized for Hysterectomy, by Medicaid vs Private Insurance Coverage

	Medicaid (n = 1185)	Privately Insured (n = 1240)
Hospital characteristics, %		
Public ownership	33.7%	13.9%***
High Medicaid share[a]	73.7%	23.2%***
Teaching hospital	43.2%	29.0%***
Number of beds		
≤250	22.0%	32.5%***
251–399	37.2%	39.4%
≥400	42.8%	28.2%
High staff-to-bed ratio[b]	74.4%	67.9%***
Patient characteristics		
Mean age, y	37.7	42.8***
Race/ethnicity *(distribution)*, %		
White	44.6%	74.1%***
African American	37.0%	14.4%
Hispanic	13.2%	4.8%
Asian	3.3%	2.0%
Other	1.9%	4.8%
Postmenopausal, %	7.5%	12.3%***
Diagnoses, %[c]		
Abnormal bleeding	62.4%	70.7%***
Pain	63.0%	60.2%[d]
Fibroids	40.2%	44.0%[d]
Endometriosis/adenomyosis	15.5%	18.9% **
Uterine or vaginal prolapse, incontinence[e]	15.9%	21.9%***
Emergency hysterectomy	3.3%	0.6%***
Preinvasive cervical disease	14.6%	5.5%***
Confirmed malignancy	17.2%	15.5%[4]
Pelvic inflammatory disease	9.5%	4.2%***
Undiagnosed adnexal mass	10.3%	11.9%[d]
Suspected malignancy	4.1%	5.1%[d]
Endometrial hyperplasia	2.8%	5.8%***
Sterilization	0.3%	0.1%[d]
Other	1.9%	3.8%**
Number of conditions *(distribution)*		
1	16.0%	12.5%*
2	31.1%	33.3%
3	34.9%	33.9%
≥4	17.9%	20.0%
Severity of most severe condition *(distribution)*		
Mild	37.6%	47.5%***
Moderate	28.4%	26.5%
Severe	20.9%	17.6%
Unknown[f]	13.1%	8.4%
Treatment in the 2 years before the hysterectomy, %		
Previous medical treatment[g]	25.5%	34.6%***
Previous laparoscopy	17.1%	12.3%**
Previous cone biopsy, cervical biopsy, or colposcopy	19.8%	8.2%***
Previous dilatation and curettage	22.4%	28.0%**

Continued

Fewer Medicaid-covered women had conditions that were categorized as mild (37.6% vs 47.5%) or had medical treatment before their hysterectomy (25.5% vs 34.6%), and more Medicaid-covered women had missing data in their medical records that prevented an evaluation of severity (13.1% vs 8.4%) (Table 1). The Medicaid-covered women had more laparoscopies (17.1% vs 12.3%) and procedures related to cervical disease (cone biopsies, cervical biopsies, and colposcopies) (19.8% vs 8.2%) before their hysterectomies; however, the privately insured women had more dilation and curettage procedures (28% vs 22.4%) before their hysterectomies. More Medicaid-covered women had diabetes or were obese (8% vs 2.2% and 4.3% vs 1.5%, respectively), and the Medicaid-covered women had fewer vaginal procedures (19.2% vs 21.3%) and more radical hysterectomies (2.5% vs 0.8%).

The missing severity rating (Table 1) reduced the denominators for appropriateness to 1030 for the Medicaid sample and 1136 for the privately insured sample. There were no statistical differences by payer in either the indicator that suggested that hysterectomy was inappropriate or the indicator that inpatient care could be harmful (Table 2). However, the Medicaid-covered women developed more complications (26% vs 15.3%), including life-threatening ones (3.1% vs 1.5%), and infections (8% vs 4%). There were 4 deaths: 2 in the Medicaid group and 2 in the privately insured group.

While Medicaid-covered women and privately insured women had similar percentages of inappropriate hysterectomies overall, one quarter of the women in the total sample had a hysterectomy that was judged inappropriate by the standards developed for our study. In the regression model, being Hispanic or "other"; being postmenopausal; having a previous colposcopy, cone biopsy, cervical biopsy, or dilatation and curettage; having a diagnosis of pelvic inflammatory disease or cancer; and having more than 1 condition were associated with having a hysterectomy that was not deemed inappropriate compared with White women (Table 3). In an unadjusted analysis, being African American was associated with having an inappropriate hysterectomy for both Medicaid-covered (odds ratio [OR]=2.12; 95% confidence interval [CI]=1.57, 2.87)

TABLE 1—*Continued*

Comorbidities, %		
Diabetes	8.0%	2.2%***
Ischemic heart disease	5.8%	4.1%[d]
Other non-ischemic heart disease	7.6%	8.2%[d]
Hypertension	19.3%	16.5%[d]
Obesity	4.3%	1.5%***
Type of hysterectomy *(distribution)*		
Vaginal	19.2%	21.3%**
Abdominal	78.3%	77.9%
Radical	2.5%	0.8%

[a] The hospital in which the patient received care was in upper third of percentile of patients covered by Medicaid.
[b] The hospital in which the patient received care was in upper third of percentile of full-time staff to number of beds.
[c] Women may have had more than 1 diagnosis.
[d] Not statistically significant.
[e] Also included rectocele, uterocele, and other pelvic-floor problems.
[f] Missing data in the medical record prevented an evaluation of admission severity.
[g] Includes treatment with drugs for gynecologic conditions: oral contraceptives, progesterone, danazol, gonadotropin releasing hormone agonist, drugs for pelvic pain, and antidepressants for pain given in the past 2 years.
*P<0.05; **P<0.01; ***P<0.001.

TABLE 2—Quality of Care Indicators for Medicaid-Covered and Privately Insured Women Hospitalized for Hysterectomy, by Medicaid vs Private Insurance Coverage

	Medicaid (n = 1185), %[a]	Privately Insured (n = 1240), %[a]	
Inappropriate hysterectomy	24.0	25.1	NS
Process of care *(distribution)*			
No or uncertain harm	90.4	88.2	NS
High probability of immediate harm	1.6	1.5	
High probability of delayed harm	8.0	10.3	
Clinical outcomes			
Total complications	26.0	15.3	***
Deaths	0.2	0.2	NS
Life-threatening complications	3.1	1.5	**
Infections	8.0	4.0	***

Note. NS = Not statistically significant.
[a] Because severity was missing for 155 of the Medicaid-covered women and 104 of the privately insured women, the denominators for this calculation were 1030 and 1136, respectively.
*P<0.05;**P<0.01;***P<0.001.

and privately insured women (OR=2.58; 95% CI=1.82, 3.67) (data not shown). However, adding fibroids to the model nullified that association; women who had this condition were 6 times more likely to have an inappropriate hysterectomy regardless of race/ethnicity (OR=6.04; 95% CI=4.11, 8.26).

Number of beds, Medicaid share, staff-to-bed ratio, teaching status, and whether the hospital was public were not associated with receiving care that was potentially harmful; race/ethnicity and payer status were dropped from the patient care regression model (Table 3). Only 2 variables were associated with receiving potentially harmful care: whether the procedure was an emergency (OR=2.81; 95% CI=1.13, 7.01) and the state in which the hospital was located. Compared with Michigan, women in California (OR=1.76; 95% CI=1.00, 3.09) and Georgia (OR=1.96; 95% CI=1.02, 3.76) hospitals were more likely to receive care that was potentially harmful.

Inappropriate hysterectomy, problems with inpatient care, and admission severity were not associated with developing a complication (Table 3). There was a 40% increase in the likelihood of developing a complication among Medicaid-covered women compared with privately insured women, a finding that was statistically significant (OR=1.40, CI=1.11, 1.76). More important factors associated with developing a surgical complication were having an emergency hysterectomy (OR=28, 95% CI=7.48, 105), having an abdominal hysterectomy (OR=1.54, 95% CI=1.25, 2.11), having a radical hysterectomy (OR=3.16, 95% CI=1.52, 6.53), or being obese (OR=2.11, 95% CI=1.22, 3.64). Having a diagnosis of fibroids was associated with a decrease in complications (OR=0.73, 95% CI=0.57, 0.92). Being African American was associated with a 68% increase in the risk for a complication (OR=1.68, 95% CI=1.29, 2.09); this association was independent of other risk factors in the model, i.e., the risk for an African American woman developing a complication was increased among both the Medicaid-covered women (unadjusted OR=1.47; 95% CI=1.10, 1.97) and the privately insured women (unadjusted OR=1.78; 95% CI=1.20, 2.65) (data not shown). The risk for developing a complication among Hispanic women in the cohort was elevated (OR=1.34) but was not statistically significant. Finally, being postmenopausal was associated with developing complications (OR=1.61, 95% CI=1.21, 2.14). It should be noted that the effect of hospital characteristics was tested in the regression analyses and was not found to be associated with inappropriateness, problems with inpatient hospital care, or complications.

DISCUSSION

Our results indicate that inpatient care for Medicaid-covered women who underwent a hysterectomy was equivalent to the care provided to comparable privately insured women in this population. Despite this, the Medicaid-covered women were more likely to develop complications. The association between com-

TABLE 3—Quality of Care Indicators for Women With Medicaid Hospitalized for Hysterectomy

	Adjusted OR (95% CI)[a]	
Having an inappropriate hysterectomy		
Medicaid coverage[b]	0.92	(0.67,1.25)
Race/ethnicity[c]		
African American	1.07	(0.80,1.43)
Hispanic	0.59	(0.37,0.94)*
Other	0.30	(0.19,0.48)***
Postmenopausal	0.44	(0.30,0364)***
Prior colposcopy, cone biopsy, or cervical biopsy	0.50	(0.33,0.75)***
Prior dilatation and curettage	0.05	(0.02,0.10)***
Diagnosis of fibroids	6.04	(4.11,8.26)***
Diagnosis of pelvic inflammatory disease	0.03	(0.00,0.71)*
Diagnosis of cancer	0.01	(0.00,0.16)**
>1 diagnosis	0.54	(0.39,0.73)**
Potential for experiencing harmful care		
Medicaid coverage[b]	0.86	(0.59,1.27)
Race/ethnicity[c]		
African American	1.12	(0.81,1.55)
Hispanic	1.12	(0.61,2.05)
Other	1.26	(0.79,2.02)
Emergency hysterectomy	2.81	(1.13,7.01)*
State		
California	1.76	(1.00,3.09)*
Georgia	1.96	(1.02.3.76)*
Factors associated with complications		
Inappropriate hysterectomy	0.95	(0.70,1.28)
Process of care		
High probability of immediate or delayed harm	1.21	(0.86,1.68)
Medicaid coverage[b]	1.40	(1.11,1.76)**
Type of procedure[d]		
Abdominal hysterectomy	1.54	(1.25,2.11)**
Radical hysterectomy	3.16	(1.52,6.53)**
Postmenopausal	1.61	(1.21,2.14)**
Race[c]		
African American	1.68	(1.29,2.09)***
Hispanic	1.34	(0.92,1.95)
Other	0.90	(0.54,1.52)
Diagnosis of fibroids	0.73	(0.57,0.92)**
Uterine weight >280 g	1.31	(0.94,1.82)
Obesity	2.11	(1.22,3.64)**
Emergency hysterectomy	28.0	(7.48,105)***
Low severity	0.94	(0.73,1.21)

Note. OR = odds ratio, CI = confidence interval.
[a]The confidence intervals were derived from variances corrected for cluster sampling from within hospitals and states.
[b]Private insurance coverage is the reference category.
[c]White is the reference category.
[d]Vaginal hysterectomy is the reference category.
*P<0.05; **P<0.01; ***P<0.001.

plications and Medicaid status persisted after we adjusted for urgency of the operation, type of procedure, race/ethnicity, and factors related to the patients' physical condition, such as obesity or menopausal status. There were no variables in our data that explained the difference in clinical outcomes between the Medicaid-covered women and privately insured women. This included indicators of previous care, such as the receipt of previous medical treatment and previous surgical and diagnostic procedures, and receiving care that could be potentially harmful. The finding is consistent with at least 1 study that found that women who underwent a hysterectomy and who were insured by Medicaid had a 20% increase in risk for complications compared with privately insured women.[12] While there are few other studies of hysterectomy outcomes by payer group, studies of acute myocardial infarction,[13] colon cancer,[14] and breast cancer[15] have shown an association between poor outcomes and payer status. More than 1 study has shown Medicaid-covered patients suffer more avoidable hospitalizations than do privately insured patients.[16,17] The reasons for these disparities are unclear. Research has hypothesized that Medicaid enrollees have problems accessing outpatient care,[18,19] perhaps because of insurance-related delays or because individuals only obtained Medicaid coverage once they became ill. In our data, we have little information about previous ambulatory care, except for the fact that the Medicaid-covered women may have had less access to noninvasive ambulatory care treatment, because fewer of them received hormonal treatment or pain medication (Table 1). However, this was not associated with complications in the regression analysis. Another possible cause of the differential complication rates is that the Medicaid-covered women may have received substandard care before the hospitalization. Again, our data do not inform this hypothesis.

There are few studies that have looked specifically at the hospital care of Medicaid patients. One study of medical injury found that Medicaid-covered patients were at increased risk for adverse events because of negligence in the operating room.[20] A number of studies have found that patients who underwent procedures at high-volume small

hospitals or teaching hospitals had fewer complications.[21–24] Our analysis strongly hypothesizes that Medicaid-covered women received care that was equivalent to that received by the privately insured women.

We also found that being African American was independently associated with complications. This finding is consistent with 1 study of more than 53 000 hysterectomies in Maryland, where African American women were 40% more likely to develop complications, nearly 3 times as likely to have a long hospital stay, and 3 times as likely to die even though, as in our study, the African American women were younger on average.[12] African American women in our study were much more likely to have fibroids; however, having fibroids was protective in the regression analysis of complications (Table 3), which indicated that fibroids did not cause complications. Another study found that among women who underwent an abdominal hysterectomy for fibroids, those who had a uterine weight of more than 500 grams had a higher risk for complications.[25] However, a uterine weight under 280 grams was the only similar variable available to our analysis, and it was not statistically significant. While it is possible that African American women who have very large fibroids wait to have surgery because of limited access to covered services, our data did not allow us to evaluate this.

Although the probability of an inappropriate hysterectomy was the same for Medicaid-covered women and privately insured women, and for the White and African American women in our study, the overall rate of inappropriate hysterectomy was approximately 25%. In our study, the only factor that predicted inappropriate hysterectomy was having a diagnosis of fibroids. Forty-seven percent of the women in our study who had fibroids also had an inappropriate rating compared with 13% of those who had other diagnoses. Researchers found even more dramatic results in a study of women who underwent a hysterectomy in 3 California hospitals.[26] They used the Rand/UCLA method of rating appropriateness and American College of Obstetricians and Gynecologists criteria, and they found that 70% of the women had an inappropriate hysterectomy and 79% of the women who had fibroids had inappropriate surgery. The reason for this was that the recommended diagnostic steps were not done before surgery. The difference between that study and our study is that interviews were conducted and outpatient records were examined. Our appropriateness criteria were less precise because of limits in the data abstracted from medical records. The authors of the California study concluded that because there have been no clinical trials of hysterectomy effectiveness, physicians may not have objective data with which to make appropriate decisions.

There are potential limitations to the interpretation of our study results. The Rand/UCLA method used in our study was developed to assess the overuse of various medical procedures. The reproducibility of this method for judging quality of care has been called into question, particularly with conditions such as hysterectomy for which stringent evidence-based criteria are less available than for coronary revascularization.[10] However, the Rand/UCLA method has been found to be internally consistent, which makes it a useful tool for benchmarking appropriateness and patient care criteria for comparison between 2 groups.[27]

Our study made it apparent that the data collected from medical records had some problems. There were more missing data points, which were needed to construct the admission severity scores, among the Medicaid-covered women than among the privately insured. In a sensitivity analysis, we found that deleting the observations not categorized for severity in the regression model did not affect the association between admission severity and complications. That reassured us that severity was not associated with developing complications.

At the time we conducted this study, there were virtually no studies that compared the quality of specific components of inpatient care provided to Medicaid-covered and privately insured patients. These studies continue to be rare. One study showed that similar resources were expended on, and similar care was provided to, low-risk obstetric Medicaid-covered and privately insured patients.[28] Another study showed that the payer source did not explain differences in hospital resource use for sick infants.[29] There have been no comparable studies of quality of care for hysterectomy.

CONCLUSIONS

Our study of more than 2000 women admitted to hospitals in California, Georgia, and Michigan in 1991 found that appropriateness of hysterectomy was equivalent for Medicaid-covered women and privately insured women, as was the care the 2 groups received in the hospital. However, Medicaid-covered and African American women had higher rates of postoperative complications that were not associated with the quality of inpatient care or with the severity of condition that led to the procedure. The complications were highest among women who had an abdominal hysterectomy, which remains the most common type of hysterectomy procedure.[30] Because hysterectomy is the second most common surgery among women after cesarean section, disparities in outcomes after hysterectomy will lead to an increased economic burden to Medicaid.[29] Further studies of the racial/ethnic and sociodemographic issues are needed so that these disparities may be addressed; particularly, researchers need to determine what nonhospitalization factors are involved in the disparities found in this and other studies. ■

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Contributors

R.B. Hakim analyzed the data and wrote the paper. M.B. Benedict supervised the study and contributed to the data analysis and the writing of the article. N.J. Merrick planned and directed the study and contributed to the data analysis and the writing of the article.

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Human Participant Protection

Institutional review boards at each hospital in the study approved this research.

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Gender Differences in Physical Disability Among an Elderly Cohort

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Objectives. We analyzed the role of sociodemographic factors, chronic-disease risk factors, and health conditions in explaining gender differences in disability among senior citizens.

Methods. We compared 1348 men and women (mean age = 79 years) on overall disability and compared their specific activities of daily living, instrumental activities of daily living (IADL), and mobility limitations. Analysis of covariance adjusted for possible explanatory factors.

Results. Women were more likely to report limitations, use of assistance, and a greater degree of disability, particularly among IADL categories. However, these gender differences were largely explained by differences in disability-related health conditions.

Conclusions. Greater prevalence of nonfatal disabling conditions, including fractures, osteoporosis, back problems, osteoarthritis and depression, contributes substantially to greater disability and diminished quality of life among aging women compared with men. (*Am J Public Health.* 2004;94:1406–1411)

Although aging women experience lower mortality rates and lower rates of some chronic diseases (e.g., coronary and pulmonary disease) and use health care services more often than men,[1–4] they consistently report more functional limitations and physical disability than their male counterparts.[2,4–12] It has been hypothesized that the greater prevalence and severity of arthritis and musculoskeletal disease among older women explain some, but not all, of the latter difference.[3,6,13–15] It also has been hypothesized that differences may arise because of psychosocial factors, i.e., women by nature may be more likely to report or overreport ill health and disability and men may underreport their infirmities.[1,4,6,15] While there is a substantial amount of literature that describes gender differences in chronic health conditions and other health outcomes, studies that have specifically examined gender differences in physical disability are more limited,[2,5,9–11,14,16] particularly those that have attempted an in-depth analysis aimed at understanding the reasons for these disparities, including the possible role of sociodemographic factors, chronic-disease risk factors, and specific health conditions.

We followed a cohort of elderly men and women to identify risk factors associated with physical functioning and to address gender disparities in greater detail. Over the lifetime of this study (1986–1999), the gender gap in disability was small but evident as early as 65 years of age, and the gap continued to widen into old age. Thus, our study was designed to (1) examine differences in overall physical functioning among men and women and differences in specific activities of daily living (ADLs), instrumental activities of daily living (IADLs) and mobility; (2) examine differences in the use of assistance; and (3) determine whether differences in sociodemographic factors, chronic-disease risk factors, and health conditions explain the gender disparities.

