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EDITOR'S NOTE

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Women's Health Issues is extremely pleased to introduce the first Supplement to the journal since the journal's inception in 1990. Entitled "Policy and Financing Issues for Preconception and Interconception Health," this Supplement also represents a first in the journal's 17-year-long history in the types of articles presented, starting with a number of perspectives and analyses on the current status of policies and programs that affect women's access to quality preconception and interconception health care and ending with highly policy-relevant health services research articles, which showcase our continued commitment to excellence in publishing. The majority of the articles in this Supplement are focused on the past, present, and future of preconception health and health care and how these concepts may be promoted through current programs and policies, either by taking advantage of existing opportunities or by suggesting new directions for enhancements and broader health care reform as it relates to women's health. We certainly hope that our readers will be as proud as we are of this special issue.

Women's Health Issues wishes to acknowledge the U.S. Centers for Disease Control and Prevention (CDC) and its Preconception Health and Health Care Initiative for both financial and programmatic support, without which this Supplement would not have been possible. I particularly would like to thank Dr. Hani Atrash, who co-guest edited the Supplement's specially appointed editorial panel, for his vision and encouragement. Dr. Atrash was instrumental in making the Supplement a quick reality. Special thanks also to Ms. Alison Johnson and Dr. Samuel Posner, Co-Chairs of the Initiative for the CDC, and to Kay Johnson, Special Advisor to the Initiative who also assumed the role of Co-Guest Editor with Dr. Atrash, for their strong leadership.

Finally, I would like to thank D. Richard Mauery, Managing Director of the Jacobs Institute of Women's Health and Managing Editor of *Women's Health Issues*, and Andrea Schenk and Christine Rullo, Associate Publisher and Publishing Director at Elsevier, Inc., and the rest of the staff at Elsevier for doing a superb job in supporting the Editorial Office.

Because of these combined efforts, it took less than a year from start to finish to publish this Supplement. Indeed, it took a remarkably short period of time to develop, write, and produce. For this quick turnaround, I can thank many individuals. In addition to our Co-Guest Editors and the Co-Chairs of the Initiative, we wish to thank all of the contributors to the Supplement who either agreed to submit their thoughtful and sometimes provocative analyses in a very short turnaround time or promptly responded to our call for papers and submitted manuscripts reflecting the excellence of the research they currently conduct in this field of inquiry. We are also grateful for the excellent peer reviews provided by our Guest Review Panel: Melinda Abrams, Arden Handler, Harriet Jett, Alison Johnson, Helene Kent, Milton Kotelchuck, Samuel Posner, James Resnick, Colleen Sonosky, and Lisa Speissegger.

As Editor-in-Chief of *Women's Health Issues*, I look forward to many more supplements to follow. Please do not hesitate to contact us for more information or to provide any feedback you may have at whieditor@gwu.edu.

Author Descriptions

In addition to serving as Editor-in-Chief of *Women's Health Issues*, Dr. Markus is an Associate Research Professor in the Department of Health Policy in The George Washington University School of Public Health and Health Services, where she also directs the DrPH health policy specialty degree program, and an Assistant Dean for Academic Affairs in the School of Public Health and Health Services.

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WOMEN'S HEALTH ISSUES

EDITORIAL

MARCHING FORWARD
Action Steps to Optimize the Health of Women and Babies

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The American College of Obstetricians and Gynecologists (2006) states in its policy for Access to Women's Health Care that the time has come to optimize women's health. We at the March of Dimes Foundation could not agree more, and this supplement to the *Journal of Women's Health Issues* is indeed timely. With each passing year, the costs—personal, societal, and economic—become even greater. Despite our progress on many fronts—emerging science, identification of best practices, improved technical capacity—the US infant mortality again rose slightly in 2005 to 6.9 deaths in the first year of life for every 1,000 live births, from 6.8 per 1,000 in 2004 (National Center for Health Statistics, 2008). Although statisticians tell us this change is not significant, it is another year without progress. Further, more than half a million babies are born preterm (<37 completed weeks gestation) and the US preterm birth rate has increased by nearly 20% since 1990 (National Center for Health Statistics, 2008).

For decades, women have been urged to seek early and regular prenatal care by seeing a health care provider as soon as they know they are pregnant. Prenatal care continues to be the primary way to identify problems during pregnancy, giving health providers a way to assess and manage risks for preterm labor and other threats to the health of the mother and baby; but as the rates of infant mortality and preterm birth confirm, prenatal care is not good enough. The hope lies in preconception care. The goals of preconception care are to promote the health of women of reproductive age before conception, provide appropriate information and intervention, and thereby improve pregnancy-related outcomes.

Ongoing research is continually refining our understanding of many aspects of preconception care such as the role of psychosocial and social support factors, including stress (Dole et al., 2003; Lu, Lu, & Dunkell, Schetter, 2005; Misra, Guyer, & Allston, 2003), depression (Hobel, Goldstein, & Barrett, 2008), interpersonal violence (Amaro, Fried, Cabral, & Zuckerman, 1990; Coker, Sanderson, & Dong, 2004), and racism (Collins, David, Handler, Wall, & Andes, 2004; Lu & Chen, 2004). In addition, a large number of studies suggest a relationship between adverse birth outcomes and behavioral factors such as smoking, alcohol use, nutrition, and obesity (Behrman & Stith-Butler, 2007). Other interventions known to be effective include rubella immunization, hepatitis B vaccination, diabetes management, hypothyroidism management, management of maternal phenylketonuria, screening and management for sexually transmitted diseases, HIV/AIDS screening and treatment, and avoiding isotretinoin (Accutane, Hoffman-La Roche, Nutley, NJ), oral anticoagulants, and certain anti-epileptic drugs (Atrash, Johnson, Adams, Cordero, & Howse, 2006).

The US Centers for Disease Control and Prevention (CDC) Select Panel on Preconception Care identifies $\geq$14 interventions—supported by scientific evidence and clinical practice guidelines—that could improve birth outcomes if provided before pregnancy (Johnson et al., 2006). One of the most important is folic acid supplementation, beginning $\geq$3 months before conception, to prevent spina bifida and other neural tube defects. The March of Dimes and the CDC led the effort to fortify enriched grain products and initiated an awareness campaign to educate women on the importance of taking folic acid before pregnancy. Since folic acid fortification was made mandatory in 1998, the rate of neural tube defects has decreased by 26%. The

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March of Dimes also continues to advocate for increased funding of CDC's folic acid education campaign which is currently funded at a $2.2 million. Interestingly enough, however, health professionals are not the main source of women's information about folic acid. Of women aware of folic acid, 54% learned about it from the media, whereas only 33% heard of its importance from their physicians or other health care providers (March of Dimes, 2007).

Clearly, more needs to be done to support women and men in their efforts to start families with babies in optimal health. In 2006, the CDC defined 4 goals for preconception care:

1. Improve the knowledge, attitudes, and behaviors of men and women related to preconception health;
2. Ensure that all women of childbearing age in the United States receive preconception care services that will enable them to enter pregnancy in optimal health;
3. Reduce risks indicated by a previous adverse pregnancy outcome through interventions during the interconception period; and
4. Reduce the disparities in adverse pregnancy outcomes (Johnson et al., 2006; Posner, Johnson, Parker, Atrash, & Biermann, 2006).

Again, we must ask ourselves whether we are making progress. When it comes to access, the second goal on the list, the answer is *no*. Lack of access to care, particularly for women without health coverage or in medically underserved areas, is a significant barrier. According to U.S. Census data, compiled exclusively for the March of Dimes, in 2007, 12.2 million women of childbearing age were uninsured. Uninsured women receive fewer prenatal care services than their insured peers and report greater difficulty in obtaining the care that they believe they need (Institute of Medicine, 2002). The reality is that the lack of insurance coverage is causing too many lives to be lost, or impaired, because patients cannot obtain proper care (Pear, 2005).

Likewise the answer to the question of whether we are making progress in reducing risks indicated by a previous adverse pregnancy outcome or reducing disparities, goals 3 and 4, is again *no*. The lack of development and dissemination of more quality standards and inconsistent delivery of clinical services, such as use of screening tools and postpartum visits, are factors that keep women from receiving the benefits of evidence-based practices. Some women just need more information about their risks (Chuang et al., 2008; March of Dimes, 2007), whereas others need intensive medical and social interventions (Biermann, Dunlop, Brady, Dubin, & Brann, 2006). Both health care providers and consumers need to understand the role of genetics (Mennuti, 2008), and the care delivered must be culturally competent (Canady, Tiedje, & Lauber, 2008).

Although we have made headway in better understanding the factors that affect pregnancy outcomes, we must continue to accelerate and translate our understanding of evidence-based practices to improve the health of women of childbearing age. But we cannot hope to achieve progress—or the March of Dimes to fulfill its mission to lower rates of infant mortality, preterm birth, and birth defects—if known risk factors continue to be addressed as singular events instead of as part of the life cycle continuum deserving comprehensive preventative interventions. We cannot hope to have a positive influence on a broad spectrum of outcomes including maternal health, preterm birth, birth defects, developmental disabilities, and infant mortality if we do not advance policy initiatives that promote and financially provide for preconception care, both in public and private coverage.

The time to optimize women's health is now, and the March of Dimes is committed to working together to find solutions that will bring us closer to the day when every baby—at home and globally—has a healthy start in life.

References

Amaro, H., Fried, L. E., Cabral, H., & Zuckerman, B. (1990). Violence during pregnancy and substance use. *American Journal of Public Health*, 80, 575–579.

American College of Obstetricians and Gynecologists. (2006). *Access to women's health care. Statement of policy.* Washington, DC: Author.

Atrash, H. K., Johnson, K., Adams, M., Cordero, J. F., & Howse, J. (2006). Preconception care for improving outcomes: The time to act. *Maternal and Child Health Journal*, 10, S3–S11.

Behrman, R. E., & Stith-Butler, A. (Eds.). (2007). Preterm birth: Causes, consequences, and prevention. Washington, DC: National Academy Press.

Biermann, J., Dunlop, A. L., Brady, C., Dubin, C., & Brann, A., Jr. (2006). Promising practices in preconception care for women at risk for poor health and pregnancy outcomes. *Maternal and Child Health Journal*, 10(Suppl. 5), S21–S28.

Canady, R. B., Tiedje, L. B., & Lauber, C. (2008). Preconception care and pregnancy planning: Voices of African American women. *MCN The American Journal of Maternal Child Nursing*, 33, 90–97.

Chuang, C. H., Green, M. J., Chase, G. A., Dyer, A. M., Ural, S. H., et al. (2008). Perceived risk of preterm and low-birthweight birth in the Central Pennsylvania Women's Health Study. *American Journal of Obstetrics and Gynecology*, 199, 64.e1–64.e7, Epub 2008 May 2.

Coker, A. L., Sanderson, M., & Dong, B. (2004). Partner violence during pregnancy and risk of adverse pregnancy outcomes. *Paediatric and Perinatal Epidemiology*, 18, 260–269.

Collins, J. W., Jr., David, R. J., Handler, A., Wall, S., & Andes, S. (2004). Very low birthweight in African American infants: The role of maternal exposure to interpersonal racial discrimination. *Epidemiology*, 11, 337–339.

Dole, N., Savitz, D. A., Hertz-Picciotto, I., Siega-Riz, A. M., McMahon, M. J., & Puekens, P. (2003). Maternal stress and preterm birth. *American Journal of Epidemiology*, 157, 14–24.

Hobel, C. J., Goldstein, A., & Barrett, E. S. (2008). Psychosocial stress and pregnancy outcome. *Clinical Obstetrics and Gynecology*, 51, 333–348.

Institute of Medicine. (2002). *Health Insurance is a Family Matter.* Washington, DC: National Academy Press.

Johnson, K., Posner, S. F., Biermann, J., Cordero, J. F., Atrash, H. K., Parker, C. S., et al., CDC/ATSDR Preconception Care Work Group; Select Panel on Preconception Care. (2006). Recommendations for improving preconception health and health care—United States: A report of the CC/ATSDR Preconception Care Workgroup and the Select Panel on Preconception Care. Centers for Disease Control and Prevention. *Morbidity and Mortality Weekly Report*, 55(No. RR-6), 1–23.

Lu, Q., Lu, M. C., & Dunkell Schetter, C. (2005). Learning from success and failure in psychosocial intervention: An evaluation of low birth weight prevention trials. *J Health Psych*, 10, 185–195.

Lu, M. C., & Chen, B. (2004). Racial and ethnic disparities in preterm birth: The role of stressful life events. *American Journal of Obstetrics and Gynecology*, 191, 691–699.

National Center for Health Statistics. (2008). Infant mortality statistics from the 2005 period linked birth/infant death data set, Vol. 57, No. 2, of the National Vital Statistics Report. Available: www.cdc.gov/nchs. Accessed August 11, 2008.

March of Dimes Birth Defects Foundation. (2002). March of Dimes Updates: Is early prenatal care too late? *Contemporary Ob/Gyn*, 12, 54–72.

March of Dimes. (2007). Improving preconception health: Women's knowledge and use of folic acid. *Conducted by the Gallup Organization*. White Plain, NY: Author.

Mennuti, M. T. (2008). Genetic screening in reproductive health care. *Clinical Obstetrics and Gynecology*, 51, 3–23.

Misra, D. P., Guyer, B., & Allston, A. (2003). Integrated perinatal health framework. A multiple determinants model with a life span approach. *American Journal of Preventive Medicine*, 25, 65–75.

Pear, R. (2005, May 29). Health leaders seek consensus over uninsured. The New York Times. Available: http://www.nytimes.com. Accessed May 29, 2005.

Posner, S. F., Johnson, K., Parker, C., Atrash, H., & Biermann, J. (2006). The national summit on preconception care: A summary of concepts and recommendations. *Maternal Child Health Journal*, 10(Suppl. 5), S197–S205.

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WOMEN'S HEALTH ISSUES

TRANSFORMING PRECONCEPTIONAL, PRENATAL, AND INTERCONCEPTIONAL CARE INTO A COMPREHENSIVE COMMITMENT TO WOMEN'S HEALTH

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Preconception and interconception care respond to the growing body of evidence that many of the most important determinants of birth outcomes may exist before pregnancy occurs. In this sense, the strategy of extending prenatal care into the preconception and interconception periods marks a useful step in reforming the public health approach to improving birth outcomes. However, although helpful in underscoring the continuity of risk that can ultimately find expression in adverse birth outcomes, the concern is that without greater critical attention these relatively new care constructs have the potential to undermine rather than strengthen a comprehensive system of women's health care.

Introduction

It is essential that preconception, prenatal, and interconception care not be viewed as distinct entities, but rather emphasize their inherent linkages as part of a comprehensive vision of care. The danger lies in that an uncritical, business-as-usual embrace of these separate care strategies will only serve to exacerbate the discontinuities of care in what is already one of the most highly fragmented arenas of health care in the United States. To be constructive, therefore, the definition and particularly the operationalization of preconception, prenatal, and interconception care must generate greater integration and not isolation of service delivery systems. This will require new clinical and administrative practices that respect the currents of risk and clinical capacity that flow uninterrupted through these distinct arenas of care. However, the effort to ensure that preconception, prenatal, and interconception care will ultimately support integrated, comprehensive strategies of service provision must not only attend to technical and organizational considerations, it must also speak to questions of justice. This is because programs designed to improve birth outcomes are not generated exclusively by clinical or administrative insights alone. Rather, they are also deeply rooted in the fractious political debate over the best ways to alleviate the suffering of children and a longstanding societal ambivalence over the social roles of women.

Background: The Marginalization and Fragmentation of Childbearing Risk

A major barrier to the adoption of a more comprehensive vision of preconception, prenatal, and interconception care is the way the science of poor birth outcomes is portrayed in the world of public policy. If nothing else, the science of poor birth outcomes has been characterized by a proliferation of studies designed to identify singular risk associations, or "risk factors," such as teenage pregnancy, maternal illicit drug use, or the lack of prenatal care (Behrman & Butler, 2007). Although this extensive literature has clearly provided many important insights, it has also served to frame the causation of adverse birth outcomes as a series of elevated relative risks with little sense of how they interact or contribute to the overall problem of adverse birth outcomes in large populations. This

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preoccupation with identifying singular risk factors has, in turn, tended to deeply distort public perceptions of the causation of adverse birth outcomes in the United States and, consequently, public strategies to address it.

Teen pregnancy is worth examining in some detail because it is invariably identified as conveying a high risk for adverse birth outcomes and is often invoked in public discourse as an important cause of adverse birth outcomes in the United States. A large number of studies have documented that young maternal age is associated with a high relative risk for a variety of adverse birth outcomes, including neonatal mortality (Fraser, Brockert, & Ward, 1995). The association between low, and to a lesser extent high, maternal age and elevated neonatal mortality is clearly evident in Figure 1A. However, although the greatest relative risk resides at the extremes of the maternal age distribution, the maternal age groups that contribute most to the absolute numbers of neonatal deaths are not located at the margins of risk but in the middle of the maternal age distribution. This is clearly evident in Figure 1B, which overlays the actual number of neonatal deaths occurring to each maternal age grouping on the risk plot of Figure 1A. The overwhelming contribution from women in their 20s and early 30s is a direct reflection of the fact that most births in the United States occur to women in this age range. Although the risk of neonatal death is disproportionately high for young teens, the reality is that young teen childbearing is relatively rare. Indeed, eliminating the elevated risk of neonatal death associated with teenage childbearing would reduce the neonatal mortality rate in the United States as well as social disparities in neonatal mortality by <10%.

The confusion between relative risk and actual contribution, or attributable risk, is more than a technical concern; it has proven to be an important obstacle to the construction of a comprehensive approach to improving birth outcomes. This is because the higher the relative risk associated with a specific risk factor, the greater attention it receives in the public sphere. This, in turn, has pushed the public's focus on improving birth outcomes to the extreme margins of risk, even though these margins actually contribute very little to the overall problem. Significantly, this "marginalization" of the public's understanding of poor birth outcomes has had the effect of portraying our poor record of birth outcomes as the product of high-risk,

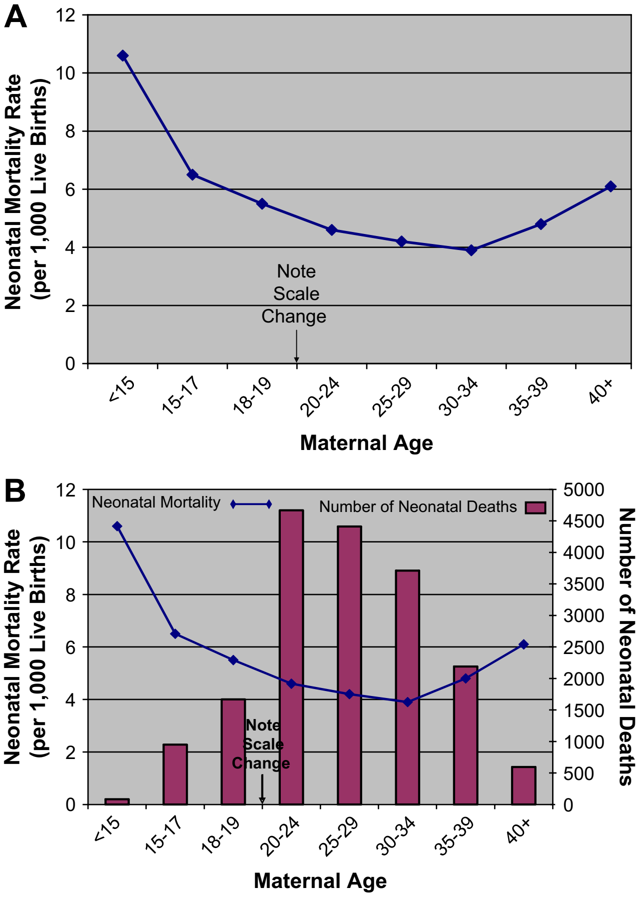

Figure 1. **A.** Neonatal Mortality Rate by Maternal Age: United States, 2004. (*Source.* Mathews, T. J., & MacDorman, M. F. [2007]. Infant mortality statistics from the 2004 period linked birth/infant death data set. *National Vital Statistics Reports*, 55, 15.) **B**. Neonatal mortality rate and number of neonatal deaths by maternal age: United States, 2004. (*Source.* Mathews, T. J., & MacDorman, M. F. [2007]. Infant mortality statistics from the 2004 period linked birth/infant death data set. *National Vital Statistics Reports*, 55, 15.)

deviant maternal behaviors, such as teenage childbearing, heavy maternal drug use in pregnancy, and a failure to seek prenatal care. Although these are serious problems for many other reasons, the vast majority of neonatal deaths occur to women in their 20s and early 30s, who do not use illicit drugs and who receive some prenatal care. Rather than make the case for enhanced access to ameliorative services, this risk association literature has helped to deform more than inform the policy deliberations concerned with improving birth outcomes. In turn, this literature has helped to generate a tragically counterproductive public rage at childbearing women, often minority women, who fall into 1 of these high-risk behavioral groupings.

The marginalization of risk has also had a harmful effect programmatically because it has resulted in a proliferation of highly targeted programs directed at relatively small groups of women while the broader infrastructure of health care delivery in these very same communities has been allowed to deteriorate. At the very same time that many communities have attempted to reduce local infant mortality rates by focusing on the margins of risk, resources have been drained from more comprehensive health services, such as community health centers or women's health initiatives.

The portrayal of adverse birth outcomes as the product of a series of relatively rare, largely behavioral, risk factors has created a deeply fragmented epidemiology. This, in turn, has generated a fragmented array of policies, programs, and constituencies all joined in the common goal of improving birth outcomes but all insulated from one another by artificially narrow domains of expertise and disciplinary self-interest. This is the context for assessing the utility of preconception, prenatal, and interconception care. Indeed, it presents the fundamental challenge to these public health constructs: How can they help to unify rather than further fragment the growing array of preventive and therapeutic interventions capable of improving birth outcomes?

Addressing this challenge must begin with the recognition that prenatal care is of crucial importance in to the health of the fetus and particularly the health of the mother. However, the evolving epidemiology of poor birth outcomes in the United States strongly suggests that one must look beyond the prenatal period alone if the tragic burden of poor birth outcomes is to be addressed. Of particular concern is the concentration of neonatal and infant mortality in extremely low birthweight and premature newborns. In 2002, more than half of all infant mortality and almost three quarters of all neonatal mortality in the United States occurred to infants born at a birthweight of $\leq$1,500 g (corresponds generally to 31 weeks of gestation; Mathews, Menacker, & MacDorman, 2004). Figure 2 presents the contribution of each birthweight group to the total number of neonatal deaths in the United States. The steep slope of the graph reflects the importance of the lowest birthweight groups. In fact, more than half of all neonatal deaths were accounted for by infants born at <700 g, which corresponds to an expected gestational age of 25–26 weeks. Severe morbidity is also concentrated in these birthweight and gestational age groups, as are the racial disparities that have long plagued the neonatal mortality rate in the United States (Wise, Wampler, & Barfield, 1995). It should be remembered that, in most jurisdictions, the legal limit for uncomplicated induced abortions is 24 weeks of gestation. Programs designed to reduce neonatal mortality and morbidity, therefore, must address extremely low birthweight and prematurity, namely births occurring on the margins of viability.

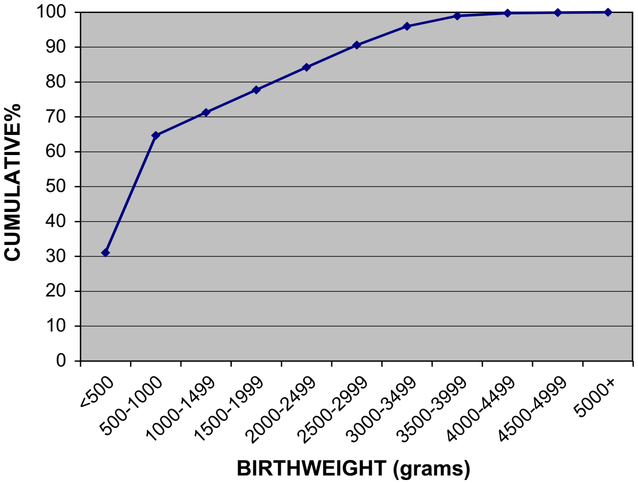

Figure 2. Cumulative percent of all neonatal deaths by birthweight: United States, 2004. (*Source.* Mathews, T. J., & MacDorman, M. F. [2007]. Infant mortality statistics from the 2004 period linked birth/infant death data set. *National Vital Statistics Reports*, 55, 15.)

Given the current epidemiology of adverse birth outcomes in the United States, the temporal window of opportunity for prevention during the prenatal period is functionally quite small. For most large prenatal care enhancement programs, it is very difficult to identify women who are pregnant, assess their risk status, make appropriate referrals for medical or social services, and implement the requisite interventions all in time to prevent the birth of the extremely premature and low birthweight infants. Not only does the temporal epidemiology of adverse birth outcomes challenge a constrained focus on prenatal care, but the nature of the prenatal conditions themselves largely preclude relatively simple and quick interventions. According to 2004 data from the Pregnancy Risk Assessment Monitoring System, approximately 20% of women delivering live-born infants had some form of chronic medical condition and 35% were either overweight or obese (D'Angelo et al., 2007). For that same year, 23% were using tobacco in the 3 months before conception with some 78% of these women reporting tobacco use postpartum. Half of the childbearing women reported alcohol use during pregnancy. Virtually all of these risk-conveying conditions begin long before conception occurs and their resolution generally requires relatively long-term and sustained interventions. In addition, some of the more effective short-term interventions designed to improve birth outcomes, such as folate supplementation to prevent neural tube defects, must act so early in pregnancy that they have to be initiated before conception. Together, these requirements for reducing the main contributor to poor birth outcomes, extreme prematurity, place a heavy and largely inappropriate burden on prenatal services, an arena of care that is functionally confined to the period between when a woman knows she is pregnant and the 25th–26th week of gestation.

Discussion: Constructing a Comprehensive Commitment to Women's Health

In theory, all fertile women between menarche and menopause are potentially preconceptional. Although preconception care has been a useful extension of prenatal care by recognizing that childbearing risk may predate conception, it is nevertheless an anticipatory health construct predicated on intentionality. Functionally, preconception care becomes useful only when a woman intends or at least anticipates a pregnancy. If a woman does not anticipate that she will conceive in the near term, it is difficult to see the utility, or indeed even the meaning, of preconception care. Understanding the importance and limits of preconception care, therefore, relates directly to how the expectation of pregnancy maps onto the reality of childbearing patterns in the United States.

Perhaps the greatest challenge to the utility of preconception care is the observation that approximately half of all pregnancies are unplanned in the United States (Finer & Henshaw, 2006). Unplanned pregnancies are even more common among poor women. Although unplanned pregnancies are less likely to result in a live birth, the fact that such a large portion of pregnancies are not anticipated raises serious questions about the potential public health impact of even high-quality preconception care.

The utility of interconception care is also limited by similar concerns. Virtually by definition, interconception care can only be defined after the fact. Although it refers to conception, most service programs consider interconception care as beginning once a woman has a child. However, it cannot be considered the "interconception" period until the woman once again becomes pregnant. When you meet a woman who has had a child, how can you know she is in the interconception period? In theory, any woman who has delivered a child is *potentially* "interconceptional" until menopause or surgical sterilization. As was the case for preconception care, interconception services only make sense if the woman intends or is likely to become pregnant again in a relatively short period of time. According to recent data from the National Survey of Family Growth, almost one third of women who give birth in the United States will not have a second child (Chandra, Martinez, Mosher, Abma, & Jones, 2005). It is not clear what portion of this group had intended to have another child. Another third will have a second child only after 3 years, with most of these after 4 years subsequent to the first birth. Whereas a short interval between pregnancies is associated with an elevated risk for adverse birth outcomes and should be addressed by both public health and clinical interventions, such births account for a minority of adverse birth outcomes (DeFranco, Stamilio, Boslaugh, Gross, & Muglia, 2007). The epidemiology suggests that a large portion of women who have delivered a child may not ever again become pregnant and, for those who do, may not anticipate the subsequent pregnancy and may go for a long period of time between pregnancies.

Preeconception care, prenatal care, and interconception care seem diagrammatically to capture the entire childbearing experience. However, when examined under an operational lens, this framing captures only pieces of the childbearing experience, ignoring large groups of the neediest women and even larger arenas of childbearing risk. Preconception care requires that pregnancies are planned, which consequently disregards a large portion of pregnancies in the United States. Prenatal care cannot address the nature and severity of many risks that life before conception may convey to pregnancy. Interconception care requires that women successfully anticipate having >1 child in a relatively short period or time. The problem with these constructs is not that they do not involve the provision of important health services. Rather, the problem is the policy-based and programmatic impact of implying that these services can be confined to an identifiable group of women who can then be afforded special access to a identifiable set of effective services.

At some point, the public health approach to improving birth outcomes in the United States must recognize that the only way to reach this goal is by addressing the requirements of women's health regardless of pregnancy status. The only way to provide preconception care for that large group of women not expecting to become pregnant but who do is by providing high-quality health care to all preconceptional women, namely, all those of reproductive age. This observation must be coupled with the understanding that prenatal care initiated only after a woman knows she is pregnant is not likely to be the most effective way to address processes occurring early in pregnancy or to reduce long-standing health-related risks. Interconception care is merely health care provided to women after they have had a pregnancy or birth; some will go on to have another pregnancy whereas others will not. Once again, this functionally becomes providing comprehensive women's health—including high-quality reproductive and obstetric care—to a population of reproductive-aged women, some of whom may go on to have another child. Moreover, it seems highly unreasonable to expect that a highly efficient and effective system of pregnancy-related care can be constructed amid a highly fragmented and poorly resourced general women's health care system. The best guarantee that a woman would receive high quality preconception, prenatal, and interconception care is the establishment of a strong, comprehensive, and exquisitely accessible health care system for all women regardless of their intention to bear children.

The need to recast preconception, prenatal, and interconception care as part of a larger commitment to women's health is not only rooted in epidemiology, but also in the dynamics of policy development and advocacy. Preconception, prenatal, and interconception care are all public health constructs that are referent to a women's reproductive capacity; they are all about "baby-making" and are directed explicitly at ensuring the health of the newborn. Among the most troubling expressions of a tight focus on the newborn has been the impulse to treat maternal health problems such as smoking, alcohol abuse, poor nutrition, and illicit drug use merely as threats to the fetus, as if they had no deleterious effect on the health of women (Chavkin, Breitbart, & Wise, 1998). This focus on fetal effects has drawn on the marginalizing epidemiology of intrauterine risk to transform a long-standing commitment to child protection into something that is perhaps best labeled "fetal protection." Here, child abuse is transformed into "fetal abuse," casting, virtually by definition, the pregnant women as assailant. Although this posture has proven attractive to some in the pediatric and law enforcement arenas, it has generally resulted in highly counterproductive programs and policies as well as deep antagonisms at times between the women's health and the child health communities (Chavkin, Elman, & Wise, 1997).

An integrated approach must also confront how the plight of newborns is traditionally portrayed in public discourse and advocacy. It has been the long-standing advocacy position that it is more effective to advocate for young children than it is for their parents. It is not surprising, therefore, that many might want to define health services to women of reproductive age in terms of newborn health. The problem is that, for the most part, children are poor because their parents are poor, and focusing on the plight of children has not generated policy remedies that have addressed the more fundamental issues of diminishing parental earning capacity, harsh parental leave policies, or disastrous housing policies for young families. Adverse birth outcomes are clearly related to women's health and focusing on the health of the newborn has not resulted in improvements in such important arenas as contraception, chronic disease management, abortion, or behavioral and mental health services. Both the epidemiology and recent history of this advocacy strategy argue against its practical utility. Advocacy stances that attempt to elevate the societal claims of newborns by ignoring the claims of women do not, in the end, serve the interests of either (Wise, 1995).

Conclusion

Preconception, prenatal, and interconception care will continue to provide useful frameworks for delivering many effective services to childbearing women. This discussion does not question the intentions or focused utility of extending a concern for newborn health to both the periods before and after pregnancy. Rather, the central premise of this discussion is that preconception, prenatal, and interconception care must be extended even further and ultimately transformed into components, albeit important components, of women's health care over a lifetime. This transformation, however, will not be accomplished easily because it requires confronting long-held approaches to the identification of newborn risk, an array of highly fragmented programmatic strategies, and advocacy positions that sound more progressive than they are.

A tightly confined preoccupation with women's reproductive capacity is not only likely to prove ineffective, it is also unjust. At some point, we must recognize that the tragedy of poor birth outcomes in the United States is largely a legacy of the poor general health status of women in the United States. Accordingly, programs and policies that are concerned for the health of the mother only to the extent that it affects that of the newborn are technically unsound and morally illegitimate. This discussion argues for a comprehensive approach to improving newborn health, one that respects the complex epidemiology of childbearing and the pragmatic requirements of constructing a strong, collective commitment to women's health.

References

Behrman, R. E., & Butler, A. S. (2007). *Preterm birth: Causes, consequences, and prevention*. Washington, DC: National Academies Press.

Chandra, A., Martinez, G. M., Mosher, W. D., Abma, J. C., & Jones, J. (2005). Fertility, family planning, and reproductive health of U.S. women: Data from the 2002 National Survey of Family Growth. National Center for Health Statistics. *Vital Health Statistics*, 23, 48.

Chavkin, W., Breitbart, V., & Wise, P. H. (1998). National survey of the states: Policies and practices regarding drug using women. *American Journal of Public Health*, 88, 117–119.

Chavkin, W., Elman, D., & Wise, P. H. (1997). Mandatory testing of pregnant women and newborns: HIV, drug use and welfare policy. *Ford Urban Law Journal, XXIV* 749–756.

D'Angelo, D., Williams, L., Morrow, B., Cox, S., Harris, N., Harrison, L., et al. (2007). Preconception and interconception health status of women who recently gave birth to a live-born infant—Pregnancy Risk Assessment Monitoring System (PRAMS), United States, 26 reporting areas, 2004. *MMWR*, 56, 1–35.

DeFranco, E. A., Stamilio, D. M., Boslaugh, S. E., Gross, G. A., & Muglia, L. J. (2007). A short interprenancy interval is a risk factor for preterm birth and its recurrence. *American Journal of Obstetrics and Gynecology*, 197, 264, e1–6.

Finer, L. B., & Henshaw, K. (2006). Disparities in rates of unintended pregnancy in the United States, 1994 and 2001. *Perspectives on Sexual and Reproductive Health*, 38, 90–96.

Fraser, A. M., Brockert, J. E., & Ward, R. H. (1995). Association of young maternal age with adverse reproductive outcomes. *New England Journal of Medicine*, 332, 1113–1117.

Mathews, T. J., Menacker, F., & MacDorman, M. R. (2004). Infant mortality statistics from the 2002 period linked birth/infant death data set. *National Vital Statistics Reports*, 53, 13.

Wise, P. H., Wampler, N., & Barfield, W. (1995). The importance of extreme prematurity and low birthweight to US neonatal mortality patterns: Implications for prenatal care and women's health. *Journal of the American Medical Womens Association*, 50, 152–155.

Wise, P. H. (1995). Child beauty, child rights and the devaluation of women. *Health and Human Rights*, 1, 101–105.

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THE FUTURE OF PRECONCEPTION CARE
A Clinical Perspective

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The concepts of preconception care (PCC) have been discussed for over 20 years and the standards for PCC have been recently promulgated by the clinical committee of the Centers for Disease Control and Prevention's Select Panel of Preconception Care. For PCC to be fully realized, however, changes must be made in clinical practice, public health supports, and health coverage. This article discusses 1) the clinical content and delivery of PCC, 2) barriers to why this care does not fit easily into the current clinical paradigm for providing medical care, and 3) how new information technologies within the concept of the medical home might be a promising new way to assist in the diffusion of these concepts.

National Consensus About the Importance of Preconception Care

Preconception care (PCC) was first described by Chamberlain as a specialty service for women who had previously had a poor reproductive outcome (Chamberlain, 1980; Chamberlain & Lumley, 1986). It was then described in the United States by the US Public Health Service (PHS) in the landmark publication, *Preventing Low Birth Weight* (Institute of Medicine, 1985) and later by Moos and Cefalo (1987) at the University of North Carolina. The concept was adopted by the US PHS Expert Panel on the Content of Prenatal Care (Jack & Culpepper, 1990a), which defined the components of PCC and emphasized that it is most effectively delivered as part of primary care services. Development of the concept was identified as a priority in the 1990s by the US PHS, whose report included, among the health promotion and disease prevention objectives for 2000, a recommendation to increase to ≥60% the proportion of primary care providers who offer age-appropriate PCC and counseling (US PHS, 1991, 2000). *Healthy People 2010* includes many objectives that address preconception health.

The National Committee on Perinatal Health, led by the American College of Obstetricians and Gynecologists (ACOG), the American Academy of Pediatrics (AAP), and the March of Dimes, made recommendations for action and offered a prototype preconception screening tool. They encouraged all primary care providers to play an active role in promoting prevention before pregnancy. The "Guidelines for Perinatal Care" jointly issued by the AAP and ACOG recommended that "all health encounters during a woman's reproductive years, particularly those that are a part of PCC, should include counseling on appropriate medical care and behavior to optimize pregnancy outcomes" (AAP & ACOG, 2001). Other ACOG publications emphasized the importance of PCC in the continuum of women's health care (ACOG, 1995, 2002; ACOG Preconception Work Group, 2005). In 2002, the March of Dimes Birth Defects Foundation suggested that as the key physician/primary care providers, obstetrician/gynecologists must take advantage of every health encounter to provide PCC

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and risk reduction before and between conceptions—the time when care really can make a difference (March of Dimes, 1993, 2002). The importance of PCC as a concept was further articulated in family medicine (Gjerdingen & Fontaine, 1991; Frey, 2002; Jack, 1995), nurse-midwifery (Reynolds, 1998), nursing (Moos, 2002, 2003), and public health (US PHS, 1991, 2000). The American Diabetes Association (2004), the American Academy of Neurology (Anonymous, 1998), and the American Heart Association/American College of Cardiologists (Hirsh, Fuster, Ansell, & Halperin, 2003) promulgated recommendations on PCC in their specialties. A similar approach has been suggested in Canada (Agrey et al., 2005; Best Start, 2002), The Netherlands (Health Council of the Netherlands, 2007), and elsewhere in Europe (Czeizel, 1999).