METHODS

The study cohort comprised 1348 elderly men and women who were part of the Alumni Health Study and who had been participating in a longitudinal study of risk factors for physical disability since 1986. Participants who were at least 60 years of age and who lived in the United States responded to yearly questionnaires that included information on health behaviors, risk factors, medication use, health status, medical conditions, physical disability, and quality of life. Data were collected from individual self-reports; participants who had difficulty completing a questionnaire were offered telephone assistance, but surrogates rarely submitted the questionnaire for intended respondents. We analyzed those respondents who completed a questionnaire in 1999, the final year in which data were collected on a number of factors that are potentially associated with disability. The later years of the original study (1999–2001) also showed the greatest percentage and degree of disability among the cohort. Further details of the original study design and population have been published elsewhere.[17,18]

The Health Assessment Questionnaire, a reliable and validated self-assessment instrument,[19] was used to obtain functional-status information and to score a measure of overall disability. Participants were asked to rate their degree of difficulty in performing ADLs and IADLs and difficulty with mobility by answering 20 questions that represented 8 categories of physical functioning: dressing/grooming, arising, eating, walking, hygiene, reaching, gripping, and doing errands/chores. Perceived difficulty in performing each activity during the past week was scored as 0 (no difficulty), 1 (some difficulty), 2 (much difficulty), or 3 (unable to do). The activity with the greatest perceived difficulty within a particular functional category determined the category score. An overall disability index that ranged from 0 (no disability) to 3 (most severe disability) was obtained by averaging the 8 category scores. Thus, some difficulty in only 1 of the 8 categories was scored 0.125, the minimal level of disability. A score of 0.375 represented either complete inability in 1 category or lesser difficulties in 2 or 3 categories. As a result, seemingly small numeric differences in scores could have a big impact on physical function. Separate scores for limitations in ADLs (self-care activities, including dressing/grooming, eating, and hygiene), IADLs (functioning in the immediate environment, including reaching, gripping,

and doing errands/chores), and mobility (arising, walking) were similarly computed.[20]

Participants also indicated if they used an aid, device, or help from another person within each functional category. Aids and devices by category included (1) dressing/grooming—button hook, zipper pull, long-handle shoe horn, etc.; (2) arising—built up or special chair (higher seat or arms or both), cane; (3) eating—built up or special utensils (thicker or longer handles or both); (4) walking—cane, walker, crutches, wheelchair; (5) hygiene—raised toilet seat, bathtub seat, bathtub bar, long-handled appliances in bathroom, etc.; (6) reach—long-handled appliances; (7) gripping—jar opener (for jars previously opened); and (8) doing errands/chores—any of the aids and devices for the first 7 categories. Participants listed any other aids or devices that were used but were not specified on the questionnaire.

The variables we examined to potentially explain gender differences were those associated with disability in this and other studies:

(1) Sociodemographic characteristics—age, years of education, and annual household income.

(2) Chronic-disease risk factors—body mass index (BMI; calculated as weight in kilograms divided by height in meters squared), BMI^2 (reflected a curvilinear relationship in this and other older cohorts), smoking history (cigarette pack-years), and drinks per week (beer, wine, and hard liquor). Data on weekly time engaged in moderate or vigorous physical activity and miles walked per day were collected but were not analyzed as explanatory factors because of the close correspondence between activity levels and disability measured at the same point in time.

(3) Medical history—arthritis, osteoporosis, chronic back problems, fractures in the past year, any joint pain lasting 6 weeks and specific locations of such joint pain, cardiovascular disease, pulmonary disease, neurological disorders, diabetes, vision and hearing difficulties, depression, and number of prescription medications to assess the degree of infirmity.

Differences between men and women in measures of disability, use of assistance, and possible explanatory factors were evaluated by t and χ^2 tests, as appropriate, with SAS, version 8.02, software (SAS Institute Inc, Cary, NC). Multivariable analysis of covariance was used to adjust gender-specific mean disability scores for possible explanatory factors. These analyses proceeded in a staged fashion to examine the contributions of sociodemographic factors alone, chronic-disease risk factors, and then health conditions and gender-disease interactions to gender differences. Because of the ordinal, non-normal distribution of the disability score, we also performed analyses with a cumulative logit model, which confirmed our results about gender differences and associated explanatory factors.[21]

RESULTS

Our initial results showed that women compared with similarly aged men were significantly more likely to report functional limitations (overall 52% vs 37%, $P<.001$) and had significantly greater degrees of disability (overall mean 0.30 vs 0.18, $P<.001$) (Table 1). Women also reported limitations in more of the 8 functional categories than did men (1.8 vs 1.1, $P<.001$) (data not shown). Mean scores within each functional category indicated that the most significant differences between women and men were in the IADLs (1.7 to 3.0 times greater among women, $P<.001$), e.g., reaching, gripping, and doing errands/chores. Differences in mobility functions were less pronounced (1.5 times greater among women) but still significant ($P<.01$), and differences in ADLs were evident in only 1 of the 3 categories assessed (hygiene, $P<.05$). Gender differences in the percent who reported limitations also were significant in 7 of the 8 categories of physical function (there were no reporting differences or differences in mean scores for the dressing/grooming function). In contrast, for women and men who reported limitations, the scores were not statistically different in any of the 8 categories. Thus, although more women than men reported category-specific limitations, the degree of impairment for those who had limitations in each category was similar for both women and men.

Gender differences in the use of aids, devices, or help from another person are shown in Table 2. Interestingly, women were significantly more likely than men to report the use of assistance for any of the 8 functional categories, whether or not they reported limitations. Among the group that had no disability, twice as many women as men (14% vs 7%, $P<.01$) used assistance for at least 1 functional category. Among the group that had some disability, the difference was 64% versus 48%, respectively ($P<.001$). These differences were evident only at disability levels less than or equal to 1.0, because at greater levels, almost 100% of the cohort used assistance (data not shown). The specific functional categories that showed significant male-female differences were the same for those who did and did not have limitations: hygiene, reaching, and gripping ($P<.05$). Within the hygiene category, women were more likely than men to use aids and devices but not help from another person (data not shown). Again, the greatest differences in use of assistance between men and women (more than 2.5 times greater among women) were in the IADL categories of reaching and gripping.

We examined characteristics of the cohort to identify factors that might contribute to the gender differences in disability (Table 3). Because the population sampled were university students during the late 1930s and early 1940s, the men and women were predominantly White, highly educated, and close in age (mean age=79 years). Other sociodemographic indicators favored the men, including being married (85% of men vs 47% of women) and having greater annual household income. However, men were heavier smokers and drinkers ($P<.001$), while women were more likely to be obese ($P<.01$). With regard to medical history, women had significantly more chronic health conditions during the past year and were taking more prescription medications than men ($P<.05$). Additionally, women reported conditions that were potentially physically disabling more often than men, including osteoarthritis ($P<.001$), osteoporosis ($P<.001$), chronic back problems ($P<.05$), and fractures ($P<.01$). They also had more pain and stiffness in their muscles and joints and more physical fatigue than men (data not shown). Cardiovascular disease was the only condition that was significantly more prevalent among the men.

TABLE 1—Gender Differences in Prevalence and Degree of Disability, by Functional Category

Functional Category	Functional Category Mean Disability Score (SE)		Some Limitations in Functional Category, %		Functional Category Mean Disability Score (SE) Among Those Who Have Limitations	
	Men (n = 1044)	Women (n = 304)	Men (n = 1044)	Women (n = 304)	Men	Women
Dressing/grooming	0.17 (0.02)	0.23 (0.03)	13.2	17.1	1.29 (0.06)	1.35 (0.10)
Arising	0.22 (0.02)	0.34 (0.04)**	19.2	27.6**	1.15 (0.03)	1.23 (0.06)
Eating	0.20 (0.03)	0.30 (0.05)	6.0	11.8***	1.24 (0.07)	1.31 (0.10)
Walking	0.26 (0.02)	0.39 (0.04)**	18.6	27.3***	1.37 (0.05)	1.41 (0.08)
Hygiene	0.09 (0.01)	0.16 (0.03)*	8.1	12.8*	1.10 (0.04)	1.21 (0.08)
Reaching	0.25 (0.02)	0.43 (0.04)***	19.0	31.6***	1.32 (0.05)	1.35 (0.07)
Gripping	0.05 (0.01)	0.15 (0.03)***	4.2	11.2***	1.23 (0.09)	1.32 (0.11)
Doing errands/chores	0.34 (0.02)	0.58 (0.05)***	23.6	40.1***	1.46 (0.05)	1.44 (0.07)
Overall	0.18 (0.01)	0.30 (0.03)***	37.4	51.6***	0.49 (0.02)	0.59 (0.04)*

*P < .05; **P < .01; ***P < .001.

TABLE 2—Gender Differences in Reporting Use of Help From Aids, Devices, or Another Person, by Functional Category and Limitation Status

Functional category	Reporting Use of Help			
	No Limitations in Functional Category, %		Some Limitations in Functional Category, %	
	Men	Women	Men	Women
Dressing/grooming	1.8	0	14.9	12.7
Arising	0	0	4.1	6.4
Eating	0	0	1.8	3.2
Walking	1.1	0.7	23.3	28.0
Hygiene	4.1	8.2*	27.2	38.9**
Reaching	0.2	3.4***	9.2	25.5***
Gripping	0.3	2.0*	11.0	28.0***
Doing errands/chores	0.5	1.36	22.1	29.3
Any of the 8 categories	7.0	14.3**	47.7	64.3***

*P < .05; **P < .01; ***P < .001.

Results of multivariable analyses that examined the influence of sociodemographic factors, chronic-disease risk factors, health conditions, and gender-disease interactions on the gender difference in overall disability are shown in Table 4. Findings indicate that the gender difference in mean disability remained statistically significant (P<.001) after we adjusted for both sociodemographic factors and chronic-disease risk factors. However, when adjustments also were made for specific comorbid health conditions and prescription medications, the resultant mean disability scores for men and women were essentially identical (mean=0.21). Results were similar when the number of prescription medications, which was used as a general measure of degree of comorbidity, was excluded from the model (mean disability=0.22 for women and 0.21 for men, P=.71), which indicated that the specific health conditions had the greatest impact. The conditions that were significantly associated with disability in our analyses included (in order of importance) neurological disease, hip or lower-extremity joint pain, bone fractures (P<.001 for all), back/neck/shoulder joint pain (P<.01), osteoarthritis, chronic back problems, osteoporosis, and depression (P<.05 for all) (data not shown). Greater disability also was associated with use of more prescription medications, greater age (P<.001 for both), lower income, less alcohol consumption (P<.01 for both), and both low and high BMI (P<.05). Tests of the gender-disease interactions indicated a significantly greater association of fractures and back/neck/shoulder joint pain with disability among women compared with men. Separate multivariable analyses also indicated that there were no remaining gender differences in ADL, IADL, or mobility limitations after we controlled for these same health conditions (data not shown).

We used a cumulative logit model to address the ordinal, non-normal distribution of the disability outcome. The results of our analysis confirmed the initial finding that chronic health conditions explained the gender difference in disability. The significance levels of possible explanatory factors were almost identical to those in the analysis of covariance for each variable, with the exception that osteoporosis was not statistically associated with disability in the logit modeling.

DISCUSSION

The comorbid conditions associated with disability among this cohort, which were predominantly musculoskeletal, neurodegenerative, and psychological in origin, were generally more prevalent among women than

TABLE 3—Sociodemographic Factors, Chronic-Disease Risk Factors, and Health Conditions, by Gender[a]

	Men (n = 1044)	Women (n = 304)
Age, mean y (range 73–99)	79.0 (0.1)[a]	78.9 (0.2)
Married, %	85.0	46.7***
Education level, mean y	17.5 (0.1)	17.3 (0.9)
Annual income, mean $	75 848 (824)	61 673 (1794)***
Body mass index (BMI), mean kg/m^2	24.8 (0.1)	24.2 (0.3)*
Obese (BMI ≥ 30), %	6.1	11.5**
Current smoker, %	2.0	1.6
Cigarette pack-years, mean	20.1 (0.9)	13.2 (1.3)***
Alcoholic drinks per week, mean	5.4 (0.2)	3.1 (0.3)***
Moderate or vigorous physical activity, %	69.2	64.5*
Miles walked per day, mean	1.3 (0.03)	1.3 (0.06)
No. of medical conditions, mean	2.4 (0.1)	2.8 (0.1)*
No. of prescription medications, mean	3.1 (0.1)	3.5 (0.2)*
Overnight hospital stays, mean	1.8 (0.1)	0.9 (0.2)
Osteoarthritis, %	15.2	27.6***
Rheumatoid arthritis, %	5.0	4.6
Duration of arthritis, mean y	15.0 (1.1)	19.1 (1.8)*
Osteoporosis, %	1.9	22.7***
Chronic back problems, %	12.3	17.8*
Any musculoskeletal problems, %	39.9	55.6***
Fracture in past year, %	2.6	6.3**
Joint pain for 6 weeks, %	42.8	43.4
Finger/hand/arm pain, %	16.6	19.1
Back/neck/shoulder pain, %	25.3	28.0
Feet/leg/hip pain, %	24.6	29.6
Cardiovascular disease, %	45.2	38.5*
Pulmonary disease, %	9.5	9.2
Neurological disorders, %	5.5	7.2
Diabetes, %	8.1	5.6
Vision/hearing difficulties, %	34.2	41.8*
Depression, %	3.3	4.0

[a]Values in parentheses denote standard errors.
*P < .05; **P < .01; ***P < .001.

among men, as documented by others,[1–5,10,14] and served, along with greater prescription medication use, to explain the reported higher levels of overall disability and the IADL, ADL, and mobility limitations among women. While lower income, less alcohol consumption, and high and low BMI were associated with disability and were more common among women in this cohort, after we controlled for these factors alone, the observed gender differences did not diminish. It is clear that ascertainment of and adjustment for the relevant concomitant health problems provided a basis for the detailed examination of gender differences in our study. Although few studies of disability have used such extensive information on health problems to effectively address the question,[2,5,8–11,16] our results are consistent with others that suggest that gender differences in function (disability) are caused by women's greater prevalence of mostly nonfatal but disabling conditions.[1–4,16]

Osteoarthritis is the leading chronic health condition for older adults in the United States.[22] It affects a greater proportion of women and is reported to be more disabling for women than for men.[4,13,23] While osteoarthritis and chronic joint pain were the most prevalent conditions associated with disability in our study, the analyses further indicate that they were not the only or the most important explanatory health factors. Additional multivariable analyses that looked at the association of sociodemographic factors, chronic-disease risk factors, and osteoarthritis and joint pain variables with overall disability showed that gender differences narrowed but remained unexplained by these factors (disability mean=0.25 for women and 0.20 for men, P=.04). Previous analyses also indicated that certain health problems that were significantly more prevalent among women—greater medication use, fractures, osteoporosis, and chronic back problems—appeared to be more strongly associated with disability than osteoarthritis. Verbrugge et al. also noted that some of these conditions had a greater relative impact on disability than arthritis.[9,15] Neurological disorders—including Parkinson's disease, multiple sclerosis, dementia, and Alzheimer's disease—and depression were clearly associated with disability but were only somewhat more common among women than among men. These findings suggest that a greater variety of acute and chronic health conditions contribute substantially to gender differences in disability and to quality of life among aging men and women.

The self-report nature of the data on physical limitations and health problems in our study raises the question of whether women may have similarly overreported (or men underreported) both types of information, which may have resulted in spurious findings regarding gender differences and explanatory comorbid conditions. However, validation studies of disability measured by the Health Assessment Questionnaire have shown good correlations (r=0.88) of scores obtained by questionnaire versus medical evaluation of activity performance, with no apparent differences in validity between men and women.[10,18] Additionally, a 1998 validation study of self-report among this cohort compared participant-reported conditions to those noted in the medical record by the participants' physicians (unpublished data). After we adjusted for physician reporting and age, there were no statistically significant differences between men

TABLE 4—Gender Differences in Disability After Adjustment for Sociodemographic Factors, Chronic-Disease Risk Factors, and Health Conditions: Results of Multivariable Analysis of Covariance

	Mean Disability Scores (SE)		
	Adjusted for Age and Sociodemographic Factors[a]	Adjusted for Age, Sociodemographic Factors, and Chronic-Disease Risk Factors[b]	Adjusted for Age, Sociodemographic Factors, Chronic-Disease Risk Factors, and Health Conditions[c]
Men	0.19 (0.01)	0.19 (0.01)	0.21 (0.01)
Women	0.29 (0.02)*	0.28 (0.02)*	0.21 (0.02)

[a]Sociodemographic factors include educational level and total annual income.
[b]Risk factors include alcohol use, cigarette pack-years, body mass index (BMI), and BMI^2.
[c]Health conditions include osteoarthritis, rheumatoid arthritis, duration of arthritis, osteoporosis, neurological disorders, cardiovascular disease, pulmonary disease, diabetes, vision/hearing problems, depression, finger/hand/arm pain, feet/leg/hip pain, back/neck/shoulder pain, chronic back problems, bone fractures, and number of prescription drugs.
*$P < .001$.

and women in any of the disease conditions assessed, including cardiovascular disease, pulmonary conditions, arthritis, other musculoskeletal disease, cancer, and vision/hearing problems. There also were no differences between the 2 groups in the total number of conditions reported. Another investigation of gender differences that compared self-reported disability with performance measures concluded that men and women generally report their disabilities accurately, and the higher prevalence of functional problems among women is probably a reflection of true greater disability on most measures.[16]

Gender differences in disability also may have resulted from earlier mortality among men who had fatal disabling conditions. On the other hand, if there were early mortality among women from, for example, obesity-related diseases, this would serve to reduce some of the gender difference among the cohort before observation in this study. While data are not available on all eligible participants before study entry, there is data on disability for participants who died over the course of follow-up. Age-adjusted disability at study entry was 0.13 versus 0.20 among men and women who were deceased by 1999. These averages were significantly greater than those among individuals who were followed through 1999 (0.05 vs 0.09, respectively) or who dropped out of the study for other reasons (0.06 vs 0.10, respectively). However, the gender difference, or ratio of male to female disability, was quite similar among those who died, dropped out, or were followed, which indicates that any "selective mortality" among men, women, or both may have had a minimal impact on the gender differences observed in our analyses. Furthermore, selective mortality that reflects disabling comorbidity among either men or women would indicate an explanatory role of concomitant health conditions on gender differences and thus be consistent with our findings. Results from a previous study of gender differences in disability prevalence also minimized the impact of selective mortality.[12]

Other important results of our study indicate that while women reported more disability than men did in almost all of the 8 functional categories, and particularly in those related to IADLs and mobility, the differences were predominantly in the percentage who reported a limitation and not in the severity of the limitation once it was identified. Use of assistance also was greater among women than among men who did or did not have physical limitations, primarily in the IADL categories. These pronounced gender differences in IADL limitations are consistent with previous studies.[1,2,7,9,24] The fact that women needed more help than men with reaching and gripping, even when no limitations were reported, also indicates that factors unrelated to true disability, such as stature and strength, may have played a role. Differences in assistance with hygiene were apparent in the use of aids or devices and not in the use of help from another person. This finding may reflect the fact that 43% of these women, compared with 13% of the men, lived alone and could not depend on another person for help. Additionally, there may have been greater concern for the prevention of falls among women, particularly among those who did not have limitations, as has been suggested by others.[4]

CONCLUSIONS

While the homogeneity of this population with regard to race/ethnicity and education may limit the generalizability of these study findings, it served as a built-in control that strengthened our ability to draw inferences from the gender comparisons. Because physical disability caused by numerous disorders is the most prevalent major health problem of the elderly in the United States,[25,26] public health policies aimed at reducing the associated burden are important. Not only do women have more disabilities than men, they also live longer with diminished quality of life. Furthermore, they need more assistance from others and the health care system. However, nonfatal disabling conditions may not receive medical care commensurate with their frequency and their impact[27]; thus, women may be less likely to recover from an initial illness experience.[5,8,12] In addition to efforts at disease prevention, resources aimed at earlier identification and better case management of patients with potentially disabling conditions may serve to slow functional decline and diminish its burden on both the individual and society. ■

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H.B. Hubert was the principal investigator and supervised the analyses. K.N. Murtagh completed the data analyses, and both authors contributed to the writing of the article.

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This study was approved by the institutional review board of Stanford University.

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Weapons in the Lives of Battered Women

Susan B. Sorenson, PhD, and Douglas J. Wiebe, PhD

Objectives. We assessed weapon use in intimate partner violence and perspectives on hypothetical firearm policies.

Methods. We conducted structured in-person interviews with 417 women in 67 battered women's shelters.

Results. Words, hands/fists, and feet were the most common weapons used against and by battered women. About one third of the battered women had a firearm in the home. In two thirds of these households, the intimate partner used the gun(s) against the woman, usually threatening to shoot/kill her (71.4%) or to shoot at her (5.1%). Most battered women thought spousal notification/consultation regarding gun purchase would be useful and that a personalized firearm ("smart gun") in the home would make things worse.

Conclusions. A wide range of objects are used as weapons against intimate partners. Firearms, especially handguns, are more common in the homes of battered women than in households in the general population. (*Am J Public Health.* 2004; 94:1412–1417)

More than 1.5 million physical or sexual assaults are committed by current or former intimate partners each year in the United States, and 1 in 4 women report having been harmed by an intimate partner during their lifetime.[1] About one half of the female victims sustain an injury, but only about 20% of those who are injured seek medical treatment.[2] Even so, US emergency departments treat nearly 250 000 patients—mostly women—annually for injuries inflicted by an intimate partner.[2] Women injured by intimate partners account for about 1 in 5 hospital emergency department visits for intentional injury.[2]

Because weapons increase the ability to inflict harm, it would be useful to know more about objects that are used as weapons against intimate partners. Far less is understood about the means than about the results (i.e., the medical outcomes) of weapon-related violence. Of particular interest are firearms, because they have a higher case fatality rate than other means of inflicting assaultive injury.[3,4] In addition, firearms are among the few weapons that are subject to purchase or possession restrictions.

The primary objectives of the present study were twofold: (1) to investigate the range of weapons used and the relative frequency with which weapons are used against intimate partners and (2) to describe firearm prevalence and use in intimate partner violence. In addition, we assessed battered women's perspectives on firearm-related policies that would affect them directly. To obtain such information, we interviewed residents of battered women's shelters—women who were likely to be representative of those who have experienced substantial amounts of violence and who have had various objects used against them by an intimate partner.

METHODS

Sample Recruitment and Data Collection

Structured in-person interviews were sought with women staying in 84 emergency shelters for battered women across California. The 84 shelters constituted the population of emergency shelters then funded by the California Department of Health Services. Permission to conduct interviews with residents of emergency shelters was first sought from each agency's executive director and then sought from shelter residents themselves. Shelters that agreed to participate were given a $125 certificate for domestic violence prevention training materials, regardless of whether residents of the shelter participated. Participating residents were offered a $25 grocery store certificate for their time.

Executive directors of 72 agencies (86%) gave permission for residents of their emergency shelters to be interviewed. Residents of 67 of the 72 shelters (93%) were eligible (i.e., were aged at least 18 years and spoke English or Spanish) and agreed to participate in the study. RoperASW (Princeton, NJ), a national survey research firm, conducted the 417 interviews during May through August 2001. Most (77.8%) were conducted in English, 18.1% were in Spanish, and 4.2% used a combination of both; interviews averaged 19 minutes each.

Interview Content

The first set of questions focused on the types of weapons that had ever been used against the respondent by an intimate partner, by the respondent to harm her partner, or by the respondent in self-defense. Because we were interested in both injury and noninjury outcomes, the questions specified weapon use intended to hurt, to scare, or to intimidate. After identifying the person of interest and motive for use (e.g., the respondent, use in self-defense), the interviewer read the same list of potential weapons, which included an "other" option.

The second area focused on firearms within the context of the woman's most recent relationship—that is, the relationship the woman was in before she entered the shelter. The questions included firearm ownership by the woman's partner, whether a firearm was kept in the home, and the use of guns within the context of the relationship. If the 2 partners had not lived together (and only 7.9% had not), we asked about guns in each residence and tabulated responses across the 2 households. In addition, the woman's perspective was sought regarding firearm-related manufacture and distribution innovations not currently available in the United States—that is, personalized firearms ("smart guns") and spousal notification/consultation regarding firearm purchases.

Survey development included refining questions with a focus group of battered women, pretesting, and pilot testing. The final question-

naire was translated into Spanish and translated back into English, and minor changes were made to ensure equivalency of the forms.

RESULTS

Respondent Characteristics

For two thirds (67.9%) of the respondents, this was their first stay at an emergency shelter for battered women; for 17.5%, it was their second stay. Most of the respondents (57.1%) had been at the shelter for 3 weeks or less. Most (69.6%) had children with them at the shelter; one third (31.4%) had children staying elsewhere.

Most of the respondents were members of minority groups: 36.9% were Hispanic, 15.7% were Black, 12.8% were of another ethnicity, and 34.7% were White. Two thirds (66.8%) were US natives, 20.4% were born in Mexico, and 12.8% were born elsewhere. The average age was 33 years (range: 18–69 years). About one third (36.2%) of the respondents were married, 42.3% were living with but not married to their partner, 13.5% were separated or divorced, and 8.0% reported another relationship status. About one third (36.4%) had less than a high school education, 27.7% had graduated from high school, 27.5% had some college education, and 8.4% had graduated from college. Almost half (44.4%) of the respondents were employed outside the home (28.0% full-time, 16.4% part-time), 37.4% were housewives, and 18.1% had another employment status. The typical respondent was poor. Almost half (42.4%) reported an annual household income of less than $15 000, 23.4% reported $15 000–$29 999, and 13.3% reported $25 000–$39 999; few (9.9%) reported an annual income of $40 000 or more. Eleven percent (11.1%) said that they did not know their household income.

Lifetime Weapons Use in Intimate Partner Violence

Against battered women. The first column of Table 1 lists objects that had ever been used as a weapon by an intimate partner to hurt, threaten, or scare the respondent. Almost all of the respondents had had words and hands or fists used against them. The majority had had a door (e.g., slammed against body or limb) or wall (e.g., they were shoved against a wall), feet, or some type of household object used against them. Household objects identified most often were telephones or telephone cords (19.9%), pots/pans (9.8%), and plates/dishes (9.4%). Other objects used against the respondents included, but were not limited to, ashtrays, brooms, furniture, knives (nonkitchen), pillows, scissors, bottles, and irons. Among the 22.8% who reported that an intimate partner had used a tool against them, hammers and screwdrivers were most commonly reported (41.1% and 36.8%, respectively). Wrenches, pliers, and axes were among the other tools specified. More than one third reported that an intimate partner had used a motor vehicle as a weapon against them.

Among the 36.7% who reported that a firearm had been used against them, victimization by a handgun was reported twice as often as that by a long gun. Whether a firearm was used against the respondent was positively associated with the number of weapons used (t test=17.1, $P<.001$). Women who had been victimized with a firearm and those who had never been victimized with a firearm reported that an average of 8.1 and 4.6 types of weapons had been used against them, respectively.

By battered women against an intimate partner. Battered women were substantially less likely to use a weapon against an intimate partner than to have it used against them (see the second column of Table 1). Words were the most common weapon used against a partner, followed by hands or fists, feet, and household objects. Few of the women had used a motor vehicle or a firearm against an intimate partner.

By battered women in self-defense. Although few women had used objects as weapons to harm an intimate partner, it was common for them to have used objects in self-defense (see the third column of Table 1). The use of words, hands or fists, and feet was common. A substantial minority had used a door or wall, household object, or motor vehicle in self-defense.

Few of the respondents reported having used a gun in self-defense. There was some overlap between using a gun in self-defense

TABLE 1—Objects Used by an Intimate Partner to Hurt, Scare, or Intimidate or in Self-Defense: 417 Residents of 67 California Battered Women's Shelters

	Used by Partner to Hurt Respondent, %	Used by Respondent	
		to Hurt Partner, %	to Defend Self, %
Weapon Type			
Hands or fists	96.9	19.2	79.3
Feet	65.7	7.7	54.2
Words	98.3	49.9	82.2
Door or wall	71.5	3.5	28.5
Belt	25.2	0.5	2.9
Kitchen knife	34.4	4.1	15.4
Other household object (e.g., telephone, pan, ashtray)	56.8	6.2	25.0
Machete	9.4	0.2	0.5
Tool (e.g., hammer, screwdriver)	22.8	0.7	5.1
Car, pickup truck, or other vehicle	37.4	4.6	18.2
Long gun	15.9	1.0	1.4
Handgun	32.1	1.2	3.1
Other	21.8	3.1	5.5
No. of types of weapons			
Mean ±SD	5.9 ±2.6	1.0 ±1.4	3.2 ±1.9
Range	1-13	0-11	0-11

Note. Objects are listed in the order that respondents were asked about them. Missing data were rare (<0.01% on each question).

and using a gun in aggression. Of the 15 women who had used a firearm in self-defense, 5 had also used a firearm aggressively against a partner. Of the 6 who had used a gun aggressively against a partner, 5 also had used the gun in self-defense.

Firearms in Most Recent Relationship

Firearm ownership by the partner. Two fifths (39.1%) of the respondents reported that their most recent partner owned a gun during the time of the relationship. (Few [3.8%] said that they did not know whether their partner owned a gun.) Among the 163 respondents whose partner owned a firearm, 53.4% reported that he obtained a firearm during the time of the relationship. Most respondents (66.9%) reported that the partner's having a gun made them feel less safe; 11.7% reported feeling more safe, and 8.0% reported feeling safer at first but less safe later. One third (35.0%) of the partners who had a gun had more than 1.

Firearm presence in the home. About one third (36.7%) of respondents reported that they had a gun in their home at some point during the time of the relationship with their most recent partner. Most reported that having a gun in the home made them feel less safe (79.2%), but some said that they felt safer (11.7%) or safer at first but less safe later (5.8%).

As shown in Table 2, only 2 of the measured respondent characteristics were associated with having a gun in the home. The odds of having a firearm in the home was higher for women with a college education than for those with a high school education (adjusted odds ratio=2.16, $P<.006$) and for US-born women than for immigrant women (adjusted odds ratio=1.84, $P<.03$). Adding the number of weapons used against the woman improved the fit of the model, and for every additional weapon ever used against the woman, the odds of having a gun in the home increased by 1.38.

TABLE 2—Predictors of Having a Firearm in the Home: 417 Residents of 67 California Battered Women's Shelters

	AOR (95% CI)	
	Model Incorporating Demographic Characteristics Only	Model Incorporating Demographic Characteristics and No. of Weapons
Ethnicity		
Hispanic (vs White)	1.07 (0.59, 1.93)	1.10 (0.58, 2.07)
Black	0.67 (0.35, 1.31)	0.63 (0.31, 1.29)
Other	0.78 (0.38, 1.58)	0.77 (0.36, 1.64)
US born (vs immigrant)	1.84* (1.05, 3.24)	1.25 (0.69, 2.27)
Relationship status		
Living with (vs married)	0.78 (0.47, 1.28)	0.84 (0.49, 1.43)
Separated or divorced	0.82 (0.41, 1.64)	0.69 (0.33, 1.44)
Other relationship	0.47 (0.18, 1.19)	0.41 (0.15, 1.10)
Education		
<High school (vs high school)	0.86 (0.49, 1.51)	0.72 (0.39, 1.31)
College	2.16** (1.25, 3.72)	2.21** (1.23, 3.95)
Workforce status		
Working part-time (vs full-time)	1.00 (0.52, 1.93)	1.17 (0.58, 2.35)
Housewife	0.85 (0.50, 1.47)	0.90 (0.51, 1.61)
Other working	1.21 (0.63, 2.32)	1.37 (0.68, 2.77)
Children in home during past year (vs no)	1.43 (0.81, 2.52)	1.47 (0.80, 2.68)
No. of weapons used against the woman (lifetime)		1.38* (1.25, 1.53)

Note. AOR = adjusted odds ratio; CI = confidence interval.
*$P<.05$; **$P<.01$.

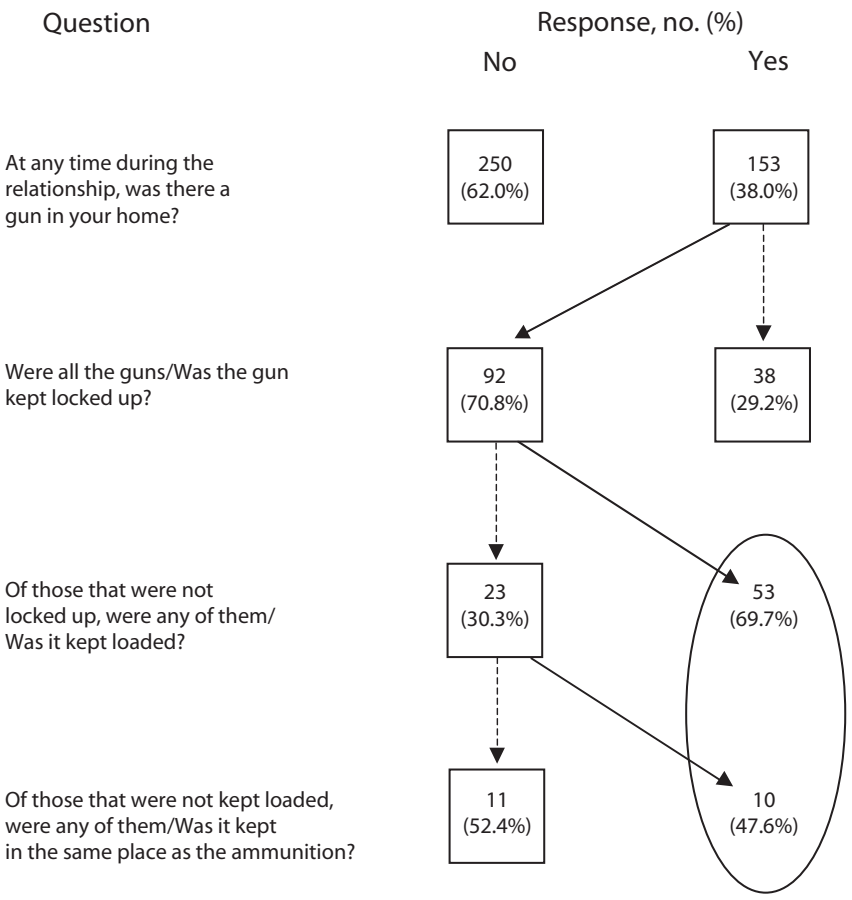
Handguns were more common than long guns. Among the 153 households containing a firearm, 54.3% had handguns only, 12.4% had long guns only, and 30.7% had both handguns and long guns. A few (4) respondents reported that they did not know what kind of gun was in the home.

The average number of firearms in homes with at least 1 gun was 3.8 (SD=9.2). The average number of handguns and long guns in a household was 2.5 (range: 0–50; median: 1) and 2.2 (range: 0–50; median: 1), respectively. Eleven (0.7%) of the women with a gun in the home reported that 10 or more guns were kept in the home. Most (78.0%) of the women with a gun in the home knew where the gun was kept (or where all guns were kept); 17.0% said that they did not know where the gun was kept (or where any guns were kept).

In a substantial minority of the households containing firearms, guns generally were easy to access and to fire (Figure 1). Of the 153 battered women who reported the presence of a gun or guns in the home, at least 41.2% lived where a gun was kept unlocked and loaded or unlocked and with ammunition.

Firearm use. If a gun was kept in the home, the respondent was asked whether she and her partner had used the gun(s) against each other. Nearly two thirds (64.5%) responded that the partner had used one of the guns to scare, threaten, or harm her. When asked what happened during the incident, 71.4% of these 98 women reported that the partner threatened to shoot or to kill her. Respondents also reported that the partner threatened to kill himself (4.1%) or to harm or to kill the children (3.1%). Five percent (5.1%) of the women reported that their partner had shot at them (16.3% did not answer the question). In most cases (74.5%), substances had been used by the partner just before the incident: 30.6% had used alcohol and other drugs, 27.6% had used alcohol only, and 16.3% had used other drugs only.

A small proportion (6.7%) of the women reported that they had used a gun in the home against their most recent intimate partner; most often, they "scared him away/ran him off" or threatened to kill or harm him.



Note. Solid arrows indicate responses leading to the observation that, among respondents reporting a gun or guns in the home, 41.2% said that at least 1 gun was kept unlocked and either already loaded or kept with ammunition. Some respondents said that they did not know how the guns were stored: 23 of 153 did not know whether the guns were locked up, 16 of 92 did not know whether the unlocked guns were kept loaded, and 2 of 23 did not know whether ammunition was kept with the unlocked and unloaded guns. These "do not know" responses were omitted from the figure.

FIGURE 1—Gun-keeping practices in the homes of 417 residents of 67 California battered women's shelters during their relationships with a violent partner.

Although few of the women had used a gun against her partner, 31.0% of those with firearms in the home said that they had thought about doing so. Among the reasons for considering using a gun, the most common ones focused on the partner—to defend against (20.8%), to kill (18.2%), to threaten or intimidate (6.5%), or to injure but not kill him (5.2%). To defend against an intruder (18.2%), to kill herself (9.1%), or to go hunting or target shooting (7.8%) were the remaining specified categories. Each of the women who used a gun against her partner reported that her partner had used a gun against her.

Perspectives on Hypothetical Options

Some countries (e.g., New Zealand) require that when a person wants to purchase a firearm or a certain kind of firearm, the opinion of the person's spouse or intimate partner be sought. Three fourths (74.3%) of the respondents thought that this would be a good law to have, 12.7% said that it would be a bad law, 11.8% were not sure, and a few (1.2%) did not answer. Among respondents who thought that it would be a good law, more than half liked the idea because it would help to protect them from the violent partner (28.3%) or because they would then know that he had or was getting a gun (23.8%). Another 30.5% liked it because "the spouse or partner is the one who knows that person best." The single other response category to this open-ended question was that the decision to obtain a gun should be a mutual decision (14.1%). Those opposing such a law expressed sentiments to the effect that guns should not be available at all (36.6%), while others expressed opinions such as "I don't like guns" (7.3%) or "it's no one's business" and "an adult should be able to buy a gun" (4.9%). Regardless of their perspective on such a law, 91.8% of the women reported that if their opinion were sought, they would say that it was not OK for their partner to get the gun.

Personalized or "smart" guns are in development.[5] Such weapons are designed so that only an authorized user (e.g., the owner of the gun) can fire them. Most respondents (67.9%) reported that having a personalized firearm in the home would make things worse for them, 11.5% reported that it would make "no difference," 5.5% said that it would make things better, and 14.8% were unsure what effect it would have. Among those who said that a personalized firearm would make things worse, it was evaluated negatively because the woman felt that the partner could use the gun against her or the children (43.9%), because only the partner could use the gun and she could not use it for self-defense (32.2%), because she was opposed to having guns in the home (11.8%), or because any kind of gun is unsafe (9.8%).

DISCUSSION

A wide range of objects were used to injure and intimidate battered women. Although hands, fists, feet, and common household objects were the most common means of inflicting harm, the use of vehicles and firearms, 2 mechanisms with high lethality potential, were reported by more than one third of the women in this study.

Having a firearm in the home appeared to be more common in homes in which battering occurs than in households in the general population. In California, a state where more than 620 000 women experience intimate-partner violence each year,[6] about 31.0% of households contain a firearm.[7] Our findings suggest that among households where vio-

lence has occurred that was sufficiently chronic or severe for the woman to have sought refuge at a battered women's shelter, the proportion of households with a gun or guns is 36.7%, or about 20% higher than in the general population. As is the case with US household gun ownership,[8] the prevalence of having a gun in the home increased with education level, ranging in this study from a low of 27.8% among respondents with less than high school education to 49.7% among those who had attended or graduated from college. The proportion of households with a long gun only or with both a long gun and a handgun was lower among the households of battered women than among the general population (4.6% vs 8.9% for a long gun only; 11.3% vs 15.6% for both types of gun). However, the proportion of households with a handgun only was much higher among the women in this study than among the general population (19.9% of respondents' households in this study vs 7.0% of households in the general population).

Study findings suggest that guns kept in a home in which there is violence are used to harm household members—specifically, an adult woman. This finding indicates 2 observations: (1) if a gun was present, its use in intimate partner violence was relatively common, and (2) the gun used against the respondent was a gun that was kept in the home. Previous research has found that keeping a gun in the home increased the risk for household members to be murdered at home; the risk for women was particularly high.[9–11] However, it was not reported in that research or in related research[12] whether the gun used was kept in the home.

Women who had been victimized by an intimate partner with a firearm also reported more types of weapons having been used against them during their lifetimes. Battering typically progresses from a relatively low level of violence to a level that is more frequent and severe. We cannot ascertain from these data when the firearm was first used in the course of the abuse: it may have been introduced early on and provided the tactical means by which other weapons were used against the woman or it could have been added later, after multiple other objects were used against her. We must caution that, aside from firearms use, relationship-specific weapon use was not assessed in this study; therefore, we cannot assume that the various weapons the woman reported were all used against her by the same partner, although such an assumption would seem logical. Thus, we acknowledge the possibility that a woman was in a relationship with one partner who used a firearm against her, another who used a household object against her, and so forth. Moreover, because these data share the limitations of all self-report data, we suggest that whenever possible, future research should access multiple data sources. In addition, replication of this study with other populations would be useful.

Implications for Health Care

Battered women make more visits to emergency departments than do other women[13] and are at risk for numerous adverse physical, psychological, and social sequelae.[14] Accurate identification of the underlying cause of patient-exhibited symptoms would likely benefit individuals' long-term health and reduce health service use.

Even if an injury is caused by battering, the use of common household objects to inflict injury may obscure that fact. For example, a woman who participated in the focus group that was part of the questionnaire development reported that her partner used a string trimmer (an electric or gas-powered lawn/garden tool) to injure her and that in the emergency room her injuries were treated as a common household accident. Incorporating information about the incident in addition to the injury type and anatomical site would likely increase the numbers of injuries accurately attributed to battering.[15]

Implications for Policy

Federal and state legislation has acknowledged and attempted to mediate the link between firearms and domestic violence.[16–18] As with other types of survivors or victims,[19] battered and formerly battered women have been effective advocates for policy change. To our knowledge, this study is the first to seek opinions regarding firearm policies directly relevant to their circumstances from a large number of women at high risk of sustaining serious injury caused by battering. Most of the women in our study thought that smart guns would worsen their situation, whereas most favored a policy requiring spousal notification/consultation for firearm purchases.

It is important to note that battered women may be reticent to disclose violence for fear of further abuse or other consequences. Evidence of such reticence emerged in our study: when posed with a hypothetical situation in which a violent partner had applied to purchase a gun and the respondent had been asked whether the partner had been violent to her, 71.4% of respondents answered that they would have said yes if asked during the time of the relationship; this percentage rose to 87.0% when the timing of the hypothetical situation was changed to after the relationship had ended, or at least while the respondent was residing at a battered women's shelter. Thus, although a substantial majority reported that they would have acknowledged the partner's violence in a gun purchase situation, 13.0% said that they would not have done so even if they were in a seemingly safe place away from the partner.