Delivery of Preconception Care

Despite this broad interest in PCC, there has been only modest progress in implementing these concepts into clinical practice. Health services research and translational research to inform changes in clinical practice have lagged. Existing research indicates that most women realize the importance of optimizing their health before pregnancy, whether or not the pregnancy is planned (Frey & Files, 2006), and that most physicians think PCC is important (Morgan, Hawks, Zinberg, & Schulkin, 2006). However, most providers do not routinely recommend or provide PCC to their patients (Williams et al., 2006). One randomized clinical trial found that, even when given specific training, physicians failed to take action on risks identified at the time of a negative pregnancy test (Jack, Culpepper, Babcock, Kogan, & Wesimiller, 1998). National surveys indicate that 84% of women 18–44 years of age have had a health care visit during the past year, and that most women of reproductive age obtain preventive health services any given year (Salganicoff, Ranji & Wyn, 2005); thus there are many opportunities to deliver PCC. However, about only 1 in 6 obstetricians/gynecologists or family physicians provide PCC to the majority of the women for whom they provide prenatal care (Henderson, Weisman, & Grason, 2002). There is still a great deal that we must learn about why PCC is not more widely practiced.

The Clinical Content of Preconception Care

In the introductory article to this supplement, Johnson, Atrash, & Johnson (2008) reviewed the accomplishments of the first 4 years of the Centers for Disease Control and Prevention (CDC)'s Workgroup on Preconception Health and Health Care. A key component of this initiative was the organization of the Select Panel on Preconception Care in June 2005. The panel established implementation workgroups to develop strategies for implementing the PCC recommendations published in the *Morbidity and Mortality Weekly Report* (CDC, 2006) in 5 areas—clinical, public health, consumer, policy and finance, and research and surveillance. In June 2006, members of the clinical workgroup asked the following questions: What are the clinical components of PCC? What is the evidence for inclusion of each component in clinical activities? Over the next 2 years, the 29 members of the clinical workgroup and >30 expert consultants reviewed in depth >80 topics selected based on the effect of PCC on the health of the mother and/or infant, prevalence, and detectability. A series of topics related to PCC were studied by a member of the clinical committee or by a selected content expert, in a process similar to systematic review. The first author, in concert with the editors, then identified members of the clinical committee with interest and expertise in that content area and asked them to contribute to that manuscript. For each topic, the workgroup assigned a score for the strength of the evidence supporting its inclusion in PCC and assigned strength of the recommendation. The resulting series of 16 manuscripts were published in a supplement to the *American Journal of Obstetrics and Gynecology* (Jack & Atrash, in press). These topics, organized into 14 separate clinical areas, together define the clinical content of PCC (Table 1). The work describes the content of the health promotion activities that are part of PCC and describes the content of preconception risk assessment activities—immunizations, infectious diseases, medical conditions, psychiatric conditions, parental exposures, genetics and genomics, nutrition, environmental exposures, psychosocial stressors, medications, and reproductive history. Finally the committee discussed PCC for special populations and for fathers. A table providing a summary list of the topics reviewed, the consensus recommendation for each topic, the strength of the recommendation, and the rating of the quality of the evidence is included in the AJOG supplement (Jack & Atrash, in press). As identified in the recent Eunice Shriver Child Health and Human Development's *Setting the Research Agenda* meeting, translating the CDC "best practices" identified by the CDC's Select Panel into everyday use by clinicians is a major priority.

Barriers to the Delivery of Clinical Preconception Care

The slow growth of PCC results from the many challenges faced in providing this care. In a 1990 commentary in *JAMA*, Jack and Culpepper (1990b) identified the following 7 barriers to the dissemination of PCC: 1) those most in need of services are those least likely to receive them; 2) provision of services is often badly fragmented; 3) there is a lack of available treatment services for high-risk behaviors; 4) reimbursement for risk

Table 1. Clinical Content of Preconception Care

Clinical Areas	Specific Topics
Health promotion	Family planning and the *Reproductive Life Plan*, physical activity, weight status, nutrient intake, folate, immunizations, substance use, sexually transmitted infections
Immunizations	Human papillomavirus, hepatitis B, varicella, measles, mumps, and rubella, influenza, dTaP
Infectious diseases	HIV, hepatitis C, tuberculosis, toxoplasmosis, cytomegalovirus, listeriosis, parvovirus, malaria, gonorrhea, chlamydia, syphilis, herpes simplex virus, asymptomatic bacteriuria, periodontal disease, bacterial vaginosis group B streptococcus
Medical conditions	Diabetes, thyroid, phenylketonuria, seizures, hypertension, rheumatoid arthritis, lupus, renal disease, renal disease, cardiovascular disease, thrombophilia, asthma
Psychiatric conditions	Depression/anxiety, bipolar disease, schizophrenia
Parental exposures	Alcohol, tobacco, illicit substances
Family and genetic history	All individuals, ethnicity-based, family history, personal history
Nutrition	Dietary supplements, vitamin A, folic acid, multivitamins, vitamin D, calcium, iron, essential fatty acids, iodine, underweight, overweight, eating disorders
Environmental exposures	Mercury, lead, soil/water hazards, workplace exposures, household exposures
Psychosocial risks	Inadequate financial resources, access to care, physical/sexual abuse
Medications	Prescription, over-the-counter, dietary supplements
Reproductive history	Prior preterm birth, prior C-section, prior miscarriage, prior stillbirth, uterine anomalies
Special populations	Women with disabilities, immigrant/refugee populations, cancer survivors
Men	Preparation for fatherhood, supportive relationships, exposures, genetic history

assessment and health promotion activities is inadequate; 5) health promotion messages are not effective unless received by a motivated couple; 6) only a few conditions have data supporting intervention before conception rather than intervention early in pregnancy; and 7) many clinical training programs do not emphasize risk assessment and health promotion skills. These barriers to delivering PCC as part of clinical services are as relevant today as they were then.

A Change in the "Business as Usual" Paradigm

A diffusion theory of new medical practices has been defined for many different new medical concepts, techniques, and technologies. However, in part because of the barriers outlined, diffusion of PCC practices has not been successful. A fundamental shift is needed that incentivizes health promotion, risk assessment, and counseling within medical practice. A new model of care that emphasizes primary care services, assists with coordination of specialty services, and is linked to new information technologies that allow for such care to be conveniently provided offers the potential to assist the much-needed diffusion of these concepts (Atrash et al., in press). Examples of how we can change business as usual are described below.

The patient-centered medical home

For PCC to be diffused into routine clinical care, there is a need for new innovations in the way care is provided. Concepts such as the patient-centered medical home—which has been described as a partnership approach between patients and providers to provide primary health care that is accessible, patient-centered, coordinated, comprehensive, continuous, and culturally appropriate (Sia, Tonniges, Osterhus, & Taba, 2004)—strive to invoke fundamental change in the way primary care is structured, delivered, and financed, leading to a more efficient and cost-effective health care system. Some of the key principles for advancement of this concept relating to PCC include: 1) realigning incentives to support patient centered preventive care practices; 2) monitoring outcomes at the practice and population levels; 3) maximizing patient adherence to customized self-care management programs; 4) modifying public and private financing for preventive care (e.g., Medicaid, private insurance, public health financing); 5) empowering clinical and nonclinical staff to navigate patients through the medical system; 6) coordinating care through linkage of clinical electronic medical records of primary care coordinators with centralized electronic medical records; and 7) establishing a system of primary care reimbursement that compensates clinicians for care coordination and technology infrastructure advancements. Within the patient-centered medical home concept, the financial and policy incentives are aligned so that health information technology (HIT) can be fully implemented and can provide a framework for delivery of PCC.

HIT and preconception care

One of the few areas of consistent bipartisan agreement in congress is support for development of HIT. HIT systems hold great promise for assisting in the delivery of PCC services, especially in their ability to assist clinicians in the delivery of PCC care as part of their clinical practice. HIT is a tool that can help to overcome some of the barriers to providing routine health promotion messages, performing risk assessments, and initiating clinical interventions. Electronic medical

Table 2. Why Virtual Patient Advocates Can Effectively Deliver Preconception Care

1. Relies only minimally on text comprehension and uses the universally understood format of face-to-face conversation, thus making it less intimidating and more accessible to patients with limited literacy skills.
2. Enhances recall of critical information. A study that compared information delivery to students via an agent using speech output to an identical system using text output found that students recalled more information when using the VPA system (Moreno et al., 2000).
3. Provides redundant channels of information for conveying semantic content of communicated in speech enhancing the likelihood of message comprehension using nonverbal conversational behaviors—such as hand gestures that convey specific information through pointing ("deictic" gestures) or through shape or motion ("iconic" and "metaphoric" gestures; McNeill, 1992).
4. Listeners not only pay attention to hand gestures made by a speaker, they integrate this information into their understanding of the verbal message being communicated, and actually prefer information in the gesture channel when it conflicts with information in speech (Cassell et al., 1998, 2001).
5. Provide a much more flexible and effective communication medium than a videotaped lecture or even combined video segments. The use of synthetic speech makes it possible to tailor each utterance to personal information, to the context of the conversation, and to nonverbal behavior exhibited by the patient.
6. Deliver individualized, consistent, high-quality messages, every time. The information and education provided can be targeted and tailored to an individual's risk profile so that patients are not required to listen to prolonged messages that are not directly relevant to them, thus improving interest.
7. Are cost-effective because they negate the need for extensive clinician time, thus providing great cost savings; the VPA could be delivered to many women when adapted to a web-based platform.
8. Provide a natural, easy-to-use, and accessible source of information for patients, especially those with low literacy skills, and a low-pressure environment where patients are free to take as much time as they need (Bickmore et al., 2008).
9. Characteristics of the agent can be adapted to address issues of race, gender, and ethnicity in educational settings—studies show that student's rating of affability, engagement, and who they "better relate to" varies by race and can be modified based on characteristics of the agent (Baylor et al., 2003; Baylor & Kim, 2003).
10. Can assess competency and understanding of the subject about the messages it delivers. Reports of the knowledge and reported future behaviors can be produced for our human staff to analyze and to further intervene for those at risk.
11. Enhance learning—research has found that students who interact with the VPA produce more correct solutions and rate their motivation to continue learning and interest in the material significantly higher (Graesser et al., 1999; Lester et al., 1997, 1999; Moreno et al., 2000; Person et al., 2001).

records are but the tip of the iceberg of HIT; the medical home of the future must be set up to carry out health promotion and patient education that is easily delivered and acceptable to patients. New, innovative information technologies are inevitable and will help to transform the office visit, allowing a shift toward a more efficient, prevention-centered approach to care. Computer programs, delivered over the web or in the clinic, will allow for risk screening and patient education about prevention while better utilizing provider time. One example of such a system that is being developed to provide PCC within a patient-centered medical home concept is described below.

Virtual patient advocates: An example of a HIT system to deliver preconception care

Our team has designed and created a unique HIT system—the Virtual Patient Advocate (VPA)—that includes a computerized, animated character designed to integrate best practices from provider–patient communication theory. The VPA emulates the face-to-face conversational behavior of an empathic provider, including nonverbal communicative behavior such as gaze, posture, and hand gestures to deliver patient education messages tailored to individual needs, assess patient comprehension, and record progress (Bickmore, Caruso, Clough-Gorr, & Heeren, 2005; Bickmore, Gruber, & Picard, 2005; Bickmore & Giorgino, 2006; Bickmore & Pfeifer, 2008). This new HIT tool is ideal for delivering PCC because it addresses problems of fidelity, competency, ease of delivery to large numbers of patients, clinician time constraints, patient acceptability, and high cost—problems that we identified as barriers to translating PCC best practices to clinical care (Jack, 2008).

Several studies have focused specifically on the use of life-like pedagogical agents and animated conversational agents for the enhancement of both adult and patient education (Baylor & Kim, 2003; Baylor, Shen, & Huang, 2003; Cassell, McNeill, & McCullough, 1998; Cassell, Vilhjálmsson, & Bickmore, 2001; Graesser, Wiemer-Hastings, Wiemer-Hastings, & Kreuz, 1999; Lester, Stone, & Stelling, 1999; Lester, Voerman, Towns, & Callaway, 1997; McNeill, 1992; Moreno, Lester, & Mayer, 2000; Person, Graesser, Bautista, & Mathews, 2001). Such studies have found evidence of improved understanding and learning, and of increased motivation to learn, and interest in subject matter with the use of such systems. These improvements in learning and motivation were greater even than those seen with educational software systems that lacked an animated character (Bickmore & Mauer, 2006). In a study comparing different interaction modalities on the personal data assistant-based system, it was found that users who conducted relational (getting acquainted) interactions with the system rated social bonding with the agent and caring of the agent highest when it was presented as an embodied (animated humanoid) conversational agent, compared with text and static image representations of the agent (Bickmore & Mauer, 2006). Another study investigated methods that a VPA could use to explain health documents to patients, and found that low health literacy patients preferred the VPA over explanation by a human (those with high health literacy rated the VPA and human equally; Bickmore, Pfeifer, & Yin, 2008).

Putting these types of systems to work for PCC could generate interest and enhance knowledge of potential risks and important preventive strategies. Table 2 shows the reasons that HIT such as the VPA could be especially effective in delivering PCC.

Three-tier HIT toolbox

Our team is developing three tools to assist in the VPA-delivered PCC.

First, a *PCC curriculum* containing multiple levels of information about preconception risks that will be used to educate women about these topics has been developed. The VPA will be programmed to incorporate the risk assessment to gauge the level of teaching necessary for each topic. For example, if a woman reports smoking or having active exposure to secondhand smoke, she will receive the full information about the benefits of quitting smoking and avoiding exposure, whereas a woman who reports no exposure (either first- or secondhand) will receive positive reinforcement as well as brief dialogue about the importance of not smoking and of avoiding secondhand exposure. Thus, the curriculum will be tailored to each woman's unique needs, concentrated in areas where she needs the most attention. The VPA can be designed so that women receive key messages but are able to "drill down" into more detail as they choose. At each level, the information provided is designed for women of all health literacy levels.

Second, an individualized *reproductive life plan* booklet will be printed and spiral bound for each patient to take home. This booklet contains important information about health, identified preconception risks, resources for support, and services to help make behavior changes. Subjects will be encouraged to share this plan with their medical provider, as well as their partner, if applicable, so that risks can be reviewed. The *Reproductive Life Plan* will be designed to make reproductive life decision making accessible to women with limited health literacy.

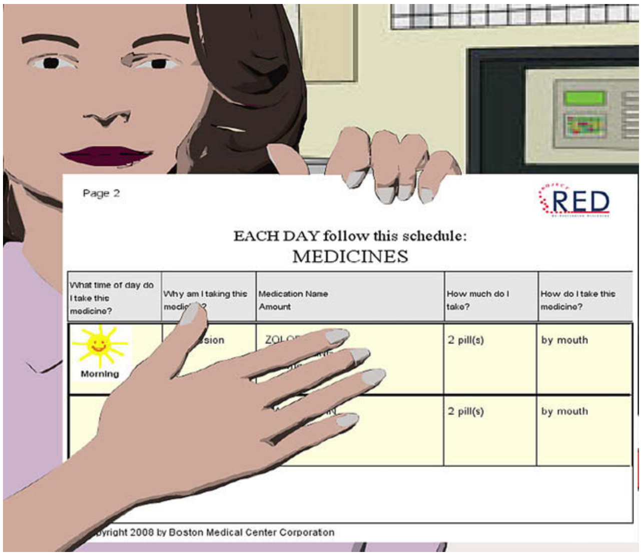
Third, the VPA system will print out a *personalized letter* to the woman's primary care physician listing the topics that were discussed and the activities that need to be performed in the clinical site (e.g., MMR vaccination, toxoplasmosis titer, among others).

The preconception care kiosk

The VPA will perform preconception risk assessment, health promotion, and interventions using a computer workstation that is a clinic-based kiosk configuration. The VPA is run on a touch-screen computer with integrated speakers, mounted on a mobile kiosk with an articulated arm that can be used by the patient while lying in bed, or sitting in a chair. Headphones are available for privacy if desired. After a brief training session (lasting <1 minute, based on our experience in pretesting), the patient is left to interact with the VPA on the kiosk to review the PCC health promotion curriculum, undergo risk assessment, and then initiate interventions for specific risks identified. Tests of comprehension can be administered by the VPA and material reviewed as necessary. The *Reproductive Life Plan* is then finalized, published, and given to the patient. The letter to her primary care provider is printed and the woman is encouraged to review this material with her care provider. At the end of the interaction, the workstation can print a list of remaining issues and patient questions that the VPA was unable to resolve for nurse follow-up. These focused issues can then be addressed by human intervention.

Final Comment

For more than 20 years, the concepts of PCC have been discussed; the CDC's initiative in this area has added new impetus to its diffusion, particularly with the publication of the evidence in support of the PCC clinical content in the fall of 2008 (Jack & Atrash, in press). At the same time, many barriers to providing these services remain. A fundamental shift is needed that incentivizes well woman care and preventive visits that include health promotion, risk assessment, and counseling within primary care. A new model of care that emphasizes a primary care medical home that accepts responsibility for delivering such services that is linked to new information technologies that allow for such care to be conveniently and comprehensively provided could offer the potential to assist in the much needed delivery of these services. Although changes in clinical practice are necessary to ensure that women receive PCC, such changes cannot and will not occur without important modifications to public policy, health care financing, and incentivization.



References

Agrey, N., Crowe, K. M., Levitt, C., MacDonald, J., MacLean, D., & Polomeno, V. (2005). Preconception care. In Hanvey, L. (Ed.), *Family-centered maternity and newborn care: national guidelines*. Ottawa: Health Canada. Minister of Public Works and Government Services.

American Academy of Pediatrics (AAP). (2001). American College of Obstetricians and Gynecologists (ACOG). *Guidelines for perinatal care* (5th ed.). Elk Grove Village, IL: AAP.

American College of Obstetricians and Gynecologists (ACOG). (1995). Preconceptional care. ACOG Technical Bulletin No. 205. *International Journal of Gynaecology and Obstetrics*, 50, 201–207.

American College of Obstetricians and Gynecologists (ACOG). (2002). *Guidelines for women's health care* (2nd ed.). Washington, DC: Author.

American College of Obstetricians and Gynecologists (ACOG) Preconception Work Group. (2005). The importance of preconception care in the continuum of women's health care. *Obstetrics and Gynecology*, 106, 665–666.

American Diabetes Association. (2004). Preconceptional care of women with diabetes. *Diabetes Care*, 27(Suppl.), S76–S78.

Anonymous. (1998). Practice parameter: Management issues for women with epilepsy (summary statement). Report of the Quality Standards Subcommittee of the American Academy of Neurology. *Neurology*, 51, 944–948.

Atrash, H., Jack, B.W., Johnson, K., Coonrod, D.V., Moos, M.K., Stubblefield, P., et al. (In press). Where is the "W" in MCH? *American Journal of Obstetrics and Gynecology*, 199 (suppl).

Baylor, A.L., &, Y. (2003). The role of gender and ethnicity in pedagogical agent perception. In Proceedings of E-Learn (World Conference on E-Learning in Corporate, Government, Healthcare, &s Higher Education). Phoenix, Arizona

Baylor, A.L., Shen, E., & Huang, X. (2003). Which pedagogical agent do learners choose? The effects of gender and ethnicity. In Proceedings of E-Learn (World Conference on E-Learning in Corporate, Government, Healthcare, & Higher Education). Phoenix, Arizona.

Best Start—Ontario's Maternal, Newborn and Child Development Resource Center. (2002). *Preconception and health: Research and strategies*. Toronto, Ontario: Canada. Available: http://www.beststart.org.

Bickmore, T., Caruso, L., Clough-Gorr, K., & Heeren, T. (2005). "It's just like you talk to a friend"—Relational agents for older adults, interacting with computers. *Interacting With Computers*, 17, 711–735.

Bickmore, T., & Giorgino, T. (2006). Health dialog systems for patients and consumers. *Journal of Biomedical Informatics*, 39, 556–571.

Bickmore, T., Gruber, A., & Picard, R. (2005). Establishing the computer-patient working alliance in automated health behavior change interventions. *Patient Education and Counseling*, 59, 21–30.

Bickmore, T., & Mauer, T. (2006). Modalities for building relationships with handheld computer agents. In Proceedings of the ACM SIGCHI Conference on Human Factors in Computing Systems (CHI). Montreal, Canada.

Bickmore, T., & Pfeifer, L. (2008). Relational agents for antipsychotic medication adherence. In Proceedings of the CHI'08 Workshop on Technology in Mental Health. Florence, Italy, April 6, 2008.

Bickmore, T., Pfeifer, L., & Yin, L. (2008). The role of gesture in document explanation by embodied conversational agents. *International Journal of Semantic Computing*, 2, 47–70.

Cassell, J., McNeill, D., & McCullough, K. E. (1998). Speech-gesture mismatches: Evidence for one underlying representation of linguistic and non-linguistic information. *Pragmatics and Cognition*, 6, 1–33.

Cassell, J., Vilhjálmsson, H., & Bickmore, T. (2001). The behavior expression animation toolkit. In Proceedings of the SIGGRAPH '01: BEAT: Los Angeles, California.

Centers for Disease Control and Prevention (CDC). (2006). Recommendations for improving preconception health and health care—United States: A report of the CC/ATSDR Preconception Care Workgroup and the Select Panel on Preconception Care. *Morbidity and Mortality Weekly Reports*, 55(No. RR-6), 1–23.

Chamberlain, G. (1980). The pre-pregnancy clinic. *British Medical Journal*, 281, 29–30.

Chamberlain, G., & Lumley, J. (Eds.). (1986). *Prepregnancy care: A manual for practice*. Chichester: Wiley.

Czeizel, A. E. (1999). Ten years of experience in periconceptional care. *European Journal of Obstetrics, Gynecology, and Reproductive Biology*, 84, 43–49.

Frey, K., & Files, J. (2006). Preconception healthcare: What women know and believe [electronic version]. *Maternal and Child Health Journal*, 10(Suppl.), S73–S77.

Frey, K. A. (2002). Preconcepton care by the non-obstetrical provider. *Mayo Clinic Proceedings*, 77, 469–473.

Gjerdingen, D. K., & Fontaine, P. (1991). Preconception health care: a critical task for family physicians. *Journal of the American Board of Family Practice*, 4, 237–250.

Graesser, A., Wiemer-Hastings, K., Wiemer-Hastings, P., & Kreuz, R. (1999). AutoTutor: A simulation of a human tutor. *Cognitive Systems Research*, 1, 35–51.

Health Council of the Netherlands. (2007). Preconception care: A good beginning *(publication no. 2007/19E)*. The Hague: Health Council of the Netherlands.

Henderson, J. T., Weisman, C. S., & Grason, H. (2002). Are two doctors better than one? Women's physician use and appropriate care. *Women's Health Issues*, 12, 138–149.

Hirsh, J., Fuster, V., Ansell, J., & Halperin, J. L. (2003). American Heart Association; American College of Cardiology Foundation. American Heart Association/American College of Cardiology Foundation guide to warfarin therapy. *Circulation*, 107, 1692–1711.

Institute of Medicine Committee to Study the Prevention of Low Birth Weight. (1985). *Preventing low birth weight*. Washington, DC: National Academy Press.

Jack, B. (1995). Preconception care (or how all family physicians "do" OB). *American Family Physician*, 51, 1807–1808.

Jack, B. (2008). Translational, behavioral and clinical research: CDC's Clinical Workgroup Perspective. Preconception care research: Improving birth outcomes and reproductive health workshop. Eunice Kennedy Shriver National Institute of Child Health and Human Development, April 14–15, Bethesda, Maryland.

Jack, B., & Atrash, H. (In press). The content of preconception care (special issue). *American Journal of Obstetrics and Gynecology*, Supplement (December 2008).

Jack, B., & Culpepper, L. (1990a). Preconception care. In I. R. Merkatz, J. E. Thompson, P. D. Mullen, & R. L. Goldengerg (Eds.), *New perspectives on prenatal care* (pp. 69–88). New York: Elsevier.

Jack, B. W., & Culpepper, L. (1990b). Preconception care: Risk reduction and health promotion in preparation for pregnancy. *Journal of the American Medical Association*, 264, 1147–1149.

Jack, B. W., Culpepper, L., Babcock, J., Kogan, M., & Wesimiller, D. (1998). Addressing preconception risks identified at the time of a negative pregnancy test: A randomized trail. *Journal of Family Practice*, 47, 33–38.

Johnson, K., Atrash, H., & Johnson, A. (2008). Policy and finance for Preconception Care: Opportunities for Today and the Future. *Women's Health Issues*, 18(Suppl), S2–S9.

Lester, J., Stone, B., & Stelling, G. (1999). Lifelike pedagogical agents for mixed-initiative problem solving in constructivist learning environments. *User Modeling and User-Adapted Interaction*, 9, 1–44.

Lester, J.C., Voerman, J.L., Towns, S.G., & Callaway, C.B. (1997). Cosmo: A life-like animated pedagogical agent with deictic believability. In Proceedings from the IJCAI 97. Nagoya, Aichi, Japan.

March of Dimes Birth Defects Foundation. (1993).Committee on Perinatal Health. Toward Improving the Outcome of Pregnancy (TIOP II): The 90s and Beyond. White Plains, New York.

March of Dimes Birth Defects Foundation. (2002). March of Dimes Updates: Is early prenatal care too late? *Contemporary Ob/Gyn*, 12, 54–72.

McNeill, D. (1992). *Hand and mind: What gestures reveal about thought*. Cambridge: Cambridge University Press.

Moos, M. K. (2002). Preconceptional health promotion: opportunities abound. *Maternal and Child Health Journal*, 6, 71–73.

Moos, M. K. (2003). Preconceptional wellness as a routine objective for women's health care: an integrative strategy. *Journal of Obstetrics, Gynecology, and Neonatal Nursing*, 32, 550–556.

Moos, M. K., & Cefalo, R. C. (1987). Preconceptual health promotion: A focus for obstetric care. *American Journal of Perinatology*, 47, 63–67.

Moreno, R., Lester, J.C., & Mayer, R.E. (2000). Life-like pedagogical agents in constructivist multimedia environments: Cognitive consequences of their interaction. In Proceedings of the World Conference on Educational Multimedia, Hypermedia, and Telecommunications (ED-MEDIA). Montreal, Canada.

Morgan, M., Hawks, D., Zinberg, S., & Schulkin, J. (2006). What obstetrician-gynecologists think of preconception care [electronic version]. *Maternal and Child Health Journal*, 10(Suppl.), S59–S65.

Person, N. K., Graesser, A. C., Bautista, L., & Mathews, E. C. (2001). Evaluating student learning gains in two versions of AutoTutor. In J. D. Moore, C. L. Redfield, & W. L. Johnson (Eds.), *Artificial intelligence in education: AI-ED in the wired and wireless future* (pp. 286–293). Amsterdam: IOS Press.

Reynolds, H. D. (1998). Preconception care: An integral part of primary care for women. *Journal of Nurse Midwifery*, 43, 445–458.

Salganicoff, A., Ranji, U. R., & Wyn, R. (2005). *Women and health care: A national profile. In Key findings from the Kaiser Women's Health Survey.* Menlo Park, CA: Kaiser Family Foundation. Available: http://www.kff.org/.

Sia, C., Tonniges, T., Osterhus, E., & Taba, S. (2004). History of the medical home concept [electronic version]. *Pediatrics*, 113(5 Suppl.), 1473–1478.

US Public Health Service (PHS). (1991). Healthy people 2000: National health promotion and disease prevention objectives *(DHHS Pub. No. 91-502212)*. Washington, DC: US Department of Health and Human Services.

US Public Health Service (PHS). (2000). *Healthy people 2000: Midcourse review and 1995 revisions*. Washington, DC: US Department of Health and Human Services.

Williams, J., Abelman, S., Fassett, E., Stone, C., Petrini, J., Damus, K., & Mulinare, J. (2006). Health care provider knowledge and practices regarding folic acid: United States, 2002-2003 [electronic version]. *Maternal and Child Health Journal*, 10(Suppl.), S67–S72.

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WOMEN AND HEALTH INSURANCE
Implications for Financing Preconception Health

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This article examines health insurance coverage among women of reproductive age and considers how national health insurance reform may affect access to high-quality, timely, and affordable preconception and interconception care. A focus on preconception and interconception care increasingly is understood as essential, not only to the health of women, but to that of infants as well, and thus, as a key part of a comprehensive infant health strategy. After a brief overview that examines the relationship between preconception and interconception health care and health insurance reform, the article examines the current state of health insurance coverage among women of childbearing age and the underlying causes of uninsurance and underinsurance in this population group.

The article then sets forth a proposed health insurance reform taxonomy in the context of health and health care generally, and preconception and interconception health care in particular. It is the underlying assumption of this article that preconception and interconception care can serve as bellwethers of the extent to which health reform achieves preventive results. Such results include coverage reforms that not only put acute treatments within financial reach, but that also help finance interventions that can help to achieve population-wide preventive results, in this case, long-term improvement in the health of both women and children.

This article examines health insurance coverage among women of reproductive age and considers how national health insurance reform may affect access to high-quality, timely, and affordable preconception and interconception care. A focus on preconception and interconception care increasingly is understood as essential, not only to the health of women, but to that of infants as well, and thus, as a key part of a comprehensive infant health strategy (Trust for America's Health, 2008). After a brief overview that examines the relationship between preconception and interconception health care and health insurance reform, the article examines the current state of health insurance coverage among women of childbearing age and the underlying causes of uninsurance and underinsurance among this population group.

The article then sets forth a proposed health insurance reform taxonomy in the context of health and health care generally, and preconception and interconception health care in particular. It is the underlying assumption of this article that preconception and interconception care can serve as bellwethers of the extent to which health reform achieves preventive results. Put another way, preconception and interconception health coverage are emblematic of reforms that not only put treatment within financial reach, but also help to finance interventions that can help to achieve population-wide preventive results, in this case, long-term improvement in the health of both women and children.

Preconception Care

A special report on preconception care, issued jointly in 2006 by the Centers for Disease Control and

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Prevention (CDC)/Agency for Toxic Substances and Disease Registry Preconception Care Work Group and the Select Panel on Preconception Care (CDC, 2006), identifies the health of women of reproductive age as a critical aspect of population health, not only in relation to the health of women themselves, but that of their children as well. Given the relationship between health care and women's and children's overall health, the Work Group and Select Panel, in their joint recommendations, include 4 recommendations, 3 of which either directly or indirectly address health care access and quality: 1) improve the knowledge and attitudes and behaviors of men and women related to preconception health; 2) ensure that all women of childbearing age in the United States receive preconception care services (i.e., evidence-based risk screening, health promotion, and interventions) that will enable them to enter pregnancy in optimal health; 3) reduce risks indicated by a previous adverse pregnancy outcome through interventions during the interconception period, which can prevent or minimize health problems for a mother and her future children; and 4) reduce the disparities in adverse pregnancy outcomes (CDC, 2006).

The report thus draws a direct link between health and health care, thus making improvements in health care access and quality basic to the population goal of preconception health. In doing so, the report thereby establishes its relevance to a discussion of health insurance reform because of the indisputable link—demonstrated through an avalanche of studies—between health insurance coverage and the receipt of health care (Hadley, 2002; Institute of Medicine [IOM], 2004). These studies consistently show that insured individuals have higher rates of appropriate health care utilization compared with their uninsured counterparts. In view of this link, 3 basic questions move to the forefront:

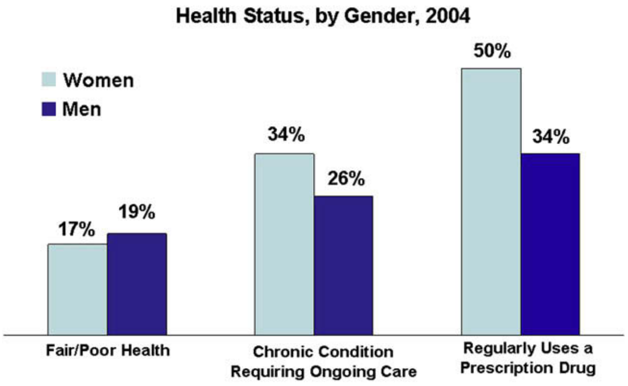
1. What is the current state of women's health insurance coverage and what are the underlying drivers of these patterns?
2. What are the critical and relevant domains of any discussion regarding the design and operation of health insurance coverage? (Where this question is concerned, these domains, like any good taxonomy, are the same regardless of the population subgroup or health condition under consideration, even if their application to any particular problem might produce somewhat different results.)
3. Within these key domains, what specific policies might, in turn, best position health insurance reform to make a difference where preconception health is concerned, by promoting access to health care;- that is—in the words of the IOM—safe, effective, patient centered, timely, efficient, and equitable (IOM, 2001)?

Women and Health Insurance Coverage

The high cost of health care, coupled with competing social investment considerations, such as education, shelter, economic development, and public safety, result in a worldwide struggle to find the right balance between population health investments and health care finance. What makes the United States unique is the extent to which the nation—alone among all wealthy nations—has failed to systematically pursue this struggle on behalf of the population as a whole. Where health care and health insurance coverage are concerned, the United States has no "unified field theory" by which it balances health care finance and population health. Instead, the nation relies on an approach to health care finance that, when compared with other nations, leaves millions without coverage, produces health care of uneven quality, suffers from unusual complexity, exhibits extraordinary deference to powerful stakeholders in the health care marketplace, and lacks equity (Lopert & Rosenbaum, 2007; Schoen et al., 2007).

In truth, the problem of health insurance coverage is not one that can realistically be approached by gender or by any factor unrelated to the social imperative of ensuring that everyone has access to health care when needed. Indeed, the Preconception Report itself recognizes the vital importance of partners' health to women's and infants' health. The importance of maintaining the health insurance discussion at a universal level is especially true in a nation in which health care is market driven. In such an environment, adequate health insurance coverage is an absolute prerequisite to a reasonable level of health care. Some communities are fortunate enough to have subsidized primary health care available through publicly funded clinics (Shin, Finnegan, Sharac, & Rosenbaum, 2008). US law also guarantees access to emergency examination and stabilization treatment at hospitals with emergency departments. But most medically underserved communities lack clinics (National Association of Community Health Centers, 2007), and hospitals' emergency care obligations are in fact exceedingly constrained, limited to screening and the most basic stabilization interventions if an emergency medical condition is found (Rosenblatt, Law, & Rosenbaum, 1997).

Nonetheless, there is reason to focus on women as a group, as demonstrated by the following series of figures prepared by the Kaiser Family Foundation. Figure 1 shows that, compared with men, women report a greater likelihood of fair to poor health and a higher proportion of women report the presence of $\geq$1 chronic condition and use of health care. Women also

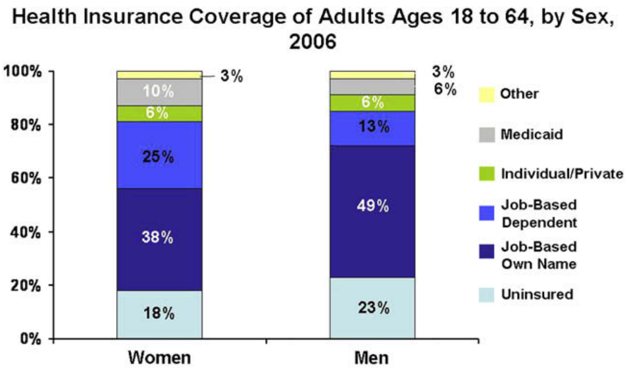


Note: Includes women and men ages 18 to 64.
Source: Henry J. Kaiser Family Foundation (KFF), *Kaiser Women's Health Survey*, 2004.

Figure 1. Why focus on women? Health status by gender, 2004. *Note.* Includes women and men, ages 18–64. (From The Henry J. Kaiser Family Foundation, *Kaiser Women's Health Survey*, 2004.)

experience a wage and income gap that persists over their lifetimes and that elevate the potential for health related access problems (Kaiser Family Foundation, 2008a). Furthermore, experts primarily focus on women's (as opposed to men's) interaction with the health care system when considering the health care dimension of preconception health, thereby further elevating the importance of women's health insurance coverage.

Figure 2 compares health insurance coverage patterns for men and women. Women are more likely to have health insurance, but at the same time coverage patterns differ distinctly by gender. Figure 2 shows that family composition and labor patterns result in important distinctions between men and women: Women are less likely than men to have employer-sponsored health insurance coverage in their own name (38% vs. 49%), more likely to have employer coverage on a dependent basis (25% vs. 13%), and are nearly twice as likely to have Medicaid (10% vs. 6%).



Note: Other includes Medicare, TRICARE, and other sources of coverage.
Source: KFF analysis of the March 2007 Current Population Survey, Census Bureau.