Conclusions

A wide range of objects are used against and by battered women. Firearms are more common in the households of battered women and their partners than among the general population, which is cause for concern, given the lethality of firearms. In addition, firearms can be used to intimidate a woman into doing something or allowing something to be done to her—such coercion would not necessarily result in physical injury or at least not in a gunshot wound. For this reason, firearms and injury research should go beyond gunshot wounds to examine the role of threat potential in facilitating harm.

The feasibility of implementing spousal notification/consultation in the United States merits discussion, particularly in light of technological advances such as personalized weapons. If battered women's views are more fully taken into account, unintended consequences of engineering and public policies may be foreseen and avoided. ■

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Contributors

S.B. Sorenson conceived the study, secured the funding, designed the questionnaire, recruited shelters, supervised data collection, conducted data analysis, and drafted parts of the article and edited others. D.J. Wiebe assisted in questionnaire development and shelter recruitment, conducted data analysis, and drafted parts of the article and edited others.

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Human Participant Protection

The study was approved after full review by the University of California, Los Angeles general campus institutional review board.

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Gender Differences in Substance Use Treatment Entry and Retention Among Prisoners With Substance Use Histories

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Objectives. We examined gender similarities and differences in the predictors of substance use treatment entry and of the combination of treatment entry and completion.

Methods. The sample consisted of 2219 male and female program participants. Maximum likelihood probit estimation was used to identify background and attitudinal characteristics predictive of substance use treatment entry and retention.

Results. We observed gender similarities and differences in predictors of treatment entry and the combination of treatment entry and completion. Many of the factors that attract individuals to treatment are the same ones that keep individuals in treatment.

Conclusions. Attitudinal predictors—namely, motivation to change—showed the greatest consistency between genders and between predictors of treatment entry and predictors of treatment entry and completion. (*Am J Public Health.* 2004;94:1418-1424)

Drug abuse has been identified as the nation's most serious health problem, because it strains the health care system and has adverse effects on families, the economy, and public safety.[1] The considerable growth among prison populations during the past decade has largely involved individuals with substance abuse problems.[2] The national incarceration rate has steadily increased, and more than 550,000 individuals now return to their communities each year, most of them with untreated drug abuse problems.[3] Thus, the public health role of the criminal justice system is now greater than ever before.[4]

Although research shows treatment to be effective, there is a potential for enhancing its effectiveness through a better understanding of treatment entry and retention.[4,5] An understanding of treatment entry in particular is important, because only a small number of substance users enter treatment.[5,6] Most of the attention within the field of substance abuse has been on treatment retention—only recently, in the last decade, has attention been paid to help-seeking behavior.[6,7] Encouraging appropriate help-seeking behavior by substance users can help reduce misuse, particularly by women, of health services other than substance abuse treatment.[6,8,9]

Our understanding of treatment entry and retention within prison settings is very limited because there are few prison-based studies of treatment retention[10,11] and no studies of treatment entry. The limited studies of treatment entry among community samples of various types of drug abusers[7,12–19] encountered little consistency among the characteristics they found to be predictive of treatment entry.[5] However, higher levels of problem severity have been associated with treatment volunteerism (volunteering for treatment). In addition, studies that include dynamic predictor factors (factors that change over time) have found that individuals with higher motivation are more likely to enter treatment.[19]

The findings in the literature on treatment retention[10,11] are similar to those on treatment entry: sociodemographic factors have been inconsistent predictors of retention[11,20–30] and have generally not been strong predictors.[6,10] However, various measures of motivation have been consistently related to treatment retention.[10,25,26,29,31–34]

There is a growing awareness in the treatment retention literature of gender differences that may differentially affect retention for women.[35,36] Women are more likely than men to enter treatment[17] and to engage in drug treatment.[37] Some studies show women to be less likely than men to remain in drug treatment,[23,27,28] whereas other reports have found no relationship.[38,39] Women's programs that offer specialized services or interventions[35,36,40–42] have higher retention rates. Research, however, has not systematically addressed the question of gender differences in treatment entry and treatment retention.

The purpose of our study was to examine treatment entry as well as the combination of treatment entry and completion. Previous research seldom has examined prison populations, and there is little information on gender differences in treatment entry or completion. Therefore, we examined individuals incarcerated in federal prisons and separately examined men and women. Finally, we assessed whether differences existed between characteristics of individuals who merely enter treatment and individuals who both enter and complete treatment.

Retention was conceptualized as program completion, because federal prison programs have a defined time frame. Unlike previous research, which examined predictors of retention among individuals already admitted to a program, we examined the combination of treatment entry and retention. It was necessary to account for self-selection into treatment (i.e., volunteering), because the causal process of volunteering for treatment might be similar to that of volunteering for and completing treatment.

METHODS

Participants

Participants took part in an evaluation of the Federal Bureau of Prisons' (BOP's) residential drug abuse treatment programs. Participants were in 4 female "unit-based" (all participants reside in the same housing unit) programs or 16 male unit-based programs and were admitted to treatment between 1991 and 1995. Three of the programs were 1000-hour interventions that offered treatment over

a 12-month period. The remaining 17 programs were 9-month, 500-hour interventions. The cognitive–behavioral treatment programs emphasized relapse prevention and criminal lifestyle issues. Admission criteria required that inmates be within 36 months of release and have a moderate to severe substance use problem. Treatment volunteers did not choose between the 12-month and 9-month programs, because their choices were limited to the programs available at their prison.

Comparison subjects were randomly selected from among individuals who met the criteria for admission to the programs but who did not volunteer for treatment. Individuals who met criteria for program admission but who did not volunteer for treatment were randomly selected from 40 prisons between 1993 and 1995. To ensure that these comparison subjects did not later become treatment participants, selection was made only from among inmates who had less than 15 months remaining on their sentences. The overall sample consisted of 2219 participants. Of 1734 men, 1189 were treatment participants and 545 were comparison participants; of 485 women, 300 were treatment participants and 185 were comparison participants.

Measures

Experimental predictors were background and attitudinal characteristics found to be predictive of treatment entry or treatment retention in other studies, background characteristics which differed between men and women who use drugs, and attitudinal measures with theoretical relevance to drug treatment programs.[43] Data were derived from the BOP's automated database and from inmate interviews and surveys. To forestall refusals, it was arranged that inmates would continue to receive their normal pay (for assigned work) while participating in the research.

Demographic characteristics were race/ethnicity, years of education, and ever having been legally married. Indicators of criminal history included severity of current offense, history of violence, age at time of most recent commitment, age at first arrest, and sentence length. In addition to employment status in the month before incarceration, a variety of family background items were included: family ties, spouse substance use problems, plans to live with minor children (aged ≤18 years) after release, history of physical abuse before 18 years of age, and history of sexual abuse. Substance use history was categorized by type of drug or drugs ever used on a daily basis. Other items included history of drug treatment and previous illegal drug use quit attempts of at least 30 days' duration. Lifetime *Diagnostic and Statistical Manual of Mental Disorders, Revised Third Edition*[44] diagnostic information for depression and antisocial personality disorder was obtained with the automated Diagnostic Interview Schedule, which has been found to be reliable and valid.[45,46]

The 4 stages of Prochaska's Change Assessment Scale were used to measure internal motivation.[47] Individuals must realize that they have a problem, i.e., not deny their problem (precontemplation); contemplate acting to address the problem (contemplation); take specific action (action); and after taking action, use strategies to maintain change (maintenance). Another attitudinal measure used was the Hope Scale,[48] which comprises 2 subscales. The first subscale, *agency,* refers to a person's sense of successful determination in relationship to reaching his or her general goals. The second subscale, *pathway,* refers to a person's sense of being able to plan to meet his or her goals. The final attitudinal measure was the deliberate problem-solving subscale of the ways of coping questionnaire.[49]

A measure of external incentive provided an indication of whether an individual was eligible for a sentence reduction (in increments up to 1 year) for successful program completion. This incentive became available at the midpoint of the data collection period; thus, it was possible to identify whether the individual volunteered before or after this incentive became available and how much time he or she could have gained: no time, less than 5.5 months off, or more than 5.5 months off.

Treatment completion was defined as completing either the 9- or the 12-month program. Reasons for treatment noncompletion included discharge for disciplinary reasons, termination for administrative reasons (e.g., released before completion), and dropout. The analyses distinguished the 9- and 12-month programs because of the possibility that completing a 12-month, 1000-hour program is more difficult than completing a 9-month, 500-hour program.

Design

Maximum likelihood probit estimation procedures were used to provide estimated probabilities for the two outcomes. The choice of a probit procedure rather than a logit procedure was one of convenience, because the results derived from these 2 procedures are very similar.[50,51] Methodological details are available elsewhere.[44]

RESULTS

Effects vector coding, wherein each coefficient represents the contrast of a specific category with the adjusted grand mean, was used for categorical variables. However, for preincarceration drug use, dummy variable coding was used to compare each category with the referent category of no daily substance use in the year before incarceration.

A positive probit coefficient implied a greater likelihood of entering or completing treatment, whereas a negative coefficient implied a reduced likelihood. The Wald χ^2 test[52] was used to test for gender differences between coefficients when coefficients were significant. For simplicity, the results displayed in Tables 1 and 2 include only variables that were significant. Results for the type of program (12 month or 9 month) were excluded from those reported for treatment entry, because the coefficient representing the type of program (12 month or 9 month), because individuals were not able to choose between the 2 types of programs. Table 3 displays characteristics found to be significant in 1 or more models. Although women had more problems in employment and depression and were more likely to have a history of physical abuse, they also had higher levels of internal motivation.

Treatment Entry

Table 1 displays the results for treatment entry. Race/ethnicity was unrelated to treatment entry. However, both men and women of higher education levels were less likely to enter treatment. An effect was found for having been convicted of an offense of moderate

TABLE 1—Predictors of Treatment Entry for Men and Women: Maximum Likelihood Probit Estimation

Characteristic	Men Estimate (SE)	Women Estimate (SE)
Race/ethnicity		
African American	0.019 (0.119)	0.476 (0.215)*
Other	−0.071 (0.208)	−0.373 (0.380)
Severity of offense		
Moderate	0.203 (0.081)**	−0.375 (0.142)*
High	−0.167 (0.111)	0.054 (0.193)
Greatest	0.010 (0.108)	0.324 (0.242)
Average/good family ties	−0.273 (0.089)**	0.269 (0.121)*
Education level	−0.073 (0.024)**	−0.096 (0.043)*
Employment at time of incarceration		
Employed	0.056 (0.113)	0.346 (0.186)
Not in workforce	−0.132 (0.201)	0.622 (0.312)*
Unemployed	−0.029 (0.155)	−0.239 (0.249)
Unknown status	0.221 (0.305)	−0.838 (0.440)
Substance use history before arrest		
Daily use of alcohol only	−0.058 (0.138)	1.157 (0.508)*
Daily use of marijuana only	−0.089 (0.111)	−0.512 (0.254)*
Daily use of marijuana and other illicit drug(s)	0.100 (0.101)	−0.039 (0.237)
Psychiatric diagnoses		
Depression only	0.005 (0.168)	−0.475 (0.209)*
Antisocial personality disorder only	−0.074 (0.105)	0.270 (0.233)
Both antisocial personality disorder and depression	−0.247 (0.156)	−0.492 (0.227)*
Neither antisocial personality disorder nor depression	0.039 (0.096)	0.332 (0.164)*
Family characteristics		
History of physical abuse (before 18 years of age)	−0.029 (0.074)	0.217 (0.107)*
Plan to live with minor children after release	0.148 (0.057)**	0.246 (0.102)*
Internal motivation score (Prochaska's Change Assessment Scale)		
Precontemplation	−0.495 (0.091)**	−0.622 (0.181)**
Contemplation	0.642 (0.178)**	0.556 (0.324)
Action	−0.032 (0.170)	−0.445 (0.290)
Maintenance	0.310 (0.106)**	0.497 (0.211)*
External incentive of sentence reduction		
Year off–0 months	−0.593 (0.205)**	−0.309 (0.247)
Year off–1 to 5 months	−0.492 (0.149)**	−0.319 (0.177)
Year off–5 to 12 months	−0.026 (0.165)	−0.238 (0.208)
Type of program		
12-month	0.113 (0.072)	−0.427 (0.152)**
Constant	−0.641 (0.619)	0.590 (1.081)

*P < .05; **P < .01.

severity, but the direction of the effect for men was opposite that for women: whereas women with a moderate-severity offense were less likely to enter treatment, men with a moderate-severity offense were more likely to enter treatment. Results of Wald χ^2 tests for the difference between coefficients were significant ($\chi^2 = 12.5$; $P < .05$).

Opposite effects for family ties were found between men and women. Women with "average/good" family ties were more likely to enter treatment, whereas men with "average/good" family ties were less likely to do so. Women who were not in the labor force before incarceration were more likely to enter treatment. In contrast, employment history was unrelated to treatment entry for men. Results of Wald χ^2 tests showed both of these coefficients to differ between men and women: $\chi^2 = 13.05$ for family ties and $\chi^2 = 4.14$ for not being in the labor force.

Among men, there were no significant effects for type of substance use. In contrast, among women, 2 categories of prearrest daily substance use were related to treatment entry. Women who used marijuana only were *less* likely to enter treatment, and women who used alcohol only were *more* likely to enter treatment. Results of Wald χ^2 tests showed that only the coefficient for alcohol use ($\chi^2 = 5.68$) was a significant gender difference.

Antisocial personality disorder and depression diagnoses were related to treatment entry for women but not for men. Women with neither diagnosis were more likely to enter treatment, whereas women with a diagnosis of depression, either alone or in combination with antisocial personality disorder, were less likely to enter treatment. The coefficients for these diagnoses did not differ significantly from those for men.

Both men and women planning to live with minor children after release were more likely to enter treatment. Women who had been physically abused before 18 years of age were more likely to enter treatment. This characteristic was not significant for men, and results of the test of differences between coefficients for men and women were not significant.

Results for the Change Assessment Scale were similar for men and women. Men and women with high precontemplation scores (is unaware of drug problem) were less likely to enter treatment, whereas individuals with high maintenance scores (works to maintain the gains previously made and prevent relapse) were more likely to enter treatment. Among men, those with high contemplation scores (recognizes problem and is contemplating taking action) were more likely to enter treatment. Among women, the coefficient for contemplation was marginally significant (at the conventional .05 level) and in the same direction as among men, but the coefficients did not significantly differ.

TABLE 2—Predictors of Treatment Entry and Completion for Men and Women: Maximum Likelihood Probit Estimation

Characteristic	Men Estimate (SE)	Women Estimate (SE)
Severity of offense		
Moderate	0.108 (0.065)	−0.264 (0.121)*
High	−0.097 (0.091)	0.122 (0.172)
Greatest	0.219 (0.091)*	0.503 (0.211)*
Age		
At first arrest	−0.002 (0.006)	0.031 (0.013)*
At time of commitment	0.013 (0.006)*	−0.003 (0.014)
Average/good family ties	−0.197 (0.073)**	0.192 (0.104)
History of violence		
<5 years ago	−0.230 (0.079)**	−0.248 (0.221)
>5 years ago	0.068 (0.070)	0.133 (0.223)
Sentence length (months)	−0.001 (0.000)*	−0.004 (0.003)
Substance use and drug treatment history before arrest		
Daily use of alcohol only	0.000 (0.108)	−0.480 (0.306)
Daily use of marijuana only	0.014 (0.089)	0.261 (0.212)
Daily use of marijuana and other illicit drug(s)	0.087 (0.079)	0.286 (0.172)
Previous drug treatment	−0.094 (0.046)*	0.079 (0.087)
Psychiatric diagnosis		
Depression only	0.138 (0.133)	−0.254 (0.190)
Antisocial personality disorder only	0.057 (0.084)	0.506 (0.180)**
Both antisocial personality disorder and depression	−0.121 (0.134)	−0.397 (0.202)*
Neither antisocial personality disorder nor depression	0.151 (0.076)*	0.373 (0.138)**
Plan to live with minor children after release	0.149 (0.045)**	0.148 (0.084)
Internal motivation score (Prochaska's Change Assessment Scale)		
Precontemplation	−0.396 (0.075)**	−0.429 (0.168)**
Contemplation	0.447 (0.149)**	0.333 (0.320)
Action	−0.172 (0.145)	−0.450 (0.295)
Maintenance	0.264 (0.089)**	0.639 (0.210)**
External incentive of sentence reduction		
Year off–0 months	−0.560 (0.217)**	−0.207 (0.292)
Year off–1 to 5 months	−0.281 (0.144)	−0.090 (0.186)
Year off–5 to 12 months	0.036 (0.157)	−0.225 (0.208)
Type of program		
12-month	−0.121 (0.052)*	−0.285 (0.118)*
Constant	−3.909 (0.459)**	−3.647 (0.931)**

*P<.05; **P<.01.

Results of the measure of external incentive—the year-off incentive—differed between men and women. Among men, those ineligible for a sentence reduction and those eligible only for a reduction of 5.5 or fewer months were less likely to enter treatment compared with those eligible for greater reductions. Although the coefficients were not significant for women, χ^2 tests did not show the coefficients for men to be significantly different from those for women.

Treatment Entry and Completion

Approximately 78% of the men and 64% of the women completed treatment. The program completion rate was lower for the 12-month than for the 9-month program participants. Among men, 74% of the 12-month participants completed treatment, compared with 80% of the 9-month participants. Among women, the percentages were 60% and 67%, respectively.

The results displayed in Table 2 show that race/ethnicity was not related to entering and completing treatment. Among both men and women, those with a greater-severity offense were more likely to complete treatment. In contrast, among women only, those with a moderate-severity offense were less likely to complete treatment. The nonsignificant coefficient for men was found to differ significantly from that for women (χ^2=7.44) and was in the opposite direction.

Chi-square tests showed that the apparent gender differences for other indicators of criminal history were sustained only for age at first arrest. Women who were older at their first arrest were more likely to complete treatment. The coefficient for men, although not significant, was in the opposite direction (χ^2=9.40). Men with a recent (i.e., within the past 5 years) history of violence and those with longer sentence lengths were less likely to complete treatment, whereas men who were older at the time of their current commitment were more likely to complete treatment.

Family ties were related to treatment completion among men but not among women. Men with average/good family ties were less likely to complete treatment. The coefficient for women differed from that for men (χ^2=9.39) and, although not significant, was in the opposite direction.

There were no significant effects among either men or women for type of substance use. However, among men only, those with a history of drug treatment were less likely to complete treatment. The coefficient for women was nonsignificant but was significantly different from that for men (χ^2=19.59).

Men and women without either a diagnosis of antisocial personality disorder or a diagnosis of depression were more likely to complete treatment. Among women only, those with a diagnosis of antisocial personality disorder only were more likely to complete treatment, whereas those with both diagnoses were less likely to complete treatment. Chi-square tests showed that only the coefficient for a diagnosis of antisocial per-

TABLE 3—Characteristics of Men and Women Eligible to Enter Residential Drug Treatment

	Men	Women
White, %	62.6%	50.9%
Highest grade completed (mean no. of years), y	12.1	11.5
Age, y		
At time of commitment (mean)	34.0	32.8
At first arrest (mean)	21.3	24.2
Severity of offense, %		
Moderate	42.2	46.6
Greatest	20.6	9.3
Average/good family ties, %	92.8	84.3
Employment at time of incarceration, %[a]		
Employed	53.3	37.3
Not in workforce	3.9	7.5
Sentence length (mean), mo	82.3	40.0
Recent history of violence (<5 years ago), %	14.4	7.2
Substance abuse history (1 year before arrest), %		
No daily drug/alcohol use	16.5	13.6
Daily use of alcohol only	10.9	3.7
Daily use of illicit drug–marijuana only	17.9	14.0
Daily use of illicit drug other than marijuana–cocaine, heroin, opiates, barbiturates, etc.	54.7	68.7
Psychiatric diagnosis, %		
Depression only	7.9	19.4
Antisocial personality (ASP) only	28.4	16.9
Both depression and ASP	8.1	13.3
Neither depression nor ASP	55.6	50.4
Plan to live with minor children after release, %	38.2	60.0
History of physical abuse (before 18 years of age), %	15.5	31.3
Internal motivation score (Prochaska's Change Assessment Scale)		
Precontemplation (mean)	1.95	1.59
Contemplation (mean)	3.37	3.15
Action (mean)	3.38	3.14
Maintenance (mean)	2.78	2.62
Year-off provision but no time available, %	18.8	7.7
Type of program: 12 month (treatment participants only), %	23.8	36.7

[a]Percentages do not sum to 100 because not all categories of employment are included in the table.

sonality disorder differed between men and women ($\chi^2=5.12$).

Men who planned to live with minor children after release were more likely to complete treatment. Although no such effect was apparent for women, χ^2 tests showed that the coefficients did not differ.

Among both men and women, those with high precontemplation scores were less likely to complete treatment, whereas those with high maintenance scores were more likely to complete treatment. Among men only, those with higher contemplation scores were more likely to complete treatment. This coefficient for women was nonsignificant and did not significantly differ from that for men.

Among men only, external incentives were related to treatment completion: men who could not have benefited from the sentence reduction provision were less likely to complete treatment. The coefficient for men was not significantly different from that for women. Among both men and women, individuals who entered a 12-month program were less likely to complete treatment.

DISCUSSION

The results of this study indicate that greater attention should be paid to treatment entry, particularly in prison settings, where substance abuse treatment is often voluntary and where individuals who enter treatment are very likely to complete treatment. Because retention is higher than in non–prison based treatment programs and because an increasing number of drug users are incarcerated, a question of greater importance is whether the intended or ideal target population is being reached. Criminal justice settings currently provide an opportunity to ameliorate public health problems, such as AIDS associated with drug use, because a large percentage of substance users are involved in the criminal justice system.

Although federal prison drug treatment programs do not target any specific subpopulation of substance abusers, our findings suggest policy modifications that could better address the issues of all those needing treatment. The importance of internal motivation for treatment entry and retention among both genders implies a broader application is needed of interventions that have been found to increase internal motivation. Motivational enhancement intervention research has shown that such interventions can enhance a client's motivation to change[53–55] and that motivational interviewing can increase session attendance and the likelihood of treatment completion.[55,56] The use of such interventions could help kindle motivation among individuals entering treatment. Individuals with initial low levels of motivation could be referred to a pretreatment program to enhance their motivation for treatment. Alternatively, because treatment resources are often limited, efficiency might be enhanced by requiring that individuals reach a minimal threshold of motivation before admission.

Both internal and external motivations draw individuals into treatment. Previous research on external motivation has been carried out primarily within the context of community-based programs, where external motivation is often defined as coerced treatment (e.g., legal pressure).[57,58] However, little is known about the effect of external incentives, such as sentence reductions, that can be

offered in prison settings. Our findings indicate that in addition to such "carrots" as sentence reduction, internal motivation is very important because it remained a predictor of treatment entry and treatment completion in the presence of external incentives.

Our finding that women without diagnoses of depression or antisocial personality disorder were more likely to enter treatment comes at a time of increasing recognition of the needs of substance abusers with co-occurring disorders.[59,60] Treatment effectiveness may be enhanced by ensuring that individuals with comorbid psychiatric problems and drug use enter and complete treatment. This study found a greater percentage of women than men with diagnoses of depression. This is consistent with previous research findings where women, more often than men, were found to use drugs to alleviate physical or emotional pain or to cope with depression.[61–64] Previous findings have also shown that women are more likely than men to view their problems in terms of health concerns and psychological distress[8,9] and to be motivated to enter treatment because of psychological and social pressures.[65] Thus, if drug treatment is perceived by potential treatment volunteers as focusing on substance use rather than on the psychological distress that might motivate them to seek treatment, they may be less likely to enter treatment.[4] For women, motivational programs and treatment programs will need to clearly emphasize the role of substance abuse treatment in alleviating depression and other psychological distress. Simultaneously addressing women's psychological problems and substance use while they are incarcerated could prevent the misuse of other health and mental services after release.

Placing predictors of treatment entry for women within the context of background characteristics highlights the relevance of social pressures and relationships. Women were more likely to have a history of physical abuse, to have a diagnosis of depression, and to report that they planned to live with minor children after release but were less likely to have positive family ties. All of these factors are related to treatment entry for women. Addressing personal problems that caused them to self-medicate with illegal drugs in the first place may enhance women's motivation for treatment. Most women reported they will be responsible for minor children when released from prison. Thus, treatment entry and retention may be enhanced by women's recognition that substance use treatment may have a positive effect on their family relationships.

Both men and women were less likely to complete the 12-month program compared with the 9-month program, which indicates the importance of determining an optimal treatment length and intensity level in terms of both adherence and outcome.

Our study improves the understanding of treatment retention by comparing factors that predict treatment entry with factors that predict both treatment entry and retention. Because levels of drug use among state prisoners and local jail inmates are even higher than among those in the federal systems, our findings should also be relevant for drug treatment programs in those correctional settings. Many of the same processes that attract individuals to treatment also keep individuals in treatment. Motivation to change leads individuals to enter treatment and also leads them to remain in treatment. Social ties and external incentives are associated with treatment entry but also with treatment retention. If the same factors that lead an individual to seek help also keep the individual in treatment, the focus of research should be on treatment entry to ensure that the individuals who are most in need of treatment and who can most benefit from it are the ones who receive treatment. However, because treatment availability and treatment admission processes may differ in nonfederal correctional settings, future studies need to identify additional crucial issues surrounding treatment entry. ■

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Human Participant Protection

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The Potential Protective Effect of Youth Assets on Adolescent Alcohol and Drug Use

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Objectives. We examined the association between adolescent alcohol and drug use and 9 youth assets in a low-income, inner-city population.

Methods. An in-person survey of 1350 adolescents and parents assessed youth assets and risk behaviors. We analyzed data with χ^2 tests and logistic regression analyses.

Results. When we controlled for appropriate variables, there were significant positive relationships between several youth assets and nonuse of alcohol and drugs. Furthermore, youths who possessed all of the statistically significant youth assets were 4.44 times more likely to report nonuse of alcohol and 5.41 times more likely to report nonuse of drugs compared with youths who possessed fewer youth assets.

Conclusions. Our study supports the view that specific youth assets may protect youths from alcohol and drug use. (*Am J Public Health.* 2004;94:1425–1430)

One hundred thousand deaths per year in the United States are associated with alcohol consumption.[1] Alcohol is the most frequently used mind-altering substance among adolescents, and alcohol-related problems are common among youths.[2,3] Moreover, for those who begin drinking at age 14 years or earlier, approximately 40% experience problems with alcohol dependency at some point in their lives.[4] Illegal drug use among adolescents more than doubled between 1992 and 1997, from 5.3% to 11.4%.[5] In addition to its propensity to result in health problems adolescent drug abuse is associated with other types of unhealthy behaviors.[6]

In recent years, efforts to reduce adolescent risk behaviors have focused on viewing youths as resources instead of potential problems.[7,8] Viewing youths as resources provides them with an environment that encourages positive growth and development, despite potential adversity.[7] This focus on positive youth development has promoted a research and program approach that links risk reduction with simultaneous efforts to increase protective factors—or *assets*—such as achievement-focused values, positive peer role models, and close ties to caring adults.[9,10] The youth development approach is constructed from an accumulation of empirical research in adolescent behaviors, and it incorporates social constructs that may prevent selected risk behaviors, such as drug and alcohol abuse and delinquency, as well as promotes positive outcomes and resiliency.[11] Furthermore, an asset perspective emphasizes aspects of socialization that are significant in adolescent development (e.g., family interaction, peer support, and school environment).[11]

Emerging research and empirical evidence suggest that specific protective assets may indeed insulate adolescents from engaging in certain risk behaviors. For example, in a study of 6000 youths in grades 6 through 12, researchers found that assets accounted for 10% to 43% of the variance in "thriving indicators" (e.g., school success, overcoming adversity, and helping others) beyond the contributions of demographic variables.[12] Another study linked specific youth assets with the nonuse of tobacco.[13]

Although only a few studies have examined the relationship between youth asset and alcohol and drug use, some youth alcohol and drug studies have examined the influence of factors closely related to the youth asset concept. For example, research has found that peer pressure and parental influences are associated with youth alcohol and drug use,[14,15] and successful prevention programs, such as the Life Skills Training Program[16–18] and Project Star,[19,20] indirectly have incorporated some youth asset concepts into their prevention efforts.

Most of the published research on youth development has focused on a limited number of youth assets or related concepts, and few studies have examined multiple positive influences and how these might prevent alcohol and drug use among youths. The purpose of our study was to examine the relationship between 9 youth assets and alcohol and drug use in a community sample of adolescents and their parents. We hypothesized that youths who had 1 or more of the assets would be significantly less likely to engage in alcohol and drug use. Demographic factors—youth age, gender, and race/ethnicity; parental income and education; and family structure—that may be related to alcohol and drug abuse also were evaluated.

METHODS

Study Population

Data were collected from 1350 randomly selected households that had at least 1 parent and 1 adolescent. These households were located in the inner-city areas of 2 Midwestern cities with populations of approximately 500 000 each. Youth (n = 1255) mean age was 15.4 (± 1.7) years, and 52% of the sample was female. Forty-eight percent of the youths were non-Hispanic White, 23% were non-Hispanic Black, 19% were Hispanic, and 10% were non-Hispanic Native American. Approximately 48% of the youths lived in 2-parent households, 66% lived in households with reported annual income levels of less than $35 000, and 13% of the youths had parents who had not graduated from high school.

Design

When a household contained more than 1 adolescent or parent, 1 parent and 1 adolescent were randomly selected for interviews. Interviews were conducted with a computer-assisted data entry system in the participants' homes. The adolescent and the parent were interviewed simultaneously in

different rooms of the residence. The adolescent self-administered the risk behavior questionnaire by listening to tape-recorded items with headphones and then entering responses into the computer. Basic demographic information was collected from both the parents and the adolescents. Scales in our study focused on 2 general concerns: youth assets and youth risk behaviors. The survey response rate was 51% and included all refusals plus 8% of the randomly-selected households for which we never determined who lived there (i.e., eligible adolescent with a parent). An extensive description of the study methods is published elsewhere.[21]

Measures

Demographic variables. Depending on the analyses—Chi-square analysis and logistic regression analysis (The stratified age variable was used in the chi-square analyses and the continuous age variable was used in the logistic regression analyses.)—youth age was used either as a continuous variable or as a variable stratified into 3 categories: 13 to 14 years, 15 to 17 years, and 18 to 19 years. Youth race/ethnicity was defined as non-Hispanic Black, non-Hispanic Native American, non-Hispanic White, and Hispanic. Annual parental income was stratified into 3 categories: less than $20 000, $20 000 to $35 000, and greater than $35 000. Parental education also was stratified into 3 categories: both parents had less than a high school education; at least 1 parent had completed high school, a general equivalency diploma (GED), or some college; and at least 1 parent had a bachelor's degree or higher. Parents defined their family structure as both parents living in the household or 1 parent living in the household.

Alcohol and drug use. Because youth assets are thought to be protective against risk behaviors, the outcomes of interest were coded (in a positive direction) as nonuse of alcohol and nonuse of drugs. Nonuse of alcohol was defined as a negative answer to the question, "During the past 30 days, did you drink any alcohol, such as beer, wine, or liquor?" Nonuse of drugs was defined as a negative answer to the question, "During the past 30 days, did you use or do any drugs, such as marijuana, inhalants, methamphetamine, speed, cocaine, crack, or heroin?" The dependent behavior risk factor variables were coded as 1 (did not report risk factor) or 0 (did report risk factor).

Youth assets. The program and evaluation team used focus groups and needs assessment data to determine the key assets to be examined in our study. A literature search was conducted to identify appropriate items for asset measurement. Items with established reliability and validity from previously published research were used whenever possible: if appropriate items were not available in the literature, items were created and were pretested.

Factor analyses and reliability tests were used in scale construction—scales were constructed with items that loaded .40 and above on 1 factor and with reliability scores (Cronbach's α) of at least .60. The 9 assets examined (listed with the number of items for each asset, Cronbach's α, and a sample item) were (1) nonparental adult role models (7 items, α=.74, "You know adults that encourage you often."), (2) peer role models (6 items, α=.81, "Are most of your friends responsible?"), (3) family communication (4 items, α=.61, "How often do you talk to an adult in your household about your problems?"), (4) use of time (groups/sports) (4 items, α=.71, "You participate in an organized activity after class."), (5) use of time (religion) (2 items, α=.71, "How often do you participate in church/religious activities?"), (6) community involvement (6 items, α=.78, "You work to make your community a better place."), (7) aspirations for the future (2 items, α=.67, "As you look to your future, how important is it to you that you stay in school?"), (8) responsible choices (6 items, α=.69, "You can say no to activities that you think are wrong."), and (9) good health practices (exercise/nutrition) (1 item, "You take good care of your body by eating well and exercising"). Good health practices (exercise/nutrition) were measured with a single item, because no 2 items loaded for this scale in the factor analyses. A full description of the development and the construction of the assets is published elsewhere.[22]

Assets were reported as present (1) or absent (0) on the basis of youth mean responses to the variables included in the asset. Items that comprised each asset were generally scored from 1 to 4 (4=the most positive response), and an individual was said to have the asset if the mean score was 3 or higher. A mean score of 3 or higher indicated that the positive behavior was reported as "usually or almost always," "very important or extremely important," or "agree or strongly agree."

A composite variable was created when multiple assets were significant in the same model after we adjusted for the demographic variables. This variable was dichotomous and compared youths who had all of the significant assets with youths who had some or none of the significant assets.

Statistical Analysis

The sample sizes for the univariate analyses were 1255 for the alcohol use outcome and 1250 for the drug use outcome. Youths were not included in the analysis if they had 1 or more of the following: missing demographic data (n=41), race/ethnicity other than those listed in Table 1 (n=20), and missing data on alcohol or drug use (n=60). Only youths who had data for all 9 assets were included in the multivariate modeling, which resulted in samples sizes of 1122 for alcohol use and 1120 for drug use.

All statistical analyses were performed with SPSS 10.0 software (SPSS Inc, Chicago, Ill).[23] A P value of $\leq .05$ was used unless otherwise stated. We used χ^2 tests to assess univariate associations between the dichotomous risk factor and the demographic variables. We used logistic regression to calculate the unadjusted odds ratios (ORs) between each asset and the absence of the risk factor, and we used multiple logistic regression to calculate the adjusted odds ratios. We controlled for possible confounders when calculating the adjusted odds ratios. We controlled for youth age (continuous), gender, and race/ethnicity regardless of the univariate relationship. Other possible confounders included parental income, parental education, and family structure (1- vs 2-parent household); we controlled for a confounder only if the univariate analysis indicated a P value of $\leq .10$. Interactions between each asset and each demographic variable were assessed in each logistic regression with the P value level set at $\leq .01$. For significant interactions, we conducted logistic

TABLE 1—Characteristics of Study Population, by Adolescent Nonuse of Alcohol and Drugs

Characteristic	Nonuse of Alcohol (n = 1255), No. (%)	*P*	Nonuse of Drugs (n = 1250), No. (%)	*P*
Youth age, y				
13–14	442 (88.9)	< .001	444 (92.3)	.006
15–17	640 (76.6)		637 (86.4)	
18–19	173 (65.9*)		169 (88.2*)	
Youth race/ethnicity				
Non-Hispanic Black	287 (87.8)	.001	286 (92.7)	.079
Non-Hispanic Native American	126 (78.6)		124 (87.1)	
Non-Hispanic White	605 (77.7)		608 (86.8)	
Hispanic	237 (74.3)		232 (88.7)	
Youth gender				
Female	651 (80.8)	.217	650 (88.3)	.771
Male	604 (78.0)		600 (88.8)	
Parental annual income, $				
< 20 000	391 (80.8)	.240	385 (87.0)	.373
20 000–35 000	440 (76.8)		439 (88.4)	
> 35 000	424 (80.9)		426 (90.1)	
Family structure				
2-parent household	602 (82.6)	.009	603 (91.7)	.001
1-parent household	653 (76.6)		647 (85.6)	
Parental education				
< high school, both parents	158 (75.9)	.298	156 (89.1)	.238
1 parent achieved high school, GED, or some college	901 (79.4)		896 (87.7)	
At least 1 parent achieved bachelor's degree or higher	196 (82.7)		198 (91.9)	

Note. GED = general equivalency diploma.
*Significant trend ($P < .05$).

regression stratifying by the demographic variable that showed the significant correlation.

We also used multiple logistic regression to determine the cumulative effect of the assets after we assessed the impact of each asset on the outcomes. Demographic variables were included as covariates in the analyses, and assets with a *P* value of ≤.05 were included in the final model. Interactions between the assets and the demographic variables were assessed with a *P* value of ≤.01, and an interaction term was added to the final model when appropriate. After we controlled for relevant demographic variables, we used multiple logistic regression to measure the association between the composite asset variable and the applicable outcome.

RESULTS

Nonuse of alcohol. Seventy-nine percent of the respondents reported nonuse of alcohol. Youth age, youth race/ethnicity, and family structure were significantly associated with nonuse of alcohol (Table 1). As age increased, the proportion of nonuse of alcohol significantly decreased. Non-Hispanic Black youths reported a higher prevalence of nonuse of alcohol than did youths of other races/ethnicities. Youths from 2-parent households were significantly more likely than those from 1-parent households to report nonuse of alcohol.

Table 2 shows the unadjusted and adjusted odds ratios between nonuse of alcohol and each youth asset. The adjusted odds ratios were significant for 4 of the 9 youth assets (peer role models, family communication, good health practices [exercise/nutrition], and aspirations for the future). For example, youths who had the peer role model asset were nearly 2.5 times more likely to report nonuse of alcohol compared with youths who lacked the asset.

Significant interactions between assets and demographic variables were present for 3 assets (use of time [religion], community involvement, and responsible choices); therefore, we conducted analyses stratifying by the interacting demographic variable (Table 2). There was a positive, significant relationship between the use of time (religion) asset and the nonuse of alcohol, but the relationship was considerably stronger for females (OR = 4.07) than for males (OR = 1.57). The community involvement asset appeared to serve as a protective factor from alcohol use only for youths living in 1-parent households (OR = 2.56). Finally, females who had the responsible choices asset were nearly 4 times more likely to report nonuse of alcohol compared with females who lacked the asset (OR = 3.90). The odds ratios for males were not significant.

The peer role models, use of time (religion), family communication, and responsible choices assets remained significant after we adjusted for demographic variables and other significant assets (Table 3). For example, youths who had the use of time (religion) asset remained more than 2 times more likely to report nonuse of alcohol compared with youths who lacked the asset after we controlled for the relevant demographic variables and the other 3 assets in the model (adjusted OR = 2.17). The interaction between gender and the responsible choices asset also remained significant, which suggests that the asset was protective from alcohol use only for females (adjusted OR = 3.30).

A composite variable that compared youths who had all 4 significant assets (peer role models, use of time [religion], family communication, and responsible choices) with youths who had 3 or fewer of the 4 assets was created. The adjusted odds ratio for the composite variable was 4.44 (95% confidence interval [CI] = 2.56, 7.72), which indicates that youths who had all 4 of these assets were more than 4 times more likely to report nonuse of alcohol compared with youths who had 3 or fewer of the assets.

Nonuse of drugs. Eighty-nine percent of the 1250 youths who responded reported nonuse of drugs in the past 30 days. As shown in Table 1, younger youths reported nonuse of drugs significantly more often than

TABLE 2—Odds Ratios (ORs) for Adolescent Nonuse of Alcohol, by Youth Assets

Youth Asset	No.	Unadjusted OR (95% CI)	Adjusted[a] OR (95% CI)
	Individual analyses[a]		
Nonparental adult role models	1128	1.23 (0.86, 1.77)	1.30 (0.89, 1.91)
Peer role models	1253	2.52*** (1.90, 3.34)	2.41*** (1.80, 3.22)
Family communication	1255	2.04*** (1.55, 2.70)	1.97*** (1.47, 2.64)
Use of time (groups/sports)	1252	1.20 (0.89, 1.63)	1.05 (0.77, 1.44)
Use of time (religion)	1255	2.92*** (2.17, 3.91)	. . . (. . .)
Good health practices (exercise/nutrition)	1254	1.45** (1.09, 1.92)	1.38* (1.03, 1.86)
Community involvement	1252	1.49 (0.97, 2.29)	. . . (. . .)
Future aspirations	1126	1.59* (1.09, 2.32)	1.48* (1.00, 2.20)
Responsible choices	1255	1.88*** (1.34, 2.64)	. . . (. . .)
	Stratified analyses		
Use of time (religion)[b]			
Gender			
Female	651	. . . (. . .)	4.07*** (2.58, 6.42)
Male	604	. . . (. . .)	1.57* (1.03, 2.40)
Community involvement[c]			
Family structure			
2-parent household	601	. . . (. . .)	0.78 (0.43, 1.42)
1-parent household	651	. . . (. . .)	2.56*** (1.26, 5.17)
Responsible choices[b]			
Gender			
Female	651	. . . (. . .)	3.90*** (2.38, 6.40)
Male	604	. . . (. . .)	1.14 (0.67, 1.94)

Note. CI = confidence interval.
[a]Adjusted for youth age, youth race/ethnicity, youth gender, and family structure.
[b]Adjusted for youth age, youth race/ethnicity, and family structure.
[c]Adjusted for youth age, youth race/ethnicity, and youth gender.
*$P \leq .05$; **$P \leq .01$; ***$P \leq .001$.

did older youths. A significantly higher proportion of youths in 2-parent households than of youths in 1-parent households reported nonuse of drugs.