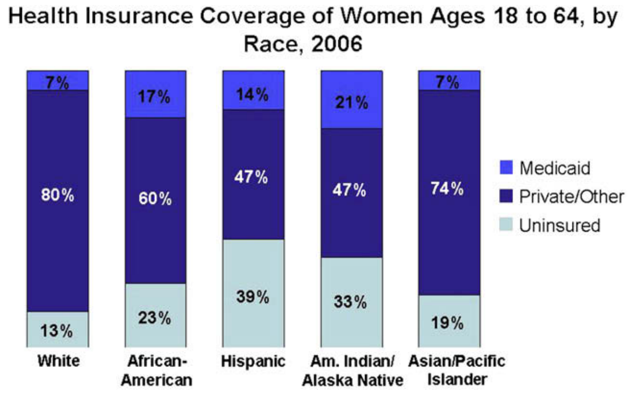
Figure 2. Insurance coverage patters differ between women and men. Health insurance coverage of adults ages 18–64, By fender, 2006. *Note.* Other includes Medicare, TRICARE, and other sources of coverage. (From the Henry J. Kaiser Family Foundation analysis of the March 2007 Current Population Survey, US Census Bureau.)

Significant variations in health insurance coverage patterns are evident by race and ethnicity, chiefly as a result of the greater levels of poverty among women of color. Women of Hispanic origin are 3 times as likely as White non-Hispanic women to be completely uninsured (Figure 3); compared with White non-Hispanic women, Medicaid's role for African-American, Hispanic, and American Indian/Alaska Native women is 2–3 times as great. Employer-based and other private coverage, available to 80% of all White non-Hispanic women, is a factor for only 60% of African-American women and fewer than half of all Hispanic and Native American women.

Figure 4 provides evidence regarding which women are at greatest risk for being uninsured. Poverty is the single most accurate predictor, placing women at a 4 in 10 risk for lack of coverage. Women who have certain demographic characteristics, such as membership in a racial and ethnic minority group, being a single parent, having limited education, or being foreign born, are also at elevated risk.

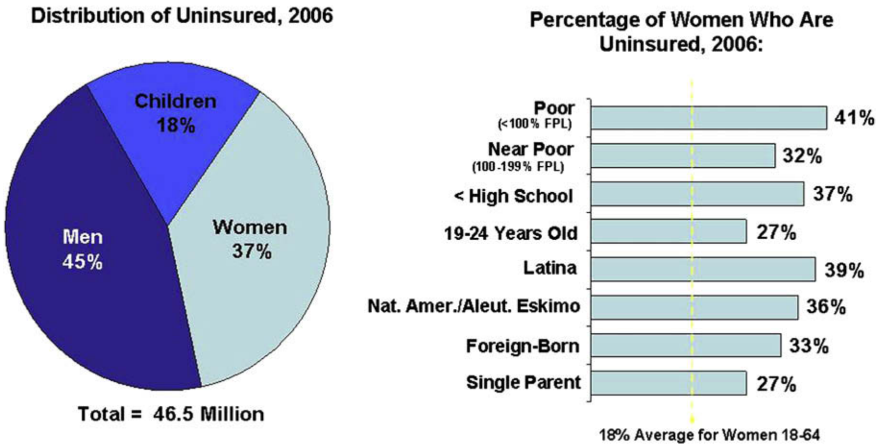
Figure 5 illustrates the extent to which women's uninsured rates vary among states. A total of 7 states show uninsured rates for nonelderly women of ≥23%; not surprisingly, these states exhibit the highest levels of noninsured rates among the nonelderly population generally. As Figure 5 shows, even in the states with the lowest proportion of women without health insurance, 1 in 11 nonelderly women was uninsured in 2006.

Although the underlying details are almost incomprehensibly complex, the high proportion of women without health insurance is a function of a simple yet sensational twin failure of policy, whose consequences over the years have come into view like an unfolding mystery story: The nation's willingness—for political,



Note: Includes women ages 18 to 64. Other includes Medicare, CHAMPUS, and other sources of coverag
Source: Kaiser Family Foundation analysis of the March 2006 Current Population Survey, US Census Bur

Figure 3. Differences in health coverage rates of women by race/ethnicity are significant. Health insurance coverage of women ages 18–64 by race, 2006. *Note.* Includes women ages 18–64. Other includes Medicare, CHAMPUS, and other sources of coverage. (From the Kaiser Family Foundation analysis of the March 2006 Current Population Survey, US Census Bureau.)



Source: Kaiser Commission on Medicaid and the Uninsured and Urban Institute tabulations of 2007 ASEC Supplement to the Current Population Survey. The Federal Poverty Threshold for a family of three in 2006 was $16,227.

Figure 4. Uninsured women: Who is at risk? (From the Kaiser Commission on Medicaid and the Uninsured and Urban Institute tabulations of 2007 ASEC Supplement to the Current Population Survey. The Federal Poverty Threshold for a family of 3 in 2006 was $16,277.

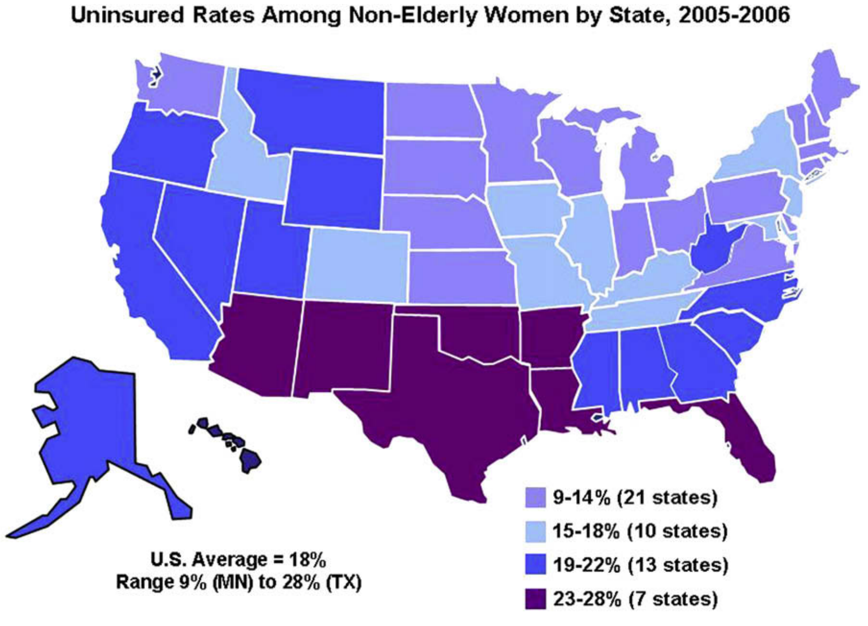
economic, and social reasons—to rely on a voluntary, employment-based health insurance system that grows shakier with each passing decade and the concomitant failure to either replace this system or at least couple it with a universally available and sustainable alternative.

A library of books and articles have been written on the subject (Glied, 1997; Hacker, 2008; Quadagno, 2005; Starr, 1982), and it is not the purpose of this article to explore the unending explanations for our failure. At the same time, it is worth recapping some of the ways in which the results of this failure manifest themselves.

Employer-sponsored coverage

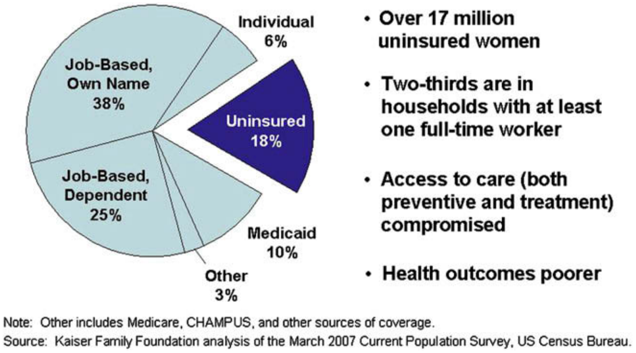
For more than a half century the nation has relied principally on voluntary, employer-sponsored coverage arrangements to ensure coverage of working-age Americans and their families. In truth, this system never worked particularly well; indeed, even what historically is considered its height during the 1970s, employer plan arrangements excluded low-wage and part-time workers, workers employed by small firms with limited payrolls, and persons with limited or no attachment to the workplace (Gabel, 1999).

Over the past 30 years, the voluntary system has eroded further in the face of several basic factors: a shift



Source: KFF analysis of the March 2006 and 2007 Current Population Survey, US Census Bureau.

Figure 5. Uninsured rates vary widely between the states. Uninsured rates among nonelderly women by state, 2005–2006. (From the Kaiser Family Foundation analysis of the March 2006 and 200 Current Population Survey, US Census Bureau.



Note: Other includes Medicare, CHAMPUS, and other sources of coverage.
Source: Kaiser Family Foundation analysis of the March 2007 Current Population Survey, US Census Bureau.

Figure 6. Improving reach of coverage: covering the uninsured. *Note.* Other includes Medicare, CHAMPUS, and other sources of coverage. (From the Kaiser Family Foundation of the March 2007 Current Population Survey, US Census Bureau.

away from a strong and stable manufacturing base for the US economy with a highly unionized workforce; demographic shifts that have produced a rise in single parent households with more limited attachment to the labor force (2 parents are always better than 1 where the need to secure a link to an employment-based system is concerned); the rise of global economic competition that in turn has led to a vast squeeze on payrolls and jobs; and the enormous toll taken by uncontrolled health care costs (Blumenthal, 2006; Gabel, 1999).

By 2007, the average family premium cost roughly $12,000 (with slight variations depending on the type of plan purchased; Kaiser Family Foundation, 2007a), more than the annual income of full-time minimum wage work. Furthermore, offer rates (i.e., the percent of firms that even offer coverage as a job benefit) have fallen significantly in the face of these trends; between 2000 and 2007, the offer rate among small firms (which employ the majority of US workers) fell from 68% to 59% (Kaiser Family Foundation, 2007b), and equally as dramatic, by 2007 employer contributions to coverage were low enough that a worker whose earnings stood at 200% of the federal poverty level would have been expected to pay >10% of her annual income toward the cost of employer-sponsored coverage (Kaiser Family Foundation, 2007b).

Public subsidization of alternative group health insurance markets, and publicly administered health insurance

Two strategies—by no means exclusive of one another—exist for at least compensating for the limits of employer-sponsored coverage. One would be to provide a subsidy to people without insurance to buy coverage in the individual insurance market, which in turn would be subject to very limited regulation in order to incentivize company participation. This is essentially what Senator John McCain has proposed in as part of his 2008 Presidential campaign. Another approach would be to incentivize employers to continue to offer group coverage and couple this incentive with the development of alternative, subsidized group health coverage arrangements for persons whose employers do not offer plans. This is essentially the approach taken by Senator Obama, who would also permit Medicaid and Medicare to continue to organize group coverage for their enrollees as well. Indeed, this is how most Medicaid agencies function at the present time in the case of their nonelderly, nondisabled beneficiary populations, and this is the approach that underlies Medicare Advantage and Medicare's "Part D" outpatient prescription drug benefit program (Rosenbaum, 2008).

What is not a viable alternative is reliance on an individual insurance market, with coverage purchased on the basis of after-tax income. Not only is the use of posttax earnings unaffordable, but the individual market is itself inherently exclusionary and unstable because of the extensive medical underwriting essential to maintaining such a market (Kaiser Family Foundation, 2008b). The limits of individual insurance products for women of childbearing age is captured in a 2004 report on the individual market prepared by the Kaiser Family Foundation, which shows that in general women make extremely limited use of the individual market. The group most likely to do so are between ages 25 and 34, and 60% seem to retain this coverage for the long term ($\geq$2 years; Kaiser Family Foundation, 2004). Because there is no tax subsidization, premiums must be paid out of after-tax income, and coverage is highly restrictive, with any significant use resulting in posttreatment underwriting (i.e., exclusion or new limits) in many states. Services such as pregnancy care and treatment for health conditions can be expected to be subject to heavy restrictions, assuming they are covered at all (Kaiser Family Foundation, 2007c).

Medicaid offers a critically important pathway to coverage for millions of women of reproductive age, and its broad benefits and limited cost-sharing make it particularly suitable for low-income women. But Medicaid's reach is limited to only that portion of the low-income population that satisfies certain federally recognized eligibility categories; in the case of women, the most relevant categories are age (coverage of poor children is mandatory until age 18 and optional to age 21), pregnancy, disability, and parental status (Schneider, 2003). As a result, neither a single 24-year-old single woman nor a low-income nondisabled adult woman with a spouse but no children earning twice the minimum wage ($6.55 as of July 24, 2008; Labor Law Center, 2008) would qualify. States certainly have the option of extending Medicaid (or some other form of government insurance) to categories of individuals for whom no federal financing is available, but few do so (Kaiser Family Foundation, 2008c).

The underinsured

Although the primary focus is on persons who lack coverage entirely, in recent years, the high cost of health care has caused the breadth and scope of insurance coverage to shrink through the use of high deductibles, high cost sharing, greater exclusions, or a combination of all 3. Thus, a growing focus has been given to the problem of underinsured persons. Using a measure of cost exposure in relation to family income, a 2008 study by the Commonwealth Fund estimated that in 2007 some 25 million insured people ages 19–64 were underinsured, a remarkable 60% increase since 2003. The authors found that the rate of increase was greatest for those whose incomes exceeded 200% of the federal poverty level. Among this group, the rate of underinsurance nearly tripled. Counted together, the uninsured and underinsured comprise some 42% of the nonelderly US adult population, and the economic stresses on the group are acute (Schoen et al., 2008).

The Key Domains of Health Insurance Coverage

Any full assessment of health reform and its effects on a population must take into account all of the key domains of health insurance policy. Over the years, experts have attempted to delineate the principal domains of coverage policy (Altman, 2008; Davis, 1975; Davis, Schoen, & Collins, 2008), but in truth the domains evolve over time as health insurance, in both its structure and its relationship to the underlying health care and public health systems, also continues to evolve as a result of marketplace changes, fundamental technology changes, such as the introduction of health information technology, and economic considerations.

Based on my own involvement with national health reform over many years—in both large-scale efforts as well as in numerous smaller scale initiatives to achieve incremental improvements in coverage—I use a taxonomy that consists of 8 separate policy domains. The number of domains has expanded as health insurance has become more directly intertwined with health care, and as health insurance products have both proliferated in design and have become increasingly complex to understand.

In the mid-1970s, considered by experts to represent the zenith of employer-sponsored coverage arrangements (Gabel, 1999), virtually all insured persons received coverage through what often is termed "fee-for-service" health insurance arrangements. These arrangements typically were sold by insurers that were captives of the health care industry itself, such as Blue Cross and Blue Shield plans. Coverage was broad and was effectuated typically through indemnification of policyholders, with direct payment of providers in the case of Blue Cross and Blue Shield. However, the financial transaction might occur (direct or via indemnity coverage), payment typically was at—or close to—the amount that a provider charged, and cost sharing was low. In essence, insurers essentially acted as conduits through which money passed, as passive payers that engaged in little if any active management of health care practice or costs (Rosenblatt et al., 1997).

Thirty years later, the landscape has completely changed. Three decades of skyrocketing cost, the enactment of the Employee Retirement Income Security Act (which freed employers from a provider-dominated insurance system), sweeping reforms in public insurance programs, and a fundamental reorganization of health insurance markets have combined to transform coverage. Today, all but a handful of nonelderly (publicly or privately) insured persons are members of health benefit plans that essentially deliver what they insure through loosely or tightly organized and managed provider networks (loosely in the case of more expensive plans, tightly managed in the case of public health insurance and less costly privately sponsored plans; Rosenblatt et al., 1997). Network providers are in turn selected by the plans in which they participate and are subject to plans' operational rules. Payments are risk based, and cost sharing is steep.

Coverage itself has changed radically. In the 1970s, group health coverage was relatively loosely structured legally. Benefit classes and key coverage terms such as *medical necessity* were rarely defined. Insurers were only beginning to introduce utilization management, and payment formulas aimed at shifting risk and incentivizing provider conduct were generally nonexistent. In the odd chance that a claim was denied (after the fact of treatment), beneficiaries probably stood an excellent chance of winning in court, because of the legal rule of *contra proferentem,* which ensured that legal ambiguities in contractual documents would be construed against the drafter (Rosenblatt et al., 1997).

Today, privately sponsored group health benefit plans are awash in legalisms, with tightly drafted contracts that are structured solely at the discretion of the sponsor and are subject to very few external coverage standards (particularly in the case of self-insured plans). Whether self-funded or -insured, group benefit plans employ coverage documents that are dense with definitions, exclusions, and that—thanks to far better lawyering and an obscure but powerful US Supreme Court decision[1]—vest broad discretion in health benefit plan administrators to interpret crucial contract terms as part of plan operations. This aggressive use of legal terms that favor the plan administrator, coupled with limited judicial review, means that in all likelihood (no definitive study ever has been done), most appeals involving individual coverage denials are decided in favor of the plan. Health benefit plans sold to state Medicaid programs continue to be subject to more robust coverage and performance standards, but even here, Congress has shown a penchant in recent years to loosen coverage requirements

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[1] *Firestone Tire & Rubber Co. v. Bruch*, 489 U.S. 101 (1989).

to permit states more discretion in the design and operation of the private sector plans they purchase (Rosenbaum, 2007).

In assessing the implications of insurance for improved access to preventive services, a series of essential domains must be considered, any 1 of which can significantly affect how health insurance ultimately performs in relation to health care access. These domains are as follows:

1. The availability of coverage;
2. The stability of coverage;
3. The accessibility of coverage;
4. The affordability of coverage;
5. The design of coverage;
6. The ability of coverage to protect enrolled persons from high health care costs in relation to both what is covered and what is excluded from coverage;
7. The extent to which coverage is administered fairly in relation to both the health needs of the population and those of any particular patient;
8. The extent to which coverage payment policies help to foster health care access and the adequate distribution of health care resources among the population; and
9. The extent to which the results of coverage are measured for their quality and equity, that is, whether the performance data collected are used to improve quality of care and reduce disparities in health and health care.

1. *Availability of coverage*

The question of availability focuses on who qualifies for coverage. Will populations be excluded and, if so, will the basis of the exclusion be factors unrelated to the need for coverage, such as legal status, state residence, or health status or preexisting condition?

2. *Stability of coverage*

Once available, will coverage be stable? If multiple sources of financing continue to be a presence (and both presidential plans as of the spring of 2008 assume a continuation of a multipayer approach to coverage), what safeguards exist to eliminate the potential for coverage breaks and lapses? For example, in a reformed system that retains employment-based coverage, what protections exist to avert a lapse in coverage for persons who become unemployed and must turn to an alternative coverage source such as a government-sponsored plan or one offered by a voluntary group association? What steps are taken to make coverage stable in the case of persons who travel interstate, such as migrant laborers and itinerant workers? The challenge of stability may be addressed through enrollment features, and it may also be a function of product availability. For example, a national coverage scheme that calls for state administration might include ≥ 1 national plans that are marketed in all states and that allow for portability for self-employed persons.

3. *Accessibility of coverage*

How accessible is coverage? Is enrollment automatic in relation to another status (e.g., automatic enrollment of all persons covered by the Social Security system and their families)? What steps must individuals take to secure coverage? The answer to this question may turn significantly on whether the reform model is both universal and compulsory, that is, whether coverage is not only widely available but also required, as in the case of the Democratic Presidential plan for children.

4. *Affordability of coverage*

Are enrollment fees or premiums affordable in relation to family income? Do the premiums adjust for family income, family size, and extraordinary expenses incurred by certain families, such as families headed by disabled workers or with special needs children?

5. *The design of coverage*

The issue of coverage design is enormous and one that is of particular interest to the specific topic of preconception coverage. Coverage design is a function of several key subdomains:

- The classes of benefits covered (e.g., physician services, hospital inpatient care, prescribed drugs). Are service classes such as health and nutrition counseling recognized, and if so, under what circumstances?
- The range and types of permissible exclusions and limitations that are built into coverage classes (e.g., excluding certain treatments from otherwise covered benefit groupings, such as cosmetic surgery from coverage of physician and hospital services);
- Service definitions (e.g., the use of a service definition that inherently excludes certain treatments, an example of which would be a definition of physical therapy that defines the intervention in relation to the restoration of a body part to normal functioning rather than an intervention to maintain functioning or avert its loss);
- The definition of medical necessity used by a health plan to make individual coverage determinations or assess whether or not to cover new treatments for all covered persons. Thus, for example, a medical necessity definition in the case of women that focuses on the attainment of health, and the maintenance of health during reproductive years would be considerably broader than a definition that focuses strictly on diagnosing and treating diagnosed medical conditions.

> The former definition emphasizes a preventive scope of coverage, and the latter allows limits tied to specific diagnoses and symptoms. Under this second scenario, preventive counseling, unless a specific service class, might not be considered covered, whereas psychiatric therapy in connection with a specific mental illness diagnosis would. Similarly, counseling to address weight-related problems might be considered necessary under a broader definition, assuming a health counseling coverage class. Under a narrower definition, counseling might be considered necessary only in connection with a diagnosis of diabetes or cardiovascular disease.

Coverage design is of particular interest where, as here, the focus is on a particular health care intervention. Applied to a health insurance discussion, the CDC's "Recommendations to Improve Preconception Health and Health Care" call for several major reforms in the design of coverage to create a comprehensive women's benefit for women of reproductive age:

1. A "well-woman" benefit (Recommendations 3 and 6), consisting of coverage of routine preventive visits (at unspecified intervals and including a prepregnancy checkup)[2] to assess risks, identify, for treatment, previously undiagnosed chronic illnesses and conditions, and provide health promotion counseling;
2. Comprehensive preconception treatment consisting of a broad array of otherwise covered benefits as well as a provision that would override otherwise applicable benefit limitations and exclusions in the case of diagnosed conditions in women of childbearing age that pose the potential to adversely affect maternal health and birth outcome (Recommendation 4). (Condition-related benefit limitation overrides are not uncommon under both publicly and privately sponsored health insurance plans. For example, Medicaid exempts from otherwise applicable "amount, duration and scope" limits medically necessary treatments in the case of individuals <21 and pregnancy-related conditions. Similarly, a private health insurer might permit a broader array of treatments for certain physical or mental conditions to avert an adverse outcome such as unnecessary institutional care). This type of expanded coverage of treatments for interconception risk can be thought of as the use of a special definition of medical necessity as well as an override of otherwise applicable benefit limits.
3. Parallel to the second recommendation, comprehensive interconception treatment for women whose previous pregnancies have ended in adverse outcome (Recommendation 5). As with preconception treatment, this recommendation can be thought of as an array of treatments within covered benefit classes, using a special definition of coverage, as well as an exemption from otherwise excluded treatments when necessary in connection with interconception care.
4. As with child health, interconception care is governed by a schedule that specifies examinations at periodic intervals. Thus, experts recommend visits in accordance with a specified schedule based on the best evidence.

6. Whether coverage protects against health care costs in relation to both covered and excluded services

A critical factor in coverage that, as previously noted, is receiving increased scrutiny is the problem of cost sharing, which in turn takes a number of forms: deductibles, the use of coinsurance or copayments, the imposition of annual or lifetime dollar limits on financed treatments, and the imposition of higher cost sharing for the use of health care providers who are not part of a health plan's recognized provider network. Optimally in the case of preconception care, well-women visits would be exempt from cost sharing, deductibles, and coinsurance or copayments would be low to minimal (in the case of low-income women), and the use of preconception/interconception care would not count against annual and lifetime maximums. Where medically necessary to address maternal risk, cost sharing for out-of-network treatments would be held to in-network levels.

7. Whether coverage is administered fairly at the population and individual patient levels

Fair administration encompasses a wide array of important factors, such as the use of utilization review techniques that are evidence based and transparent, the provision of prompt reviews in the case of treatment denials or exclusions, and a fair, rapid, and transparent appeals process that is evidence based and that permits access to an impartial and appropriately trained decision maker. Fair administration issues also focus on the accessibility of services in relation to language, disability, and special cultural or population considerations.

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[2] The Recommendations (Recommendation 3) express this as necessary in every "primary care" visit. However, most insurance plans may not cover routine primary care for women once they reach adulthood, except in connection with gynecologic care. A specific routine health examination would have to be recognized as either a specific benefit class or as a payable treatment within the subclass of medical and health professional services.

8. Whether coverage fosters access and the equitable distribution of health care resources

Coverage, although an end in itself, is also an intermediate point. The true goal is health care itself. Thus, several dimensions of coverage in relation to care become crucial, including the adequacy of provider networks in relation to the demand for care, payment levels that promote active involvement by qualified providers, special payments to health care providers who are located in low-income and medically underserved communities or who offer health care in multiple languages, additional health care "enabling" services, or other patient supports. Of crucial importance are enhanced payments to health care safety net providers in health reform models that are not universal and that continue to exclude certain classes of individuals, such as persons who are not state residents or who are not legally present in the United States.

9. Quality improvement, performance measurement, and public reporting

In recent years, policy makers increasingly have moved to the forefront the question of performance measurement in relation to overall quality and the effects of health care financing on overall costs as well as on the reduction of disparities in health and health care. The topic of quality improvement is multitiered and considers performance at the individual clinical level, the health care system level, the plan level, and at geographic levels that permit comparison of the relationship of place, community, and geographic location to health and health care expenditures and outcomes.

Prospects for Reform

The proposals of presidential candidates invariably are only partially formed and remain sufficiently hazy in their features so that a true assessment of impact is difficult. Nonetheless, the roadmap to health insurance reform effectively creates a classification system under which reasonable judgments can be drawn regarding whether a particular candidate's recommended plan will advance or limit prospects for improving preconception health. Specifically, these factors allow assessment of certain basic questions:

1. Does the plan seem to move toward universal, equitable, and stable coverage without interruptions and lapses based on age, employment status, health, or wealth?
2. Does the plan acknowledge the relationship between health care financing on the 1 hand and health care access and quality on the other by specifying a level of coverage that is preventive, evidence based, and in line with population health considerations?
3. Does the plan, in its payment and coverage features, acknowledge the need for direct investment in certain community health care providers whose special activities for members at risk of poor health and medical underservice are essential in achieving population equity in health and health care?
4. Does the plan emphasize equitable administration and broad transparency and accountability?

Whether the preconception health of women becomes a specific goal of reform will depend in great measure on the extent to which thought leaders and reform stakeholders perceive women's health generally—and preconception health in particular—as a central aim of reform. Regardless of where the key stakeholders in health reform may come down on the question of abortion rights, their voices are essential in advocating for primary and preventive reforms that advance preconception and interconception health that are fully integrated into comprehensive coverage that is sufficient to address the full spectrum of health needs.

References

Altman, D. (2008). Pulling it together: Critical path to health reform. Washington, DC: Kaiser Family Foundation. Available: http://www.kff.org. Accessed July 14, 2008.

Blumenthal, D. (2006). Employer-sponsored insurance—Riding the health care tiger. New England Journal of Medicine, 13, 195–202.

Centers for Disease Control and Prevention (CDC). (2006). Recommendations to improve preconception health and health care—United States. *MMWR*1–23, 55/RR06.

Davis, K. (1975). *National health insurance: Benefits, costs, and consequences*. Washington, DC: The Brookings Institution.

Davis, K., Schoen, C., & Collins, SR. (2008). The building blocks of health reform: Achieving universal coverage and health system savings. New York: The Commonwealth Fund. Available: http://www.commonwealthfund.org. Accessed July 14, 2008.

Gabel, J. (1999). Job-Based health insurance, 1977–1998: The accidental system under scrutiny. *Health Affairs*, 18, 62–74.

Glied, S. (1997). *Chronic condition: Why health reform fails*. Cambridge, MA: Harvard University Press.

Hacker, J. (Ed.). (2008). *Health at risk: America's ailing health system—And how to heal it*. Irvington, NY: Columbia University Press.

Hadley, J. (2002, May). Sicker and poorer: The consequences of being uninsured. Washington, DC: Kaiser Commission on Medicaid and the Uninsured.

Institute of Medicine (IOM). (2001). *Crossing the quality chasm: A new health system for the 21st century*. Washington, DC: National Academies Press.

Institute of Medicine (IOM). (2004). *Insuring America's health: Principles and recommendations*. Washington, DC: National Academies Press.

Kaiser Family Foundation. (2004). Update on individual health insurance. Available: http://www.kff.org. Accessed June 9, 2008.

Kaiser Family Foundation. (2007a). Kaiser/HRET survey of employer health benefits. Available: http://www.kff.org/insurance/7672/index.cfm. Accessed June 9, 2008.

Kaiser Family Foundation. (2007b). Kaiser/HRET survey of employer health benefits. ChartPak. Available: http://www.kff.org/insurance/7672/upload/7693.pdf. Accessed June 9, 2008.

Kaiser Family Foundation. (2007c). Women's health insurance coverage fact sheet. Available: http://www.kff.org/womenshealth/6000.cfm. Accessed June 9, 2008.

Kaiser Family Foundation. (2008a). Women's health policy coverage and access to health care (exhibit 1). Available at: http://www.kaiseredu.org/tutorials_index.asp#womenshealth1. Accessed June 8, 2008.

Kaiser Family Foundation. (2008b). How private health coverage works: A primer, 2008 update. Available: http://www.kff.org/insurance/upload/7766.pdf. Accessed July 14, 2008.

Kaiser Family Foundation. (2008c). States moving toward comprehensive health care reform. Washington, DC: Kaiser Commission on Medicaid and the Uninsured. Available: http://www.kff.org/uninsured/kcmu_statehealthreform.cfm. Accessed July 14, 2008.

Labor Law Center. (2008). State and federal minimum wage rates. Available: http://www.laborlawcenter.com. Accessed July 14, 2008.

Lopert, R., & Rosenbaum, S. (2007). What is fair? Choice, fairness, and transparency in access to prescription medicines in the United States and Australia. *The Journal of Law, Medicine & Ethics*, 35(4), 643–656.

National Association of Community Health Centers. (2007). Access denied: A look at America's medically disenfranchised. Washington, DC. Available: http://www.nachc.com/client/documents/research/Access_Denied42407.pdf. Accessed July 14, 2008.

Quadagno, J. (2005). *One nation, uninsured: Why the U.S. has no national health insurance*. New York: Oxford University Press.

Rosenblatt, R., Law, S., & Rosenbaum, S. (1997). *Law and the American health care system*. New York: Foundation Press.

Rosenbaum, S. (2007). After the Deficit Reduction Act: Using Medicaid to design accountable systems of care for people with complex and special needs. Hamilton, NJ: Center for Health Care Strategies, Inc. Available: http://www.chcs.org/publications3960/publications_show.htm?doc_id=468686. Accessed June 8, 2008.

Rosenbaum, S. (2008). The proxy war: SCHIP and the government's role in health care reform. *New England Journal of Medicine*, 358, 869–872.

Medicaid resource book. Kaiser Commission on Medicaid and the Uninsured, Washington D.C. Available: http://www.kff.org/medicaid/2236-index.cfm. Accessed June 9, 2008.

Schoen, C., Osborn, R., Doty, M.M., Bishop, M., Peugh, J., & Murukutla, N. (2007, October 31). Toward higher-performance health systems: Adults' health care experiences in seven countries, 2007. Health Affairs Web Exclusive, Available: http://content.healthaffairs.org. Accessed July 14, 2008.

Schoen, C. (2008). How many are uninsured? Trends among U.S. adults, 2003 and 2007. Health Affairs Web Exclusive. Available: http://content.healthaffairs.org/cgi/content/abstract/hlthaff.27.4.w298. Accessed June 13, 2008.

Shin, P., Finnegan, B., Sharac, J., & Rosenbaum, S. (2008, January). Health centers: An overview and analysis of their experiences with private health insurance. Washington, DC: Kaiser Commission on Medicaid and the Uninsured. Available: http://www.kff.org/uninsured/7738.cfm. Accessed July 14, 2008.

Starr, P. (1982). *The social transformation of medicine: The rise of a sovereign profession and the making of a vast industry.* New York: Basic Books.

Trust for America's Health. (2008). Healthy women, healthy babies: An issue brief from Trust For America's Health. Washington, DC: Author. Available: http://healthyamericans.org/reports/files/BirthOutcomesLong0608.pdf. Accessed July 11, 2008.

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EMPLOYER APPROACHES TO PRECONCEPTION CARE

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In recent years, the idea of preconception care–education, counseling, and interventions delivered to women before they become pregnant–has gained traction as a critically important health promotion opportunity for women and their families. Employers, as purchasers of health care and as providers of wellness services, have an important role to play in the promotion of preconception care. Large, self-insured employers can craft their medical benefit plans to include evidence-informed preventive health benefits such as preconception care. Employers can also design and implement worksite health promotion programs that address preconception, pregnancy, and postpartum health. And employers of all sizes can educate women and their partners on pregnancy health through tailored communication. This article provides an overview of the business case for preconception care and concrete steps employers can take to support and incent preconception care among their beneficiaries. The article also includes suggestions on ways providers and health professionals support employers in these efforts.

Overview

Ever-increasing health care costs are taking their toll on businesses across the United States. As the Nation faces a recession, the health care cost crisis will continue to grow in importance for both the private and public sectors. As purchasers of health care, employers have developed a myriad of strategies to address the health care cost problem, including increasing employee cost-sharing, reducing or eliminating specific benefits, restricting eligibility, and implementing new plan designs, such as high-deductible health plans. Employers have also emphasized consumer education and engagement, and are supporting quality improvement initiatives at the provider and plan levels. Many employers now see disease prevention and health promotion as a promising opportunity for curbing health care costs and safeguarding employee productivity. In fact, employers consider promoting health improvement programs to be one of the 10 most effective cost-management tactics (National Business Group on Health [NBGH], 2008).

Pregnancy is a major cost and productivity concern for employers. Women of reproductive age (16–44 years) represented 46% of the US workforce in 2004 (US Census Bureau, 2005). More than 6 million pregnancies were reported in 2004, and there were 4.11 million births, including 2 million births to women in the workforce (Centers for Disease Control and Prevention [CDC], 2008; US Census Bureau, 2005). Two thirds of women aged 18–64 have job-based health coverage, either through their own employer or their spouse's employer (Kaiser Family Foundation, 2007). A substantial number of pregnancies result in complications or poor birth outcomes; this puts large employers, who are typically self-insured, at risk for catastrophic health care costs, short- and long-term disability claims, and substantial productivity declines. Employers must also contend with expected and unexpected turnover owing to pregnancy and pregnancy-related health problems. Employers are particularly concerned by the increasing rates of prematurity and low birth weight.

Between 1980 and 2000, the proportion of babies born preterm increased by 26% and the proportion of babies born at a very low birth weight (<1,500 grams)

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increased by 25.9% (Atrash, Johnson, Adams, Cordero, & Howse, 2006). Approximately 11% of babies covered by employer-sponsored insurance are born prematurely, and each year employers pay for roughly half of the $18 billion in medical claims charged for the care of premature infants (National Committee for Quality Assurance, 2006). Among privately insured women in 2005, the average total cost (in paid outpatient visits, hospital, and pharmacy claims) for a premature infant was $46,000. This figure includes the cost of the birth, neonatal care, and infant care through the first year of life. In comparison, an uncomplicated vaginal delivery cost $8,120 and an otherwise uncomplicated cesarean section delivery cost $11,666 (March of Dimes, Thomson Reuters Healthcare, 2008, unpublished data). These figures include the cost of 9 months of prenatal care, labor and delivery, and 3 months of postpartum care for the mother.

Poor birth outcomes are also a leading cause of lost productivity for women. "Complications of pregnancy" (e.g., gestational diabetes and hypertension, premature labor, antepartum or postpartum hemorrhage) is the second leading cause of short-term disability and the 6th leading cause of long-term disability for employed persons in the United States (Met Life Disability, 2003). The exact dollar cost of pregnancy-related disabilities depends on the causal condition and ensuing length of disability, but the March of Dimes estimates that on average, employers lose nearly $3,000 per premature birth owing to parents' extended absence and mothers' short-term disability claims (March of Dimes, 2007).

It is also important to remember that the cost of a poor birth outcome does not end with the neonatal period. Premature babies, for example, are at high risk for long-term impairment, including physical disability, cerebral palsy, mental retardation, and attention-deficit and hyperactivity disorder (Hack et al., 2006). In fact, medical experts estimate that a quarter of infants leaving neonatal intensive care units have chronic and costly health problems (Hack et al., 2006). Most large employers provide health coverage to qualifying dependents through age 18 or 19, and 43% provide coverage through age 25, so long as the child is enrolled in an accredited school. Furthermore, many large employers remove age limits for disabled dependents (NBGH, unpublished data, 2006). This means that employers pay the excess health care costs for children harmed by a poor birth outcome for many years.

The Business Case for Preconception Care

Employers have struggled to find effective ways to prevent poor birth outcomes among their beneficiaries. In recent years, the idea of preconception care—education, counseling, and interventions delivered to women before they become pregnant—has gained traction as a critically important health promotion opportunity for women and their families.

Women of childbearing age face an alarming number of risk factors for poor birth outcomes. Data from the CDC's Pregnancy Risk Assessment Monitoring System show that in the 3 months before pregnancy, 23.2% of women used tobacco, 50.1% consumed alcohol, and only 35.1% took a multivitamin at least 4 times a week (D'Angelo et al., 2007). In the year before their pregnancy, 18.5% of women reported experiencing significant stress and 3.6% experienced physical abuse, 2 risk factors linked with preterm labor. In addition, 1.8% had diabetes, 6.9% had asthma, 2.2% had hypertension, and 10.2% had anemia (D'Angelo et al., 2007). Other research shows that among women who could get pregnant, 3% take prescription or over-the-counter drugs that are known teratogens, and 4% have preexisting medical conditions that could negatively affect a pregnancy if not appropriately managed before conception (Adams et al., 2002). Once pregnant, 11% of women continue to smoke and 10% continue to drink alcohol (Adams et al., 2002). This information suggests that many women could benefit from preconception counseling to ameliorate or reduce prevalent risk factors for prematurity, birth defects, and other complications.