The unadjusted and adjusted odds ratios between each asset and the nonuse of drugs were significant for all 9 assets (Table 4). The highest adjusted odds ratios were for peer role models (OR=2.95), suggesting that after we controlled for demographic factors, youths who had this asset were nearly 3 times more likely to report nonuse of drugs compared with youths who lacked the asset. Six other assets (nonparental adult role models, family communication, use of time [religion], community involvement, aspirations for the future, and responsible choices) had adjusted odds ratios of 2 or higher.

In the final model, the peer role models, use of time (religion), and responsible choices assets remained significant after we controlled for demographic variables and other significant assets (Table 3). Youths who had any 1 of the assets were more than 2 times more likely to report nonuse of drugs compared with youths who lacked the asset after we accounted for the contribution of relevant demographic factors and the other 2 assets.

We created a composite variable that compared youths who had all 3 significant assets (peer role models, use of time [religion], and responsible choices) with youths who had 2 or fewer of the 3 assets. The adjusted odds ratio for the composite variable was 5.41 (95% CI=2.70, 10.84), which indicates that youths who had all 3 assets were more than 5 times more likely to report nonuse of drugs compared with youths who had 2 or fewer of the assets.

DISCUSSION

The purpose of our study was to investigate relationships between 9 youth assets and alcohol and drug abuse in a low-income, inner-city population. The results suggest that most of the youth assets are associated with a lower prevalence of youth alcohol and drug abuse. Furthermore, specific assets are collectively more strongly associated with a lower likelihood of youth alcohol and drug abuse.

Significant positive relationships were found between nonuse of alcohol and the availability of peer role models, positive family communication, good health practices related to exercise and nutrition, and adolescents' aspirations for the future. An adolescent who had any 1 of these assets was approximately 1.5 to 2.5 times less likely to have used alcohol than an adolescent who did not have any one of these assets.

These results, in particular the findings regarding the peer role models and family communication assets, support previous research findings that youths who had these assets or positive factors were less likely to use alcohol.[14–20]

The relationships between the use of time (religion) and the responsible choices assets and nonuse of alcohol varied by youth gender. Females who had either the use of time (religion) asset or the responsible choices asset were approximately 4 times more likely to report nonuse of alcohol compared with females who lacked either asset. These results suggest that studies of adolescent females at risk for alcohol use should test strategies that increase skills for making responsible choices.

Many adolescents reside in 1-parent households: previous research indicates that youths living in 1-parent households are more likely to participate in risk behaviors.[21,23–25] Fifty-two percent of the adolescents in our study lived in 1-parent households, and these youths were approximately 2.5 times more likely to report nonuse of alcohol if they were actively involved in community activities. The results from our study support the efficacy of programs that include community involvement as an intervention or prevention strategy for youth alcohol and drug use, particularly for youths living in 1-parent households.[19,20]

TABLE 3—Odds Ratios (ORs) for the Cumulative Association of Youth Assets with Nonuse of Alcohol and Drugs

	Adjusted OR (95% CI)
Nonuse of alcohol[a,b] (n = 1122)	
Peer role models	1.97* (1.41, 2.76)
Use of time (religion)	2.17* (1.55, 3.04)
Family communication	1.79* (1.28, 2.50)
Responsible choices	
Females	3.30* (1.93, 5.63)
Males	0.89 (0.50, 1.56)
Likelihood ratio test[c] $\chi^2 = 91.29$, df = 5, $P < .0001$	
Hosmer and Lemeshow goodness-of-fit test $\chi^2 = 7.22$, df = 8, $P < .5125$	
Nonuse of drugs[a] (n = 1120)	
Peer role models	2.27* (1.49, 3.44)
Use of time (religion)	2.24* (1.46, 3.42)
Responsible choices	2.19* (1.41, 3.42)
Likelihood ratio test[c] $\chi^2 = 53.41$, df = 3, $P < .0001$	
Hosmer and Lemeshow goodness-of-fit test $\chi^2 = 8.13$, df = 8, $P < .4213$	

Note. CI = confidence interval.
[a]Adjusted for youth age, youth race/ethnicity, youth gender, family structure, and other assets in the model.
[b]Interaction between youth gender and Responsible Choices is included, and gender-specific adjusted ORs are reported.
[c]Comparing the model with demographic variables only with the model with demographic variables and assets.
*$P \leq .001$.

There was a significant positive relationship between each of the 9 youth assets and nonuse of drugs, even after we accounted for the influence of other demographic factors. Youths who had any 1 of the assets were approximately 1.5 to 3 times more likely to report nonuse of drugs than youths who did not have any one of these assets.

This striking result emphasizes the importance of and the need for additional longitudinal studies that utilize a youth asset approach to reduce drug use. Moreover, these results mirror the findings from our previous study which reported significant positive relationships between each of the same 9 assets and nonuse of tobacco.[13]

TABLE 4—Odds Ratios (ORs) for Adolescent Nonuse of Drugs, by Youth Asset

Youth Asset	N	Unadjusted OR (95% CI)	Adjusted[a] OR (95% CI)
Nonparental adult role models	1126	1.93** (1.26, 2.94)	2.01** (1.30, 3.12)
Peer role models	1248	3.00*** (2.07, 4.35)	2.95*** (2.03, 4.30)
Family communication	1250	2.08*** (1.46, 2.95)	2.11*** (1.47, 3.03)
Use of time (groups/sports)	1247	1.71** (1.14, 2.57)	1.56* (1.03, 2.36)
Use of time (religion)	1250	2.93*** (1.99, 4.30)	2.65*** (1.80, 3.92)
Good health practices (exercise/nutrition)	1249	1.67** (1.67, 2.37)	1.55* (1.08, 2.22)
Community involvement	1247	2.18* (1.16, 4.13)	2.04* (1.07, 3.88)
Future aspirations	1124	2.23*** (1.43, 3.46)	2.07** (1.32, 3.25)
Responsible choices	1250	2.58*** (1.74, 3.83)	2.57*** (1.71, 3.86)

Note. CI = confidence interval.
[a]Adjusted for youth age, youth race/ethnicity, youth gender, and family structure.
*$P \leq .05$; **$P \leq .01$; ***$P \leq .001$.

These findings also support previous studies and risk prevention research that linked various constructs with the reduction of drug use.[13–20]

Perhaps the most important finding of our study is that specific assets appear to collectively reduce the odds of engaging in alcohol and drug use, and the strength of the collective assets/risk behavior association is well beyond that of the relationship between any of the asset/risk behavior bivariate relationships. Youths who had the peer role models, use of time (religion), family communication, and responsible choices assets were 4.44 times more likely to report not using alcohol compared with youths who had 3 or fewer of the assets. Similarly, youths who had the peer role models, use of time (religion), and responsible choices assets were 5.41 times more likely to report not using drugs compared with youths who had 2 or fewer of the assets. These results support the notion that the combinations of assets may be more effective than any single asset for preventing risk behavior.

Researchers and practitioners may find the results of our study useful for the development, testing, and possible implementation of risk reduction programs. Some of the assets (peer role models, nonparental adults role models, and community involvement) have been amendable to use in interventions. However, it may be a greater challenge to develop and then test effective intervention strategies for the use of time (religion) and family communication assets or interventions that simultaneously promote multiple assets. In spite of this challenge, it may be worth the time and the resources to fully research various intervention strategies that increase and strengthen youth assets.

There are limitations to our study. Alcohol and drug use were assessed only for the past 30 days; therefore, it is unknown what behavior occurred outside this time period. Also, youths may have not have responded honestly, providing socially acceptable responses to the drug and alcohol questions, even though they were allowed to read the questions and then enter their responses into a computer while unobserved. Nonetheless, this protocol may have reduced the number of socially acceptable responses. Another

limitation is that the reliability coefficients for 3 of the asset constructs were below .70, and the good health practices (exercise/nutrition) asset was assessed with a single item. Also, the moderate response rate raises questions about the generalizability of these results. However, no significant differences were found when the race/ethnicity composition and household income results from the sample were compared by zip codes with census data from the same neighborhoods, which suggests that the sample was representative of the intervention neighborhoods. Finally, the data analyzed in our study are cross-sectional; causal relationships between youth assets and alcohol and drug use cannot be tested.

CONCLUSIONS

These results suggest that there is a positive relationship between presence of youth assets and the nonuse of alcohol and drugs. Youths who possess even 1 of the assets were significantly less likely to use drugs compared to youth who possessed fewer assets.

Similar relationships were indicated between several of the assets and alcohol use. In some instances, females and youths living in 1-parent households appeared to especially benefit from the presence of a specific asset. Importantly, this is the first study to report that specific assets collectively are more strongly associated with a lower likelihood of youth alcohol and drug abuse. Considerably more research is needed, however, to explain the asset/risk behavior relationship and to more confidently inform prevention practice. ■

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Contributors

R. Oman led the writing and assisted with conceptualizing and supervising the study. S. Vesely conducted the analyses and assisted with writing the article. C. Aspy, S. Rodine, and L. Marshall assisted with the study and writing the article. K. McLeroy conceived of and supervised the study and assisted with writing the article.

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Human Participant Protection

This study underwent and received full review and approval from the institutional review board of the University of Oklahoma Health Sciences Center.

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Health Care System Changes and Reported Musculoskeletal Disorders Among Registered Nurses

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Objectives. We evaluated the impact of health care system changes on nurses' health, and we studied reported musculoskeletal disorders associated with these changes.

Methods. This cross-sectional study (n = 1163) defined a musculoskeletal disorder case as moderate pain that lasted at least 1 week or occurred monthly during the past year. Nurses were asked about changes in the health care system in the past year, and responses to 12 changes were summed and were categorized as low, moderate, or high changes.

Results. When the changes were summed, the adjusted odds ratios for musculoskeletal disorders for more than 6 versus 0 to 1 changes were (1) neck: 4.45 (95% confidence interval [CI] = 1.97, 10.08), (2) shoulder: 2.63 (95% CI = 1.17, 5.91), and (3) back: 3.42 (95% CI = 1.61, 7.27).

Conclusions. The adverse impact on health caused by the changing health care system must be addressed to prevent further injuries among nurses. (*Am J Public Health.* 2004;94:1431–1435)

Few industries in the United States have undergone more sweeping organizational changes over the past 2 decades than the health care industry. The managed care movement has resulted in shorter hospital stays and higher acuity (severity of illness) levels of hospitalized patients, which has thereby required more skilled and time-consuming nursing care.[1] However, because nurses represent the largest expenditure in health care facilities, 1 of the major cost-cutting strategies has been to reduce the size of the nursing workforce, often to inadequate levels.[2] Between 1981 and 1993, total hospital employment grew steadily, while nursing personnel declined by 7.3% after case-mix was controlled.[3] Recent studies have examined the association between nursing staff levels and quality of care in hospitals and have concluded that a higher percentage of nursing care hours were correlated with better patient outcomes, including fewer medical errors.[4–9]

Inadequate staffing also has been associated with back injuries among nurses[10]; however, few studies have examined the association between nursing staff levels and other injuries and illnesses. The Minnesota Nurses Association did examine this association and found that when registered nurse positions in hospitals decreased by 9%, the number of work-related injuries or illnesses among registered nurses increased by 65%.[11] Clark et al.[12,13] found that poor organizational climates and high workloads were associated with a 50% to 200% increase in the likelihood of needlestick injuries and needlestick near misses among hospital nurses.

Nursing and personal-care facilities rank second (incidence rate = 13.8 per 100) and hospitals rank sixth (incidence rate = 8.4 per 100) among Occupational Safety and Health Administration–recordable nonfatal occupational injuries.[14] Nurses who work within these industry sectors face many occupational-health risks, the most common of which are musculoskeletal disorders. For example, the past-year prevalence of low-back pain/injury is 30% to 60%.[15–19] Nurses are often required to lift heavy loads, work in awkward postures, and transfer patients.[20–23] Because nurses are already at risk for musculoskeletal disorders, a reduction in professional nursing staff and other changes in nursing care delivery are likely to lead to even higher rates of these disorders.

The Institute of Medicine report on nursing staffing[10] and the National Occupational Research Agenda Organization of Work group report[24] both call for a study of the occupational-health consequences of changes in health care delivery. Therefore, we examined the individual and the combined impacts of health care organizational changes that have accompanied the move to managed health care on reported musculoskeletal disorders of the neck, shoulder, and back. If an association between inadequate nursing staff levels and injuries among nurses can be demonstrated, health care administrators may be compelled to improve current nursing staff systems, especially in light of the shortage of nurses throughout the United States.

METHODS

Sample and Data Collection

We conducted our study with a cross-sectional survey design. We selected a random sample of 2000 actively licensed registered nurses from 2 US state registries. The states of Illinois and New York were selected because of the ethnic diversity among their nursing workforces. Also, New York had a high rate of managed care penetration, while Illinois had a low rate at the start of the study.[25] Of the 2000 randomly selected nurses, 67 were ineligible because of death or incorrect mailing information, which left 1933 nurses in our sample. We contacted these nurses, and 1428 (74%) responded. Our analysis was restricted to the 1163 respondents who were currently working as nurses, who had been in their current jobs for at least 1 year, and who did not report a nonwork-related injury/accident up to 3 months before the onset of symptoms. Data were collected via an anonymous 8-page survey that was mailed to participants' homes from October 1999 through February 2000. The questionnaire included questions about neck, shoulder, and back problems; physical and psychological demands; and health care changes. Participant contact included up to 6

first-class mailings: an introductory letter, 2 reminder postcards, and 3 questionnaires.

Variables

We measured reported musculoskeletal disorder cases with items from the Nordic questionnaire of musculoskeletal symptoms,[26] including pictures of the affected body sites. The operational definition of a musculoskeletal disorder was having had a relevant symptom (pain, numbness, tingling, aching, stiffness, or burning) in the past year that lasted 1 week or more or occurred at least monthly with at least moderate pain on average. The level of pain was determined with a 5-point pain scale[27]: "none/no pain," "mild/minimal," "moderate," "severe," and "worst pain ever in my life." This definition of a musculoskeletal disorder was developed, tested, and validated in research conducted by scientists at the National Institute for Occupational Safety and Health.[28] Nurses who met the criteria for this definition (for any neck, shoulder, or back musculoskeletal-disorder case, or all 3) were compared with nurses who were completely asymptomatic for any neck, shoulder, or back musculoskeletal-disorder problem.

Nurses were asked to report whether 12 health care system changes that addressed staff levels, patient acuity, and the delivery of nursing care had increased, decreased, or stayed the same over the past year. These 12 items, which were selected from the 37 items used by Shindul-Rothchild,[29] represented those changes deemed to be most related to nursing care delivery. Responses that indicated a negative change, such as an increase in unfilled nursing positions or a decrease in the average length of stay, were assigned 1 point each; responses that indicated no change or a positive change were coded 0.

A negative change included an increase in "work/job responsibilities," "floating off regular unit/area"(assignment other than their usual unit), "unfilled registered nurse positions," "registered nurse layoffs," "facilities/units closed," "client/patient load per registered nurse," "full-time registered nurses replaced by part-time/temporary registered nurses," "patient acuity," and "unlicensed personnel providing direct care." Decreases in the number of "nurse executives," "advanced practice nurses"(registered nurses with advanced clinical training, usually a master's degree in nursing), or "length of stay" also were defined as negative changes. In addition to examining the 12 individual health care system change items, the negative change items were summed (α coefficient=.81) and were evaluated as low-risk (2–3 changes), moderate-risk (4–6 changes), or high-risk (>6 changes) categories. Those with 0 or 1 change served as the reference category. The reference and high-risk categories were designed to include the extremes (top 20% and bottom 20%) in the degree of changes. The remaining 60% of nurses reported health care system changes in either the low or moderate category. Three additional items asked respondents whether they agreed or disagreed (4-point scale) with the statement, "My job: (1) has adequate staffing levels; (2) security is good; (3) is very satisfying to me." Responses were dichotomized (agree/strongly agree=reference).

The potentially confounding variables of age and body mass index (BMI) were treated as continuous variables in our analysis. Smoking, race/ethnicity, having children under age 4, and caring for other dependents had as reference categories nonsmoker, White, having no children under 4, and having no other dependents, respectively. Having young children or other dependents was assessed to identify nonwork responsibilities that may place respondents at risk for a musculoskeletal disorder. Current primary workplace (hospital vs other) and position (staff nurse vs other) also were obtained from the respondents.

Psychological demands were measured with 8 items from the Job Content Questionnaire.[30,31] Each item (e.g., work hard, work fast) was measured with a 4-point scale to indicate frequency of exposure. Responses were dichotomized and were summed, which generated total scores that ranged from 0 to 8 for a continuous psychological demand scale (α=0.78). Exposure to physical demands, such as awkward postures and heavy lifting, was measured with 12 items. In addition to using the highly validated and widely cited Job Content Questionnaire items, we incorporated occupation-specific physical-demand items as recommended by Karasek.[32]

Data Analysis

The mean of the summed health care system change items was estimated for reported neck, shoulder, and back musculoskeletal-disorder cases and for the nurses who were completely asymptomatic. We generated the age-adjusted odds for being a musculoskeletal-disorder case (neck, shoulder, and back) in relation to each individual health care system change item. We then generated logistic regression models that used the categorized health care system changes variable adjusted for the identified potential explanatory or confounding factors. The covariates were forced into the model with the odds for musculoskeletal disorders reestimated after each addition for the following covariate groups: demographics and lifestyle (age, race/ethnicity, children under 4, dependent care, BMI, smoking), work characteristics (workplace and position), and psychological and physical demands. We used SPSS 10.0 software (SPSS Inc, Chicago, Ill) to conduct our analysis. We used logistic regression analysis because musculoskeletal disorders were not normally distributed among these populations. It should be noted that the odds ratio is an overestimate of the rate ratio or the relative risk in this analysis, where the risk of injury is greater than 10%.

RESULTS

The prevalence of reported neck, shoulder, and back musculoskeletal-disorder cases among this population was 20%, 17%, and 29%, respectively. Table 1 provides a description of the sample, including the percentage of nurses who reported the 12 health care system changes. Demographically, the sample reflected US nurses,[33] and more than half reported negative changes in 4 health care system change items (Table 1). The percentages of nurses who agreed/strongly agreed that "my job has adequate staffing levels," "my job security is good," and "my job is very satisfying to me," were 37%, 25%, and 27%, respectively.

When analyzed individually, 3 of the 12 health care system change items were significantly associated with musculoskeletal disorders at all 3 body sites (Table 2). Three additional changes were associated with back or with neck and back musculoskeletal disorders. The mean number of changes among

TABLE 1—Sample Demographics and Selected Health Care System Changes Among a Sample of Registered Nurses (n = 1163): New York and Illinois, 1999–2000

	No. (%)
Demographics	
Gender (female)	1091 (95.4)
Age (> mean of 45 years)	523 (46.3)
Race (White)	950 (83.0)
Marital status (married)	769 (71.0)
Educational attainment (bachelor's degree or higher)	579 (50.3)
Past-Year Health Care System Changes	
Work/job responsibilities[a]	886 (77.6)
Patient acuity[a]	653 (67.8)
Unfilled registered nurse positions[a]	597 (65.0)
Client/patient load per registered nurse[a]	647 (64.7)
Full-time registered nurse replaced by part-time/temporary registered nurse[a]	343 (49.6)
Facilities/units closed[a]	255 (48.7)
Float off regular unit/area[a]	316 (48.6)
Unlicensed personnel providing direct care[a]	293 (44.9)
Length of stay/visit/procedure[b]	331 (35.2)
Registered nurse layoffs[a]	130 (30.6)
Nurse executives[b]	187 (21.2)
Advanced practice nurses[b]	83 (13.3)

[a]Increased.
[b]Decreased.

TABLE 2—Age-Adjusted Odds Ratios for a Musculoskeletal Disorder vs Being Asymptomatic, by Past-Year Negative Health Care System Changes: New York and Illinois, 1999–2000

	OR (95% CI)		
Health Care Changes	Neck MSD	Shoulder MSD	Back MSD
Work/job responsibilities[a]	1.43 (0.98, 2.08)	0.93 (0.64, 1.35)	1.68 (1.18, 2.40)
Patient acuity[a]	0.89 (0.54, 1.45)	0.52 (0.29, .95)	0.96 (0.61, 1.51)
Unfilled registered nurse positions[a]	1.36 (0.94, 1.98)	1.17 (0.79, 1.73)	1.80 (1.27, 2.57)
Client/patient load per registered nurse[a]	1.47 (1.08, 1.99)	1.36 (0.98, 1.88)	1.66 (1.25, 2.21)
Full-time registered nurse replaced by part-time/temporary registered nurse[a]	2.57 (1.73, 3.80)	1.78 (1.19, 2.67)	2.60 (1.82, 3.91)
Facilities/units closed[a]	2.67 (1.67, 4.26)	1.97 (1.20, 3.21)	2.21 (1.45, 3.36)
Float off regular unit/area[a]	1.30 (0.78, 2.18)	1.01 (0.59, 1.71)	1.33 (0.83, 2.12)
Unlicensed personnel providing direct care[a]	2.29 (1.42, 3.68)	1.80 (1.11, 2.94)	2.28 (1.49, 3.49)
Length of stay/visit/procedure[b]	1.15 (0.73, 1.80)	1.08 (0.67, 1.73)	1.35 (0.88, 2.06)
Registered nurse layoffs[a]	0.91 (0.61, 1.36)	1.01 (0.66, 1.54)	1.31 (0.91, 1.88)
Nurse executives[b]	1.72 (0.91, 3.24)	1.61 (0.85, 3.05)	1.45 (0.81, 2.58)
Advanced practice nurses[b]	1.11 (0.53, 2.35)	0.87 (0.38, 1.98)	1.34 (0.70, 2.59)

Note. MSD = musculoskeletal disorder; OR = odds ratio; CI = confidence interval.
[a]Increased.
[b]Decreased.

asymptomatic nurses (3.33) was significantly different from that of nurses who reported neck, shoulder, or back musculoskeletal disorders (4.24–4.47 changes per nurse).

When the sum of health care system changes was categorized, there was a strong association (OR>2.40) between reported moderate and high levels of health care system changes and neck and back musculoskeletal disorders, and between reported high levels of change and shoulder musculoskeletal disorders, compared with those who reported low levels of health care system changes. After adjustment, the odds for reporting a musculoskeletal disorder at all 3 body sites were attenuated somewhat by psychological and physical demands, yet the odds were still highly significant for the highest level of changes (>6) compared with the reference group. The adjusted odds ranged from 2.63 to 4.45 (Table 3). In other words, an odds ratio of 4.45 meant that among all nurses who reported more than 6 health care system changes were more than 4 times as likely to meet the criteria for a neck musculoskeletal disorder compared with those who reported 0 or 1 changes after we adjusted for all other variables considered in our analysis. Because these analyses were at the injury level of analysis, and because some nurses reported injury at more than 1 body site, we also analyzed the data with "any case" as the outcome (data not shown). The findings from these analyses were similar to the body site–specific results.

DISCUSSION

We found that health care organizational changes were associated with reported musculoskeletal disorders, even after we controlled for demographics, work characteristics, and psychological and physical job demands. The odds ratios for neck, shoulder, and back musculoskeletal disorders showed a consistent and increasing trend with the level of reported health care system change. The physical workload associated with lifting and transferring patients is responsible for many back musculoskeletal disorders among nurses.[32] However, our findings indicate an association between organizational changes and musculoskeletal disorders that is independent of the effect of physical job demands. The limited published data on the impact of health care system changes, particularly staff levels, on injuries and illness among nurses support our findings.[15–17,31,34] These collective findings suggest a number of different levels at which the prevention of musculoskeletal disorders among nurses should be targeted.

In the United States, changes in health care delivery are having a profound impact on patient care and nursing practice. Our survey data from more than 1000 nurses indicate that nurses are experiencing difficult work conditions that have an impact on their health over and above the psychological and physical job demands. When we asked about health care system changes in the past year, 65% of the nurses reported an increase in patient loads and 68% reported an increase in patient acuity. The fact that only one fourth of the nurses reported their job as "very satisfying" and as "security is good" sug-

TABLE 3—Odds Ratios for Being a Musculoskeletal-Disorder Case by Categories of Health Care System Changes: New York and Illinois, 1999–2000

Categorical Health Care Changes	OR (95% CI) Neck MSD	Shoulder MSD	Back MSD
Unadjusted model			
Reference 0–1	1.00	1.00	1.00
Low (2–3)	1.80 (0.98, 3.31)	1.03 (0.58, 1.84)	2.27 (1.30, 3.98)
Moderate (4–6)	2.41 (1.37, 4.22)	1.16 (0.68, 1.98)	2.60 (1.53, 4.42)
High > 6	4.86 (1.38, 6.10)	2.92 (1.53, 5.60)	6.02 (3.18, 11.40)
1–Adjusted for demographics and lifestyle (age, race/ethnicity, children under age 4, dependent care, BMI, smoking)			
Reference 0–1	1.00	1.00	1.00
Low (2–3)	2.00 (1.07, 3.73)	1.10 (0.60, 2.01)	2.36 (1.32, 4.20)
Moderate (4–6)	2.61 (1.46, 4.65)	1.19 (0.68, 2.08)	2.72 (1.57, 4.71)
High > 6	5.79 (2.86, 11.73)	3.29 (1.66, 6.52)	6.25 (3.21, 12.17)
2–Adjusted for above (demographics, lifestyle) plus work characteristics (workplace and position)			
Reference 0–1	1.00	1.00	1.00
Low (2–3)	2.15 (1.14, 4.06)	1.17 (0.63, 2.16)	2.39 (1.33, 4.31)
Moderate (4–6)	3.01 (1.63, 5.56)	1.33 (0.73, 2.41)	2.72 (1.52, 4.87)
High > 6	7.10 (3.34, 15.08)	3.82 (1.83, 7.95)	6.29 (3.12, 12.66)
3–Adjusted for above (demographics, lifestyle, work characteristics) plus psychological demands			
Reference 0–1	1.00	1.00	1.00
Low (2–3)	1.97 (1.04, 3.74)	1.10 (0.59, 2.06)	2.25 (1.24, 4.08)
Moderate (4–6)	2.52 (1.33, 4.80)	1.16 (0.61, 2.22)	2.18 (1.20, 3.97)
High > 6	5.68 (2.58, 12.53)	3.28 (1.50, 7.19)	4.45 (2.15, 9.23)
4–Adjusted for above (demographics, lifestyle, work characteristics, psychological demands) plus 12-item physical demand scale			
Reference 0–1	1.00	1.00	1.00
Low (2–3)	1.88 (0.98, 3.61)	1.06 (0.56, 2.01)	2.08 (1.13, 3.80)
Moderate (4–6)	2.18 (1.12, 4.22)	1.00 (0.51, 1.96)	1.79 (0.97, 3.32)
High > 6	4.45 (1.97, 10.08)	2.63 (1.17, 5.91)	3.42 (1.61, 7.27)
Final Model			
χ^2	74.6	69.7	100.3
df	13	13	13
P	< 0.001	< 0.001	< 0.001

Note. MSD = musculoskeletal disorder; OR = odds ratio; CI = confidence interval; BMI = body mass index.

gests that an organizational approach to improving health care delivery and quality of care is critically needed. Our findings that health care system changes are associated with up to a 3-fold increase in neck and back musculoskeletal disorders suggest that if changes in workload and work complexity are not addressed, there may be further negative implications for the health care delivery system and, ultimately, patient care.

The cross-sectional design of our study is a limitation in that it prevented us from interpreting the temporal association among variables described in this report. By definition, this cross-sectional study was limited to the current workforce: nurses who no longer worked in nursing because of a musculoskeletal disorder or other health conditions were not included. The absence of these individuals from the study population underestimated the prevalence of reported musculoskeletal disorders and the association of health care system changes with a musculoskeletal disorder. We are currently conducting a longitudinal study to further estimate musculoskeletal-disorder prevalence and to clarify the association between reported past-year health care system changes and the onset of reported musculoskeletal disorders.

A second limitation is the exclusive use of self-reported data. To minimize the likelihood of poor recall of health outcomes, we limited the recall period for reported musculoskeletal disorder to the past year, and we used a threshold definition of a musculoskeletal disorder that was used in other occupational-health research.[28] Nurses, as a group, have been shown to provide valid and reproducible risk factor and health outcome data when surveyed.[35–37] Because there was no validation of a reported musculoskeletal disorder from observation or from a physical examination, these findings need to be interpreted with caution.

CONCLUSIONS

Our study is an important contribution to the literature because it examines the association between health care system changes and nurses' health (in this case, musculoskeletal disorders). Our finding that changes in health care services delivery compromises not only quality of care and patient safety but also nurses' health should provide further evidence of the need for a systematic approach to improving work conditions in the health care industry. ■

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Contributors

A. Trinkoff and J. Lipscomb conceived the study and supervised all aspects of study implementation. J. Lipscomb synthesized the analyses and led the writing of the article. B. Brady assisted with study implementation and conducted data analyses. J. Geiger-Brown conducted data analyses. All authors contributed to the conceptualization of the study, the interpretation of study findings, and the writing of this article.

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Human Participant Protection

The institutional review board of the University of Maryland, Baltimore, approved the study protocol.

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Function and Response of Nursing Facilities During Community Disaster

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Objectives. We sought to describe the role and function of nursing facilities after disaster.

Methods. We surveyed administrators at 144 widely dispersed nursing facilities after the Los Angeles Northridge earthquake.

Results. Of the 113 (78%) nursing facilities that responded (11 365 beds), 23 sustained severe damage, 5 closed (625 beds), and 72 lost vital services. Of 87 nursing facilities implementing disaster plans, 56 cited problems that plans did not adequately address, including absent staff, communication problems, and insufficient water and generator fuel. Fifty-nine (52%) reported disaster-related admissions from hospitals, nursing facilities, and community residences. Nursing facilities received limited postdisaster assistance. Five months after the earthquake, only half of inadequate nursing facility disaster plans had been revised.

Conclusions. Despite considerable disaster-related stresses, nursing facilities met important community needs. To optimize disaster response, community-wide disaster plans should incorporate nursing facilities. (*Am J Public Health.* 2004;94:1436–1441)

When disasters occur, communities expect public health agencies and medical practitioners to provide services and leadership.[1] The adequacy of response to these critical public health events is largely determined by the extent to which disaster plans are comprehensive and are tailored to the population's needs and resources. Rapid implementation of such integrated plans is essential both for treating potentially large numbers of injuries[2,3] and for ensuring the safety of vulnerable populations, especially that of high-risk groups such as persons with disabilities, elderly individuals, and the chronically ill.[4–9]

Often, these vulnerable populations reside in nursing facilities, an increasingly important component of the US health care system. For instance, almost 2 million adults are admitted to the nation's 16 800 nursing facilities each year.[10,11] Moreover, 1 in 2 women and 1 in 3 men are expected to spend time in nursing facilities over the next several decades.[12] These statistics reflect the rising prevalence of chronic disease among an aging population and the increased use of nursing facilities for skilled postacute care. Since the late 1980s, hospitals have discharged patients earlier, and nursing facilities have assumed a greater role in caring for these sicker, more medically complex patients.[13,14]

Despite their expanded role in serving vulnerable populations, nursing facilities often are overlooked as a health resource and generally are not incorporated into disaster-relief plans. In fact, some researchers have dismissed nursing facilities as irrelevant to hospital patient care after disasters.[15] Because few studies have focused on nursing facilities' responses to catastrophes, the role of nursing facilities during these events remains undefined. Furthermore, little is known about the stresses that nursing facilities undergo during a community crisis. Although some data exist on the medical and psychological sequelae of disasters for vulnerable populations,[6,16–19] there is scant information on systemwide responses to hospitalized vulnerable populations or nursing facility residents.[20] When nursing facilities are mentioned, the focus usually is on a single facility's experiences or on a single problem such as evacuation. These reports indicate that the health care system's response to this population may be problematic.[21] For example, the general impression after Hurricane Andrew in 1992 was that Florida nursing facilities were ill-prepared to respond to the disaster.[20,22,23]

To help address this paucity of information, we surveyed Los Angeles County nursing facilities to learn about their experiences after the 1994 Northridge earthquake. Both the extent and the location of this disaster provided a unique opportunity for examining nursing facilities during community crisis. Despite the fact that California prepares for such events, the 6.7-magnitude quake produced widespread damage. Fifty-seven deaths (33 from trauma, 24 from sudden cardiac death) were attributed to the temblor, more than 900 patients were evacuated from damaged hospitals, and more than 9000 people were treated in emergency departments or hospitals.[24] The event was so significant that Donna Shalala, then Secretary of Health and Human Services, activated the National Disaster Medical System and sent Disaster Medical Assistance Teams to the area. By examining nursing facilities' responses to this crisis, we hoped to expand the data on how these facilities function after disasters, to identify problems they may experience, and to gain a better understanding of their potential role in the larger health service delivery system. Acquiring better information in this area is particularly important in light of the recent terrorist attacks in the United States and the increased focus on improving community disaster response.[25]

METHODS

Sampling Frame

We attempted to identify nursing facilities that were structurally damaged by the earthquake. We contacted the Los Angeles Building Inspector's Office, the state and county Departments of Health Services, the state and county Offices of Emergency Services, and the Office of Statewide Health Planning and Development to determine whether these organizations had obtained any information on

earthquake damage related to nursing facilities. We also contacted the *Los Angeles Times,* the leading Los Angeles newspaper, which provided extensive earthquake coverage. None of the public data collected by these groups after the earthquake included nursing facilities as a category or even listed such facilities as health facilities.

We matched Los Angeles Building Inspector's Office maps outlining areas of commercial/residential damage with California health facility planning area (HFPA) maps to determine which HFPAs were affected by the earthquake. With this mapping process, we identified 7 HFPAs that experienced significant damage. We then used Office of Statewide Health Planning and Development data to identify nursing facilities located within these HFPAs. We determined that 144 nongovernment and government nursing facilities were located within the 7 affected areas.

We mailed a disaster response survey to the administrators of the 144 facilities that we had identified in the affected areas. The surveys were mailed in June 1994, 5 months after the January 17 earthquake. A cover letter encouraged administrators from both damaged and undamaged facilities to respond. This letter included endorsements from the California Association of Health Facilities and the California Association of Homes and Services for the Aging, 2 voluntary statewide organizations representing long-term care and nursing facilities. In August, all nonrespondents received a follow-up telephone call and mailing. Nursing facilities returned completed surveys between June and September 1994. No financial incentive was provided.

Survey Items

Our survey addressed 5 phases of disaster planning and management that have been identified in the public health literature: anticipation and prevention, alert and warning, immediate postevent, assistance and relief, and rehabilitation.[26] We also incorporated feedback from members of a local nursing facility consortium. Specifically, the survey questions addressed nursing facilities' disaster plans, structural damage sustained, postdisaster assistance contacts received, changes in admission patterns after the disaster, and problems experienced after the earthquake. The 5-month delay between the earthquake and the survey mailing allowed us also to query nursing facilities about rehabilitation after the acute recovery phase. We pilot tested the survey with administrators from 3 nursing facilities and used the pilot data to revise the survey. Although most questions were multiple-choice format, we included some open-ended questions to better elicit each facility's experiences.

Structured Interviews

After mailing the surveys, we conducted separate structured interviews with 3 social workers who participated in discharge planning for different hospitals and with 3 social workers from different nursing facilities. We interviewed persons who were actively serving clients in the HFPAs at the time of the event and who were continuing to do so at the time of the interview. One social worker was from a damaged hospital that had evacuated patients, and 2 were from hospitals that continued to operate. Likewise, 1 nursing facility representative was from a facility that had closed because of damage, and 2 were from facilities that remained open.

RESULTS

Respondents

One hundred thirteen nursing facilities, representing 11 365 patient beds, responded (response rate=78%). Of these, 23 facilities (20%) reported significant or severe structural damage; 5 of these facilities, representing 625 beds, had closed because of structural damage. We defined "structural damage" as building damage that interfered with the facility's primary operations or that rendered parts of the facility unsafe.

We contacted the 31 nonresponding nursing facilities (representing 2976 beds). Seven reported a change in administrator and director of nursing since the earthquake, and the remaining 24 either felt that they did not have time to complete the survey or did not want to participate. None of the nonresponding nursing facilities had closed or had transferred patients out of the facility because of the disaster.

Role of Nursing Facilities

Fifty-nine nursing facilities (52% of respondents) reported disaster-related admissions immediately after the earthquake. As Figure 1 shows, these admissions were in response to a variety of community needs. In addition to the increased volume of admissions, the patterns of referrals to nursing facilities changed. For example, 35% of facilities reported that they had received transfer requests from hospitals that normally did not send them patients. Moreover, 31% of respondents reported a greater number of disaster-related requests for admission after the event than actual admissions, indicating that nursing facilities may

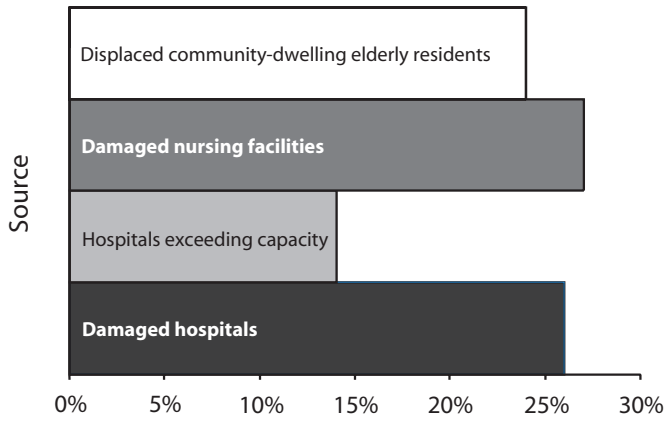

FIGURE 1—Percentage of nursing facilities admitting new residents, by source.

have received more community requests than they could accommodate.

Our interviews with social workers corroborated these findings. These individuals commented on the need to rapidly transfer hospital patients from damaged hospitals and the importance of both hospitals and nursing facilities in accommodating these needs. They also noted that the event adversely affected many community-dwelling elderly, who were displaced from affordable rental housing, became fearful of living alone, or found themselves unable to remain in the community when their support systems were disrupted by the earthquake. The social workers confirmed that these factors resulted in increased admissions to nursing facilities from the community, both for respite care (i.e., short supportive stays) and for long-term care after the disaster.

Problems Reported

Although nursing facilities assumed greater responsibilities after the earthquake, they experienced significant stress as they did so. Sixty-four percent of respondents reported that their facility lost at least 1 vital service (e.g., telephone, water, or electricity) after the disaster. These losses occurred in 78% of damaged nursing facilities and in 60% of undamaged nursing facilities. Fifteen nursing facilities transferred residents to other facilities. Eighty-seven nursing facilities (77%) implemented disaster plans, and 65% of these facilities cited a problem with their plans. In all, we identified 42 different types of disaster plan problems, which we grouped into the 9 categories displayed in Table 1.

Staff absences were cited most frequently as the problem that disaster plans inadequately addressed. Reasons for postdisaster absences included loss of transportation, loss of childcare or other dependent coverage, damages/losses sustained at home, and limited access to the nursing facilities because of blocked roads. Although most nursing facilities reported that staff shortages did not interfere with patient care, some noted that the shortages forced available employees to work more than 24 hours so that essential resident care could continue. Many other reported problems might also be anticipated across other settings (e.g., loss of functioning telephone lines, impeded evacuations resulting from the loss of elevator function, or debris blocking beds and exits). Problems more specific to health care settings included lack of access to emergency communications equipment; inability to notify families or providers when residents were relocated because collated family or provider lists were unavailable; difficulty keeping cognitively impaired persons out of unsafe areas; inappropriate evacuation sites (e.g., high school gym) for residents receiving intravenous therapy, complex wound care, or continuous tube feeding; blocked roads that hindered access to nursing facilities and required facilities to be self-supporting for extended time periods; severe structural damage mandating evacuation to unsheltered areas without access to emergency water supplies or medications; and lack of appropriate or handicap-accessible evacuation vehicles.

TABLE 1—Reported Problems With Disaster Plan and 5-Month Revisions to Disaster Plan

Problem Category	Percentage of Nursing Facilities That Cited Problems With Their Disaster Plan[a]	Percentage of Nursing Facilities With Any Problem That Addressed This Problem Within 5 Months
Staff absences	32	5
Phone equipment not working	29	7
Immediate movement and evacuation, staff knowledge of policies and procedures (blocked exits, movement from upper floors to lower floors, resident confusion, turning off sprinklers)	23	29
Insufficient water supply	20	14
Insufficient emergency generator fuel	21	11
Other supplies insufficient (flashlights, blankets, food, linens)	18	32
Obtaining needed information and assistance not directly related to problems with phone equipment (information on available beds for transfers out, safety of building, external damage and needs)	15	5
Transfers out (obtaining appropriate transportation, evacuation to an inappropriate off-site location)	12	3
Other (lack of information needed to contact families and attending physician, cognitively impaired patients wandering into unsafe areas, addressing fears of staff and residents)	10	7

[a]Percentage of nursing facilities with any problem that cited 1 or more problems in the category.

System Response to Nursing Facilities

Despite nursing facilities' potential role in disaster response and the significant stresses that they experienced after the earthquake, the early disaster assistance they received was limited. Seventy-two percent of respondents (65% of damaged facilities, 74% of undamaged facilities) reported that no person or entity acted as a regional or area "central clearinghouse" for information about facility needs, bed availability, and community resources. The social workers also noted the lack of such a system and commented on the challenges of identifying available beds for patients in need of transfer, as well as other potential needs after the earthquake. They emphasized the need for a central information clearinghouse.

In the first 24 hours after the event, public service agencies (e.g., paramedics, the Red Cross) contacted 2 damaged and 7 undamaged nursing facilities; oversight agencies (e.g., the health department, the city building inspector, the Office of Statewide Health Planning and Development, the Occupational Safety and Health Administration) contacted 2 undamaged and 6 damaged nursing facili-

ties. In addition, most nursing facilities reported that their medical directors were absent and therefore unable to provide triage assistance during this critical period: only 17 nursing facilities (5 damaged, 12 undamaged) reported that their medical directors were present at the facility during the first 24 hours after the disaster. Finally, only 6 damaged and 28 undamaged nursing facilities reported the presence of a physician during this 24-hour interval.