The business case for investing in preconception care is growing. A recent 3-study meta-analysis showed that preconception care can be cost-saving (Grosse, Sotnikov, Leatherman, & Curtis, 2006). One of the selected studies, a prospective analysis of a hypothetical comprehensive preconception care program, calculated that every $1 spent on preconception care could save $1.60 in maternal and fetal care costs, namely by reducing the need for maternal and infant hospitalization. In the second study, a matched retrospective analysis of a cohort from California, investigators observed reduced maternal and infant hospitalization costs of $5.19 for every $1 spent on preconception care. In the third study, women enrolled in a preconception care program (the intervention group) received 2 outpatient visits before pregnancy and then regular prenatal care. Pregnant women in the intervention group experienced fewer congenital malformations (4.2% vs 13.5%) compared with women in the prenatal care-only group. The infants of women in the preconception care program were also 50% less likely to require neonatal intensive care unit hospitalization (Grosse et al., 2006). Studies like these help payers to understand the value of investing in preconception care.

In addition, many of the interventions that support healthy pregnancies also benefit women's overall health. Obesity, alcohol and drug abuse, tobacco use, sexually transmitted infections, and many other issues addressed in preconception care are critical for women's health and well-being. Each of these conditions cost employers money in terms of medical and pharmacy claims, disability claims, and work loss; thus, many employers have already adopted specific programs to address these issues. Preconception care is in line with employer's larger objective of promoting employee health and productivity.

Unfortunately, despite CDC and professional association guidelines that strongly recommend ≥1 prepregnancy office visit for preconception services, preconception care is rarely provided in a systematic way. In fact, fewer than one third of women report speaking with a health care provider about preparing for a healthy pregnancy before they became pregnant (D'Angelo et al., 2007). Reasons for the low utilization of preconception care are manifold and include access, cost, and knowledge barriers.

NBGH Recommendations to Support Preconception Care

The NBGH is a nonprofit membership organization of large, self-insured employers. Collectively, these employers provide health care coverage to 55 million people in the United States. The NBGH advises its members on health care benefits and health promotion programs. In 2007, the NBGH released the Maternal and Family Health Plan Benefit Model, 1 component of a larger toolkit for employers on investing in maternal and child health (NBGH, 2007). The Plan Benefit Model includes recommendations on 34 evidence-informed benefits specifically designed for children and adolescents, as well as preconception, pregnant, and postpartum women. The Plan Benefit Model was developed by a Benefits Advisory Board that included corporate medical directors and benefit managers, health plan representatives, health care consultants, and experts from the American Academy of Family Physicians, American Academy of Pediatrics, and the National Association of Pediatric Nurse Practitioners. The Plan Benefit Model was also reviewed by a panel of 30 external experts. Preconception care was one of several innovative preventive benefits recommended in the Plan Benefit Model.

The model's preconception care benefit was based on the CDC/Agency for Toxic Substances and Disease Registry Preconception Care Work Group and the Select Panel on Preconception Care Guidelines. It provides coverage for "medical services aimed at improving the health outcomes of pregnant women and infants by promoting the health of women of reproductive age before conception." The benefit allows for up to 2 office visits per calendar year to address: 1) maternal assessment, including family history, behaviors, obstetric history, and a general physical examination; 2) vaccinations for rubella, varicella, and hepatitis B; 3) screening for HIV, sexually transmitted infections, and genetic disorders; as well as 4) counseling for folic acid supplementation, smoking and alcohol cessation, and weight management (CDC, 2008). To incent utilization and remove potential cost barriers, the NBGH recommended that employers provide 100% coverage for preconception care by eliminating copayment or coinsurance requirements and not subjecting the benefit to a deductible.

Current Coverage Challenges

Current Procedure Terminology (CPT) codes are developed by the American Medical Association for the purpose of providing a uniform language that accurately describes medical, surgical, and diagnostic services provided by physicians and other clinicians (American Medical Association, 2008). Employers and health plan administrators use these codes to define coverage, track utilization, and support payment and other claims algorithms. In 2007, there was not a specific or universal CPT code for the bundled set of services defined as "preconception care" by the CDC and professional associations.

Currently, plans and providers who deliver preconception care services use longstanding well-exam codes (99381–99397) or general preventive health counseling codes (e.g., preventive medicine counseling/risk factor reduction, individual, 15–60 minutes, 99401–99404; administration/interpretation of health risk assessment instrument, 99420) in addition to codes for specific interventions or procedures (e.g., rubella immunization). These "substitution codes" do not adequately reflect the scope of services provided. Moreover, they do not allow for tracking or comparison across populations, because it is impossible to tell which women received services defined as preconception care and which women received general preventive services such as tobacco cessation counseling or immunizations. Both of these issues are problematic for employers: Employers typically only provide coverage for services with clear and unique codes, and they have a strong interest in tracking population-specific utilization.

Next Steps

Preconception care is an integral part of reproductive and women's health care. Preconception care should be attractive to employers from both cost and productivity standpoints because preconception care promotes healthy pregnancies, thereby reducing the rate of complications and poor birth outcomes. Barriers to preconception care, such as lack of coverage, cost, access problems, and women's lack of knowledge about the importance of prepregnancy interventions, can and should be addressed by employers.

However, before preconception care benefits can be widely adopted and promoted by employers and other purchasers, the coding issues must be resolved. Moreover, health plan administrators should work with their networked providers and facilities to ensure that preconception services are offered and delivered in a standardized way. Additional data in support of the business case for preconception care is also likely to spur benefit expansion. Medical and public health professionals should also work to proactively communicate the importance of preconception care to health plan administrators, health care consultants, and insurance brokers. Although large employers with self-funded health plans can design their own benefit plans, small and medium-sized employers typically purchase fully insured products from health plan administrators, and do not have the option of adding single or custom-designed benefits. Encouraging health plans to adopt preconception care as a standard offering may be the only way to ensure that this important health benefit is available to the millions of women who work for small and medium-sized businesses.

Other Ways to Support Preconception Health

In addition to offering a comprehensive preconception care benefit, employers can also provide worksite education and wellness initiatives that promote healthy pregnancies. The NBGH recommends that large employers adopt the following programs and policies to promote pregnancy health.

- Offer pregnancy-related health promotion programs at the worksite or in the community.
- Include pregnancy-related health issues in existing wellness programs or develop new programs specific to pregnancy concerns. Examples include nutrition, tobacco cessation, weight management, encouraging exercise through healthy lifestyle incentives, and stress management.
- Provide incentives for healthy pregnancy behaviors and participation in pregnancy-related health promotion programs. For example, provide rebates or reimbursements for breast pumps or child car seats for participation in parenting/birthing classes.
- Consider including basic preconception and prenatal care services in onsite medical facilities, when available.
- Implement a campus-wide tobacco ban to protect women of childbearing age from secondhand smoke.
- Educate beneficiaries on maternity leave, family medical leave, parental leave, and other support policies that may be available.
- Support and promote breastfeeding by providing a worksite lactation program, rebates on breast pumps, and access to lactation consultants, onsite or by telephone.
- Cover all Food and Drug Administration-approved prescription contraceptive methods at no cost to the employee to facilitate the prevention of unintended pregnancies and promote healthy approaches to family planning.

Conclusion

Employers have an important role to play in the promotion of preconception care. Large, self-insured employers can craft their medical benefit plans to include evidence-informed preventive preconception care. They can also design and implement worksite health promotion programs that address preconception, pregnancy, and postpartum health. And employers of all sizes can educate women and their partners on pregnancy health through tailored communication. To spur employers' adoption of preconception care benefits, the field must develop standardized and specific codes, ensure that providers have the resources and training necessary to deliver high-quality services, and develop systems to monitor utilization, track progress, and report outcomes.

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References

Adams, E. K., Miller, V. P., Ernst, C., Nishimura, B. K., Melvin, C., & Merritt, R. (2002). Determinants of health: Neonatal health care costs related to smoking during pregnancy. *Health Economics*, 11(3), 193–206.

American Medical Association. (2008). *CPT code search.* Retrieved March 28, 2008 from https://catalog.ama-assn.org/Catalog/cpt/cpt_search.jsp

Atrash, H. K., Johnson, K., Adams, M., Cordero, J. F., & Howse, J. (2006). Preconception care for improving perinatal outcomes: the time to act. *Matern Child Health Journal*, 10(5 Suppl), S3–11.

Campbell, K. P. (2007). *Investing in maternal and child health: An employer's toolkit*. Washington, DC: National Business Group on Health.

Centers for Disease Control and Prevention. (2008). Pregnancy rate drops for U.S. women under age 25. Retrieved March 27, 2008 from http://www.cdc.gov/nchs/pressroom/08newsreleases/pregnancydrop.htm

D'Angelo, D., Williams, L., Morrow, B., Cox, S., Harris, N., Harrison, L., Posner, S. F., Hood, J. R., & Zapata, L. (2007). Preconception and interconception health status of women who recently gave birth to a live-born infant–Pregnancy Risk Assessment

Monitoring System (PRAMS), United States, 26 reporting areas, 2004. *MMWR Surveill Summ*, 56(10), 1–35.

Dan, D., & Marlo, K. (2008). *Health care cost drivers*. Washington, DC: National Business Group on Health.

Dye, J. L. (2005). *Fertility of American women: June 2004. Current Population Reports*. Washington, DC: U.S. Census Bureau. P20-555.

Grosse, S. D., Sotnikkov, S. V., Leatherman, S., & Curtis, M. (2006). The business case for preconception care: methods and issues. *Matern Child Health J*, 10(5 Suppl), S93–S99.

Hack, M., Taylor, H. G., Drotar, D., Schluchter, M., Cartar, L., Andreias, L., Wilson-Costello, D., & Klein, N. (2005). Chronic conditions, functional limitations, and special health care needs of school-aged children born with extremely low-birth-weight in the 1990s. *JAMA*, 294, 318–325.

March of Dimes. (2007). *Help reduce cost: The cost to business.* Retrieved July 17, 2007 from http://www.marchofdimes.com/prematurity/21198_15349.asp

March of Dimes, Thomson Reuters Healthcare. (2008). [The cost of prematurity and complicated deliveries to U.S. employers]. Unpublished data.

Met Life Disability. (2003). *A year in the life of a million American workers*. New York, NW: Leopold RS.

National Business Group on Health. (2006). Unpublished data. *[Maternal and child health benefits survey]*. Washington, DC: Author.

National Committee for Quality Assurance. (2006). *The state of health care quality 2005: Industry trends and analysis*. Washington, DC: Author.

The Kaiser Family Foundation. (2007). Women's Health Insurance Coverage Fact Sheet, December 2007. Retrieved September 13, 2007 from http://www.kff.org/womenshealth/6000.cfm

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WOMEN'S HEALTH ISSUES

ROLE OF MEDICAID FAMILY PLANNING WAIVERS AND TITLE X IN ENHANCING ACCESS TO PRECONCEPTION CARE

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Purpose. **This article identifies the ways in which Medicaid eligibility expansions for family planning services and the Title X network of family planning clinics provide opportunities to introduce preconception care. The introduction of family planning eligibility expansions brought in populations heretofore ineligible for Medicaid. Family planning clinics serve a large number of low-income and young women and would play an important part in introducing preconception care. However, very real barriers to preconception service provision need to be addressed before this goal can be fully realized.**

Background. **When established in 1965, Medicaid, by and large, covered low-income women and their children receiving welfare. A succession of Medicaid eligibility expansions for pregnancy-related care broke the link with welfare. More recently, expansions implemented in 20 states have created an eligibility pathway to Medicaid coverage for women before pregnancy. Today, whether as part of a Medicaid family planning program or independently, many women receive family planning services through the nation's system of publicly funded clinics. As the nation's only dedicated source of funding for family planning services, Title X supports a nationwide network of family planning clinics on which young women rely for affordable and confidential reproductive care.**

Discussion. **Working preconception care into the existing family planning and pregnancy care programs would create a single, continuous reproductive health care platform. Family planning clinics could introduce preconception health measures to the young women who rely on them for their reproductive health care. Important barriers to rolling out preconception care still exist, however. For family planning providers to integrate the services into their current practices, a definition of the package of services that is realistic to provide in a family planning setting must be crafted. In addition, securing a stable funding stream is a necessary prerequisite to any large-scale integration of preconception care into family planning settings. Finally, attention needs to be given to ways to talk to predominantly young clientele about preparing for a pregnancy at the moment when they are coming in for services precisely to avoid becoming pregnant.**

Conclusion. **Despite the challenges laid out, integrating preconception care into family planning services is achievable. Combining preconception care with family planning and pregnancy care initiatives would be a significant step in moving the country closer to the goal of providing the comprehensive reproductive health care women need.**

Introduction

Eligibility expansions for family planning services and supplies that have been implemented under Medicaid by 20 states have created an eligibility pathway to coverage under the program for women before childbirth. This innovation makes the provision of preconception care under this massive health program—one on which nearly 4 in 20 low-income women of reproductive age rely for their care (Gold, Richards, Ranji, & Salganicoff, 2007)—a possibility in a meaningful way for the first time. These programs also place family planning clinics, critical providers of sexual

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and reproductive health services, to center stage in the move to provide preconception care to young and low-income women. At the same time, however, these efforts raise important issues related to the package of services, the need for a stable funding stream to support the care, and protocols for providing it in a family planning setting.

An Eligibility Pathway to Coverage Under Medicaid

When Medicaid was first established, women covered under the program generally were single mothers in families eligible for welfare. Because of Medicaid's link to welfare, a program that generally only covered families, low-income women without children would not normally be covered. In 1984, only 14% of women with an income $<$150% of poverty who did not have a child were covered under the program (The Alan Guttmacher Institute, 1987a).

In the 1980s, Congress broke the welfare–Medicaid link for low-income pregnant women by first allowing—and later requiring—states to extend eligibility for Medicaid-covered prenatal, delivery, and postpartum care (specifically including postpartum family planning services) for up to 60 days postpartum. Congress required states to cover women with incomes $\leq$133% of the federal poverty level—far above most states' regular Medicaid eligibility ceilings. At their option, states could expand eligibility for pregnancy-related services to women with incomes $\leq$185% of poverty or beyond (Gold, Singh, & Frost, 1993).

This expansion was critical to bringing women onto the program for a package of pregnancy-related services. The proportion of births paid for by Medicaid rose from 17% of all births in 1985 (The Alan Guttmacher Institute, 1987b) to $>$40% today (Kaiser Family Foundation, 2002). However, it did little to extend coverage to women before a first pregnancy, a necessary prerequisite to providing preconception care.

The first steps in that direction came in the early 1990s, when states began seeking approval from the Centers for Medicare and Medicaid Services, the federal agency that administers the Medicaid program, for research and demonstration waivers to expand eligibility under the program for family planning services and supplies. These waiver programs take 3 approaches (Table 1). The first built directly on the expansions for pregnancy-related care, which allow states to provide Medicaid-funded family planning, as part of postpartum care, for 60 days after a woman gives birth. Four states currently have federal approval to continue coverage for family planning services, generally for 2 years postpartum. The second route, utilized by Delaware and Florida, is a variation on this approach. These states continue Medicaid family planning coverage for individuals who leave the Medicaid program for any reason.

Table 1. State Medicaid Family Planning Eligibility Expansions

State	Losing Coverage Postpartum	Losing Coverage for Any Reason	Based Solely on Income
Alabama			133%
Arizona	2 years		
Arkansas			200%
California			200%
Delaware		2 years	
Florida		2 years	
Illinois		*	200%
Iowa	*		200%
Louisiana			200%
Maryland	5 years		
Michigan			185%
Minnesota			200%
Mississippi			185%
Missouri	1 year		
New Mexico			185%
New York	*		200%
North Carolina			185%
Oklahoma			185%
Oregon			185%
Pennsylvania			185%
Rhode Island	2 years		
South Carolina			185%
Texas			185%
Virginia	*		133%
Washington			200%
Wisconsin			200%
Total	4	2	20

*State also extends Medicaid eligibility for family planning services to these individuals.

From the Guttmacher Institute. (2008). State Medicaid Family Planning Eligibility Expansions, State Policies in Brief. Available: http://www.guttmacher.org/statecenter/spibs/spib_SMFPE.pdf. Accessed September 20, 2008.

The third and boldest approach taken by states is to extend Medicaid family planning coverage based on income rather than on previous participation in the program. Twenty states have instituted these broad-based expansions, with most extending coverage to individuals with an income at or near 200% of the poverty level. In nearly all these states, the income ceiling used to determine eligibility for family planning is the same ceiling used to determine eligibility for Medicaid-covered pregnancy-related care in the state (Kaiser Family Foundation, 2008). By extending coverage to residents with no previous association with the program at all, these efforts have extended Medicaid coverage to large numbers of women before they become pregnant.

Significantly, these programs are not a permanent part of the states' efforts. Obtaining a waiver is a difficult and cumbersome process that can take a state upwards of 2 years. And even then, as research and demonstration waivers, they are approved by Centers for Medicare and Medicaid Services for an initial 5-year period and then renewed only in 3-year increments. Nonetheless, 60% of women of reproductive age live in 1 of the 20 states that have extended Medicaid coverage, at least for family planning, to women before pregnancy (The Guttmacher Institute, 2008). By forging an eligibility pathway for these women, these efforts essentially make coverage of preconception care under Medicaid possible in a meaningful way for the first time.

Title X: A Platform for Care

Although the state Medicaid expansions have the potential to give at least some women a pathway to coverage, that eligibility would be little more than a hollow promise without a network of providers able to deliver the care and services women need. For a significant proportion of young women seeking sexual and reproductive health services, family planning clinics serve as that critical network of providers. Of the teenagers who received a sexual or reproductive health care service in 2002, 41% did so at a family planning clinic, as did 28% of women in their early 20s and 21% of women in their late 20s (unpublished data, The Guttmacher Institute, April 18, 2008). In 2001, 7,600 publicly funded family planning clinics provided contraceptive services to 6.7 million women in the United States. Family planning clinics are located in 85% of counties nationwide (Frost, Frohwirth, & Purcell, 2004).

In many ways, Title X, the sole federal program devoted to the provision of family planning services to young and low-income women, undergirds this entire system. The program, which is administered by the US Department of Health and Human Services, awards grants to public and nonprofit private agencies who may be state or local health departments as well as nongovernmental organizations, such as community health centers, Planned Parenthood affiliates, or regional family planning councils. Each state has ≥1 grantee. Grantees can either provide services directly or do so through intermediate, delegate agencies. Of 87 current grantees, 48 are state or local are health departments; in 33 states and territories, the only Title X grantee in the jurisdiction is a health department (Office of Population Affairs, 2008).

The nearly 4,500 providers that receive some Title X funding serve approximately 5 million clients each year (Fowler, Gable, & Wang, 2008). In addition to funding the provision of direct medical services, Title X supports the clinic infrastructure, contributes to the extensive counseling needed by some clients and provides so-called enabling services such as the as outreach, education, and training.

Almost 60% of women served at clinics receiving Title X funds are <25 years old (Fowler et al., 2008). Basic hallmarks of the Title X effort make clinics funded under the program accessible to young women (The Alan Guttmacher Institute, 2000). Title X-funded clinics offer a broad range of US Food and Drug Administration-approved contraceptive methods. All clients, including teenagers, receiving care in a clinic funded through the program are entitled to confidential services. As a way to ensure confidentiality, teens are charged based on their own incomes, not their family's income.

Clients may not be denied care because of an inability to pay. Services are provided free of charge to poor clients. Other clients are assessed a fee based on their ability to pay, with clients with an income >250% of the federal poverty level ($17,600 for a family of 3 in 2008) required to pay the full fee (US Department of Health and Human Services, 2008).

Opportunities and Issues

Together, the Medicaid eligibility expansions and the family planning clinic network pose a rare opportunity to develop the same sort of synergy between Title X-funded providers and Medicaid as is emerging to expand access to family planning services (Gold, 2007). The Medicaid expansions offer the eligibility pathway and the family planning clinic network provides a constellation of providers with a proven ability to deliver sexual and reproductive health services to women before pregnancy. Nonetheless, critical challenges remain, including developing a precise definition of the package of care that can be provided in a family planning clinic, securing an adequate funding stream, and developing ways to provide the service as part of a family planning visit.

Defining the service set. The first step in establishing a health care home for preconception care is defining the package of services to be offered. Some large, influential associations such as the American Academy of Nurse Practitioners, have not adopted specific guidelines for preconception care, whereas others have identified only general guidance. However, some organizations offer detailed guidelines that often include services usually associated with primary health care. The most detailed plans, such as those adopted by the American College of Obstetricians and Gynecologists and the Centers for Disease Control and Prevention, stress the inclusion of nutritional supplementation, vaccinations, management of chronic health conditions, patient history reviews, genetic screening, identification and treatment of physical and mental health risk behaviors, and family planning counseling (Centers for Disease Control and Prevention, 2006; Freda, Moos, & Curtis, 2006).

Providing such a wide array of services is likely not a realistic expectation for most family planning clinics. Although family planning clinics typically offer a wide range of contraceptive services and counseling, they offer fewer noncontraceptive services, such as primary health and gynecologic care. In 1999, only half of all family planning agencies and 38% of Title X funded agencies provided primary health care services to their clients (Finer, Darroch, & Frost, 2002).

With family planning clinics unlikely to reconfigure their efforts to provide the full range of primary care, it is necessary to narrow the package of services considerably to a subset of particular relevance and importance to the clinics' client base. Toward this end, officials in Illinois identified common risk factors associated with poor pregnancy outcomes in their state. Officials used this information to craft a smoking cessation program and a perinatal depression initiative to address 2 risk factors strongly associated with poor pregnancy outcomes (Saunders, 2007).

Even this narrower package of care will nonetheless likely include services that are new and largely unfamiliar to clinics, creating a critical need for extensive training for both the clinical and administrative staff to avoid the oft-noted historic reticence of providers to discuss preconception care because of their own lack of knowledge (Curtis, Abelman, Schulkin, Williams, & Fassett, 2006). Providers will likely need to attain a rudimentary knowledge of chronic disease case management, mental health care, and nutritional counseling, among other issues. Moreover, clinics would need to develop and maintain extensive referral networks for services, such as smoking cessation programs, weight management classes, and treatment of chronic conditions that remain outside their ability to provide.

Securing adequate funding. Successful integration of preconception care into family planning clinics will depend, in no small measure, on the availability of a secure funding stream. Medicaid would be an ideal centerpiece of this effort. As a first step, each state Medicaid program would need, either individually or as a result of action on the federal level, to ensure that the full range of preconception services is covered for its enrollees.

But, to fully realize the program's promise as a funding source, each state program would need to replicate and build on what some state programs have done for family planning: to base eligibility solely on income and to establish a single comprehensive eligibility pathway for family planning, preconception care as well as prenatal, delivery, and postpartum care. Such a comprehensive eligibility category and package of services is a critical first step in ensuring low-income women the reproductive health care they need.

Nonetheless, recent changes to Medicaid preclude coverage under the program for many most in need, including recent and undocumented immigrants (Sonfield, 2007). These policy changes are already putting an increasing burden on family planning clinics funded through the Title X program that are prohibited from denying care because of an inability to pay. Increasingly, clinics are forced to turn to capped sources of revenue such as Title X or state funds to pay for what seems to be a growing number of clients ineligible for Medicaid because of these restrictions.

But even for those clients who would qualify for reimbursement, Medicaid does not fully reimburse providers for the cost of care. A small-scale study of Title X grantees in 2004 found that Medicaid reimbursed family planning providers, on average, for 54% of the cost of an initial visit (Sonfield, Gold, Frost, & Alrich, 2006). Of the 19 respondents, 7 indicated that the amount they received as reimbursement from Medicaid covered <40% of the cost of providing the care.

Moreover, although some states adjust their Medicaid reimbursement levels for family planning periodically, some do so only intermittently. In fact, roughly half of the states with income-based family planning waivers adjust their Medicaid rates on an ad hoc basis, depending on state finances and politics, a practice that can result in years-long stretches where rates are left untouched, not even adjusted to keep up with inflation (Sonfield, Alrich, & Gold, 2008). As a result, family planning clinics often look to programs such as Title X to fill this gap as well.

Already struggling to fill these gaps to provide access to family planning services to women in need, Title X would be hard pressed to cover the costs of providing preconception care for women either ineligible for Medicaid or whose care is not fully reimbursed under the program. Although the cost of providing reproductive health care rose dramatically over the past 25 years, Title X funding has stagnated. For Title X clinics, the cost per user of providing contraceptive services rose >50% between 1995 and 2001 alone, but funding has not kept pace (Gold, 2002). When taking inflation into account, Title X funding for fiscal year 2007 was 63% lower than it was in fiscal year 1980 (unpublished data, The Guttmacher Institute, February 5, 2008). Although Congress took the extraordinary step of increasing appropriations under the program by nearly $20 million for 2008, increases of such magnitude would need to continue annually for decades to fully fund the effort. An expansion to include preconception care would require additional, and significant, funding increases.

Providing the service in a family planning setting. Pregnancies occurring among young women often pose the highest risk of complications (Fraser, Brockert, & Ward, 1995). That fact makes the delivery of preconception care in family planning settings at once critical and extremely difficult. To realize clinics' potential, significant effort needs to be invested in developing ways to talk to a predominantly young clientele about why and how to prepare for a pregnancy in the future when they are coming in for services precisely to avoid becoming pregnant. Developing methodologies to deliver this set of services to this population, at this specific moment and in this setting, is critical to realizing the enormous opportunities that exist.

Despite these myriad challenges, there are reasons to be optimistic. The Medicaid eligibility expansions for family planning developed an eligibility pathway to coverage for a large number of women before their first childbirth. The nationwide network of family planning clinics has proven its ability to reach out to these women and to provide them with a critical set of reproductive health services.

Nonetheless, fully integrating preconception care into this provider network raises important questions. Health care providers have yet to settle on a universal framework for preconception care or identify a funding stream capable of covering the potentially considerable costs. And finding ways to talk to clients about preparing for a pregnancy at some point when they are seeking, first and foremost, to prevent a pregnancy in their lives at the moment, is a critical but undeniably difficult task. In short, although these new opportunities to reach young, childless women with preconception care raise important logistical questions, they clearly signal that health care providers are moving in the right direction.

References

Centers for Disease Control and Prevention. (2006). At a glance: Preconception health and care, 2006. Available: http://www.cdc.gov/ncbddd/preconception/documents/At-a-glance-4-11-06.pdf, Accessed June 2, 2008.

Curtis, M., Abelman, S., Schulkin, J., Williams, J. L., & Fassett, E. M. (2006). Do we practice what we preach? A review of actual clinical practice with regards to preconception care guidelines. *Maternal and Child Health Journal*, 10, S53–S58.

Finer, L., Darroch, J., & Frost, J. (2002). U.S. agencies providing publicly funded contraceptive services in 1999. *Perspectives on Sexual and Reproductive Health*, 34, 15–24.

Fowler, C.I., Gable, J., & Wang, J. (2008). Family planning annual report: 2006 national summary. Research Triangle Park, NC: RTI International.

Fraser, A., Brockert, J., & Ward, R. (1995). Association of young maternal age with adverse reproductive outcomes. *New England Journal of Medicine*, 332, 1113–1117.

Freda, M., Moos, M., & Curtis, M. (2006). The history of preconception care: Evolving guidelines and standards. *Maternal and Child Health Journal*, 10, S43–S52.

Frost, J., Frohwirth, L., & Purcell, A. (2004). The availability and use of publicly funded family planning clinics: U.S. trends, 1994–2001. *Perspectives on Sexual and Reproductive Health*, 36, 206–215.

Gold, R. B. (2002). Nowhere but up: Rising costs for title X clinics. *Guttmacher Policy Review*, 5, 6–9.

Gold, R. B. (2007). Stronger together: Medicaid, Title X bring different strengths to family planning effort. *Guttmacher Policy Review*, 10, 13–18.

Gold, R.B., Richards, C., Ranji, U., & Salganicoff, A. (2007). Issue brief: Medicaid's role in family planning. Menlo Park, CA: Kaiser Family Foundation. Available: http://www.kff.org/womenshealth/upload/7064_03.pdf. Accessed June 2, 2008.

Gold, R. B., Singh, S., & Frost, J. (1993). The Medicaid eligibility expansions for pregnant women: Evaluating the strength of state implementation efforts. *Family Planning Perspectives*, 25, 196–207.

Kaiser Family Foundation. (2002). Births financed by Medicaid as a percent of total births, 2002. Available: http://www.statehealthfacts.org/comparemaptable.jsp?ind=223&cat=4. Accessed June 2, 2008.

Kaiser Family Foundation. (2008). Income eligibility levels for pregnant women under Medicaid, 2008. Available: http://www.statehealthfacts.org/comparetable.jsp?ind=206&cat=4. Accessed June 2, 2008.

Office of Population Affairs. (2008). Title X-funded family planning grantees, delegates, and clinics. Available: http://www.hhs.gov/opa/familyplanning/grantees/services/index.html. Accessed June 2, 2008.

Saunders, D. (2007). Using Medicaid to improve preconception health. Presented at the 2nd National Summit on Preconception Health and Health Care. Oakland, CA.

Sonfield, A. (2007). The impact of anti-immigration policy on publicly subsidized reproductive health care. *Guttmacher Policy Review*, 10, 7–11.

Sonfield, A., Gold, R. B., Frost, J. J., & Alrich, C. (2006). *Cost pressures on Title X family planning grantees, FY 2001*. Washington, DC: The Guttmacher Institute.

Sonfield, A., Alrich, C., & Gold, R. B. (2008). *State government innovation in the design and implementation of Medicaid family planning expansions*. Washington, DC: The Guttmacher Institute.

The Alan Guttmacher Institute. (1987a). The financing of maternity care in the United States. *New York:* Author.

The Alan Guttmacher Institute. (1987b). Blessed events and the bottom line: Financing maternity care in the United States. *New York:* Author.

The Alan Guttmacher Institute. (2000). *Fulfilling the promise: Public policy and U.S. family planning clinics*. New York: Author.

The Guttmacher Institute. (2008). *Special tabulation of data from 2006–2007 Current Population Survey.* New York: Author.

US Department of Health and Human Services. (2008). Poverty guidelines. Federal Register [serial online], 73(15). Available: http://aspe.hhs.gov/poverty/08poverty.shtml. Accessed January 23, 2008.

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WOMEN'S HEALTH ISSUES

COMMUNITY APPROACHES TO WOMEN'S HEALTH
Delivering Preconception Care in a Community Health Center Model

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Preconception care has been recognized as an important set of interventions necessary to improve pregnancy outcomes and the overall health of women of childbearing age. Traditionally underserved populations such as the low income, uninsured, racial and ethnic minorities, homeless, and migrant farmworkers have less access to a usual source of primary care and therefore are more at risk for adverse health outcomes. The national network of Community Health Centers was created to break down compounding barriers to care that leads to poor health. Health centers are a vital source of care for low-income women. Almost 60% of health center patients are women, about half of whom are women of childbearing age. In addition, health centers provide care for >17% of low-income births in the United States. Most health centers offer their patients preconception services, such as HIV/AIDS screening and treatment, weight management, nutrition counseling, and smoking cessation programs, in addition to comprehensive primary care services. Three quarters of health centers provide mental health services and half provide substance abuse treatment services onsite; the rest provide these services in partnership with other providers. Health centers also participate in a number of community-based programs focused on improving women's health and providing preconception care services. As policymakers and public health planners consider options for enhancing the utilization of preconception care, they must also consider options for expanding access to health centers nationwide.

Preconception care has been recognized as an important set of interventions necessary to improve pregnancy outcomes and the overall health of women of childbearing age. It embodies primary and preventive services that all women need, regardless of whether or not they become pregnant. Despite its public health role, many preconception services are not widely used because of a lack of awareness among providers and patients, or lack of reimbursement by insurers (Centers for Disease Control and Prevention [CDC], 2006; Hillemeier, Weisman, Chase, Dyer, & Shaffer, 2008). In addition, women in communities and populations that are marginalized from primary care owing to cost, language, cultural, geographic, and other barriers to care are particularly at risk for not receiving preconception care services. Traditionally, underserved populations such as the low income, uninsured, racial and ethnic minorities, homeless, and migrant farmworkers have less access to a usual source of primary care and therefore are more at risk for adverse health outcomes (Mead, Cartwright-Smith, Jones, Ramos, & Siegel, 2008).

The national network of Community Health Centers was created to break down compounding barriers to care (42 U.S.C. §254b). With a health promotion mission for the entire community, health centers provide a comprehensive and diverse set of primary, preventive, and social services throughout the lifecycle and preconception care is integrated into these services.

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This article reviews the role of health centers in providing preconception care among vulnerable populations and discusses policy issues that challenge the ability to deliver these services and expand the Health Centers Program.

The Community Health Center Approach

Mission

The federal Health Centers Program has a 40-plus-year history of improving health status among traditionally at-risk populations. The earliest health centers recognized that improving community health starts by improving access to care and by addressing the social determinants of health, including poverty, low levels of education and health literacy, language and cultural barriers, and lack of health care resources. Today, the program includes Community Health Centers, Migrant Health Centers, Health Care for the Homeless Centers, Public Housing Health Centers, and even School-Based Health Centers. All health centers must meet 5 unique program requirements set in statute. Health centers must:

1. be located in a federally designated medically underserved area or serve a designated medically underserved population;
2. have nonprofit, public, or tax-exempt status;
3. provide comprehensive primary and preventive health care services throughout the lifecycle, and other services needed to facilitate access to care in a cultural competent manner;
4. be open to all community members, regardless of ability to pay or insurance status; and
5. be governed by a patient-majority board.

These core program requirements relate back to health centers' mission of serving those most in need and otherwise without health care. The governing board is a unique feature that ensures consumers directly manage their care and identify areas of remaining community need. Together, these programmatic prerequisites break down traditional and compounding barriers to care, broaden the definition and scope of health care, and make health centers an important intervention for patients of all ages and health care needs, including low-income women of childbearing age.

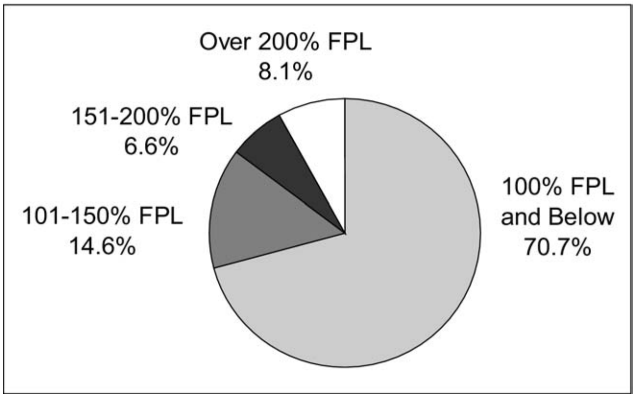

Figure 1. Health center patients by income level, 2006. *Note.* The Federal Poverty Level (FPL) for a family of 3 in 2006 was $17,170 (see http://www.aspe.hhs.gov/poverty/06poverty.shtml). Based on percent known. Percents may not total 100% owing to rounding. From the Bureau of Primary Health Care (2006).

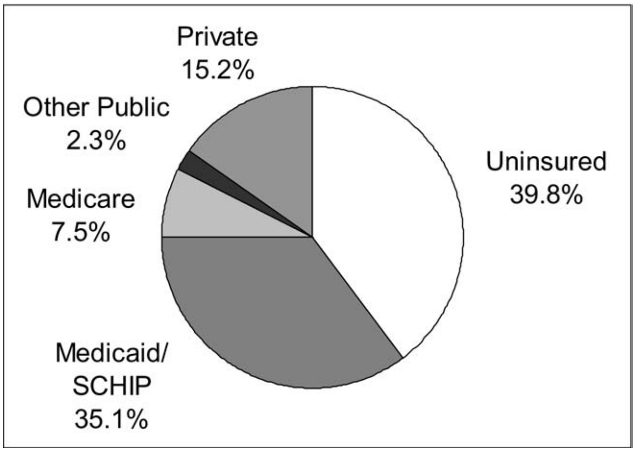

Figure 2. Health center patients by insurance status, 2006. *Note.* Other Public may include non-Medicaid SCHIP. Percents may not total 100% owing to rounding. From the Bureau of Primary Health Care (2006).

Program Size and Patients

More than 1,150 health center organizations currently serve >17 million patients through >6,300 service delivery locations across the country. Health centers are located in every state and territory, and are about evenly split between urban and rural communities (Bureau of Primary Health Care, 2006). The National Association of Community Health Centers (NACHC)

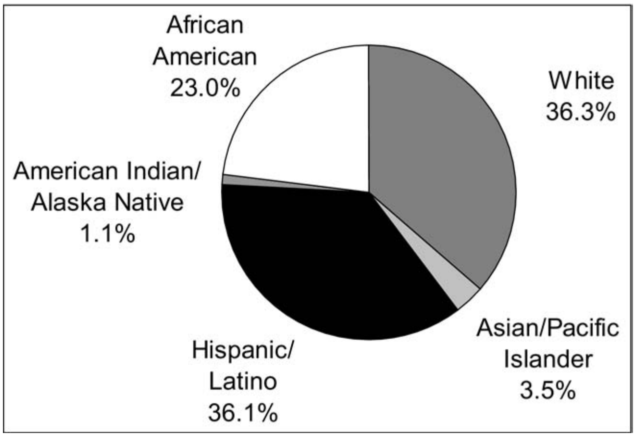

Figure 3. Health center patients by race/ethnicity, 2006. *Note.* Based on percent known. From the Bureau of Primary Health Care (2006).