Interestingly, we found that other nursing facilities served as a source of support after the event. Almost one third of respondents reported that other nursing facilities called to offer assistance in the first 24 hours after the earthquake. These contacts seemed to be well targeted—all 23 damaged nursing facilities received such telephone calls. In addition, 10 undamaged facilities reported that other nursing facilities had contacted them to offer help. These communications occurred spontaneously, independent of any formal or predetermined interfacility contact system.

Rehabilitation and Preparation/ Prevention for Future Events

During the 5 months after the earthquake, only 1 of the 5 nursing facilities that closed because of earthquake damage had reopened. During the 3 years following the disaster, an additional 3 facilities reopened. During the 5-month period, some but not all, of the nursing facilities changed their transfer or disaster plans. Table 1 displays the percentage of facilities that reported a problem with their plans and that modified the plan to correct the problem within 5 months of the disaster. Of the 23 facilities without a transfer plan, only 1 had created such a plan. Of the 56 nursing facilities citing any problem with their disaster plans, 29 had made changes. In addition, although 42 facilities reported a need for resident or staff counseling after the disaster, only 18 had offered professional counseling within the 5 months.

DISCUSSION

This survey provided important information about nursing facilities' function and role in a community after a major disaster. Facilities experienced internal and external stresses that were not limited to structural damage. Most reported a lack of public assistance; other nursing facilities, rather than public agencies, were primary support contacts for damaged facilities. Despite considerable challenges, nursing facilities met a variety of community needs and accepted new residents from multiple disaster-related sources, including damaged hospitals and nursing facilities, hospitals exceeding their bed capacity, and displaced community-dwelling residents. This increase in admissions was done without advance organization and often without coordination from a central information clearinghouse.

Each disaster provides the public health community opportunities to better prepare for future events.[1,22,27] Our findings indicate that incorporating nursing facilities into disaster planning may increase the flexibility of emergency response systems and hospitals, facilitating triage to the lowest safe level of care. Advance planning also may minimize stresses experienced by already vulnerable older persons. Finally, nursing facilities that are prepared to respond during a crisis, require less attention from emergency response personnel and therefore place less stress on the disaster response system.

The nursing facilities in our study reported increased admission requests from the community after the disaster. Despite the often-expressed goal of maintaining the elderly in their own residences, this population is often overlooked in community disaster planning. Some community-dwelling elderly may be more vulnerable after a disaster owing to interrupted access to medical services needed to manage chronic disease,[28] disaster-induced health problems (e.g., falls, dehydration) or psychological stress,[6,9,18,28] loss of informal support systems, failure to match services to the populations most in need,[8,19] and lack of low-cost housing for the elderly and other vulnerable populations after disasters.[29] Clearly, the appropriate role of nursing facilities and of alternative support services (e.g., nonnursing facility, community-based support services) for this population bears closer examination, and advance planning.

Some problems reported by nursing facilities might have been anticipated from the experiences of vulnerable populations in other disasters. For instance, in various weather-related disasters, older persons with complex medical needs were evacuated to unsuitable locations[4,21]; poor planning impeded coordination among hospitals, nursing facilities, and home health agencies[20]; shelters were unable to accommodate persons with disabilities[4]; and psychological stress was widespread.[30,22]

Unfortunately, other problems reported by the respondents seem to reflect the lower standing of nursing facilities within the medical system. Limited aid from conventional sources, staffing problems, and the relative absence of medical directors and physicians, as compared to other healthcare settings,[31] reflect and magnify such facilities' isolated status even during times of relative calm. Most nursing facilities chronically confront the problems of low staffing ratios,[32–34] barely-subsistence-level wages for nursing staff,[35] infrequent visits by a small number of physicians,[31,36] and inadequate coordination with hospitals.[37–39] Although the health system expends great effort and resources to protect hospitalized older persons,[15,22] interest appears to wane when these patients enter nursing facilities.

Despite this resource disparity, nursing facilities and hospitals share the paradox of possessing disaster resources while simultaneously risking disruption or closure when disasters occur.[22,40,41] Although nursing facilities cannot treat severe trauma, hospitals are not as focused on vulnerable older persons and postacute care as are nursing facilities. Thus, both may make unique contributions. Nevertheless, most proposals for disaster response integrate hospitals but not nursing facilities,[15,41–43] thereby reinforcing the discrepancy in advance preparation and implementation of disaster plans between hospitals and nursing facilities. Many nursing facilities in our study failed to address problems with their disaster plans or to provide counseling, indicating that nursing facilities needed more resources and assistance to improve their planning.

Disaster plans should be flexible, allowing facilities to respond to internal and external stressors, and should be tailored to each community's resources and to the disasters it is likely to face. Relevant recommendations from literature in other settings (e.g., hospitals,

emergency departments, field triage units) include maintaining medical disaster backpacks and equipment modules[3]; stocking 1 week's worth of supplies and generator fuel[22]; creating centralized portable information lists that include patients' medical requirements and family contacts; sharing contingency plans for staff absences and transportation needs[22]; and assigning professionals trained in community-based emergency response to assess damage and capacity.[3] Clear communication protocols and backup plans are critical.[42,44,45] Finally, plans should identify appropriate shelters for nursing facilities residents and other persons with complex medical needs.[4]

It is encouraging that after we completed this study, the Hospital Council of Southern California and the Los Angeles County Department of Health Services Emergency Medical Services Agency met with representatives of several health facilities and organizations to discuss the inclusion of nursing facilities in regional disaster plans. Moreover, a subsequent communitywide drill included nursing facilities. We hope that this study will prompt other communities to incorporate nursing facilities into their disaster plans.

Limitations

Limitations of this study include the possibility that the retrospective self-reports of nursing facilities might over- or underrepresent their postdisaster problems and contributions. In addition, given that disasters are unique events, the generalizability of our conclusions may be limited. Finally, our methodology did not independently assess the disaster's effect on facility residents' health.

Conclusions

As nursing facilities increasingly assume responsibility for greater numbers of frail, medically complex patients, their effective functioning during community disasters will gain even more importance. The potential of nursing facilities to increase the capacity and flexibility of disaster plans is particularly important in view of the recent US focus on disaster response. To fully realize their expanded role, nursing facilities should be incorporated into community disaster plans, assisted in the creation of formal disaster plans, and included in epidemiological disaster assessments. ■

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Contributors

D. Saliba led all aspects of the study, including planning, literature review, survey design, research questions, analysis, and article preparation. J. Buchanan contributed to the survey design, research questions, analysis design, and article preparation. R. Kington contributed to research design and to recruitment of nursing homes and reviewed analyses and all drafts.

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Human Participant Protection

The study underwent expedited review by the Rand, University of California, and Department of Veterans Affairs institutional review boards and approval was obtained prior to mailing the survey. The survey did not solicit individual patient data. Each administrator was assured that the identity of individual facilities would remain confidential.

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Graphic Canadian Cigarette Warning Labels and Adverse Outcomes: Evidence from Canadian Smokers

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Objectives. We assessed the impact of graphic Canadian cigarette warning labels.

Methods. We used a longitudinal telephone survey of 616 adult smokers.

Results. Approximately one fifth of participants reported smoking less as a result of the labels; only 1% reported smoking more. Although participants reported negative emotional responses to the warnings including fear (44%) and disgust (58%), smokers who reported greater negative emotion were more likely to have quit, attempted to quit, or reduced their smoking 3 months later. Participants who attempted to avoid the warnings (30%) were no less likely to think about the warnings or engage in cessation behavior at follow-up.

Conclusions. Policymakers should not be reluctant to introduce vivid or graphic warnings for fear of adverse outcomes. (*Am J Public Health.* 2004;94:1442–1445)

In recognition of the growing health and economic burden of tobacco use,[1,2] the World Health Organization recently adopted the world's first public health treaty, the Framework Convention on Tobacco Control. This requires nations to implement a range of tobacco control policies, including important provisions for package labeling. The Framework Convention on Tobacco Control calls for large, clear health warnings "that may be in the form of a picture" and cover between 30% and 50% of the pack.

Warning labels that meet and exceed these requirements were introduced on Canadian cigarette packages in December 2000. The Canadian labels feature 1 of 16 full-color, sometimes graphic, health warnings, covering more than 50% of the front and back of cigarette packages. Messages that provide more detailed health risk and cessation information appear on the inside of packages.

Graphic warnings have been criticized on 4 general grounds: they will cause unnecessary or excessive emotional distress; smokers will simply avoid the warnings; graphic labels will undermine the credibility of the message; and, most notably, graphic or "grotesque" labels will cause reactance, or *increases* in consumption.[3,4] However, at present, there are no published findings on the impact of graphic warning labels.

The present study sought to assess emotional reactions, avoidant behaviors, and self-report measures of impact in response to the new Canadian warning labels. The study also examined to what extent, if at all, emotional responses and avoidant behaviors predicted cessation behavior at a 3-month follow-up.

METHODS

Participants

Participants were 622 adult smokers living in southwestern Ontario. Adult smokers were aged 18 years or older, had smoked at least 100 cigarettes in their lifetime, and smoked at least 1 cigarette per day at the time of the survey.

Procedure

Baseline interviews were conducted during October and November 2001, approximately 9 months after the introduction of the graphic warnings. The sample was selected using a modified Mitofsky–Waksburg random-digit dialing technique.[5]

Eligible households were identified by asking respondents the number of adult smokers in the household, and the "most recent birthday" method[6] was used to select participants from households with more than 1 adult smoker. A total of 14% (n=111) of eligible respondents refused or failed to complete the survey: 3% of potentially eligible households (it was assumed that 23% of households contained an eligible smoker, based on regional data from the Canadian Tobacco Use Monitoring Survey[7]) "broke off" before screening, and 11% of eligible respondents refused or terminated after screening. In addition, 10% (n=80) of potentially eligible households were not reached, resulting in an American Association of Public Opinion Research No. 4 response rate of 76% (n=616).[8] Participants completed a 3-month follow-up survey in January and February 2002.

Measures

Smoking Status and Demographic Variables. The baseline survey assessed daily cigarette consumption, number of years as a smoker, quitting history, and demographic variables. Intention to quit smoking was measured by asking participants whether they were seriously considering quitting in the next 30 days, 3 months, 6 months, 1 year, or not at all.

Perceived Impact of the Warning Labels. Participants were asked to what extent the warning labels had affected 4 cessation-related outcomes: daily cigarette consumption, how often they thought about the health risks of smoking, confidence in their ability to quit, and the likelihood they would quit smoking. Participants responded to these items on a 5-point bipolar Likert scale coded as negative impact (e.g., "I am a little/a lot less likely to quit as a result of the warnings"), no impact, and positive impact (e.g., "I am a little/a lot more likely to quit . . .").

Depth of Processing. A measure of *depth of processing* was developed to assess the salience of the warning labels and the extent to which smokers attended to the warnings. Nine items assessed how carefully smokers had looked at the warnings (e.g., "How closely have you ever read the messages on the outside of packages?") or reflected and elaborated on the warnings (e.g., "How often have you thought about the warnings on the inside of the pack?"). Responses were given on 5-point Likert scales and summed to create an index of depth of processing (Cronbach $\alpha=0.83$).

Emotional Reactions, Avoidance, and Credibility. Participants were asked whether they

had made any efforts to avoid the warnings by covering or hiding the labels, using a cigarette case of their own, or requesting a specific package to avoid a particular warning. Avoidance behaviors were analyzed as a dichotomous outcome, where 0=no effort to avoid the warnings and 1=any effort to avoid the warnings. Participants were also asked to what extent, if at all, they had felt fear or disgust as a result of the labels, using a 5-point Likert scale ranging from "not at all" to "extreme." An index of negative emotional reaction to the warnings was created by summing Likert responses for fear and disgust (r=0.034, P<.001). Credibility of the warnings was measured by asking: "How accurately do you feel the warnings depict the risks to your health?" using a 5-point bipolar scale ranging from "very inaccurately" to "very accurately."

Follow-Up Survey. The 3-month follow-up survey assessed any changes in smoking behavior, including attempts to quit ("Have you made any attempts to quit smoking in the past 3 months that lasted at least 24 hours?") and reductions in daily consumption. A dichotomous variable was created for cessation-related outcomes, where 0=no cessation behavior and 1=participants who had either quit, made at least 1 attempt to quit, or reduced their smoking by at least 1 cigarette per day.

Statistical Analysis

Logistic regression analyses were used to predict cessation behaviors at follow-up. All odds ratios were adjusted for measures of cigarettes per day, years smoking, intentions to quit, prior attempts to quit, gender, age, and education. All analyses were conducted using SPSS, Version 10.0 (SPSS Inc, Chicago, Ill).

RESULTS

Characteristics of Sample

A total of 616 participants completed the baseline survey. Table 1 shows that the characteristics of the study participants were similar to those of a representative sample of Canadian smokers.[7] The 1 exception is that a greater proportion of study participants were female; however, gender was not associated with any of the predictors in the regression analyses, presented later. A total of 432 participants completed the 3-month follow-up survey, for a follow-up rate of 70%. There were no significant differences between completers and noncompleters on demographic variables or any explanatory variables, including measures of smoking status, emotional reaction, credibility, and avoidance.

TABLE 1—Characteristics of Survey Respondents and of a Representative Sample of Canadian Smokers: Southwestern Ontario, October–November, 2001

Variable	Sample (n = 616)	Canada
Female, %	56.8	46.6*
Minimum of 12 years of education, %	52.1	51.3
Mean age, y	39.0	40.2
Cigarettes per day	16.2	17.0
Years smoking	20.7	21.4
Prior attempts to quit	3.5	. . .
Intentions to quit within 6 mo, %	41.2	42.5

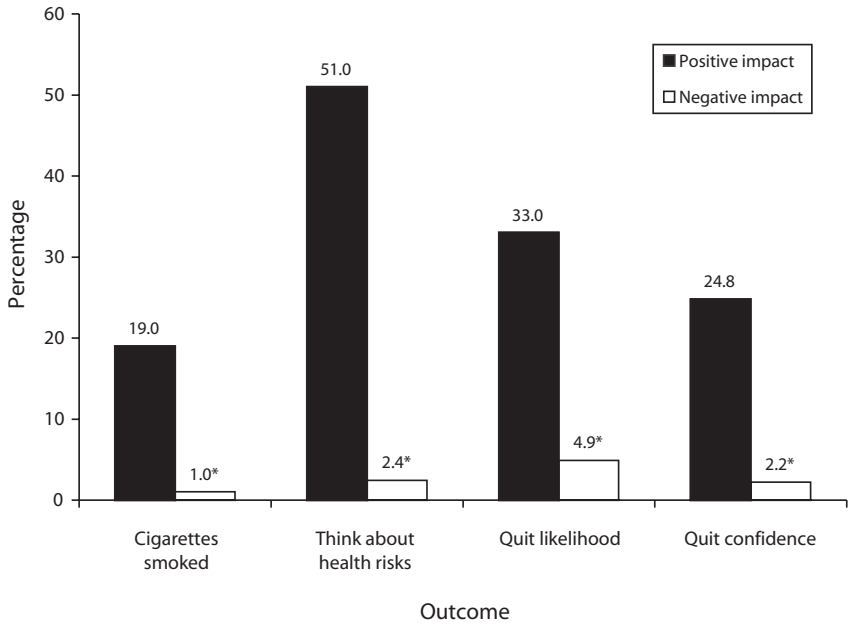
Source. Data for Canadian smokers are from the Canadian Tobacco Use Monitoring Survey.[7]
*P<.05.

Self-Report Impact

Figure 1 indicates that a substantial proportion of smokers perceived a cessation-related benefit from the warning labels. Most important, 19% of smokers reported that the warnings had made them smoke less, in contrast to only 1% who reported that they smoked more as a result of the labels (χ^2=1334.6, P<.001, df=1). Overall, 63% of smokers reported at least 1 cessation benefit, whereas only 6% reported any negative impact (χ^2=2462.2, P<.001, df=1).

Avoidance

A total of 36% of respondents reported making at least some effort to avoid the labels. Specifically, 19% had tried to cover or hide warnings, 21% had used a different case as a result of the warnings, and 17% had requested a specific package to avoid a particular warning label. Avoidance was not associated with either depth of processing of the warning labels at baseline (odds ratio [OR]=



*P<.001.

FIGURE 1—Self-reported outcomes of Canadian warning labels, at baseline (n = 616).

0.97, 95% confidence interval [CI]=0.93, 1.01) or cessation behaviors at follow-up (OR=0.86, 95% CI=0.56, 1.32).

Emotional Reactions

A substantial proportion of smokers reported experiencing at least some fear (44%) and disgust (58%). Smokers who reported greater fear and disgust in response to the labels were significantly more likely to have read and thought about the warnings at baseline (β_{stand}=.39, *P*=.001). Fear and disgust were also positively associated with each of the 4 self-report measures of perceived effectiveness at baseline. For example, smokers who reported greater fear were significantly more likely to indicate that the labels had reduced the amount they smoke (OR=2.02, 95% CI=1.59, 2.60), and increased their likelihood of quitting (OR=1.82, 95% CI=1.50, 2.22). Finally, a logistic regression was conducted to determine whether negative emotional reactions to the warnings at baseline predicted cessation behavior at follow-up. Smokers who reported greater fear and disgust were significantly more likely to have quit, made an attempt to quit, or reduced their smoking at follow-up (OR=1.37, 95% CI=1.15, 1.64). The results were similar when fear and disgust were analyzed as individual variables, rather than being combined in the index of negative emotion.

Credibility

Only 13% of smokers felt that the warnings were at all inaccurate in depicting the health risks of smoking. In addition, only 27% of smokers reported that the warnings contained "too much" health risk information, whereas 50% of all smokers wanted to see even more health information on cigarette packages.

DISCUSSION

The Canadian warning labels have elicited strong emotional reactions from smokers. However, these findings indicate that negative emotional reactions were associated with *greater* effectiveness of the warning labels. Most important, smokers who reported greater fear and disgust were more likely to either have quit, made an attempt to quit, or reduced their smoking at follow-up.

These results are consistent with the primary intent of the warning labels, which is to communicate health risks that are manifestly frightening and harsh. Warnings of lung cancer, for example, that fail to contain arousing information also fail to communicate these risks in a truthful, forthright manner. In this context, emotional reactions should be interpreted as a measure of effectiveness. In addition, although some respondents reported trying to avoid the warnings, those who avoided the warnings were no less likely to read and think about the warnings, and no less likely to engage in cessation behavior at follow-up.

Most important, this research provides no evidence of any reactance or boomerang effect in response to graphic pictorial warning labels. On the contrary, the findings suggest that the Canadian warnings may yield a public health benefit: approximately one third of smokers reported that the labels have increased their likelihood of quitting. Although the current study cannot speak directly to any public health benefit, the warnings may also act as a harm reduction measure, as 20% of smokers reported smoking less as a result of the warnings.

Finally, the graphic nature of the Canadian warnings does not appear to have compromised their credibility. Approximately 13% of smokers rated the warnings as inaccurate, only a 2% increase from the same question asked in 1999 of the previous text-only Canadian warning labels.[9] These findings add to the evidence that smokers perceive government-mandated cigarette warnings to be a credible source of health information.[9,10]

This research has several limitations. First, in the absence of pre-post measurements, the current study was not able to assess changes in avoidance and emotional reactions from the previous generation of Canadian warning labels. Second, there is no control group against which to compare the impact of the Canadian warnings. However, the current findings are consistent with those from a quasi-experimental study of US and Canadian youth indicating a lack of adverse outcomes and greater impact for Canadian warning labels compared with US labels.[11]

Overall, the current research suggests that policymakers should not be reluctant to introduce graphic cigarette warning labels based on potential adverse outcomes. Rather, short of exaggerating the risks of smoking or crossing the bounds of public decency, warning labels should adopt vivid and striking features that increase their salience among smokers. ■

About the Authors

David Hammond and Geoffrey T. Fong are with the Department of Psychology at the University of Waterloo, Waterloo, Ontario. Paul W. McDonald and Roy Cameron are with the Department of Health Studies, and K. Stephen Brown is with the Department of Statistics and Actuarial Science at the University of Waterloo. Paul W. McDonald and K. Stephen Brown are also with the Ontario Tobacco Research Unit. Geoffrey T. Fong, Paul W. McDonald, Roy Cameron, and K. Stephen Brown are also with the Centre for Behavioural Research and Program Evaluation, University of Waterloo.

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Contributors

D. Hammond conceived the study, conducted the analysis, and was the principal author of the article. G.T. Fong, P.W. McDonald, R. Cameron, and K.S. Brown contributed to the study design, analysis, and article preparation.

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Human Participant Protection

This study was reviewed and approved by the office of research ethics at the University of Waterloo.

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Department of Environmental Health, Science, and Policy
University of California
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EOE

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National Human Genome Research Institute
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