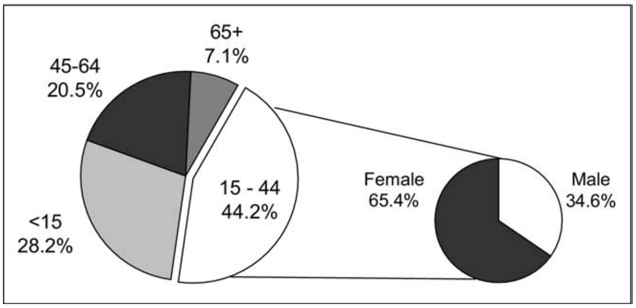

Figure 4. Health center patients by age, 2006. From the Bureau of Primary Health Care (2006).

estimates that health centers will provide >68 million patient visits this year.

As the figures below demonstrate, health center patients are overwhelmingly low income (Figure 1), uninsured or publicly insured (Figure 2), and racial/ethnic minorities (Figure 3)—demonstrating the ability of health center patients to reach populations customarily marginalized from care. Although 12.3% of the total U.S. population is low income, nearly all (92%) health center patients are low income, with most living below the federal poverty level (U.S. Census Bureau, 2007). Although 15.8% and 12.9% U.S. residents nationally are uninsured and Medicaid insured, respectively, 40% of health center patients are uninsured and 35% have Medicaid (U.S. Census Bureau, 2007). At the same time, roughly two thirds of health center patients are members of racial and ethnic minority groups, compared with roughly one third of the U.S. population (Kaiser Family Foundation, 2005). Nearly one third (29%) of health center patients prefers to be served in languages other than English (Bureau of Primary Health Care, 2006). Health centers provide care for women who account for 17.2% of all low-socioeconomic births nationally, a proportion that increases for minority women (Shi, Stevens, Wulu, Politzer, & Xu, 2004). Health center patients range greatly in age (Figure 4), speaking to the ability of health centers to care for patients throughout the lifecycle. Large numbers of patients are also migrant farmworkers or homeless individuals.

Female patients currently make up 59% of all patients, with women of childbearing age (ages 15–44) accounting for 29% of all patients and half (49%) of all female patients. One in 10 female patients of childbearing age is also a user of health center prenatal care services. The proportion of patients that are women of childbearing age is slightly higher in urban areas as compared to rural areas (51% vs. 46%). The same is true for the proportion of women of childbearing age that are prenatal care users (11% in urban areas vs. 8% in rural areas; Bureau of Primary Health Care, 2006). Although these proportions have held fairly steady over time, the Health Centers Program has expanded dramatically in recent years, meaning that health centers have significantly expanded their reach to women of childbearing age. Between 2001 and 2006, both the total number of health center patients and the number of female patients ages 15–44 grew by 46% (Bureau of Primary Health Care, 2001, 2006).

Health Center Financing

Speaking to their status as safety net providers, health centers rely on a diverse mix of grant funding, Medicaid, and third-party payments. At 37%, Medicaid is the largest single source of revenue for health centers. Federal health center grants are second, at 21%. State and local grants and contracts make up another 9% of total revenue, yet are a vital source of financing for health centers facing rising demand from new uninsured, underinsured, and chronically ill patients (NACHC, 2005). The number of uninsured patients grew 55% between 2001 and 2006, far higher than the percent growth of total patients (Bureau of Primary Health Care, 2001, 2006).

Although revenue from Medicaid is directly related to the proportion of patients with Medicaid, the same is not true for revenue from Medicare, other public insurance, and private insurance (Figure 5). Medicaid is the strongest payer because health centers are reimbursed for their Medicaid patients through a Prospective Payment System, which provides an average per-patient cost for each visit. On the other hand, although 15% of patients have private insurance, only 6.5% of revenue is related to private insurance, indicating that private insurance covers little of a health center's costs and that these patients are predominately underinsured (NACHC, 2005). Additionally, federal grants have not kept up with the cost of patient care, covering only 50% of average costs for an uninsured patient, a steady decline since 2001 (Bureau of Primary Health Care, 2001, 2006). Given these factors, it is not surprising that health centers' average operation margins were only 0.2% in 2006 (Bureau of Primary Health Care, 2006).

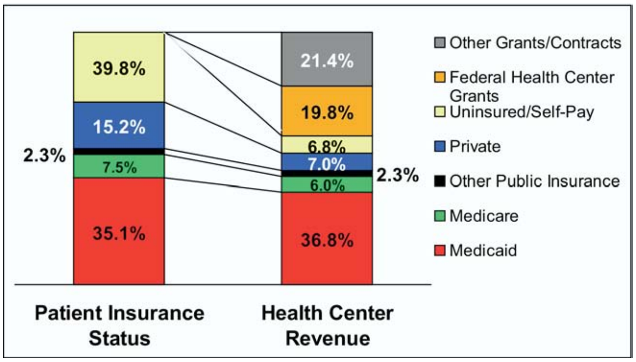

Figure 5. Health center patient insurance status and revenue by source, 2006. *Note.* Percents may not total 100% owing to rounding. From the Bureau of Primary Health Care (2006).

Table 1. Select Interventions Important for Preconception Care Provided by Health Centers, 2006

Preconception Intervention	% of Health Centers Providing Onsite	% of Health Centers Providing Onsite and/or Through Formal Referral Relationship
HIV testing and counseling	91.6	99.8
Weight reduction program	77.3	95.1
Nutrition services	76.8	98.4
Smoking cessation program	57.9	96.0
Mental health treatment and counseling	76.3	99.4
Substance abuse treatment and counseling	50.9	98.7

Notes. These services are identified by the Centers for Disease Control and Prevention (CDC) as preconception interventions with proven health effects. See CDC, "Preconception Health and Care, 2006," At A Glance, http://www.cdc.gov/ncbddd/preconception/documents/At-a-glance-4-11-06.pdf. "Onsite" includes services rendered by employees, contracted providers, volunteers and others who render services in the health center's name. Health centers may also provide services through formal and contractual referral arrangements. Includes health centers with federal health centers grants only, which make up roughly 90% of all health centers. Mental health treatment and counseling are not specifically identified by the CDC, but related interventions are (e.g., substance abuse, eating disorders).
From the 2006 Uniform Data System, Bureau of Primary Health Care, Health Resources and Services Administration, DHHS.

Outcomes

Health centers are associated with removing barriers to care and effectively reducing health disparities, while also generating savings to the health care system (Proser, 2005). For example, health center Medicaid, uninsured, Hispanic, and black female patients are more likely to have had a Pap test over 3 years than their counterparts nationally (Shi, 2005). Low socioeconomic status (SES) women seeking care at health centers experience lower rates of low birth weight (LBW) babies compared with all low-SES mothers (7.5% vs. 8.2%), a trend that holds for each racial/ethnic group. This is particularly noteworthy for African American women of low SES who are especially at higher risk for adverse pregnancy outcomes. If the LBW black–white disparity seen at health centers could be achieved nationally, there would be 17,100 fewer LBW black infants annually (Shi et al., 2004). Furthermore, patients who rely on health centers as their usual source care have lower total health care expenditures than those who receive most of their care elsewhere—saving the health care system between $9.9 billion and $17.6 billion annually (NACHC, the Robert Graham Center, and Capital Link, 2007a).

Delivery Model and Services

Health centers both embody and go beyond the concept of a medical home. A *medical home* is a continuous and usual source of care that includes a personal relationship with a provider and a care management team of medical professionals that coordinates and integrates the patient's complete care, is committed to continuous quality improvement, is patient-centered and focused on the whole patient throughout her lifecycle, coaches the patient about changing behaviors, and helps the patient to understand her conditions (American Academy of Family Physicians et al., 2007).[1] Having a medical home is a greater predictor of receiving care than having insurance alone, and is associated with better utilization and outcomes, including needs recognition, earlier and more accurate diagnoses, reduced emergency room use, fewer hospitalizations, lower costs, better prevention, fewer unmet needs, and increased patient satisfaction (Starfield & Shi, 2004). Low-income, minority, and uninsured populations especially benefit from having a medical home given that these groups run a greater risk of having adverse health outcomes, an inability to access primary care, and use of costly hospital-based care for avoidable conditions (Politzer, Schempf, Starfield, & Shi, 2003). The advantages of having a medical home are particularly pertinent regarding preconception care; having provider continuity, accessing consistent, quality care throughout the women's lifecycle, and receiving early intervention are all key factors in keeping women healthy.

As medical homes, health centers provide a comprehensive array of primary and preventive health care services, and many also provide dental, behavioral health, and pharmacy services. Health centers customize and tailor their services to meet the specific needs of their patients and communities, including language services. Within this mix are many interventions recognized by the CDC as essential to preconception care (CDC, 2006). As Table 1 denotes, most health centers offer on-site services that include HIV/AIDS screening and treatment, weight management, nutrition counseling, and smoking cessation programs. Three-quarters of health centers provide mental health services and half provide substance abuse treat-

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[1] For a larger discussion on medical homes and a review of literature, see National Association of Community Health Centers and the Robert Graham Center. Access denied: A look at America's medically disenfranchised. (2007, March). Available: www.nachc.com/research-reports.cfm.

ment services onsite, while the rest provide these services in partnership with other providers.

The CDC also recognizes management of chronic illness, specifically hypertension and diabetes, as an important component of preconception care (CDC, 2006). Nearly every health center is now participating in a chronic care management initiative to improve health outcomes and minimize health disparities for patients with chronic illness. Known as the Health Disparities Collaboratives (HDCs), this continuous quality improvement initiative also incorporates patient self-management and decision support techniques, electronic information systems, and even community outreach. The diabetes HDCs, perhaps the most heavily evaluated HDC targeted condition, have been associated with improved patient outcomes and processes of care (Chin et al., 2007; Huang et al. 2007). The HDCs were designed to cover all chronic conditions and be "spread" to other health center services.

Additionally, to fully address the social determinants of health, health centers integrate education and social services into primary care delivery. One in 10 full-time employed health center staff are enabling services providers, including case managers, outreach workers, health educators, insurance enrollment workers, interpreters, child care providers, and social workers (Bureau of Primary Health Care, 2006). Still other staff work through social services programs, commonly including Special Supplemental Food Program Women, Infants and Children, employment or educational counseling, and assistance in obtaining housing, with nearly all health centers providing these services onsite or through formal relationships or contracts with other organizations (Bureau of Primary Health Care, 2006). Some health centers are also linked to or manage federal Healthy Start grant programs that have the mission of reducing infant mortality (Maternal and Child Health Bureau, 2006).

One vital way to reach women in need of preconception care is through the use of *promotoras* or community health workers. These are lay workers who are members of the community or closely associated with the community served by health centers. They provide a vast array of services that may include culturally competent health education, translation, transportation, counseling and social support, advocacy, and some direct services such as blood pressure screenings (Bureau of Primary Health Care, n.d.). Community health workers can provide services that directly impact specific preconception care management issues highlighted by the CDC, such as diabetes management, immunizations, and HIV/AIDS and sexually transmitted disease screening and testing. For example, the Gateway Community Health Center in Laredo, Texas, uses *promotoras* as key components of their diabetes self-management program. The *promotoras* run a 10-week diabetes self-management course, a 10-week support group, and provide weekly phone call follow-ups to reinforce what patients have learned and to help with morale (Diabetes Initiative, n.d.). La Clinica de Familia in Las Cruces, New Mexico also uses *promotoras* to provide educational services on issues such as substance abuse and tobacco cessation, prenatal care and parenting classes, breast and cervical cancer education and screening, environmental home assessments, and diabetes management (Community Health Advisors Project, n.d.).

Examples of Health Center Programs That Address Preconception Care

From the board of directors, which is made up of mostly patients, to the specific programs and services they offer, health centers are responsive to the needs of their community. Although all health centers have similar missions and general approaches to providing health services to their community, each health center is also unique because it responds to the particular needs of their patients. The programs described below are just a few examples of the types of programs and services all health centers provide to improve preconception health. The common thread among all of these programs is the connection with the greater community and the creative approach health centers take to ensure the health of their patients.

Arizona Rural Frontier Women's Health Coordinating Center (RFCC)

In 2004, the Arizona Association of Community Health Centers, which represents health centers and their patients, was awarded a contract by the U.S. Department of Health and Human Services to create the RFCC. The RFCC was established to "coordinate and leverage a network of existing resources to provide a full range of services to women and their families living in rural/frontier communities of Arizona" (Arizona Rural Frontier, n.d.-A). Women who reside in rural areas must overcome a number of hurdles to leading a healthy lifestyle such as high rates of uninsurance, underinsurance, and poverty, geographic isolation, and lack of accessible providers (Arizona Rural Frontier, n.d.-B). The RFCC helps health centers to provide care tailored to the specific needs of rural women throughout their lifecycle through clinical care, outreach, education, and leadership skills. The RFCC's wide range of services include extensive clinical services geared toward women, research and clinical trials, a newsletter that shares information about women's health and well-being, and the creation of the Arizona Women's Health Initiative Council that is tasked with "analyz[ing], evaluat[ing], and think[ing] innovatively about rural women's health in Arizona" (Arizona Rural Frontier, n.d.-C).

Community Center of Excellence in Women's Health

The U.S. Department of Health and Human Services' National Community Centers of Excellence in Women's Health (CCOE) program is designed to integrate, coordinate, and strengthen linkages between existing community programs and activities to enhance services available to women, and to reduce fragmentation in women's health services. The program provides recognition and resources to community-based programs to develop and integrate 6 components: health services delivery, particularly preventive services; training for health care professionals including allied health professionals and others; community-based research; public education and outreach; leadership development for women; and technical assistance to other communities to replicate the CCOE model (Office of Women's Health, n.d.). Several health centers across the country are currently participating in this program, and have integrated CCOE programs into their primary care programs. Two examples include the Mariposa Community Health Center and the Kokua Kalihi Valley Health center.

The Mariposa Community Health Center, located on the border of southern Arizona and Sonora, Mexico, provides women with women-focused clinical care, health education for women and the communities they live in, leadership training, and educational opportunities. Mariposa health center offers a wide array of clinical services that assist women with preconception care such as education about HIV/AIDS, diabetes, tobacco cessation, cancer prevention, and nutrition (Mariposa Community Health Center, n.d.).

Kokua Kalihi Valley Health in Honolulu, Hawaii, serves a population that primarily consists of low-income, Asian-American and Pacific Islander women. This population has historically had high rates of diabetes mellitus and overweight/obesity and associated conditions (Kokua Kalihi, n.d.). The health center uses its Center of Excellence funding to bolster its education and outreach programs through women's health workshops, women's health maintenance groups that offer a wide variety of dance and exercise classes, community-based health promotion and screening activities, and monthly outreach activities to isolated parts of the community (Kokua Kalihi, n.d.). These programs are all intended to prevent chronic diseases and use physical activity and dietary changes to improve the health of at-risk and high-risk women.

Women's Health Services in Community Health Centers

In addition to specially funded programs such as RFCC or CCOE, many health centers incorporate women's health programs into their standard set of primary care services. For example, the Joseph M. Smith Community Health Center in Allston and Waltham, Massachusetts, provides women-focused health care throughout the lifecycle. They hire providers who focuses on the needs of adolescents; offer a full array of prenatal and pregnancy related services, including a "centering pregnancy" program that focuses on healthy living for the whole family; have a gynecology specialist on site to address any complex needs; run a nutrition program with a special emphasis on women with weight-related issues; use a mobile mammography van at their sites to reach women who cannot visit local hospitals for screening; and provide eligible women with breast and cervical cancer screening through their Women's Health Network (Joseph M. Smith, n.d.). The David Powell Clinic in Austin, Texas, specializes in treatment of patients with HIV and AIDS. This health center runs a "fully-integrated HIV-specific women's health clinic staffed entirely by women, including physician services provided by a Board Certified Family Practitioner" (Community Care Services, n.d.) The women's health clinic offers HIV-specific early gynecologic assessment and treatment services and reassesses women every 6 months.

Policy Discussion

Health centers play a vital role in providing preconception care services to women who might otherwise not have access to care. Unfortunately, health centers face many threats to their survival. It is essential that policy changes are made to increase the primary care workforce in health centers, broaden access to insurance, improve insurance coverage and reimbursement, and increase federal and state funding to health centers.

Overcoming Remaining Barriers to Care

Health centers provide an effective model for the delivery of preconception care and have the infrastructure and experience to deliver preconception care, especially to those women most likely to lack access to such care, or primary care in general. Although lack of insurance is a common barrier to accessing primary care, being insured does not guarantee access to a usual source of care. Compounding this, a looming primary care workforce shortage and the fact that too few providers locate in underserved areas could mean that fewer women have access to the preventive services they require, regardless of insurance status (Grumbach, 2008; Steinwald, 2008). In fact, NACHC and the Robert Graham Center recently found 56 million insured and uninsured people already do not have access to a primary care physician—much less a medical home—because of a shortage of such physicians in their local communities (NACHC & the Robert Graham Center, 2007b). However, focusing on the sheer numbers of health professionals for the underserved is not enough. Providers must be culturally competent, speaking the same language and understanding the customs and beliefs of the patients they serve.

Health centers have launched an aggressive growth plan to ensure that the medically disenfranchised and others facing additional barriers have access to a usual source of care. The *ACCESS for All America* plan envisions reaching 30 million patients by the 2015. Assuming that women of childbearing age would make up the same proportion of all patients as they do currently, this would mean that 8.7 million such women would have access to comprehensive and regular care through a health center. But to reach this goal, a substantial investment in health center infrastructure and the clinical workforce to staff the expansion is needed.

Insurance and Reimbursement Challenges

Delivering high-quality, culturally competent care to vulnerable populations in medically underserved areas is not an easy task given the fiscal realities of the health care system. At a time when health care costs are rising each year and health centers have slim operating margins, health centers and their patients cannot afford reductions in their funding sources. To the contrary, they will need additional resources to meet increasing demand and this need is exacerbated in down economic cycles. Policies that increase both federal and state funding for health centers are essential to their continued success.

Financial pressures come from treating both uninsured and insured patients. As noted, 40% of health center patients are uninsured, yet federal and state grants do not cover the full cost of caring for the uninsured. As a result, health centers often need to shift revenue from other sources to meet the needs of the uninsured. Even if patients have insurance, policies may not cover essential preconception care services or billing codes may not exist for particular services (CDC, 2006; Hillemeier et al., 2008). Medicaid is a crucial source of health insurance for low-income women, who make up three quarters of the program's adult population (Kaiser Family Foundation, 2007). Medicaid covers 10% of all non-elderly low-income women in the country and finances >40% of all births in the United States (Kaiser Family Foundation, 2007). Yet, many low-income women remain uninsured during the preconception period because they do not become eligible for Medicaid until they are pregnant, making it difficult for them to access preconception services.

On the federal level, the passage of the Medicare, Medicaid, and SCHIP Benefits Improvement Act of 2000 (BIPA; Public Law 106-554) and the Deficit Reduction Act of 2005 (DRA; Public Law 109-362) have changed the way health centers are reimbursed under Medicaid and allowed new restrictions to Medicaid coverage. BIPA created a new Prospective Payment System for health center Medicaid reimbursements that replaced the prior cost-based reimbursement system. Because health centers receive a PPS rate for Medicaid services, they are not harmed in the same way other safety net providers are when states reduce Medicaid cost-based reimbursement rates. Whether or not PPS reimbursement rates are adequate depends on how states implement the statute. Those states that allow for frequent rate recalculation to account for changes in health care costs and scope of services provided by health centers are more likely to provide adequate reimbursement levels (Shin & Finnegan, 2007; GAO, 2005). PPS rates should be regularly and adequately adjusted to reflect the true cost of providing services to health center patients so that health centers may expand the preconception care and other preventive services they offer. In addition, the DRA imposed strict citizenship verification requirements that create barriers to proving one's eligibility, resulting in many eligible individuals not remaining on Medicaid owing to lack of documentation. Given health centers' limited profit margins and inadequate reimbursement for providing care to the uninsured, replacing Medicaid patients with uninsured patients would place significant financial strain on health centers.

Unlike the federal government, states are required to balance their budgets every year. This means that when the economy weakens, states lose revenue and are likely to cut public funding for programs. For example, a one percentage point increase in unemployment is estimated to result in an increase of 1 million Medicaid and SCHIP beneficiaries at a cost of $1.4 billion in additional state spending. At the same time, state general revenues would be expected to fall 3%–4%, reducing the resources states have available to pay for health care or other programs (Dorn, Garrett, Holahan & Williams, 2008). States have historically restricted Medicaid and SCHIP programs during downturns in the economy and 13 states are already anticipating cuts in 2008 owing to the current economic situation (Dorn et al., 2008). Although the DRA protects health center services as a mandatory benefit, other safety net providers could be harmed by Medicaid benefit reductions. As noted, health centers will be negatively affected by state decisions to restrict Medicaid eligibility that results in health centers serving more uninsured patients and fewer Medicaid patients.

Finally, it is essential that federal and state governments continue and expand funding to health centers. Federal funding takes the form of grants to cover uninsured patients and program areas (e.g., dental services), insurance reimbursement, and funding for special programs such as the CCOE. In fact, health center directors report stretched resources for the HDCs as a major challenge to their sustainability (Chin et al., 2007). Health centers regularly conduct quality improvement assessments as part of an ongoing effort to improve the service they provide. Additional funds from the federal or state governments to assess how health centers collaborate with other programs that promote preventive care for women may help to increase access to preconception services. Health centers also may receive state support to cover general operations, construction, funds for improving health information technology, care for the uninsured, and emergency preparedness resources. In fiscal 2008, 36 states provided >$600 million to health centers, funding that is essential to the ability of health centers to provide a full array of services to their patients (NACHC, 2008).

Conclusion

Health centers are part of the fabric of their communities and the opportunities to reach out to other community organizations and patient populations are essential in ensuring the success of programs that assist women with preconception care needs. As policymakers and public health planners consider options for improving the utilization of preconception care, enhancing health centers is one important way to increase access to preconception care and women's health services to low-income and uninsured women. Their comprehensive, prevention- and community-oriented approach is the ideal setting for the delivery of preconception care to traditionally at-risk women. In addition, health centers augment the effectiveness of care that patients receive by integrating social and enabling services into primary care delivery. Investment in health centers that allows them to maintain their current capacity and expand into new service areas will increase their reach to more underserved women in need of preconception care as well as general preventive services.

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References

American Academy of Family Physicians, the American Academy of Pediatrics, the American College of Physicians, and the American Osteopathic Association. (2007). Joint principles of a patient-centered medical home released by organizations representing more than 300,000 physicians. Available: http://www.aafp.org. Accessed May 15, 2008.

Arizona Rural Frontier. (n.d.-A). Available: http://www.rfwhcc.org/index.php. Accessed May 5, 2008.

Arizona Rural Frontier. (n.d.-B). Frequently asked questions. Available: http://www.rfwhcc.org/faq.php. Accessed May 5, 2008.

Arizona Rural Frontier. (n.d.-C). Leadership activities. Available: http://www.rfwhcc.org/lead.php. Accessed May 5, 2008.

Bureau of Primary Health Care, Health Resources Services Administration, U.S. Department of Health and Human Services. (n.d.). Border county health workforce profile: Texas. Available: http://bhpr.hrsa.gov. Accessed May 5, 2008.

Bureau of Primary Health Care, Health Resources and Services Administration. (2001). Uniform data system. Washington, DC: U.S. Department of Health and Human Services.

Bureau of Primary Health Care, Health Resources and Services Administration. (2006). Uniform Data System. Washington, DC: U.S. Department of Health and Human Services.

Centers for Disease Control and Prevention, U.S. Department of Health and Human Services. (2006). Preconception Health and Care at a Glance. Available: http://www.cdc.gov. Accessed May 15, 2008.

Chin, M. H., Drum, M. L., Guillen, M., Rimington, A., Levie, J. R., Kirchhoff, A. C., et al. (2007). Improving and sustaining diabetes care in community health centers with the health disparities collaboratives. *Medical Care*, 45, 1135–1143.

Community Care Services at the David Powell Clinic. (n.d.). Women's services. Available: http://www.ci.austin.tx.us. Accessed May 16, 2008.

Community Health Advisors (*Promotoras*) Project. (n.d.). Available: http://www.nmsu.edu. Accessed May 5, 2008.

Diabetes Initiative. (n.d). Advancing diabetes self-management. Available: http://diabetesnpo.im.wustl.edu. Accessed May 5, 2008.

Dorn, S., Garrett, B., Holahan, J., & Williams, A. (2008). Medicaid, SCHIP and economic downturn: Policy challenges and policy responses, executive summary. Menlo: Kaiser Family Foundation. Available: http://www.kff.org. Accessed May 6, 2008.

42 U.S.C. §254b. The Community Health Center Program is found in Section 330 of the Public Health Service Act.

Government Accountability Office (GAO). (2005). Health centers and rural clinics: State and federal implementation issues for Medicaid's new payment system (GAO-05-452), 17-22. Available: http://www.gao.gov. Accessed May 15, 2008.

Grumbach, K. (2008). The crisis in the primary care physician workforce. Testimony before the Senate Health, Education, Labor and Pensions Committee on behalf of University of California, San Francisco and Center for California Health Workforce Studies.

Hillemeier, M., Weisman, C. S., Chase, G. A., Dyer, A. M., & Shaffer, M. L. (2008). Women's preconceptional health and use of health services: Implications for preconception care. *Health Services Research*, 43, 54–74.

Huang, E., Zhang, Q., Brown, S. E. S., Drum, M. L., Meltzer, D. O., & Chin, M. H. (2007). The cost-effectiveness of improving diabetes care in U.S. federally qualified community health centers. *Journal of General Internal Medicine*, 21(Suppl 4), 139.

Joseph M. Smith Community Health Center. (n.d.). Women's health. Available: http://www.jmschc.org. Accessed May 16, 2008.

Kaiser Family Foundation. (2005). Population distribution by race/ethnicity, states (2004–2005), US. Available: http://www.statefactsonline.kff.org. Accessed May 15, 2008.

Kaiser Family Foundation. (2007). Women's health insurance coverage fact sheet. Available: http://www.kff.org. Accessed May 16, 2008.

Kokua Kalihi Valley Health Community Center of Excellence in Women's Health. (n.d.). Available: http://www.kkv.net. Accessed May 5, 2008.

Mariposa Community Health Center. (n.d.). Success stories. Available: http://www.mariposachc.net. Accessed May 5, 2008.

Maternal and Child Health Bureau, Health Resources Services Administration, U.S. Department of Health and Human Services. (2006). A profile of healthy start: Findings from phase 1 of the evaluation. Available: http://mchb.hrsa.gov. Accessed June 24, 2008.

Mead, H., Cartwright-Smith, L., Jones, K., Ramos, C., & Siegel, B. (2008). *Racial and ethnic disparities in U.S. health care: A chartbook.*

New York: The Commonwealth Fund. Available: http://www.commonwealthfund.org. Accessed May 15, 2008.

National Association of Community Health Centers (NACHC). (2005). Safety net on the edge. Available: www.nachc.com. Accessed May 15, 2008.

National Association of Community Health Centers (NACHC), the Robert Graham Center, and Capital Link (2007a). Access granted: The primary care payoff. Available: www.nachc.com. Accessed May 15, 2008.

National Association of Community Health Centers (NACHC), & the Robert Graham Center. (2007b). Access Denied: A look at America's medically disenfranchised.

National Association of Community Health Centers (NACHC). (2008). State funding to health centers: Overview 2004–2008. Available: http://www.nachc.com. Accessed May 15, 2008.

Office of Women's Health, U.S. Department of Health and Human Services. (n.d.). The national community centers of excellence in women's health. Available: http://www.womenshealth.gov. Accessed May 5, 2008.

Politzer, R. M., Schempf A. H., Starfield, B., & Shi, L. (2003). The future role of health centers in improving national health. *Journal of Public Health Policy*, 24, 296–306.

Proser, M. (2005). Deserving the spotlight: health centers provide high-quality and cost-effective care. *Journal of Ambulatory Care Management*, 28, 321–330.

Public Law 106-554.

Public Law 109-362.

Shi, L., Stevens, G. D., Wulu, Jr., J., Politzer, R. M., & Xu, J. (2004). America's health centers: Reducing racial and ethnic disparities in perinatal care and birth outcomes. *Health Services Research*, 39, 1881–1901.

Shi, L. (2005). The Role of health centers in improving health care access, quality, and outcome for the nation's uninsured. Testimony at Energy and Commerce Committee, Subcommittee on Oversight and Investigations Congressional Hearing "A review of community health centers: issues and opportunities." Washington, DC.

Shin, P., & Finnegan, B. (2007). Update on the status of Medicaid prospective payment systems in the states. Washington, DC: National Association of Community Health Centers. Available: http://www.nachc.com. Accessed May 6, 2008.

Starfield, B., & Shi, L. (2004). The medical home, access to care, and insurance: A review of evidence. *Pediatrics*, 113, 1493–1498.

Steinwald, A. B. (2008). Primary care professionals: Recent supply trends, projections, and valuation of services. Testimony before the U.S. Senate Committee on Health, Education, Labor, and Pensions on behalf of the U.S. Government Accountability Office.

U.S. Census Bureau. (2007). Income, Poverty, and Health Insurance Coverage in the United States: 2006. (Current Population Reports, P60-233). Washington, DC: U.S. Government Printing Office.

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WOMEN'S
HEALTH ISSUES

HEALTHY START
Lessons Learned on Interconception Care

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The Federal Healthy Start program was started in 1991 to address the factors that contribute to the Nation's high infant mortality rate, particularly among populations with disproportionately high rates of adverse perinatal health outcomes. The goals of Healthy Start are to reduce disparities in access to and utilization of health services by using a lifespan approach, improving the local health care system, and increasing consumer and community input into health care decisions. In 2007, Healthy Start served 99 communities in 38 states, the District of Columbia, and Puerto Rico. Most Healthy Start grantees are nonprofit organizations. Since 2005, all 97 Healthy Start grantees (and the 2 additional grantees funded in 2007) have been required to include an interconception care component. Three quarters of grantees enrolled the majority of their interconception clients during the prenatal period. Most grantees used care coordination and case management as the primary approach to improving interconception health care. In 2007, 93 interconception projects reported that 9 out of 10 women had an ongoing source of primary care. Grantees screened to detect health conditions and risks, as well as provided an opportunity to provide vital information to women about their risks for chronic conditions such as obesity, hypertension, and diabetes. The Healthy Start interconception components demonstrate a critical need for and the potential impact of a strong interconception care program for high-risk populations such as women living in poverty, in medically underserved communities, and without health coverage.

In the United States each year, approximately 6 million women become pregnant (Ventura, Abma, Mosher, & Henshaw, 2004). Although most women have a safe pregnancy and deliver a healthy, full-term infant, that is not the experience for all women. Major and persistent racial and ethnic disparities exist in rates of pregnancy-related mortality and morbidity, preterm birth, low birthweight, and infant mortality (Mathews & MacDorman, 2007). Despite considerable research efforts to understand and prevent these adverse outcomes, the factors that make some pregnancies more vulnerable than others have not been clearly defined. Emerging research indicates that environmental, biological, and behavioral stressors occurring over the life span of the mother from the moment she herself was conceived until she delivers her own child may explain a portion of the disparities (Lu & Halfon, 2003; Ventura et al., 2004). Moreover, consistently providing interventions to several generations may be necessary before the factors responsible for the disparities in adverse birth outcomes have been overcome (Misra, Guyer, & Allston 2003).

The interconception period (the time between the end of a woman's pregnancy to the beginning of her next pregnancy) is a critical time to modify risk

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factors—disease processes, health behaviors, and environmental hazards—that are causally associated with infant mortality and other adverse pregnancy outcomes. Clinical care and support services effectively provided to women during the interconception period may reduce risks, address complications from a recent pregnancy, and/or prevent the development of a new health problem (obesity, diabetes, depression, and hypertension; Lu et al., 2006). Additionally, interconception care provides an opportunity to reduce or eliminate risks before future pregnancies occur to ensure healthier mothers and infants.

The leading causes of infant mortality and long-term disabilities in the United States are preterm birth (birth of an infant before 37 weeks gestation) and low birthweight (weighing $<$2,500 g at birth). Experiencing a preterm birth in a previous pregnancy is the strongest predictor of subsequent preterm birth. Thus, because women with prior adverse pregnancy outcomes can be readily identified, targeted interventions in the interconception period have the potential to decrease preterm births and reduce infant mortality.

This paper describes the interconception care efforts of grantees of the Department of Health and Human Services, Health Resources and Services Administration (HRSA), Maternal and Child Health Bureau (MCHB)'s Federal Healthy Start Infant Mortality Reduction program. The pilot and full implementation experience of grantees is described, as well as the overall approach and methods.

Background on Healthy Start

The Healthy Start program was started in 1991 to address the factors that contribute to the Nation's high infant mortality rate, particularly among African-American and other populations with disproportionately high rates of adverse perinatal health outcomes, such as Native Americans and Puerto Ricans. Healthy Start provides intensive services tailored to the needs of vulnerable mothers and women in geographically, racially, ethnically, and linguistically diverse communities with exceptionally high rates of infant mortality. The goals of the program are to reduce racial and ethnic disparities in access to and utilization of health services through a lifespan approach, improve the quality of the local health care system, and to increase the consumer and community voices and participation in health care decisions.

In 2007, Healthy Start served 99 communities in 38 states, the District of Columbia, and Puerto Rico. Most Healthy Start grantees (44%) are nonprofit organizations with the majority of these being federally qualified health centers, 37% are local health departments, 11% state health departments, and 8% are categorized as "other" (usually universities and tribal organizations ($n = 3$). Sixty-six percent of all of Healthy Start grantees serve an urban population, whereas 21% serve a rural and 13% a rural/urban mix. Six of the grantees are located within 62 miles of the United States–Mexico border.

Through the implementation of evidence-based practices and innovative, community-driven interventions, Healthy Start works with individual communities to build on their existing, effective resources (outreach, health education, case management, and utilization of prenatal/interconception care) to improve the quality of and access to health care for women and infants at both the service and system levels. At the service level, beginning with direct outreach by community health workers to women at high risk, Healthy Start projects ensure that mothers and infants have ongoing sources of primary and preventive health care and that their basic needs (housing, psychosocial, nutritional and educational support, and job skill building) are addressed. After risk assessments and screening for perinatal depression, domestic violence, and other behavioral risk factors, case managers facilitate women's and infants' access to appropriate health care and other services. Case managers and other Healthy Start staff also provide health education for risk reduction and prevention. Mothers and infants are linked to a medical home and followed, at a minimum, from entry into prenatal care through 2 years after delivery.

At the systems level, every Healthy Start project has developed a consortium composed of neighborhood residents, perinatal care clients or consumers, medical and social service providers, and other key community leaders, including faith and business community representatives. Together these key stakeholders and change agents address the system barriers in their community, such as fragmentation in service delivery, lack of culturally appropriate health and social services, and barriers to accessing care. Healthy Start projects also have collaborative linkages with state programs including Title V (the Maternal and Child Health block Grant), Medicaid, State Children's Health Insurance Program, and regional perinatal care systems.

Linkages and partnerships with safety net providers, including Community Health Centers and other federally qualified health centers offering primary care, extend Healthy Start service capacity, particularly for uninsured women. These relationships can assist in reducing significant risk factors such as smoking, obesity, or diabetes, while promoting behaviors that can lead to healthy outcomes for women and their families. These positive relationships and effects, which begin during the prenatal period, continue to be monitored for both mother and baby for 2 years post-delivery to ensure that they remain linked to ongoing sources of primary care.

Table 1. Distribution of Women in Healthy Start, By Race/ethnicity and Income, 2006

Race/ethnicity	Poor (<100 FPL)	Near Poor (100%–185% FPL)	Total Served
All racial/ethnic groups	54%	31%	
By race			
White	53%	31%	25%
Black	58%	27%	60%
American Indian	38%	12%	4%
Native Hawaiian/ Pacific Islander	36%	38%	1%
By Hispanic origin			
Hispanic	18%	80%	21%

The women served by Healthy Start represent the diversity of the United States: racially, 60% of the women are Black; 25% are White; 4% American Indian; 1% Native Hawaiian or Other Pacific Islanders; and the remaining 9% multiracial. Ethnically, 21% of the women participating in Healthy Start identified themselves as Hispanic. A majority are poor or near poor (Table 1.) The Healthy Start population reflects women of reproductive age: On average, 36% are women aged 24–34, 28% are between 20 and 23 years, and 27% are teens (14% are aged 18–19 and 13% are <17 years of age; MCHB, 2006).

Because of the diverse social and medical needs and risks for adverse perinatal outcomes among the clients served by the Healthy Start projects, grantees employ a multidisciplinary staff. For example, in staffing case management, 71% of the grantees employ indigenous community workers, 66% social workers, 60% nurses, and 14% public health professionals (HRSA, 2006). The staffing for the projects reflects the cultural diversity of Healthy Start clients. All projects are required to ensure a culturally competent program and staff. Annually Healthy Start grantees report on a series of performance measures, one of which addresses the degree to which the projects are culturally competent. In 2006, 79% of the grantees report employing a culturally diverse and linguistically appropriate staff, with an additional 27% of the grantees reporting "almost meeting" this element. Seventy-six percent of the grantees indicated that they ensured the provision of training in the area of cultural and linguistic competence. This included both orientation and ongoing professional development for staff, volunteers, contractors, and subcontractors involved in service delivery. An additional 23% reported that they "almost met" this requirement for those involved in service delivery (MCHB, 2006).

Evolution of Healthy Start's Interconception Care Component

In recognition of the growing evidence in support of interconception care, the HRSA's MCHB has advanced interconception care as a core strategy of the Healthy Start program. In this context, interconception refers to the time from the end of 1 pregnancy to either the next pregnancy or 24 months postpartum, whichever comes first (HRSA, 2001).

The additional elements of high-risk interconception care over and above the customary services provided by Healthy Start grants included 1) outreach for early identification of high-risk women and high-risk infants during hospitalization; 2) linkage to primary care and specialty care for high-risk women of reproductive age; 3) linkage to Maternal and Child Health Services Block Grant (Title V), Medicaid, and other early intervention services for high-risk infants; and 4) case management and health education focusing on both appropriate and ongoing interventions for the woman's existing chronic conditions as well as risk reduction activities including smoking cessation.

During project years 2001–2005, HRSA's MCHB challenged 35 Healthy Start grantees to design and enhance their interconception care components. These 35 grantees were to pilot and identify the essential elements of implementing interconception care in Healthy Start. Most of these projects were asked to undertake this challenge without additional funding. The methods of the original 35 interconception care Healthy Start grantees varied in approach, intervention scope, community engagement, and intensity. Together, however, their strategies and results provide important, new information for future planning and delivery of interconception care to improve the health of high-risk women, their infants, and their families. Healthy Start is a gap-filling, community-based model. Yet, Johnson in her review of these 35 grantees found that few of the 35 original sites focused their interconception care efforts on community-wide barriers or used an ecological model (i.e., focusing simultaneously on individual client, community, and larger systems) that many used in their prenatal care efforts (HRSA, 2007). Between 2001 and 2005, several of these projects developed unique case management protocols, tailoring the level of service and staffing based on the risk status of the woman and her infant. All focused specific attention on postpartum clinic visits, family planning visits, and well-woman visits in the postpartum period; some of the sites delivered this service via case management while others directly provided the services through their parent organization, usually a Community Health Center or local health department (HRSA, 2007).

Interim reports from the original 35 interconception Healthy Start grantees indicated a need to involve other grantees. Beginning in 2005, HRSA–MCHB required that all 97 Healthy Start grantees (and the 2 additional grantees funded in 2007) include an interconception care component.

While some Healthy Start programs have special grants to enable them to serve women who are considered at "high risk" during the interconception period, all Healthy Start programs must demonstrate that the program's core and high risk interconception activities include the following:

- Knowledge, throughout the community, of what interconception care is, and what the related health outcomes are;
- An understanding of the gaps that exist in providing interconception care services;
- A record of completed referrals for both interconception and specialty health care services for those women who are identified as needing these services. (HRSA, 2005)

Interventions and Impact

Enrollment

One challenge reported by Healthy Start grantees that added an interconception care component to their existing strong prenatal services was identifing the best strategies to engage women beyond the end of pregnancies. In some cases, this was a continuation of services to those served prenatally and in other instances new clients were identified during the interconception period. Findings from a survey of all Healthy Start Project Directors conducted as part of a National Evaluation of the program found that three quarters of grantees (74%) enrolled the majority of their interconception clients during the prenatal period, with the remainder enrolling additional clients after delivery (HRSA, 2006). The survey also found that through case management, interconception clients receive counseling and education on the importance of interconception care (98% of the grantees), family planning (97%), and the risk of short birth intervals (97%; HRSA, 2006).

Case management and care coordination

Most grantees used care coordination and case management as the primary approach to improving interconception health and health care. Case management has a variety of definitions in the field. For these Healthy Start grantees, case management generally has a core common definition, with some variations. For interconception care components, it typically includes the following:

1. a risk assessment;
2. a care/services plan corresponding to identified risks, with regular updates over the 12- to 24-month interconception care service period;
3. referrals and follow-up assistance in linking to other services (e.g., appointments with medical providers, support for completing Medicaid applications, help in finding child care or transportation to medical appointments);
4. health promotion, education, anticipatory guidance, and counseling;
5. behavioral screening (e.g., depression screening); and
6. monitoring milestones for mother and baby (e.g., completion of the 4- to 6-week postpartum visit, selection and use of a family planning method, immunizations).

Care coordination and case management is generally delivered through individual home visits, although some grantees relied on group care methods.

Notably, Healthy Start grantees have devised approaches to tiered levels of care coordination and case management. They are using a variety of neighborhood/community-based lay health workers and professionals (nurses, social workers, etc.) to identify, engage, and support low-income, high-risk women. These tiered approaches—often based on levels of client need or intensity of the service protocol—are promising practices that should be discussed and considered by other community and state perinatal care coordination/case management projects.

Services, referrals, and linkages

An important indicator of the effectiveness of care coordination is a completed referral for specialty services for the mother and/or infant. Grantees annually report on this performance measure. Whereas 44% of the grantees reported that more than three quarters of all referrals for pregnant women were completed in 2006, only 32% reported that their postpartum clients had a completed referral in the interconception period (HRSA, 2006). This finding of a lower completed referral rate for interconception clients may reflect the challenges in delivering services to this population. Insights from the 35 original interconception grantees may explain this. Virtually all 35 of the original interconception grantees documented systemic barriers to interconception care for the families they serve. The most commonly cited barrier was the loss of Medicaid coverage 60 days postpartum, resulting in higher rates of low-income women becoming uninsured soon after pregnancy. Linking low-income women with an ongoing source of primary care is a major challenge. Although local health departments, publicly available family planning clinics, and similar clinics can provide some screening, these grantees found they generally did not have the capacity to provide ongoing primary care. Clinical capacity to serve uninsured women with postpartum depression or other mental health problems was found to be even more limited (HRSA, 2007). Rural grantees have had the most difficulty in accessing medical care for interconception women with chronic health conditions (HRSA, 2006). Healthy Start projects have focused more intensely on the provision of interconception services since 2005 and some improvements have been reported. In 2007, the 6 border projects reported that 96% of women participating in their Healthy Start interconception services have an ongoing source of primary and preventive care services for women; the remaining 93 projects report that 89% of the women served have an ongoing source of primary care (MCHB, 2006).

Identifying and addressing medical conditions and behavioral risks

Although the interconception period provides an opportunity to address chronic medical conditions, it also provides an opportunity to provide vital information to women about their risks for chronic conditions such as obesity, hypertension, and diabetes. The experiences of all 99 Healthy Start projects support this. Consistent with national recommendations, Healthy Start projects screen high-risk, low-income women during the interconception period for risks and acute and chronic health conditions. If the woman screens positive for a specific health condition and is not currently being treated, she is referred to a primary care provider for intervention services. In 2006, projects found that 14.7% of the women screened during the interconception period were in need of treatment for asthma. This compares with estimates of the incidence of asthma from the National Health Interview Survey of 5.6 per 1,000 for women (Rudd & Moorman, 2007). Nationally the 12-month incidence rate for diabetes was 7.5 per 1,000 women; in the Healthy Start population the rate for diabetes was 15.6%. Additionally, Healthy Start projects reported in 2006 that, among women served through Healthy Start interconception services (MCHB, 2006):

- 15% were in need of education and intervention to promote improved health through increased physical activity;
- 13.3% were underweight and 16.8% were obese;
- 15.4% had elevated cholesterol for which they were not receiving treatment;
- 14.8% had untreated hypertension;
- 15.6% had untreated diabetes;
- 13.3% had undiagnosed or untreated breast cancer;
- 14.4% screened positive for fecal occult blood;
- 16.8% screened positive for Group B Strep or bacterial vaginosis;
- 17.1% screened positive for other sexually transmitted infections;
- 12% screened positive for HIV; and
- 19.8% screened positive for periodontal infection.

In the behavioral risk area, the projects found the following previously unrecognized conditions: 15.4% of the women had problems with alcohol use; 16% were experiencing domestic violence; 12.4% were homeless; 18.6% used illicit drugs; and 20.7% used tobacco. In addition, 26.3% of the women were diagnosed with depression and required medical treatment and 19.9% were diagnosed with ≥ 1 other mental health disorders that required care (MCHB, 2006).

Community system change

In addition to the screening services provided to high-risk women, Healthy Start communities also focus on reducing barriers to ongoing access to quality care through targeted, local systems-building activities. One of the key performance measures that Healthy Start projects annually report on is their local activities to improve the capacity of health providers to screen Healthy Start participants for risk factors. Projects utilize several strategies including incentives; memorandums of understanding that create linkages with primary and specialty care; policy improvements; and provider training on effective and emerging screening tools. In 2006, 57 (58%) of Healthy Start projects reported that they were meeting their performance objectives in this area (MCHB, 2006).

Conclusions

For community-based projects serving the highest risk women in medically underserved communities, there are important lessons to be learned from the experience of Healthy Start in providing interconception care and support. Chief among these is the value of case management and care coordination for linking women and their infants to services. Similarly, the experience in using multidisciplinary and multilevel teams provides valuable examples of how to both maximize resources and tailor services to individual client needs. Another lesson is that a focus on postpartum visits and family planning could be effective in improving utilization rates, and in lengthening pregnancy intervals. A third lesson is that women have health risks and conditions that stretch far beyond reproductive health and screening. Detecting and treating underlying disease and health conditions is essential in interconception care projects seeking to improve health and pregnancy outcomes for low-income, high-risk women. Healthy Start grantees have developed valuable tools for training and implementation of interconception care projects; however, this must be determined through further testing and validation. Other programs also may learn from the experiences of Healthy Start in selection of performance measures and realistic objectives, a critical component of community projects. Finally, projects should be aligned with Community Health Centers and other publicly available primary care clinics, because many low-income women lose Medicaid coverage at 60 days postpartum.

As documented elsewhere in the work of the Grady Interconception Care Project in Atlanta, Georgia, and the Magnolia Project in Jacksonville, Florida (Bierman, Dunlop, Brady, Dubin, & Brann, 2006), the Healthy Start interconception components demonstrate a critical need for and the potential impact of a strong interconception care program for high-risk populations such as women living in poverty, in medically underserved communities, and without health coverage. Many such women have had prior adverse pregnancy outcomes and have medical conditions or risks that will affect any future pregnancies, as well as the woman's own health. Healthy Start grantees have explored approaches for identification of risk factors common in the community they serve, community-based outreach to women of reproductive age, tailored case management, and system-building activities. It is the synergy of these elements together that has led to improvements in both the health of high-risk women and their families within Healthy Start communities.

References

Biermann, J., Dunlop, A. L., Brady, C., Dubin, C., & Brann, A., Jr. (2006). Promising practices in preconception care for women at risk for poor health and pregnancy outcomes. *Maternal Child Health Journal*, 10(5 Suppl), S21–S28.

Health Resources and Services Administration (HRSA). (2001). *Healthy Start guidance, 2001.* Rockville, MD: Health Resources and Services Administration, U.S. Department of Health and Human Services.

Health Resources and Services Administration (HRSA). (2005). *Healthy Start guidance, 2005.* Rockville, MD: Health Resources and Services Administration, U.S. Department of Health and Human Services.

Health Resources and Services Administration (HRSA). (2006). *A profile of Healthy Start: Finding from Phase 1 of the Evaluation 2006*. Rockville, MD: Health Resources and Services Administration, U.S. Department of Health and Human Services.

Health Resources and Services Administration (HRSA). (2007). *A Review of Interconception Care in 35 Healthy Start Communities, 2001–2005, December 2007*. Rockville, MD: Health Resources and Services Administration, U.S. Department of Health and Human Services.

Lu, M. C., & Halfon, N. (2003). Racial and ethnic disparities in birth outcomes: A life-course perspective. *Maternal Child Health Journal*, 7, 13–30.

Lu, M. C., Kotelchuck, M., Culhane, J. F., Hobel, C. J., Klerman, L. V., & Thorp, J. M., Jr. (2006). Preconception care between pregnancies: The content of internatal care. *Maternal Child Health Journal*, 10(Suppl 7), S107–S122

Mathews, T. J., & MacDorman, M. F. (2007). *Infant mortality statistics from the 2004 period linked birth/infant death data set. National Vital Statistics Reports, 55, (23).* Hyattsville, MD: National Center for Health Statistics. 2007.

Maternal and Child Health Bureau (MCHB). (2006). *MCHB Discretionary performance measures for 2006*. Rockville, MD: Health Resources and Services Administration, U.S. Department of Health and Human Services.

Misra, D. P., Guyer, B., & Allston, A. (2003). Integrated perinatal health framework: A multiple determinants model with a life span approach. *American Journal of Preventive Medicine*, 25, 65–75.

Rudd, R. A., & Moorman, J. E. (2007). Asthma incidence data from the Nation Health Interview Survey, 1980–1996. *Journal of Asthma*, 44, 65–70.

Ventura, S. J., Abma, J. C., Mosher, W. D., & Henshaw, S. (2004). *Estimated pregnancy rates for the United States, 1990–2000: An update. National Vital Statistics Reports, 52(23).* Hyattsville, MD: National Center for Health Statistics.

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TITLE V STRATEGIES TO ENSURE A CONTINUUM OF WOMEN'S HEALTH SERVICES

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Maternal and child health professionals who work in Title V-funded agencies and programs are well positioned to address the continuum of women's health needs across the lifespan. Title V directors and their staff work on issues such as health status before, during, after, and between pregnancies; healthy lifestyle practices, such as physical activity; and prevention of chronic disease, such as obesity, diabetes, and heart disease. This paper provides an overview of some current efforts as well as a discussion of ongoing opportunities for Title V programs.

Introduction

Maternal and Child Health professionals who work within Title V-funded agencies and programs are well positioned to address women's health needs across the lifespan. Title V directors and their staff work on issues such as health status before, during, after, and between pregnancies; healthy lifestyle practices, such as healthy nutrition and physical activity; and prevention of chronic disease, such as obesity, diabetes, and heart disease. This paper provides an overview of state Title V women's heath activities. Information is presented about some current state efforts, as well as opportunities for ongoing Title V work to influence women's health.

Title V Maternal and Child Health Block Grant

Since its inception in 1935, the Maternal and Child Health Services Block Grant (Title V of the Social Security Act), of the largest Federal block grant programs, has provided a foundation for the health of the Nation's mothers and children (US Department of Health and Human Services [USDHHS], Health Resources and Services Administration [HRSA], Maternal and Child Health Bureau [MCHB], N.D.-b). The funds are used to help promote and improve the health of mothers and women of childbearing age, infants, children, adolescents, and children with special health care needs. This is done in a variety of ways, including direct services, such as prenatal care, pregnancy planning and spacing, well child care, immunizations, and specialty services for children and youth with special health care needs.

The HRSA's MCHB oversees the Maternal and Child Health Services Block Grant, which is also known as Title V. Block grant funds are provided to all 50 states, the 8 US territories, and the District of Columbia. These grants are directed toward addressing 10 priority challenges identified by MCHB, two of which are directly associated with preconception and interconception care: 1) to significantly reduce infant mortality and 2) to provide care for women before, during, and after pregnancy and childbirth.

To receive Title V Block Grant funds, each state and jurisdiction must submit an annual application to MCHB outlining plans to address national and state priorities. An assessment of state MCH needs is required every 5 years to identify the priority challenges facing women and children in a state. States and jurisdictions then develop a plan to address these challenges. Each year of the 5-year cycle, states are required to submit an annual report and application for continued funding. The annual Title V Block Grant application and reporting process requires states to address 18 National Performance Measures, several of which are devoted to maternal and infant health, such as adequacy of prenatal care, reduction in tobacco use during pregnancy, and reduction in infant

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mortality. Additionally, each state is required to address seven to ten state-specific Performance Measures that are derived from the state's 10 priority areas identified as a result of the 5-year needs assessment. Title V agencies make decisions about how funding will be used to address the federal and state performance measures. Funded activities cover a broad range of health issues and priorities, including preventive health services, healthy environment, healthy weight, respiratory health, oral health, mental health, nutrition and physical activity, and planning and spacing of pregnancies. Title V agencies monitor their accomplishment of these performance measures and report each year on progress. Annually this information is entered into the Title V Information System (TVIS), which provides easy access to state plans and accomplishments.

State Title V and Women's Health

State Title V agencies are engaged in many activities through their programs to improve the health of women throughout their life. The following section briefly discusses factors affecting women's health that are addressed by Title V programs.

Planning and infrastructure for a continuum of care for women

Title V agencies utilize information from the 5-year needs assessment and review various data sources, such as the National Children's Health Study (a MCHB-funded biennial survey that alternates between a survey on children and youth with special health care needs and for children's health in general), the Pregnancy Risk Assessment Monitoring System (PRAMS), the Behavioral Risk Factor Surveillance System, the Youth Risk Behavior Surveillance System, and others to determine priority issues for mothers and children in their state. The needs assessment information and data are vital for states to identify health care needs in the MCH populations and to develop programs and strategies to improve health status.

Title V promotes the development of systems of care that include, among others, preconception and interconception health and health care. It becomes clear that preconception health and care are important components of a continuum of care for women during their childbearing years and beyond. Although not all women may become mothers, health in a woman's younger years impacts her health later in life. Some States are working to build infrastructure and capacity for addressing women's health across the lifespan by developing programs that include prevention. An example of this is obesity prevention. When a woman becomes pregnant, her weight can affect her health and that of her child.

Access to health care services

Health care access affects a woman's well-being and that of any children she may have. Access to affordable and continuous health care is a challenge for many women who lack insurance or who may only receive services for reproductive needs such as pregnancy or family planning services. Title V programs work with other state agencies such as Medicaid, human services, managed care organizations, community partners, and local public health departments to address access and clinical and preventive health care needs. Critical to access to services, including preconception or interconception care, is coverage for health care. Women of childbearing ages may not be eligible for Medicaid or other publicly funded health care unless they are pregnant. Unless states have developed programs to assist women without insurance to obtain health care coverage, low-income or working poor women often have no recourse. Title V programs may help fund direct clinical services for women without coverage, may find other sources of care, such as a clinic, and may refer women to other available community-based health services, if they exist, associated with health promotion or mental health, tobacco cessation, drug abuse, and domestic violence.

Family planning services

Title V programs have long recognized the need for women to have access to affordable services to plan and space pregnancies, or to avoid pregnancy all together. The ability to space and plan pregnancies is a primary focus of the federal Title X Family Planning Services program. In some states, the Title V and Title X programs are managed within the same government agency, such as a family health or a maternal and child health bureau. In addition, funding for family planning services in many states is augmented by Title V funding, including funds channeled to local health departments, community health centers, or other community health clinics. Title V agencies also have played a key role in contributing to the development of Medicaid family planning waivers by providing support for program design, and referrals to care. For more information, see the family planning specific article in this issue.

Perinatal services

State Title V agencies commit substantial resources to addressing healthy childbearing. Some states use their Title V funding to support direct clinical care for women, such as early and comprehensive prenatal care, family planning, and other needed services. States also support the delivery of case management services for pregnant women that address appropriate weight gain, healthy lifestyle choices (e.g., tobacco and substance use), and healthy psychosocial status (e.g., screening for depression and violence) and other needs that affect outcomes for women and their infants. Additionally, Title V agencies support the delivery of population-based services that inform and educate women about available services and how women can prepare for a healthy pregnancy. Each agency is required to have a toll free telephone number that the public can use for information about community services, MCH resources, and health topics; Title V provides the infrastructure for this resource.

Health promotion services

Because many public health agencies combine programs related to mothers and children, Title V agencies often administer or work closely with other federally funded programs that provide services to women, such as WIC (Special Supplemental Nutrition Program for Women, Infants, Children) immunizations, chronic disease prevention, tobacco control, and mental health. State Title V agencies work with agencies that address other needs such as education and social support. Title V programs promote consumer education campaigns targeting women, their partners, and their families with information on a multitude of topics. Work is done with education agencies to reach youth with health promotion messages around positive nutrition and physical activity and healthy lifestyle choices, as well as effective interventions for the prevention of adolescent pregnancy and sexually transmitted infections.

Current MCH Efforts Addressing Preconception and Interconception Health

Title V agencies are working to implement the recommendations on *Improving Preconception Health and Health Care* published in 2006 by the US Centers for Disease Control and Prevention (CDC). Although prenatal care has long been a focus and continues to remain essential to healthy pregnancies, the value of long-term health and preconception care for women is recognized as vital in making further improvements in infant and women's health. Not only does this approach promise improved health for infants, but also for women, regardless of whether or not they choose to become parents. More and more states are identifying preconception (including interconception) health and health care as one of their priority needs (Johnson et al., 2006).

Several national organizations have supported the importance of preconception health and health care to their members, including state health officials and state Title V officials (Association of Maternal and Child Health Programs, 2007; Association of State and Territorial Health Officials, 2006). State Title V agencies have developed plans to address the importance of preconception and interconception health and care as evidenced in their MCH Block Grant applications and report. State public health and maternal and child health leaders support preventive measures to reduce maternal and infant morbidity and mortality as evidenced by state priorities related to healthy pregnancy and healthy newborns.

A 2006 review of Title V data through TVIS identified a total of 23 states reporting a state priority need relevant to preconception health and health care. A total of 42 states and jurisdictions reported State Performance Measure related to preconception, such as preconception health care, prevention of neural tube defects, encouraging healthy birth spacing, planning of families, reduction in unintended pregnancy, and healthy weight promotion and obesity prevention (Boulet, Johnson, Parker, Posner, & Atrash, 2006).

For preparation of this paper, a search was conducted in 2008 on the narratives of all 59 Title V MCH Block Grants through the TVIS using the keywords "preconception" and "interconception" (USDHHS, HRSA, MCHB, TVIS). The search identified 39 states and 2 jurisdictions that discussed these topics in the narrative sections of their Title V Block Grant FY 2006 Annual Report and FY 2008 Application. More than 30 grants discussed specific efforts developed in this area of women's health and 9 grants briefly addressed the subject.

Title V programs have, in a few short years, expanded their efforts to incorporate preconception and interconception health and health care along with women's health care.

The following description of state activities was obtained during a 2008 review of state Title V MCH Block Grant narratives (via TVIS), which show that many states are addressing preconception and interconception health in a number of different ways. Many Title V Programs have embraced the CDC's *Recommendations to Improve Preconception Health and Health Care* (Johnson et al., 2006). Title V resources are used to provide and coordinate services to improve women's health, train health care providers, educate women, and build infrastructure to support the delivery of such services. The following examples provide a brief description of a number of state activities underway to integrate preconception and interconception care as described in their MCH Title V Block Grant submissions. The list is not inclusive of all states' efforts in this area of women's health; it is a snapshot of what some states are doing to address preconception and interconception health and health care as described in their MCHB grant application.

Development of State Priorities and Performance Measures

A number of states have identified preconception and women's health as state priorities and/or developed state performance measures.

California

California has a state performance measure to "Enhance preconception care and work toward eliminating disparities in infant and maternal morbidity and mortality." The Preconception Care Council of California was organized in May 2006 with the leadership of the state Title V agency and the California Chapter of the March of Dimes. The council developed a comprehensive statewide plan of action that promotes preconception care in California. The California Preconception Care Initiative has developed a provider/patient resource packet to assist health care providers and has disseminated clinical information through the Internet, regional conferences, DVD, and audio presentations. Plans are currently in place to update the packet.

Connecticut

Connecticut identified "Increase access to preconception education and parenting" as an MCH priority. Efforts include identifying and promoting the development of quality preconception and parent education programs, particularly in the schools and in areas where there are high rates of teen births; developing and disseminating culturally appropriate educational materials and curricula geared to teens and young adults; tracking the number of teens and young adults who receive quality preconception and parent education in schools and in other community settings; and promoting provider training and education programs geared to encouraging brief preconception counseling and parenting education and referral to community-based educational programs.

Florida selected preconception care as a state priority. One-time funding of $3,000,000 allowed the state to fund community based Healthy Start coalitions, based on CDC's *Recommendations to Improve Preconception Health and Health Care* (Johnson et al., 2006), to support preconception health activities to include women not enrolled in Healthy Start. The community Healthy Start coalitions play an active role in promoting preconception and interconception health by providing interconception risk screening, education, counseling, and needed referrals to at-risk women enrolled in the programs. Funds have been used to develop/adopt a curriculum, train staff, and build capacity to provide interconception education. Coalitions have produced public service advertising strategies, provided conferences and educational seminars to local providers who have contact with women of reproductive age, provided direct services for dental or health care, and created programs focusing on teens, smoking cessation and young women who have never been pregnant.

Florida

The Florida Department of Health also promotes technical assistance guidelines for preconception and interconception education and care topics for women who access clinical care within the county health department programs. Florida is also working with the March of Dimes to replicate and/or revise the California *Every Woman Every Time* provider tool kit to address the needs of Florida's women.

Georgia

Georgia selected "promote preconception health" as a state priority and developed a state performance measure on public health workforce training. The state performance measure addresses the need for competency-based preconception health education for public health and private providers. Georgia has developed a preconception health brochure for dissemination through family planning clinics. Training on preconception health and health care is also offered to physicians through a contract with the Georgia Academy of Family Physicians.

Kansas

Kansas selected "Increase early and comprehensive health care before, during and after pregnancy" as a state priority measure based upon state and regional Perinatal Periods of Risk analysis. The state directed grants to state- and community-level programs for preconception and interconception care. Kansas also plans to guide policy decision making and coordinates efforts through partnerships with stakeholders such as private physicians, March of Dimes, Medicaid, other federal programs.

Kentucky

Kentucky is using the CDC Recommendations to guide interdepartmental collaborative efforts to ensure healthy maternal and child health outcomes. They have also developed a state performance measure to "Increase the percent of women of childbearing age that present to a local health department that receive a preconceptual [sic] service." Activities are accomplished through the Title X/Family Planning direct services programs that offer preconception health education and counseling.

State Coordination Efforts

Collaborating with partners to integrate preconception care is addressed by many of the states. Title V resources assist in the development of specific programs and implementation of policy changes that address the need for preconception and interconception care. An example might be a state Title V program coordinating efforts with the state Title XIX (Medicaid) agency.

Illinois Title V has implemented an intensive Interconception Care Pilot Project that focuses on reducing unintended pregnancy via programs that address family planning services and pregnancy prevention projects, such as education on unintended pregnancy and the importance of birth planning and spacing. Illinois Healthy Women has resulted in several Medicaid service improvements and expansions intended to improve women's health, including coverage for adult preventive care and risk assessments (e.g., piloting preconception), recommended content of annual preventive (preconception care) visits, and outreach to locate high-risk pregnant women. The interconceptional care strategy includes the following 3 components: 1) identification of risk/chronic condition, 2) provision of a medical home, and 3) care management. Within Medicaid, DHFS also has implemented a primary care case management model to provide a primary care "medical home," pay a monthly care management fee to providers, and use a pay-for-performance strategy. The program permits ongoing monitoring, tracking, and provider feedback, and allows direct access to certain services, such as obstetrics/gynecology and behavioral health. An innovative interconception care model in two communities is currently being piloted to identify women who previously had a poor birth outcome and provide interventions to help them address issues related to the poor birth outcome before becoming pregnant again. Changes in Medicaid billing permit and encourage maternal depression screening during pediatric visits.

Indiana is working with various partners, including the Office of Medicaid Policy and Planning, Office Of Women's Health, Indiana Perinatal Network, Indiana Minority Health Coalition, Governor's Office of Faith Based Initiatives, state legislators, local county coalitions, and others, to develop a preconception and interconception health program. Indiana also is working with the state chapter of the American College of Obstetrics and Gynecology to encourage providers to offer preconception and interconception care messages.

The Rhode Island Department of Health's Task Force on Prematurity is addressing the 10 state developed recommendations for improvement, one of which is to expand preconception care opportunities before and between pregnancies for all women.

Designing Preconception Care Service Models

Several states have either added new or are expanding current programs to include preconception and interconception services. Nebraska is expanding an existing preconception program for women and is focusing particular attention to disparities in outcomes experienced by African-American women. Arizona is developing a preconception health initiative and has funded four projects to reduce infant mortality with an emphasis on improving preconception health and awareness among women. Delaware has a preconception care program associated with the Comprehensive Family Practice Team's prenatal program. Maryland has expanded the Women Enjoying Life Longer Program, a pilot project that expands family planning services to include preventive health services including preconception care for women of childbearing age. Michigan has an Infant Mortality Coalition Initiative that implements Preconception/Interconception Care projects in 11 communities. The programs offer preconceptional counseling through the Maternal Infant Health Program, Nurse Family Partnership Programs, and the Kalamazoo Pilot Preconception Program. Michigan is in the early stages of crafting a preconception and interconception plan to promote readiness for pregnancy. One of the primary messages will be for all women contemplating pregnancy to cease smoking before becoming pregnant, and if pregnant to cease early.

New Mexico's Life Long Happiness is a family planning project that promotes the use of folic acid, avoidance of alcohol and drugs, and healthy diet and exercise for women of childbearing age to decrease birth defects. Ohio is implementing a Birth Outcomes Improvement Initiative, which will lead to the development and implementation of preconception and interconception service protocols for funded programs and other public health/private care providers. Ohio also plans to add preconception and interconception content to its care coordination and home visiting programs. Utah has developed a screening tool for women that will assist them in identifying preconception risks and provide appropriate referral resources. Utah is also developing a reference tool for women's health care providers that includes information on services and billing codes for preconception care, modeled after a California initiative. Wisconsin has enhanced the postpartum component of the Women's Health Now & beyond Pregnancy Pilot Project to address preconception care for future pregnancies. The state has developed preconception resources, such as tools, print materials, and position statements, as well as consumer and provider education promoting preconception care as a key strategy to improve birth outcomes.

Promoting Positive Health Habits

States continue to address factors such as tobacco, alcohol and drug cessation during pregnancy, as well as increased efforts to address these issues before pregnancy. Efforts to promote folic acid consumption before pregnancy are underway across the country. An emerging area is helping women attain a healthy weight.

Nebraska will fully implement the Innovative Approaches to Promoting a Healthy Weight in Women Project that works to reduce overweight and obesity by increasing the number of women who adopt healthy, positive lifestyles. North Carolina is integrating concepts and supports for women to maintain a healthy weight before pregnancy into existing preconception efforts. Utah has a state performance measure to increase the percent of women who are at a healthy weight before pregnancy. They are developing strategies to increase awareness among women of childbearing ages and health care providers about the impact of weight on poor pregnancy outcomes.

Other Activities

Most states are engaged in training and professional development for health providers and women of childbearing age. The New England states are developing a regional effort to train stakeholders in a life course approach to women's health with an emphasis on preconception care. Colorado is expanding its Healthy Baby Website to address preconception care and healthy weight before pregnancy. New Jersey, Utah, and West Virginia have developed education materials for women addressing this topic.

States are also using data to guide program and service development. Many states operate PRAMS and use the data for program planning, development of recommendations, and evaluation. Tools are also being designed for use within public health practice. New Mexico has developed a Preconception Index, which includes intendedness of pregnancy; no frequent use of alcohol or binge drinking; no smoking before pregnancy; no physical abuse in 12 months before pregnancy by husband or partner; knowledge of folic acid's role in preventing birth defects; healthy weight; and health insurance before pregnancy. Oklahoma developed a PRAMS report with recommendations for reducing unintended pregnancy that included expanding preconception care. Vermont reviewed recent PRAMS data and identified 12 preconception and 7 interconception indicators that will be analyzed and discussed in a report on preconception health.

Summary

Overall, states are engaged in a wide variety of services, programs, and strategies to advance the case for a number of preconception and interconception health and care to improve overall health of women and their children.

The following summarizes some of the ways Title V programs impact women's health and how Title V leaders are influencing women's access to preconception care.

- *Coordination of state efforts.* Title V programs continue to coordinate efforts between multiple government, nonprofit organizations, and other interested groups to improve the health of women and children with in their state.
- *Increasing access to health care*. Title V leaders bring this issue to the attention of policy makers and participate in discussions related to financing and designing of state and national health care system reform. They are also designing public health preconception intervention by either expanding existing and/or creating new service options.
- *Promoting positive health habits*. Title V and partner programs support the development of positive health behaviors, such as healthy eating and physical activity, while preventing the development of negative behaviors.
- *Engaging in workforce and consumer education*. Many Title V agencies educate the public, as well as the health and public health workforce, about preconception care. Efforts range from individual counseling to web-based information for the public and training modules for health professionals.
- *Supporting surveillance and monitoring*. Title V continues to engage in surveillance and analysis activities that monitor women's health, especially during pregnancy. The data are used in planning programs and strategies to address issues in women's health.
- *Integrating emerging issues into practice*. Title V leaders continue to support the implementation of research-based strategies that improve perinatal outcomes. The renewed attention to preconception care is being embraced by MCH leaders and is being integrated into public health practice at the state and community levels. Title V leaders are engaged in national efforts to integrate preconception and interconception efforts into public health practice and serve on the CDC's Select Panel on Preconception Care.

Title V's proud tradition of making a difference in the lives of some our country's most vulnerable people continues. These effort has been made through development and implementation of needed interventions, often in conjunction with other service providers. Title V leaders continue to integrate research-based strategies such as preconception care, into their state efforts.

References

Association of Maternal and Child Health Programs. (2007, February). Fact sheet preconception health and health care. Available: http://www.amchp.org/publications/Downloads/Precon.pdf. Accessed May 2008.

Association of State and Territorial Health Officials. (2006, February). Preconception care fact sheet. Available: http://www.astho.org/pubs/FactSheet-PreconceptionCare-FINAL.pdf. Accessed May 2008.

Boulet, S. L., Johnson, K., Parker, C., Posner, S. F., & Atrash, H. (2006). A perspective of preconception health activities in the United States. *Maternal and Child Health Journal*, 10(Suppl. 7), 13–20.

Johnson, K., Posner, S.F., Biermann, J., Cordero, J.F., Atrash, H.K., Parker, C.S., et al. (2006). Recommendations to improve preconception health and health care—United States. *MMWR* [serial online], 55(RR06), 1–23. Available: http://www.cdc.gov/mmwR/preview/mmwrhtml/rr5506a1.htm. Accessed May 2008.

Trust for America's Health. (2008, June). Healthy women, healthy babies. Available: http://healthyamericans.org/reports/. Accessed August 2008.

USDHHS, HRSA, MCHB. (N.D.-a). Title V information system (TVIS). Maternal and child health data. Maternal and child health block grant. Available: http://mchb.hrsa.gov/data/. Accessed May 2008.

USDHHS, HRSA, MCHB. (N.D.-b). Understanding Title V of the Social Security Act. Available: ftp://ftp.hrsa.gov/mchb/titlevtoday/UnderstandingTitleV.pdf. Accessed May 2008.

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TRANSLATING POLICY TO PRACTICE AND BACK AGAIN
Implementing a Preconception Program in Delaware

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The state of Delaware is in the unique position of implementing legislatively supported policy on preconception health. The state has allocated funding to translate preconception care policy to practice through a statewide program. The Delaware Division of Public Health has been given the responsibility of defining and implementing the preconception care program targeting a high-risk population. The state partnered with Medicaid, private practitioners, local hospitals, state service centers, and Federally Qualified Health Centers to develop a scope of program services that supplement the current clinical care provided at annual visits for women of childbearing age. Because the program has been in operation for 9 months, the Division of Public Health utilized feedback from the providing agencies to begin efforts for program sustainability and to modify the existing policy. Current efforts include developing outcome measures for the program, measuring program effectiveness through evaluation, and working with Medicaid and Managed Care Organizations to develop a reimbursement system for services.

Introduction

In response to an increasing infant mortality rate in Delaware when compared with the national rate (*Delaware Vital Statistics Annual Report*, 2007) the Governor of Delaware made reducing infant mortality a state priority. In 2005, she convened an Infant Mortality Task Force (IMTF) to assemble recommendations aimed at reversing the trend (*Reducing Infant Mortality in Delaware*, 2005). The IMTF provided the governor and state legislature with 20 recommendations to reduce infant mortality in Delaware. Several of the recommendations of the IMTF aimed to improve the health of women before pregnancy and called for increased access to preconception health care for Delawarean women, including providing increased access to preconception services for women with a history of poor birth outcomes; requiring that insurers cover services included in standards of care for preconception, prenatal, and interconception care; and improving comprehensive reproductive health services for all uninsured and underinsured Delawareans up to 650% of poverty. During 2005, the state legislature provided $1 million in funding to develop project and policy initiatives designed to impact infant mortality (Table 1).

In 2006, the core of the preconception care program was developed based on the Centers for Disease Control and Prevention (CDC) published recommendations for preconception health and health care in the United States (Johnson et al., 2006). The state legislature awarded >$0.5 million to develop a pilot program. The Delaware Division of Public Health (DPH) was tasked with developing the preconception program requirements, estimating program cost, and releasing a Request for Proposals to fund local agencies to implement the defined program and services.

Background

Much of the existing literature on preconception health focuses on current evidence for the impact of risk specific

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The findings and conclusions in this report are those of the author(s) and do not necessarily represent the official position of the US Centers for Disease Control and Prevention.

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Table 1. Description of Priority Recommendations in 2005 and 2006 for the Infant Mortality Initiative in Delaware

Year	Recommendation	Description
2005	Develop a research center	Specialized researchers to analyze available data sets and determine risk factors associated with infant deaths; provide oversight for the infant mortality initiative
	Create Delaware Healthy Mother and Infant Consortium (DHMIC)	Entity to provide guidance and oversight to the infant mortality initiative in Delaware; composed of Governor appointed public health professionals, hospital administrators and directors, nonprofit organization directors, state legislators, Delaware Division of Public Health (DPH) staff, and members of the community
	Implement a Fetal and Infant Mortality Review (FIMR)	Project to collect information from mothers who experienced either a fetal or infant death
	Pilot Pregnancy Risk Assessment Monitoring System (PRAMS)	Survey to collect information on women's behaviors before, during, and after pregnancy; part of National PRAMS
	Supplement existing prenatal and postnatal programs with bundled services	Program to supplement clinical care provided during pregnancy and postpartum to eligible women in Delaware
	Review policies on neonatal transport and physician capacity	Review to augment existing reports and recommendations to modify policy concerning emergency transport of infants to level 3 facilities and to assess availability of primary health care in rural areas of the state
2006	Implement a preconception care program	Program to supplement clinical care provided by agencies throughout Delaware

interventions on future pregnancy outcomes (Floyd et al., 2007; Kendrick, 2004; Korenbrot, Steinberg, Bender, & Newberry, 2002; Moos, Bangdiwala, & Meibohm, 1996; Ray, O'Brien, & Chan, 2001). Earlier research describes the barriers to preconception care such as the inability to reach those at greatest risk, fragmentation of services, limited support for treatment of high-risk behaviors, unmotivated women, and a lack of provider skills in and inadequate reimbursement for risk assessment and health promotion (Jack & Culpepper, 1990).

Recent research includes survey studies of women to assess their understanding of preconception care and utilization of current surveillance systems to determine risks (Anderson, Ebrahim, Floyd, & Atrash, 2006; D'Angelo et al., 2007; Frey & Files, 2006). Downs et al. (2008) outline the design of the Strong Healthy Women Intervention in Pennsylvania in the Central Pennsylvania Women's Health Study (Downs et al., 2008; Hillemeier, Weisman, Chase, Dyer, & Shaffer, 2008; Weisman et al., 2008). Further research on this rural cohort indicates that women's perceptions of their influence on a future pregnancy may be associated with their age, education level, marital status, and physical health (Weisman et al., 2006). Additionally, because 49% of pregnancies in the United States are unintended, reaching women during the preconception phase is critical for provision of specific services such as increased contraceptive or folic acid use (Finer & Henshaw, 2006).

Current policy work in the preconception care literature focuses on development of national and state standards for care provision, cost and benefit, existing partnerships between federal and state programs, and role of the family physician (Curtis, Abelman, Schulkin, Williams, & Fassett, 2006; Dunlop & Frey, 2007; Freda, Moos, & Curtis, 2006; Grosse, Sotnikov, Leatherman, & Curtis, 2006; Johnson, 2006). Additionally, several investigators have made recommendations for the content of preconception health care, focusing on the internatal period and linkage to current health care models through the use of health promotion (Hobbins, 2003; Lu et al., 2006; Moos, 2003, 2004, 2006). Prue and Daniel (2006) outline a social marketing strategy to plan, implement, and create demand for preconception care; the strategy outlines service definition, reasonable cost estimation, and service packaging for both providers and consumers (Prue & Daniel, 2006). However, limited publications exist on affecting policy change before and after intervention of a preconception program.

The purpose of this article is to describe the role of DPH and other agencies involved in defining and developing policy around preconception care in Delaware (Table 2), implementing pilot programs, modifying policies after program implementation, and envisioning policy and program changes in prospective years of program operation. The Delaware effort offers an example of how national policy recommendations are translated into policy and program at the state level, and how program implementation provides the foundation for modification of state policy.

Program Development and Implementation: Translating Policy to Practice

Defining the Target Population and Services

In 2006, the DPH began development of the preconception care program by defining the target popula-

Table 2. CDC Definition of Preconception Care

The provision of health promotion, screening, and intervention for women of reproductive age to modify biomedical, behavioral, or social risk factors that may impact subsequent pregnancies including updating vaccinations, managing chronic diseases, diagnosing infectious diseases, limiting tobacco and alcohol use, and monitoring diet.

From Centers for Disease Control and Prevention (2006).

tion and program services. Using available vital statistics data, evidence-based program inclusion criteria for participants were established. DPH staff examined infant death data and zip code of residence to determine high-risk areas throughout the state, enabling targeting of specific regions in Delaware for program implementation. Further analysis of state vital records data indicated that short gestation and fetal malnutrition were the major causes of infant death, and that African-American women experienced the highest proportions of poor birth outcomes (i.e., premature birth, low birth weight at delivery, stillbirth, or fetal or infant death). Resulting inclusion criteria were experience of a previous poor birth outcome with emphasis on African-American women in specific geographic regions. Finally, utilizing the CDC preconception care recommendations, the DPH also targeted for participation women who were uninsured or underinsured, or diagnosed with a chronic disease. The DPH determined that participants needed to meet only 1 of the 5 criteria to enroll in the program to ensure services for a larger majority of women of childbearing age.

After defining the target population, the DPH staff and program managers identified the types of services to be provided under the preconception care program. The federally funded Family Planning program was examined to identify any gaps in services; the program capacity of the Title V Maternal and Child Health block grant was also reviewed. Medicaid was contacted to identify the types of coverage for eligible women, discussions with DPH clinic managers were convened to better understand current services offered by the state, and private gynecologic practices were consulted to determine gaps in services in private practices and at Federally Qualified Health Centers.

The DPH staff found that although services were fragmented between agencies, an annual visit was typically covered by insurers in the state. However, services did not frame preconception care as a concept of care across the reproductive life span, instead addressing a narrower spectrum of health screening and risky behaviors. Thus, coverage did not include intensive nutrition counseling; social service counseling or referral, specifically, coping with chronic diseases and depression diagnosis and treatment; outreach into the community to inform women of preconception care and available services; and case management of all coordinating services including clinical care, education, transportation, scheduling, insurance, payment, and community support. Also, the team elected to promote the CDC concept of comprehensive life-long planning for pregnancy or other reproductive events during women's childbearing years. The resulting DPH preconception care program included funding for awarded clinical care sites to supplement their current care with these added elements (Table 3). DPH staff determined that enhancing the regional and state referral systems for these supplemental services would provide a more comprehensive case-managed system of care compared with bundled services only. Therefore, integration of services across agencies was promoted to build capacity for the program.

Table 3. Services Provided Under the Delaware Preconception Care Program for Women of Childbearing Age

Added services
- Comprehensive risk assessment (piloted at 1 site only)
- Case management based on participant level of risk
- Counseling participants on pregnancy planning to include specifically identifying a reproductive life plan and optimizing the interpregnancy interval
- Specialized counseling for participants with chronic diseases or a history of pregnancy-induced complications that may result in future poor birth outcomes
- Psychosocial counseling and referral including mental health diagnosis and treatment
- Intensive nutrition counseling including basic nutrition, breastfeeding promotion and support, and folic acid education as well as counseling for women with chronic health risks such as diabetes or obesity
- Social work services to address individual and family psychosocial needs
- Trained community support services personnel to provide street level outreach, reinforce participant education, and assist participants with social service needs

Traditional services
- Contraceptive education and counseling including access to a broad range of contraceptive methods
- Reproductive health services
- Screening for chronic diseases
- Updating immunizations
- Pregnancy diagnosis, counseling, and referral
- Testing and treatment for STIs, including gonorrhea, chlamydia, and syphilis
- Testing, treatment, and referral for HIV/AIDS
- Level 1 infertility counseling
- Screening for alcohol, drug, and tobacco use and referral to cessation programs
- Oral health education, treatment, and referral

Piloting the Programs

In calendar year 2007, the state piloted the preconception program with 2 agencies at 7 clinical sites across the state: Christiana Care Health Services and Planned Parenthood of Delaware. These 2 organizations represent different types of clinical care providers and thus developed different implementation strategies for their respective programs. Christiana Care implemented its Healthy Beginnings program within the obstetrics and gynecology, internal medicine, and pediatric outpatient offices of Wilmington Hospital located in Wilmington, Delaware, and the obstetrics and gynecology office in Newark, Delaware. These resident and faculty practice sites were selected owing to their location within multiple zip codes identified as high infant death regions and their role as providers of primary and obstetric care to a large fraction of women living in those areas. Planned Parenthood implemented the program in 5 Title X clinical sites located throughout the state.

Although both programs were required to provide preconception services, the spectrum of services provided differed owing to the nature of their clinical service models. The DPH allowed the 2 funded programs to refer participants to other agencies when specific traditional or added services were not located on-site. However, the DPH encouraged each agency to build the infrastructure necessary to provide a comprehensive package of the additional services.

The Christiana Care program is integrated into a clinical care model and provides services offered by a diverse group of health care providers located in a centralized community setting. The program is linked to a prenatal care program and women transition through each program depending on their reproductive life course. Women are enrolled in the preconception program at the time of an outpatient visit or immediately postpartum. Christiana Care uses a risk assessment screening for preconception care participants that includes psychosocial, economic, and behavioral assessments; identification of medical risks such as sexually transmitted infections, and chronic and psychological diseases; consistency of folic acid use; and adequacy of pregnancy planning throughout the reproductive life course. All participants in the Christiana Care program are screened for risks; no comparison group has been screened during the pilot phase.

The Christiana Care program provides comprehensive clinical care, education, and social services on site allowing for participants to address most needs at 1 location. A nurse or health educator works to engage each participant and to provide guidance and education about pregnancy planning, discuss health and pregnancy risks, and arrange for referral or follow-up visits. The Christiana Care staff includes a dedicated licensed clinical social worker to facilitate access to needed services and provide mental health counseling and referral, as well as a registered dietician. The program provides social services support through community outreach workers who partner with the health care team and local community service agencies. The program additionally provides clinical education to practitioners and community education to participants.

By contrast, the Planned Parenthood program provides traditional clinical services on site, but actively refers participants to partnering agencies for more intensive follow-up on additional services such as community outreach, mental health counseling, specific clinical services, and intensive nutritional counseling. The Planned Parenthood program has implemented a "wellness coaching" referral system for participants. This system includes goal setting, intensive case management, short-term counseling, assistance with filing of Medicaid paperwork, and monitored referrals. Planned Parenthood has uniquely shaped the preconception program to allow for agency-to-agency referral versus placing the responsibility of referral follow-up on the participant. Planned Parenthood partners directly with agencies such as the 24-hour crisis helpline to provide counseling for mental health issues; Planned Parenthood also works with all local dental practices to track periods of availability for new patient enrollment.

Both agencies provided services to a diverse population with Planned Parenthood's participants mirroring the racial and ethnic distribution of the state; Healthy Beginnings focused on specific minorities as recruited in its fixed locations. In the first 9 months of operation, both agencies served 9,196 women between the ages of 14 and 44. For a state with a population of almost 175,000 women between the ages of 14 and 44, these services reached approximately 5% of the eligible population. The women served include both existing and newly recruited participants who entered care based on the community outreach portion of the program. For Christiana Care, its location in a hospital and clinical setting allowed for on-site recruitment into the program, whereas Planned Parenthood recruited many of its new preconception participants through advertising and outreach. Both programs advertised the additional preconception services through brochures, television, radio, and patient intake. All potential participants were offered the additional services at a routine clinical visit during enrollment. The funding for the preconception program allowed for enrollment of additional clients at each site as well as expansion of services currently offered by each agency.

Pilot Program Outcomes

The average age range among participants was 20–24 years, with 61% residing in an identified high-risk

Table 4. Racial and Ethnic Distribution of Participants by Contractor for the First 9 Months of the Program

Agency	Black (%)	White (%)	Other (%)	Total	Hispanic (%)	Non-Hispanic (%)
Christiana Care Healthy Beginnings	394 (63)	182 (29)	51 (8)	627 (100)	56 (9)	571 (91)
Planned Parenthood of Delaware	2,918 (34)	4,790 (56)	861 (10)	8,569 (100)	523 (6)	8,046 (94)
Total	3,312 (36)	4,972 (54)	912 (10)	9,196 (100)	579 (6)	8,617 (94)

region. Among the multiparous participants, 41% were <24 months postpartum at program entry. The majority of participants (63%) were either eligible for public assistance other than Medicaid or paid for services on a sliding fee scale. Finally, the majority of Healthy Beginnings participants were black, whereas Planned Parenthood served primarily white participants (Table 4).

It is too soon in the evaluation process to provide outcomes; however, preliminary data available for the Healthy Beginnings program provide guidance for further program development. Among women not planning a pregnancy, 48% have elected to use an effective method of contraception. These findings are consistent with the prenatal program indicating that only 21% of women entering prenatal care planned the current pregnancy. Use of folic acid is also low among women in this population (30% of all participants). A history of clinical depression is common (37%) and behavioral risks are highly prevalent, with 30% using tobacco and 90% reporting eating <5 servings of fruits or vegetables daily. A majority of women in the program were offered a follow-up visit with the program nurse to focus on discussion of a pregnancy plan and unhealthy behaviors. Also, 48% of participants were referred to the on-site dietitian, 65% to a community-based weight management program, and 17% for further mental health evaluation.

Translating Practice Back to Policy

The efforts in Delaware followed a social marketing strategy and policy on preconception care was created based on CDC recommendations and current policy research. The state legislature deliberated and obtained consensus on the concept of preconception care, and then established an estimated baseline cost for such services. The DPH followed the policy recommendation, and after implementation, allowed provider feedback to permit modification of policy. This feedback loop was essential in streamlining both the set of preconception care services and the cost of the program.

After the pilot, DPH staff identified barriers for long-term sustainability that required additional modifications to policy. Barriers included maintaining level funding for a statewide program, sustaining political and legislative support, and streamlining the pilot program to best utilize available funding. The modifications to the program concerned funding and reimbursement, program structure for statewide implementation, expansion of additional services, and increasing public awareness of the program. For example, the DPH used pilot demographic, eligibility, and referral data as evidence of high need for the added services supported under the preconception program. These data were critical in providing support for program and staff expansion at existing sites during 2007. The DPH also initiated discussion with the Division of Medicaid and Medical Assistance (DMMA) to negotiate reimbursement for additional services offered by the program. The DMMA recommended that DPH partner with local managed care organizations (MCO) to discuss reimbursement for the additional services. Finally, the DPH piloted a "Pursuing Motherhood: Planning for Pregnancy" guide to local public health practitioners and consumers; feedback obtained from the pilot was used to revise the guide before statewide dissemination.

Next Steps

In subsequent years of the preconception program, the DPH plans to evaluate the effectiveness of the current program, establish outcome measures for the program and data collection protocols for annual visits, complete needs assessments of the pilot sites, begin a dialogue with state insurers to cover and reimburse the additional services, partner with other state agencies for provision of more comprehensive additional services, and expand preconception awareness through a media campaign for targeted populations.

Program evaluation is necessary to ensure that all services are impacting the targeted population to streamline the provided services and to develop outcome measures that indicate program impact. The DPH is currently in the process of evaluating each pilot site and has initiated a needs assessment of the Christiana Care site. In the next year, results from the evaluation will guide identification of the critical services that address health risks for women and modification of the package of preconception services. Using the risk assessment tools tested during the pilot phase, the DPH will approve risk categories for better utilization of case management, annual reassessment of each program participant to determine long-term changes in risk, and tailoring of outcome measures to the service population.

By addressing preconception health risks through medical care, wrap-around services, and community services, collaboration and coordination of care between DPH and other agencies is crucial. To ensure self-sustaining funding over time, the goal of the DPH is to facilitate a transition of program funding to partially or fully reimbursable services. To facilitate this process, the DPH will partner with the DMMA and the 2 primary MCO insuring services in Delaware. All parties agree that, although prenatal services are typically packaged together, the concept of packaging preconception care is new to the insurance industry. Such partnership is anticipated to lead to modification in health care policy throughout the state. Additionally, agencies are examining ways in which to combine current service packages with the preconception care program (e.g., family planning).

The DPH is committed to modifying programs to provide more intensive services to women before pregnancy and during the internatal period. To meet this goal, the DPH will develop a preconception guide for all women of childbearing age in Delaware and revise the "Pursuing Motherhood: Planning for Pregnancy" guide to better inform practitioners of the importance of providing adequate preconception care. Improving reimbursement for preconception care will be helpful in engaging providers in these efforts. The DPH will dedicate funds for a statewide education campaign to raise awareness of healthy lifestyle behaviors before pregnancy through billboards, television, and radio messages.

Conclusion

Although the concept of preconception care was difficult to define, practically apply, integrate into the existing system, and argue for continuous political support, the achievements of the DPH and the state of Delaware provider networks present a promising model of care and illustrate a method for translating policy into action and back again at the state level.

References

Anderson, J., Ebrahim, S., Floyd, L., & Atrash, H. (2006). Prevalence of risk factors for adverse pregnancy outcomes during pregnancy and the preconception period—United States, 2002–2004. *Maternal Child Health Journal,* 10(Suppl. 1), 101–106.

Centers for Disease Control and Prevention (CDC) (2006). *Preconception Health and Care, 2006: State Title V Priority Needs Focused on Preconception Health and Health Care, United States, 2005. (2006).* Atlanta: Centers for Disease Control and Prevention, National Center on Birth Defects and Developmental Disabilities.

Curtis, M., Abelman, S., Schulkin, J., Williams, J., & Fassett, E. (2006). Do we practice what we preach? A review of actual clinical practice with regards to preconception care guidelines. *Maternal Child Health Journal*, 10(Suppl. 1), 53–58.

D'Angelo, D., Williams, L., Morrow, B., Cox, S., Harris, N., Harrison, L., et al. (2007). Preconception and interconception health status of women who recently gave birth to a live-born infant—Pregnancy Risk Assessment Monitoring System (PRAMS), United States, 26 reporting areas, 2004. *Morbidity and Mortality Weekly Report Surveillance Summaries*, 56(SS10), 1–35.

Delaware Vital Statistics Annual Report, 2005 (2007). Dover: Delaware Department of Health and Social Services, Division of Public Health.

Downs, D., Feinberg, M., Hillemeier, M., Weisman, C., Chase, G., Chuang, C., et al. (2008). Design of the Central Pennsylvania Women's Health Study (CePAWHS) Strong Healthy Women Intervention: Improving preconceptional health. *Maternal Child Health Journal*, Feb 13 [Epub ahead of print].

Dunlop, A. J. B., & Frey, K. (2007). National recommendations for preconception care: The essential role of the family physician. *Journal of American Board of Family Medicine,* 20, 81–84.

Finer, L., & Henshaw, S. (2006). Disparities in rates of unintended pregnancy in the United States, 1994 and 2001. *Perspectives on Sexual and Reproductive Health,* 38, 90–96.

Floyd, R., Sobell, M., Velasquez, M., Ingersoll, K., Nettleman, M., Sobell, L., et al. (2007). Preventing alcohol-exposed pregnancies: A randomized controlled trial. *American Journal of Preventative Medicine,* 32, 1–10.

Freda, M., Moos, M., & Curtis, M. (2006). The history of preconception care: Evolving guidelines and standards. *Maternal Child Health Journal*, 10(Suppl. 1), 43–52.

Frey, K., & Files, J. (2006). Preconception healthcare: What women know and believe. *Maternal Child Health Journal,* 10(Suppl. 1), 73–77.

Grosse, S., Sotnikov, S., Leatherman, S., & Curtis, M. (2006). The business case for preconception care: Methods and issues. *Maternal Child Health Journal,* 10(Suppl. 1), 93–99.

Hillemeier, M., Weisman, C., Chase, G., Dyer, A., & Shaffer, M. (2008). Women's preconceptional health and use of health services: Implications for preconception care. *Health Services Research,* 43, 54–75.

Hobbins, D. (2003). Full circle: The evolution of preconception health promotion in America. *Journal of Obstetric, Gynecologic, and Neonatal Nursing,* 32, 516–522.

Jack, B., & Culpepper, L. (1990). Preconception care. Risk reduction and health promotion in preparation for pregnancy. *Journal of the American Medical Association,* 264, 1147–1149.

Johnson, K. (2006). Public finance policy strategies to increase access to preconception care. *Maternal Child Health Journal,* 10(Suppl. 1), 85–91.

Johnson, K., Posner, S., Biermann, J., Cordero, J., Atrash, H., Parker, C., et al. (2006). Recommendations to improve preconception health and health care—United States: A report of the CDC/ATSDR Preconception Care Work Group and the Select Panel on Preconception Care. *Morbidity and Mortality Weekly Report Surveillance Summaries,* 55(RR06), 1–23.

Kendrick, J. (2004). Preconception care of women with diabetes. *Journal of Perinatal and Neonatal Nursing,* 18, 26–27.

Korenbrot, C., Steinberg, A., Bender, C., & Newberry, S. (2002). Preconception care: a systematic review. *Maternal Child Health Journal,* 6, 71–73.

Lu, M., Kotelchuck, M., Culhane, J., Hobel, C., Klerman, L., & Thorp, J. J. (2006). Preconception care between pregnancies: The content of internatal care. *Maternal Child Health Journal,* 10(Suppl. 5), S107–S122.

Moos, M. (2003). Preconceptional wellness as a routine objective for women's health care: An integrative strategy. *Journal of Obstetric, Gynecologic, and Neonatal Nursing,* 32, 550–556.

Moos, M. (2004). Preconceptional health promotion: progress in changing a prevention paradigm. *Journal of Perinatal and Neonatal Nursing,* 18, 2–13.

Moos, M. (2006). Preconception health: Where to from here? *Women's Health Issues,* 16, 156–158.

Moos, M., Bangdiwala, S., & Meibohm, A. (1996). Impact of a preconceptional health promotion program on intendedness of pregnancy. *Journal of Perinatology,* 13, 103–108.

Prue, C., & Daniel, K. (2006). Social marketing: Planning before conceiving preconception care. *Maternal Child Health Journal,* 10(Suppl. 1), 79–84.

Ray, J., O'Brien, T., & Chan, W. (2001). Preconception care and the risk of congenital anomalies in the offspring of women with diabetes mellitus: A meta-analysis. *Quarterly Journal of Medicine,* 94, 435–444.

Reducing Infant Mortality in Delaware—The Task Force Report (2005). Dover: Delaware Department of Health and Social Services, Division of Public Health.

Weisman, C., Hillemeier, M., Chase, G., Dyer, A., Baker, S., Feinberg, M., et al. (2006). Preconceptional health: Risks of adverse pregnancy outcomes by reproductive life stage in the Central Pennsylvania Women's Health Study (CePAWHS). *Women's Health Issues,* 16, 216–224.

Weisman, C., Hillemeier, M., Chase, G., Misra, D., Chuang, C., Parrott, R., et al. (2008). Women's perceived control of their birth outcomes in the Central Pennsylvania Women's Health Study: Implications for the use of preconception care. *Women's Health Issues,* 18, 17–25.

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WOMEN'S HEALTH ISSUES

WHERE ARE THE DATA TO DRIVE POLICY CHANGES FOR PRECONCEPTION HEALTH AND HEALTH CARE?

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Improving preconception health is recognized as being crucial to improving reproductive health outcomes for women and infants. At the same time, there is increasing pressure on public health and clinical medicine programs to have evidence that documents positive health impact for continued support for program implementation and policy change. In the field of preconception health and health care, there is a growing body of evidence to support the implementation of public health programs and clinical practice. One current challenge is the unavailability of a comprehensive surveillance system providing data to demonstrate the need for such programs and to monitor the impact of programs and services. There is no single source of data or evidence for policy and financing support for preconception care; however, there are a number of related data resources that can be used to inform and support such programs. We describe national and state-level data sources from which data relevant to preconception health and health care can be extracted as well as steps that can be taken to improve the quantity and quality of preconception health data.

There is an increased call for the fields of public health and clinical medicine to invest in programs and practice models that are evidence based and have been shown to have measurable impacts on health, especially in times of scarce resources to fund scientific research. Developing health policies and financing strategies to support best practices and programs requires relevant, accurate data for successful implementation and evaluation. Preconception health and health care is 1 area in which there is a growing body of evidence to support the implementation of public health programs and clinical practice. The concept of preconception health and health care has been part of both public health and clinical practice landscapes for >20 years (Moos & Cefalo, 1987). Since 2004, there has been renewed and increased interest in preconception health and health care as both a conceptual framework and a model for improving the health of women and improving pregnancy outcomes for mothers and infants (Johnson et al., 2006). One key component of the evidence base needed to support clinical practice and public health programs is the availability of reliable and relevant surveillance data. Data are critical to developing, implementing, and sustaining policies that will make preconception health and health care

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a standard of care in both clinical services and public health programs. Although there is no single source of data or evidence for policy and financing support for preconception care, there are many data resources that can be used to inform and support changes that will result in improved health of women, and in turn their offspring. This paper describes efforts to identify existing data sources and systems that can contribute to the evidence necessary to support the development and expansion of preconception health and health care programs and policies.

We know that what gets measured gets noticed. *Healthy People 2000* (Centers for Disease Control and Prevention [CDC], 1990) included an objective (14.3) for preconception care for 60% of primary care physicians to provide age-appropriate preconception care. This objective was deleted from the next version of the *Healthy People* publication in part because it was not able to be measured. In *Healthy People 2010* (CDC, 2000), there are no objectives specific to preconception health; however, there are several objectives that are specified that relate to preconception health.

The growing evidence base to support the implementation of preconception health and health care, which includes maternal risk assessment, educational/behavioral interventions, vaccinations, screening, treatment, and health promotion programs, has not reached maturity (Korenbrot, Steinberg, Bender & Newberry, 2002). The majority of evidence currently published focuses on specific risk behaviors and conditions rather than integrated approaches or programs that address all the needs of an individual woman. For some risk factors, the evidence for effective interventions, such as folic acid and the prevention of neural tube defects, and the protocol to reduce the transmission of group B Strep from mother to infant, is well-established, whereas in other areas, such as postpartum programs to promote appropriate weight loss, there is less evidence or information (CDC, 2002; Korenbrot et al., 2002; Werler, Shapiro, & Mitchell, 1993). As ongoing research evaluates more comprehensive programs, one of the current limitations in the existing literature is that measurable indicators of preconception health and health care are not readily available and thus not do not provide the solid evidence base needed to form an integrated and comprehensive set of health care policies to improve the health of women and families across the lifespan.

Several steps necessary for the capacity of data systems to build the evidence base needed to support policy change include expanding the coverage and scope of existing surveillance systems, conducting clinical trials, and increasing program evaluation (Posner, Johnson, Parker, Atrash, & Biermann, 2006). Putting these recommendations into action is expensive and time consuming. A call has been made to address the critical first step in such an undertaking, which is to define the content and domains of preconception health and health care and identify potential sources of surveillance data. The Public Health Work Group (PHWG) of the CDC Preconception Health and Healthcare Steering Committee has been active in exploring ways to improve surveillance systems and build data analysis capacity. The PHWG has prioritized the need for developing a library of indicators available in specific data systems for different populations, selecting the most important indicators to measure, and determining which indicators are not being measured. Concurrently, the Clinical Work Group of this CDC Steering Committee has been instrumental in this process by working to clarify and define the content of clinical care. The Clinical Work Group has identified key preconception care domains, including chronic diseases; infectious diseases; medication use; genetic/inherited conditions; adverse past pregnancy outcomes such as maternal morbidity, low birth weight, premature birth, and infant death; and personal behaviors and exposures such as obesity and smoking, as well as other preconception health risk factors that have been shown to affect maternal health and pregnancy outcomes (Atrash, Johnson, Adams, Cordero, & Howse, 2006). The Policy and Finance Work Group has discussed and described the importance of including public and private payers, including Medicaid, and health maintenance organizations, in the process of defining appropriate indicators. The components of preconception care addressed by public health programs and by consumer groups are equally important for improving the health of women and families. Public health programs and consumer awareness are a critical component of health promotion and disease prevention in communities to educate and help the general public improve their health and well-being.

Under the auspices of the PHWG, dedicated effort is being put forth by representatives from 7 states (Delaware, Florida, Michigan, North Carolina, Texas, California, and Utah) to reach consensus on relevant preconception health and health care domains and associated surveillance indicators. This team has broadly addressed preconception health, including interconception health and health care, with a focus on vulnerable populations. The multistate team's initial work is 3-fold: 1) developing a library of state level indicators currently available in specific public data systems; 2) identifying the most important indicators to measure; and 3) highlighting those indicators that are currently not being measured at the state level. To date, 11 available data systems (Appendix A) have been identified that may provide state health departments with data to monitor preconception health and health care outcomes. In addition to these data sources, the team has outlined a conceptual framework for the broad domains of indicators (Table 1). These domains measure a broad range of topics useful to public program

Table 1. Conceptual framework for core state preconception health surveillance indicator domains for pre- and interconception health and health care

General health status (self-rated health) and life satisfaction
Social determinants of health
Poverty
Housing
Income
Education
Life expectancy
Health care
Health insurance or Medicaid
Identified primary care provider
Access to dental care
Barriers to care
Adequacy of care
Satisfaction with care
Reproductive health/family planning
Previous low birth weight
Previous preterm birth
Prior fetal death (stillbirth, miscarriage)
Postpartum depression
Interpregnancy interval/birth spacing
Pregnancy intention
Pregnancy wantedness
Use of contraception
Tobacco, alcohol, and substance use
Nutrition and physical activity
Fruit and vegetable consumption
Obesity and overweight
Folic acid supplementation
Multivitamin consumption
Mental health
Mental distress
Stress
Anxiety and depression
Emotional/social support
Physical abuse
Mental abuse
Adequacy of support
Chronic conditions
Infections
HIV testing
Prevalence and/or Incidence of STDs
Immunizations
Genetics/epigenetics

implementation, evaluation, and surveillance as well as consumer and clinical audiences. The conceptual framework will be used to identify specific indicators by the State Workgroup and include behavior, medical, chronic disease management, and social context indicators that have been identified as being important to preconception health and health care. Although current efforts are focused on what is most relevant to state health departments, additional effort for indicators being measured at the national and local levels is anticipated.

Although a single, comprehensive data system could ideally provide the information needed from a single source, this is not practical or feasible in the current environment. In a time when there are limited resources and infrastructures to support the existing surveillance systems, it is impractical to develop an entirely new surveillance system that can provide data to local, state, and federal researchers, program planners, and policy makers. Furthermore, the reach and coverage of a comprehensive system would require substantial resources and be duplicative of many of the existing systems. Many of the existing systems can be used to collect the relevant data by adding or modifying existing data collection instruments. Integrating data from multiple existing data systems can provide comparable results and data from a range of populations not currently covered by any 1 system. Existing data sources that could provide data for these purposes are underutilized. Adequate support for existing systems is likely to be more cost efficient than building another system from the ground up.

State-level systems, such as the Pregnancy Risk Assessment and Monitoring System (PRAMS) and state-specific surveys such as the California Health Interview Survey, Maternal and Infant Health Assessment, and Women's Health Survey, can serve as models for data collection for specific populations. Although generally not thought of as a data source for preconception care, there are a number of relevant preconception health and health care indicators currently available in PRAMS. These include prepregnancy body mass index, tobacco use, health insurance status, pregnancy planning, and health care seeking behavior. Two recent publications summarizing these indicators have resulted in an increased interest in using these data for measuring preconception health (CDC, 2007; D'Angelo et al., 2007). The PRAMS survey tool currently is undergoing its 5-year revision and the inclusion of additional preconception care indicators is under consideration. The challenge in working with this data system for policy change is that it represents a select population—women who recently had a live birth—and it is operative in only 39 states. In addition, states must choose to include preconception health modules as special topics among their optional state questions because many potential preconception health indicators are not a part of the core PRAMS questionnaire that all PRAMS states are required to use. Recent revisions of the California Maternal and Infant Health Assessment also have included new preconception health and health care indicators.

The Behavioral Risk Factor Surveillance System (BRFSS) can provide state-level data as well as national data. The BRFSS also captures local-level data for selected larger metropolitan areas. The strength of the BRFSS system is that it includes adult women, regardless of pregnancy status, and men, allowing for the assessment of selected indicators in the general population. The system is used primarily to monitor health conditions and high-risk behaviors that contribute to morbidity and mortality, and has not consistently included questions about pregnancy intention or family planning, which are useful for obtaining a complete picture of chronic disease risks, health behaviors, and unintended pregnancy. Although the BRFSS assesses a broad array of health conditions and behaviors, not all of the data elements that are needed to completely understand the burden and impact of existing conditions are included. Another limitation in the BRFSS data system is the potential for small numbers of participants in specific subgroups (e.g., pregnant women or women of reproductive age), which might undermine statistical power. Many BRFSS topics are not collected annually. Topics may rotate or sporadically appear, making surveillance on these topics more difficult. Furthermore, BRFSS is limited to households that have a landline telephone and excludes those without telephones or who only have wireless phone service.

The Youth Risk Behavior Surveillance System (YRBSS) can also provide state and national, as well as local, data for selected larger metropolitan areas. The YRBSS is a school-based survey of students in grades 9–12 that represents the general population of students. Both girls and boys are included. Similar to the BRFSS, the YRBSS is used primarily to monitor high-risk behaviors that contribute to morbidity and mortality. Although the system tracks a broad range of risk-taking behaviors among adolescents, including but not limited to smoking and drinking behaviors, states may choose to omit questions on sexual behaviors and use of family planning. Pregnancy data are also inconsistently ascertained, although the entire target population is considered to be at reproductive age. Although there may seem to be substantial overlap in some measures assessed by the YRBSS and the BRFSS, the surveillance populations are entirely different. The YRBSS also provides a unique opportunity to examine differential health behaviors between sexually active and non-sexually active youth.

Nationally representative data systems such as the National Health and Nutrition Examination Survey (NHANES) also can provide data for understanding what is needed in this field. For example, management of chronic diseases and contraindicated contraceptive use can be examined using NHANES data. Such analysis would provide information for clinical practice and public health programs on management of chronic disease among women of reproductive age and gaps in health providers' and public health programs' knowledge about contraindications for contraceptive use, which could result in adverse health events for women. The National Survey of Family Growth offers similar opportunities for examining preconception health issues. However, these data sets are unable to provide state or local estimates, thus limiting their ability to address state- or local-specific concerns.

The National Children's Study began in 2008, and was conceptualized as a comprehensive national study of child health. As children grow up in families and because this study starts by enrolling women before they become pregnant, there is an opportunity to measure risk and protective factors before pregnancy and then to assess their impact on a woman's health as well the health of her offspring. New guidance and investments are needed to include preconception health and health care measures in this new study.

One of the primary challenges of working with data from multiple sources is the issue of comparability across surveillance systems. Many research, program, and policy decisions require a number of topics that may or may not be available from specific populations and thus limit the availability of evidence to support decisions. Identification of such limitations can help to guide the modification of existing data systems and/or areas of new research. The identification of appropriate indicators in this field is a dynamic process and will change as the field matures, proven interventions are identified, and content areas are modified. The differences can also be an asset because different indicators are relevant to different populations. For example, PRAMS and BRFSS survey very different populations and relevant indicators, such as postpartum depression measured in PRAMS or chronic disease management among women not currently using an effective method of contraception in BRFSS. PRAMS is limited to those who have recently had a live birth and the depression measure is relevant to interconception health and health care, whereas the BRFSS chronic disease management assessment provides information on the general health status of those who might become pregnant. This measure could help to identify the need for interventions before pregnancy.

As opportunities arise for developing and implementing new measures and new systems, there are important issues to consider. To date, much of the data collection has focused on the burden of specific chronic disease and risk factors such as diabetes and tobacco use. Although it is important to know the prevalence of a disease, a measure that includes the proportion with the disease that is appropriately managed or the type of management received is critical to truly understanding the impact of these conditions on health outcomes. Similarly, for women with a previous poor pregnancy outcome, measurement of interconception health and health care is important to help define and intervene on factors that reduce a woman's risk of having a subsequent poor pregnancy outcome (Biermann, Dunlop, Brady, Durbin, & Brann Jr., 2006). In addition, systems such as PRAMS and BRFSS measure the broader sociocultural context with items including social stressors and perceived racism. These have important implications for the development and implementation of public health programs with a special focus on health equity, social justice, and the elimination of disparities. Research to understand the protective behaviors of women who are able to successfully manage high-risk conditions are important to the design of effective interventions. Evaluation of the health and economic impact of effective interventions is critical to develop the evidence base needed to affect public health programs and policies that promote the integration of these interventions into the standard of care.

Using a health promotion framework can facilitate the integration of preconception health and health care activities into existing clinical and public health programs and services. The State of California's recent preconception health efforts have taken this approach through a model program entitled "Every Woman, Every Time," which aims to change the preconceptional care practices of health care providers (Cullum, 2003). This framework expands preconception health beyond traditional family planning and pregnancy outcomes to a broad range of activities designed to improve women's health across the lifespan and facilitate proactive decision making about childbearing. Taking advantage of existing clinical and public health systems is a way to facilitate policy change, identify mechanisms for payment, and offer comprehensive services. The health promotion infrastructures also support systems for both summarizing existing data and collecting new data needed for effecting necessary policy changes.

Next Steps

There are a number of important actions and activities that are in process and planned for the coming years. It is important to recognize that all of the work to date on the data indicators subcommittee has been done by volunteers who recognize the importance of this activity. For the purposes of sustainability, the project would benefit from some dedicated resources. The State Working Group continues their activities to identify specific indicators from each of the data systems and has a small expert advisory committee with representation from federal, state, and academic organizations. When this work on state-level data indicators is completed, the next step is to conduct a formal gap analysis. Part of this effort will be to identify indicators that have previously been developed or develop new indicators.

Future activities include the development of a parallel data library for the national level data systems. This will follow a similar process and build on the work done by the State Working Group. The combination of the state- and national-level data systems reviews will be the basis for the open access library of data indicators. At this time, resources have not been identified for where this will be housed or for regular updating of the library. The intent of doing this work is to change surveillance systems so regular updates will be required. With the establishment of the library, it is expected that the workgroups will serve as resources for technical assistance on an as needed basis. This library of indicators will facilitate the development of state report cards or identification of indicators to be included in other programs that can be used by public health programs and policy makers for decision-making purposes.

Summary

The identification of existing data systems and their components, which can provide information needed to inform public health programs, clinical practice, and policy development, is a reasonable strategy, especially in times of scarce resources. In the absence of 1 comprehensive preconception health and health care data system, creative use of extant data systems is needed, such as integration of data across systems and expansion to include additional indicators. PRAMS, BRFSS, and the new National Children's Study are examples of existing systems that provide relevant data. In addition to the use and adaptation of existing data systems, investment in new data systems at the local, state, and national levels would allow for the development, implementation, and evaluation of preconception health and health care programs, services and policies—all of which are critical to efforts aimed at improving the health of women, children, and families.

Data on preconception health and health care will inform clinical health practice as well as public health programs and systems on the factors that influence outcomes for women, children, and families. Opportunities to support the development and expansion of preconception health and health care data systems should be taken advantage of. Efforts to include preconception health and health care indicators in existing data sets are needed. States have the opportunity to do this by choosing optional modules in existing data systems that include preconception health and health care indicators. Identifying critical data elements and including a broader set of data elements in existing and new data systems will provide opportunities to improve our understanding of the relationship between preconception health and health care and pregnancy outcomes for both mothers and their infants.

References

Atrash, H. K., Johnson, K., Adams, M., Cordero, J. F., & Howse, J. (2006). Preconception care for improving outcomes: The time to act. *Maternal and Child Health Journal*, 10, S3–S11.

Biermann, J., Dunlop, A. L., Brady, C., Durbin, C., & Brann, A., Jr. (2006). Promising practices in preconception care for women at risk for poor health and pregnancy outcomes. *Maternal and Child Health Journal*, 10, S21–S28.

Centers for Disease Control and Prevention (CDC)(1990) *Healthy people 2000*. Washington, DC: Author.

Centers for Disease Control and Prevention (CDC). (2002). Prevention of perinatal group B streptococcal disease: revised guidelines from the CDC. *Morbidity and Mortality Weekly Report*, 51, 1–22.

Centers for Disease Control and Prevention (CDC). (2005). *Healthy people 2010*. Washington, DC: Author.

Centers for Disease Control and Prevention (CDC). (2007). Surveillance of preconception health indicators among women delivering live-born infants—Oklahoma, 2000–2003. *Morbidity and Mortality Weekly Report*, 56, 631–634.

Cullum, A. S. (2003). Changing provider practices to enhance preconceptional wellness. *Journal of Obstetrical, Gynecological and Neonatal Nursing*, 32, 543–549.

D'Angelo, D., Williams, L., Morrow, B., Cox, S., Harris, N., Harrison, L., et al. (2007). Preconception and interconception health status of women who recently gave birth to a live-born infant- Pregnancy Risk Assessment Monitoring System (PRAMS), United States, 26 reporting areas, 2004. *Morbidity and Mortality Weekly Report Surveillance Summary*, 56, 1–35.

Johnson, K., Posner, S. F., Biermann, J., Cordero, J. F., Atrash, H. K., Parker, C. S., et al. (2006). Recommendations to improve preconception health and health care—United States: A report of the CDC/ATSDR Preconception Care Work Group and the Select Panel on Preconception Care. *Morbidity and Mortality Weekly Reports: Reports and Recommendations*, 55(RR 6), 1–30.

Korenbrot, C. C., Steinberg, A., Bender, C., & Newberry, S. (2002). Preconception care: A systematic review. *Maternal and Child Health Journal*, 6, 75–88.

Moos, M. K., & Cefalo, R. C. (1987). Preconceptional health promotion: a focus for obstetric care. *American Journal of Perinatology*, 4, 63–67.

Posner, S. F., Johnson, K., Parker, C. S., Atrash, H. K., & Biermann, J. (2006). The National Summit on Preconception Care: A summary of concepts and recommendations. *Maternal and Child Health Journal*, 10, S197–S205.

Werler, M. M., Shapiro, S., & Mitchell, A. A. (1993). Periconceptional folic acid exposure and risk of occurent neural tube defects. *Journal of the American Medical Association*, 269, 1257–1261.

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Appendix A. Data systems providing state level preconception health and health care measures

Data system	Source agency
Behavioral Risk Factor Surveillance System (BRFSS)	Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Division of Adult and Community Health
Birth defects surveillance	Centers for Disease Control and Prevention, National Center on Birth Defects and Developmental Disabilities
National Immunization Survey (NIS)	Centers for Disease Control and Prevention, National Center for Health Statistics
National Program of Cancer Registries	Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Division of Cancer Prevention and Control
National Vital Statistics System Birth Data	Centers for Disease Control and Prevention, National Center for Health Statistics
National Vital Statistics System Fetal Death Data	Centers for Disease Control and Prevention, National Center for Health Statistics
Pediatric Nutrition Surveillance System (PedNSS)	Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Division of Nutrition and Physical Activity
Pregnancy Risk Assessment Monitoring System (PRAMS)	Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Division of Reproductive Health
Pregnancy Nutrition Surveillance System (PNSS)	Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Division of Nutrition and Physical Activity
Sexually Transmitted Disease Surveillance	Centers for Disease Control and Prevention, National Center for HIV, STD, and TB Prevention, Division of STD Prevention
Treatment Episode Data Set (TEDS)	Substance Abuse & Mental Health Services Administration (SAMHSA), Office of Applied Studies Drug and Alcohol Services Information System (DASIS)

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WOMEN'S HEALTH ISSUES

IMPROVING WOMEN'S PRECONCEPTIONAL HEALTH
Findings from a Randomized Trial of the *Strong Healthy Women* Intervention in the Central Pennsylvania Women's Health Study

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Purpose. **Improving the health of women before pregnancy is an important strategy for reducing adverse pregnancy outcomes for mother and child. This paper reports the first pretest–posttest results from a randomized trial of a unique, multidimensional, small group format intervention, *Strong Healthy Women*, designed to improve the health behaviors and health status of preconceptional and interconceptional women.**

Methods. **Nonpregnant pre- and interconceptional women ages 18–35 were recruited in 15 low-income rural communities in Central Pennsylvania ($n = 692$). Women were randomized in a ratio of 2-to-1 to intervention and control groups; participants received a baseline and follow-up health risk assessment at 14 weeks and completed questionnaires to assess behavioral variables. The analytic sample for this report consists of 362 women who completed both risk assessments. Outcomes include measures of attitudinal and health-related behavior change.**

Main Findings. **Women in the intervention group were significantly more likely than controls to report higher self-efficacy for eating healthy food and to perceive higher preconceptional control of birth outcomes; greater intent to eat healthy foods and be more physically active; and greater frequency of reading food labels, physical activity consistent with recommended levels, and daily use of a multivitamin with folic acid. Significant dose effects were found: Each additional intervention session attended was associated with higher perceived internal preconceptional control of birth outcomes, reading food labels, engaging in relaxation exercise or meditation for stress management, and daily use of a multivitamin with folic acid.**

Conclusions. **The attitudinal and behavior changes attributable to the intervention were related primarily to nutrition and physical activity. These results show that these topics can be successfully addressed with pre- and interconceptional women outside the clinical setting in community-based interventions.**

Recent recommendations to improve preconception health and health care in the United States have inspired calls for innovative approaches to reduce adverse pregnancy outcomes, including strategies for improving women's health before they become pregnant (Haas et al., 2005; Korenbrot, Steinberg, Bender, & Newberry, 2002; Moos, 2004). The Centers for Disease Control and Prevention (CDC, 2006) recommends

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a multipronged strategy for improving women's health before pregnancy through greater access to clinical care, community-based health promotion programs, and a focus on individuals' health-related behavior. Addressing the latter 2 points, we developed the *Strong Healthy Women* intervention to improve health-related behaviors, attitudes, and health status among pre- and interconceptional women recruited in community settings (Downs et al., 2008). This paper reports the pretest–posttest results of a randomized trial of this unique multidimensional behavior change intervention.

Adverse pregnancy outcomes including preterm birth and low birthweight remain high-priority public health problems (Hamilton, Martin, & Ventura, 2007a; Institute of Medicine [IOM], 2006), and are linked with infant mortality and neurodevelopmental morbidity that can impair health and functioning throughout childhood and beyond (Anderson & Doyle, 2003; Bhutta, Cleves, Casey, Cradock, & Anand, 2002; IOM, 2006; Singh & Yu 1995). According to recent IOM estimates, the annual societal economic burden associated with preterm birth in 2005 was $51,600 per infant, totaling at least $26.2 billion for the United States as a whole (IOM, 2006). Moreover, the economic and health-related costs of preterm and low birthweight are like to fall disproportionately on low-income and minority families (Gilbert, Nesbitt, & Danielsen, 2003; IOM, 2006; Petrou, 2003; RAND, 1998).

Despite increasing rates of prenatal care utilization, rates of adverse pregnancy outcomes have risen substantially during the past 2 decades. The preterm birth rate increased from 9.6% in 1983 to 12.8% by 2006, and the low birthweight rate increased from 6.8% to 8.3% during the same time period (Hamilton et al., 2007a). Multiple gestations do not account for this upswing (Hamilton et al., 2007b). The combination of increased prenatal care and deterioration in these benchmarks have stimulated a paradigm shift in strategies to improve women's health and pregnancy outcomes from a focus on the prenatal period to the preconceptional period (Moos, 2004).

This shift in focus is also prompted by the recognition of several factors. First, multiple risk factors for adverse pregnancy outcomes have been identified in the literature (e.g., obesity, chronic disease, nutritional deficiencies, and behavior patterns including physical inactivity, smoking, and alcohol use), and large percentages of women enter pregnancy with ≥1 of these risk factors (Anderson, Ebrahim, Floyd, & Atrash, 2006; CDC, 2006). Second, increasing numbers of women are delaying childbearing (Martin et al., 2006), with the result that more women have a chronic health condition (e.g., overweight, hypertension) when they become pregnant for the first time. Third, the articulation of a lifespan perspective on women's health—in which health-related issues at 1 life stage affect health at later life stages—suggests that early intervention in women's health can reduce cumulative risks and impact pregnancy outcomes at later stages of life (Misra, Guyer, & Allston, 2003). To date, however, little research addresses the effectiveness of approaches to reduce adverse pregnancy outcomes by improving the physical and psychological health of women before pregnancy.

The Central Pennsylvania Women's Health Study

The *Strong Healthy Women* intervention was developed as part of the Central Pennsylvania Women's Health Study (CePAWHS), funded by the Pennsylvania Department of Public Health (Miller et al., 2007; Weisman et al., 2006). CePAWHS consisted of 2 phases. In the first phase, population-based survey data were collected for women of reproductive age to ascertain the prevalence of multiple risk factors for adverse pregnancy outcomes in a 28-county region of Central Pennsylvania. This region was chosen because it is diverse with respect to socioeconomic status and includes urban as well as rural and semirural locations. Survey participants reported high levels of multiple risk factors for adverse pregnancy outcomes compared with both the US and Pennsylvania female populations of comparable age. The risk factors that were relatively high in Central Pennsylvania included obesity measured by body mass index (BMI ≥30), depressive symptoms, low fruit and vegetable consumption (<1/day), alcohol use, binge drinking (defined as ≥5 drinks on 1 occasion in the past month), cigarette smoking, and nonuse of folic acid supplementation. Respondents also reported lack of regular physical activity (less than one third of women engaged in ≥30 minutes of moderate strenuous exercise on most days of the week), high rates of gynecologic infections, and high levels of psychosocial stress from multiple sources, including job and financial issues and unfair treatment owing either to race/ethnicity/culture or gender (Weisman et al., 2006). Most of these risk factors have been linked in prior research with elevated risk for preterm birth and low birthweight outcomes (Hillemeier, Weisman, Chase, & Romer, 2006; IOM, 2006; Misra et al., 2003).

In the second phase of CePAWHS, the population-based information from Phase I was used to develop a multidimensional behavioral intervention, *Strong Healthy Women*, to address the prevalent modifiable risk factors identified in Phase I. Detailed description of the development of this intervention is available elsewhere (Downs et al., 2008). Briefly, the rationale for the targets and approach of the group format, multisession intervention was based on 3 primary considerations: 1) the risk factors identified in CePAWHS Phase I; 2) prior successful behavior change interventions such as the Diabetes Prevention Program (Diabetes Prevention Research Group, 2002) and WISEWOMAN (Viadro, Farris, & Will, 2004; Will, Farris, Sanders, Stockmyer, & Finkelstein, 2004; Will et al., 2001); and 3) the social cognitive approach to behavior change.

Our social cognitive approach to behavior change is based partly on Social Cognitive Theory (Bandura, 1986), which assumes that behavior is goal directed and people are capable of self-regulation. Self-efficacy—the belief in one's ability to attain a goal—is the primary mediator of behavior change. In addition to self-efficacy, motivation and intention to change are important determinants of behavior change (Ajzen, 1991). Thus, the intervention content was designed to strengthen women's level of motivation and intention to make behavioral changes. For example, motivation was addressed through education about the link between current health-related behaviors and the future health of the woman, her child, and family generally. The intervention content also aimed to enhance participants' perceived ability to perform the new behavioral changes (i.e., self-efficacy). We chose a group format approach in part because social support is recognized as an important element in facilitating behavior change (Ajzen, 1991).

The content areas addressed in the *Strong Healthy Women* intervention included pregnancy and conception, managing stress, physical activity, nutrition (including folic acid supplementation), preventing gynecologic infection, tobacco exposure, and alcohol use. This content was integrated across six 2-hour sessions over a 12-week period. The 6 sessions were organized as follows: Session 1 introduced the content areas, set expectations, and established the buddy system (dyadic mutual support phone calls) and homework assignments. Session 2 provided information on stress and problem solving, smoking, physical activity, and gynecologic infections in relation to pregnancy, with time set aside for guided physical activity and relaxation modules. Sessions 3 and 4 focused on preconception health, stress and social support, physical activity, avoiding second-hand smoke, and nutrition, with time set aside for physical activity (e.g., guided aerobics, walking) and in healthy eating demonstrations (e.g., reading food labels, grocery shopping trip). Session 5 focused mainly on preconception health services, alcohol use, physical activity, and healthy eating. Session 6 addressed relaxation techniques, contraception, physical activity, and healthy eating.

In a randomized trial, we tested the effectiveness of the *Strong Healthy Women* intervention in improving self-efficacy for behavior change, behavioral intent, and behavior change in the topic areas addressed by the program. This trial represents an initial assessment of whether such an approach can enhance women's health and reduce the risks of adverse pregnancy outcomes among pre- and interconceptional women. In this report, we present results at posttest.

Methods

Overall study design

A randomized controlled trial of the *Strong Healthy Women* intervention was conducted in 15 low-income rural communities within the 28-county Central Pennsylvania region. Low-income rural communities were targeted because women in these communities were shown to have high rates of risk factors for adverse pregnancy outcomes in the Phase I CePAWHS population-based surveys.

The randomized trial study design is shown in Figure 1. The study was approved by the Penn State College of Medicine Institutional Review Board. Women recruited to the study provided written informed consent administered by trained study facilitators and completed a baseline risk assessment that included a self-administered 20-minute questionnaire prepared at the 7th-grade reading level. In addition to survey measures, several clinical assessments were collected, including anthropometric measurements (height, weight, waist circumference, and calculated BMI); and biomarkers (blood pressure, non-fasting blood glucose, total and high-density lipoprotein [HDL] cholesterol). All participants were given a printed report of their anthropometric and biomarker readings at the conclusion of each risk assessment, and individuals whose biomarker values fell outside the normal range were referred to a health care provider. After the baseline risk assessment, participants were randomized using a 2-to-1 ratio to either the intervention or control group. Because the study was conducted at 15 different sites, stratified randomization was performed according to site. Data checks were performed during the course of the study to ensure that women were randomized according to protocol.

Women in the intervention group were invited to participate in 6 biweekly small group sessions of the *Strong Healthy Women* intervention, beginning approximately 2 weeks after the baseline risk assessment. These group sessions were led by group facilitators who were trained for this project by the study investigators; training included grounding in the content of the intervention as well as techniques for group facilitation and successful group dynamics. Fidelity monitoring was conducted using videotapes of a sample of group sessions (2 videotaped sessions per group of women) that were rated systematically for adherence to the study protocol and for completion of content for each session. Each session was coded for the percentage of content delivered; across all sessions and groups, an average of 77% of the content was delivered, with some variation across topic areas. Participants who were unable to attend a session were provided with session materials and given the opportunity for a short make-up session before the next group meeting. Very few women took advantage of

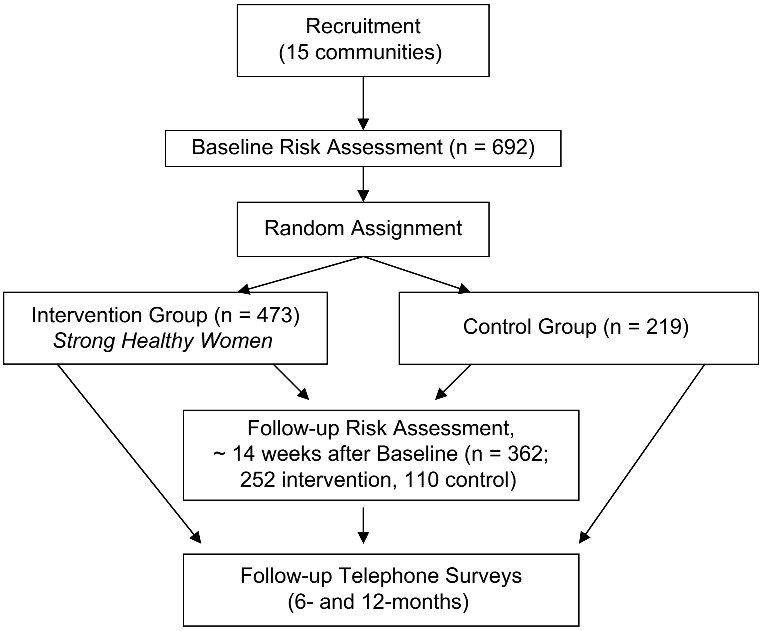

Figure 1. Randomized trial design.

the make-up sessions, and the make-up sessions are not counted in the dose–response analyses.

Women in both the intervention and control groups were invited back for a follow-up risk assessment, scheduled approximately 14 weeks after the initial baseline assessment, to obtain repeated measurement of the questionnaire, anthropometric measures, and biomarkers. Data collected over the study period from the baseline risk assessment through the follow-up risk assessment are presented in this manuscript. Long-term follow-up of all women in both conditions (by telephone interviews at 6 and 12 months after the follow-up risk assessment) to assess maintenance of behavior change is currently ongoing, and results are not yet available. Study participants received gift card incentives (e.g., $20 from local grocery stores) for attendance at each study session, including the risk assessments, the intervention sessions, and the follow-up telephone interviews.

Recruitment

Nonpregnant women ages 18–35 who were capable of pregnancy ($n = 692$) were recruited in 15 low-income, rural communities using a triangular community-based approach which has been described elsewhere (Velott, Baker, Hillemeier, & Weisman, 2008). Briefly, this approach combined partnering with a local community organization—a public service, not-for-profit agency, health care facility, or educational group—with the use of both active and passive recruitment methods tailored to the local community. Active methods involved direct communication between a study recruiter and potential participants at a community location; passive methods included use of the media, mailings, and posters/flyers. Recruitment materials designed specifically for CePAWHS were an essential ingredient of both the active and passive recruitment methods. Although recruitment targeted low-income rural communities, some of the women recruited in these communities resided in adjacent areas that were not predominantly low income or rural. Nevertheless, our recruitment approach yielded a sample of women of lower socioeconomic status and from more rural locales than women of comparable reproductive life stage, age, and county of residence in the general Central Pennsylvania population (Velott et al., 2008).

Sample

Eligibility criteria for inclusion in the study included residence within the 28-county target study region; ages 18–35; not pregnant at the time of enrollment; and capable of becoming pregnant in the future (i.e., no history of tubal ligation, hysterectomy, or other known cause of infertility). Exclusion criteria included non-English speaking. The 18–35 age range was chosen because women ages 18–35 account for >85% of live births in Central Pennsylvania and are therefore the appropriate target audience for a study focusing on pregnancy and birth-related risk factors.

The original sample size calculation was based on randomizing 500 women (in a 2-to-1 ratio of intervention to control) to achieve 80% statistical power for each primary outcome variable with a 2-sided, 0.05 significance level test, while allowing for a 30% dropout rate. Thus, the target of 80% statistical power would be met if 350 women completed the study. In actuality, 692 women were randomized, 362 of whom completed the study. Therefore, the target of 350 completers was met.

The analytic sample for the pretest–posttest findings presented here ($n = 362$) includes those women who attended both the baseline and follow-up risk assessments. Women who did not attend the follow-up risk assessment were excluded because posttest data were not available; 47% of participants in the intervention group and 50% of the women in the control group did not attend the follow-up risk assessment.

Measures

Dependent variables. Consistent with the social cognitive model, dependent variables included self-report measures of self-efficacy, behavioral intent, and behavior associated with the specific content areas addressed in the intervention: pregnancy and conception, stress management, physical activity, nutrition (including folic acid supplementation), gynecologic infection, tobacco exposure, and alcohol use. All measures were designed to apply to all participants, regardless of their baseline value on the risk factor.

The measures of self-efficacy assessed the individual's level of self-confidence that she could engage in the desired behavior, on a 4-point scale ranging from "not at all confident" to "completely confident," when confronted with specific barriers. For example, for physical activity, the question read, "How confident are you that you could get enough physical activity even if…," and a list of 13 common barriers to physical activity followed (e.g., "The weather was very bad," "I was pregnant"). In addition, internal control of birth outcomes was measured using a single item assessing perceived Preconceptional Control (Weisman et al., 2008). Because the intervention focused on improving women's health to reduce adverse pregnancy outcomes, the hypothesis was that the intervention would increase perceived preconceptional control of birth outcomes related to the baby's health.

The measures of behavioral intent assessed the individual's intent of engaging in healthy behaviors "over the next 4 months," using a 7-point scale ranging from strongly disagree to strongly agree. For example, for physical activity, the question read, "On a scale of 1 to 7, how much do you agree or disagree with the following statement: I intend to be more physically active over the next 4 months?" For analysis, responses in the upper end of the scale were collapsed for some variables due to infrequent number of responses.

Specific behaviors were measured by self-report. For example, for physical activity, questions assessed how many days per week the woman engaged in moderate or vigorous physical activity and how many minutes per day she engaged in moderate or vigorous physical activity; these questions were combined to assess whether the woman was meeting current exercise recommendations of ≥ 30 minutes of moderate to strenuous physical activity on most, if not all, days of the week (American College of Sports Medicine, 2000; Pate et al. 1995). Using questions adapted from the Behavioral Risk Factor Surveillance Survey and other sources, nutritional intake was measured by asking women how often in a typical week they consumed fruit (not counting fruit juice), green salad, vegetables (not counting carrots, potatoes, or salad), snack foods (such as chips, cookies, ice cream, frozen yogurt, and candy), dairy foods (such as milk, cheese, and yogurt other than frozen yogurt), and whole grains (such as whole wheat bread, brown rice, and cereal with fiber). We also assessed other nutrition-related behaviors, including how often they read labels on foods to compare products' nutritional value, and whether or not they use a daily multivitamin that contains folic acid. Additional health-related behaviors measured included frequency and quantity of alcohol use; any use of tobacco products including cigarettes; vaginal douching; receiving preventive gynecologic examinations; sleep patterns; and use of specific stress management techniques.

Anthropometric and biomarker indicators of health status were measured using standardized equipment and measurement techniques across sites, including digital scales for measuring weight and height; plastic measuring tapes for measuring waist circumference; and blood pressure monitors with appropriate cuff sizes. Anthropometric indicators included weight (pounds and fractions of pounds), height (inches), BMI (calculated from weight and height and analyzed as a continuous variable), and waist circumference (inches). Finger-stick blood samples were used to measure non-fasting glucose, HDL and total cholesterol, using the CardioChek P•A analyzer (Polymer Technology Systems, Inc., Indianapolis, IN). Additional health status indicators included systolic and diastolic blood pressure (mmHg), non-fasting serum glucose (mg/dL), HDL cholesterol (mg/dL), and total cholesterol (mg/dL). Anthropometric and biomarker measurements were taken by the trained facilitators, who were blinded to treatment condition (intervention or control group) when taking baseline measurements but not when taking follow-up measurements.

Independent variables. The main independent variable is treatment condition (either intervention or control group) for the pre–post analyses and the number of sessions attended (range, 0–6; mean, 4) for the dose–response analyses. In addition, age (18–35 years) and educational level (dichotomized as high school or less versus some college or more) at baseline were utilized as covariates.

Analyses

Intent-to-treat pre–post analyses were done with analysis of covariance. For this approach, the baseline measure (or pretest) is included as a covariate to adjust for any differences in baseline measures, and the follow-up measure (or posttest) is the response. Analysis was performed using a general linear model, ordinal logistic regression, or ordinary logistic regression, depending on the response variable being analyzed. A test of the proportional odds assumption was run and satisfied for all ordinal logistic regression models. In addition to treatment condition and baseline measure, age and educational level at baseline were included in each model. Their inclusion resulted from a separate analysis, which showed that age and education were predictive of attendance at the follow-up risk assessment: older women within the 18–35 age range and more highly educated women (women with some college or more) were more likely to attend the follow-up risk assessment. Accordingly, age and educational level were controlled. We included site as a blocking factor in secondary statistical analyses even though we do not report these results in the summary tables. In every circumstance, the inclusion of site does not alter the interpretation of the significance of the intervention, although the tendency was for the inclusion of site to render a slightly more conservative result for the statistical significance of the intervention.

Dose–response analyses were performed in a manner similar to the pre–post analyses, with 2 differences. First, the sample was restricted to women randomized to the intervention group. Second, the number of sessions attended, a continuous variable ranging from 0 to 6, replaced treatment group as the independent variable of interest.

Results

For descriptive purposes, the sociodemographic characteristics of the analytic sample are shown in Table 1. The sample is quite diverse with respect to all sociodemographic variables except for race/ethnicity (reflecting the demographics of the population in the targeted low-income rural communities) and with respect to health care access (i.e., having a regular source of health care and health insurance status). No statistically significant differences in the sociodemographic characteristics of the intervention and control groups were found, with the exception of age: Women in the intervention group were 1.78 years older than women in the control group, on average. As noted, age is controlled for in pre–post analyses.

Pre–post changes (over the 14-week interval between the baseline and follow-up risk assessments) were analyzed for self-efficacy for behavior change, behavioral intent, self-reported behaviors, and both anthropometric and biomarker indicators of health status. Table 2 shows the statistically significant ($p <$ 05) pre–post changes for self-efficacy, behavioral intent, and behavior change related primarily to nutrition and physical activity. Women in the intervention group were significantly more likely than controls to report higher self-efficacy for eating healthy food. They were also more likely to perceive higher preconceptional control. Participation in the intervention was also associated with greater intent to eat healthier foods and to be more physically active. Statistically significant behavior changes included greater likelihood of reading food labels to identify nutritional values, using a daily multivitamin that contains folic acid, and meeting recommended levels of physical activity. Results for pre–post analyses of anthropometric and biomarker measures from the baseline and follow-up risk assessments are shown in Table 3. No statistically significant effects of the intervention were seen in these measures.

Because there was variation in the number of group sessions attended among the intervention participants,

Table 1. Baseline Sociodemographic Characteristics and Health Care Access, by Study Group (percentages and *n*)

Sociodemographic Variables	Intervention ($n = 252$)	Control ($n = 110$)	*p*-Value*
Marital status			
Married or living with a partner	59% (148)	48% (53)	
Never or formerly married	41% (103)	52% (57)	.058
Mean age in years (standard deviation)	26.52 (5.02)	24.74 (4.64)	.002
Educational level			
High school graduate or less	36% (91)	31% (34)	
Some college	33% (83)	32% (35)	
College graduate or more	31% (78)	37% (41)	.220
Race/ethnicity			
White, non-Hispanic	92% (231)	91% (100)	
Other (African American, Hispanic, Asian)	8% (19)	9% (10)	.424
Rural–urban residence†			
Urban-focused RUCA code	47% (118)	54% (59)	
Rural RUCA code	53% (134)	46% (51)	.645
Poverty status‡			
Poor	27% (58)	29% (24)	
Near poor	33% (70)	30% (25)	
Not poor	40% (85)	42% (35)	.968
Health care access			
Usual source of health care			
Yes	75% (189)	78% (86)	
No	25% (62)	22% (24)	.554
Health insurance			
Private	57% (144)	62% (68)	
Public (largely Medicaid)	25% (64)	19% (21)	
None	17% (44)	19% (21)	.428

* Tests of statistical significance are the χ^2 test, the Mantzel-Haenszel χ^2 test, or the *t*-test, as appropriate.

† Based on ZIP code approximation of Rural–Urban Commuting Area Codes. For more information, see http://depts.washington.edu/uwruca/new.html.

‡ US Census definitions based on household income and composition.

Table 2. Statistically Significant Pre–Post Intervention Effects

	Intervention Effect	p
Self-efficacy		
For eating healthy food[†]	GLM coefficient = 1.109*	.018
Preconceptional Control[‡]	Odds ratio = 1.916	.031
Behavioral intent[§]		
To eat healthier foods	Odds ratio = 1.757	.008
To be more physically active	Odds ratio = 2.185	.000
Behavior change		
Reads food labels for nutritional values[‖]	Odds ratio = 2.264	.001
Uses daily multivitamin with folic acid[¶]	Odds ratio = 6.595	.000
Meets recommended physical activity level[#]	Odds ratio = 1.867	.019

* GLM (Generalized Linear Models) or logistic regression models with dichotomous or ordinal responses were used, depending on the format of the dependent variable. All models were adjusted for preintervention level on the dependent variable, baseline age, and educational level (see text).

[†] Based on 8-item summated scale.

[‡] Based on single-item measure of preconceptional control of birth outcomes (Weisman et al. 2008).

[§] Based on a single-item 7-point scale (categorized).

[‖] Based on a single-item 4-point scale (dichotomized).

[¶] Recode of 2 questions; indicates whether or not woman uses daily multivitamin that contains folic acid.

[#] Recode of 2 questions; indicates whether or not woman meets recommendations for ≥30 minutes of moderate or vigorous physical activity on ≥4 days per week.

we examined the effect of number of sessions attended on all study outcomes among those women randomized to the intervention (Table 4). Significant dose effects were found for 1 measure of self-efficacy—Preconceptional Control of birth outcomes—indicating significant improvement with each additional session attended. Significant dose effects were also seen for several behaviors, including reading food labels, engaging in relaxation exercise or meditation for stress management, and daily use of a multivitamin with folic acid.

Discussion

This is the first report of findings from the CePAWHS randomized, controlled trial assessing the effectiveness of a behavior change intervention designed to improve the health of preconceptional and interconceptional women. The *Strong Healthy Women* intervention is a unique group format program targeting multiple health-related behaviors that are related to pregnancy outcomes. This initial randomized trial with pre- and interconceptional women recruited in low-income rural communities demonstrated a number of positive effects. The findings suggest that participation in the *Strong Healthy Women* intervention can significantly improve self-efficacy and behavioral intentions related to several risk factors for adverse pregnancy outcomes, as well as induce actual behavior change. Key attitudinal and behavior changes achieved were related to nutrition (including reading nutritional food labels and using folic acid supplementation, but not nutritional intake related to specific food groups) and physical activity levels. These are important findings; folic acid intake is associated with reduction in certain birth defects, and nutrition and physical activity are related to important areas of health risk, including overweight and obesity, diabetes, and cardiovascular health.

In addition, evidence was found for a dose–response effect in that the number of intervention sessions attended was linked with the strength of the intervention impact. Additional dose–response analyses were performed categorizing the number of sessions attended (data not shown). For several outcomes, intervention

Table 3. Pre–Post Analyses of Anthropometric and Biomarker Measures

Measurements	Intervention Effect (GLM coefficients)*	p-Value
BMI (kg/m^2)[†]	−0.036	.809
Weight (lbs)	−0.219	.806
Waist circumference (inches)	−0.112	.752
Blood pressure (mm Hg)		
Systolic	−0.856	.465
Diastolic	−0.014	.990
Blood tests (nonfasting)		
Serum glucose (mg/dL)	0.849	.798
HDL cholesterol (mg/dL)	−2.270	.246
Total cholesterol (mg/dL)	−3.119	.532

* GLM (Generalized Linear Models) coefficients are shown. All models were adjusted for preintervention level on the dependent variable, baseline age, and educational level (see text).

[†] Calculated based on height and weight and analyzed as a continuous variable.

Table 4. Statistically Significant Dose–Response Effects*

	Effect Per Each Additional Intervention Session Attended	
	Odds Ratio	p
Self-efficacy		
Preconceptional Control[†]	1.309	.002
Behavior change		
Reads food labels for nutritional values[‡]	1.161	.015
Does relaxation exercise or meditation to relax[§]	1.236	.009
Uses daily multivitamin with folic acid[‖]	1.448	.000

* Logistic regression models were estimated, and odds ratios are shown. All models were adjusted for preintervention level on the dependent variable, baseline age, and educational level (see text).

[†] Based on a single item measure of preconceptional control of birth outcomes (Weisman et al., 2008).

[‡] Based on a single-item 4-point scale (dichotomized).

[§] Based on 2 items indicating whether or not woman used each of these techniques for stress management in the past 2 weeks.

[‖] Recode of 2 questions; indicates whether or not woman uses daily multivitamin that contains folic acid.

effects among those attending 3 sessions were significantly better than for those attending ≤2; also, the effects among those attending 3 sessions were not significantly different than for those attending ≥4 sessions. Hence, 3 sessions seems to be the optimum number of sessions. Feedback from the group facilitators and a sample of participants as part of a process evaluation provided some information about which modules were perceived as most interesting and effective, but there was no evidence that specific 2-hour sessions were less important than others. To assess this further, our future research will develop and test a 3-session version of the *Strong Healthy Women* intervention that covers the same topic areas but in a more compact format.

No significant differences in changes in anthropometric and biomarker measures were identified. We attribute these null findings to the relatively short interval of time between pre- and posttest (i.e., 14 weeks between baseline and follow-up risk assessments). Although it is possible to see changes in anthropometric and biomarker measures over this time period, such change would require relatively rapid and substantial change in behavior, rather than a gradual change, which is more realistic and attainable. In fact, the program content explicitly fostered gradual change by introducing potential behavior change in stages and providing support for the frequently tentative nature of initial change attempts. It is more likely that assessment after a longer follow-up period would allow detection of changes in these biomarkers. In future studies, we intend to conduct biomarker assessments over a 6-month follow-up period.

Other null findings are worth noting. The intervention had no significant effects on self-efficacy, behavioral intention, or behavior change in the areas of tobacco exposure (cigarette smoking and exposure to tobacco smoke in the home) and alcohol use. These are notoriously difficult behaviors to change, and it could be that the relatively brief attention to these topics within the context of the 6-session intervention was not sufficient to produce desired changes. In addition, we found no significant effects for use of stress management techniques, perhaps because the intervention could not address the underlying levels of stress experienced by participants. Finally, the intervention did not impact the prevention of gynecologic infections through reducing the use of vaginal douching or obtaining more preventive gynecologic health care; the latter might not be expected over a 14-week study period, because research shows that women seek preventive gynecologic health care approximately every 1–2 years (Salganicoff, Ranji, & Wyn, 2005). Our longer-term survey follow-up may show an impact on use of preventive health care. With modifications in the intervention, some of these topic areas could be addressed more effectively in future research.

The results of this randomized trial are promising for specific outcomes variables. However, although the sample was diverse with respect to socioeconomic status and rural–urban residence, the sample was racially homogenous (predominantly non-Hispanic white) owing to the demographic characteristics of the underlying rural Central Pennsylvania population. A goal of future research is to test the *Strong Healthy Women* intervention, after it has been modified based on our experience in this trial, in a more racial/ethnically and geographically diverse population.

The public health and policy implications of this study are noteworthy. The promising results of this initial field trial suggest that the health-related behaviors and health risks of pre- and interconceptional women can be addressed outside of the clinical setting in community-based behavior change programs. This is an important insight because effective behavior change programs are likely to be too time consuming and labor intensive for most clinical settings in which women receive routine health services before becoming pregnant. Furthermore, because this field trial recruited women in high-risk and geographically dispersed low-income rural communities, the findings also provide evidence that the behavior change intervention approach can be successful in challenging populations. Although policy and financing discussions about preconception health tend to focus on expanding access to clinical services, the public policy agenda could be broadened to include increasing the availability and financing of community-based approaches to preconception health promotion, particularly in underserved communities.

It is also noteworthy that women in the intervention group seem to have gained increased control over their own health. For example, the ability to read food labels was enhanced. This skill, which may be taken for granted, should be promoted at the community and population levels to increase the response efficacy associated with policies behind labeling. The findings can inform potential interventions related to enhanced health literacy in the nutritional domain.

The need to develop evidence-based programs to improve preconception health has been highlighted by the CDC (2006). This test of the *Strong Healthy Women* intervention provides initial evidence of the effectiveness of a unique program for reducing risks of adverse pregnancy outcomes among pre- and interconceptional women in high-risk communities. The results reported here provide the basis for further refinements to the *Strong Healthy Women* intervention as well as a model for future preconception health interventions.

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References

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50.

American College of Sports Medicine. (2000). ACSM's Guidelines for Exercise Testing and Prescription. Baltimore: Lippincott Williams and Wilkins.

Anderson, J.E., Ebrahim, S., Floyd, L., & Atrash, H. (2006). Prevalence of risk factors for adverse pregnancy outcomes during pregnancy and the preconception period—United States, 2002–2004. Maternal and Child Health Journal [serial online]. Available: http://dx.doi.org/10.1007/s10995-006-0093-z:1-6.

Anderson, P., & Doyle, L. W. (2003). Neurobehavioral outcomes of school-age children born extremely low birth weight or very preterm in the 1990s. *JAMA*, 289, 3264–3272.

Bandura, A. (1986). *Social foundations of thought and action*. Englewood Cliffs, NJ: Prentice-Hall.

Bhutta, A. T., Cleves, M. A., Casey, P. H., Craddock, M. M., & Anand, K. J. (2002). Cognitive and behavioral outcomes of school-aged children who were born preterm: A meta-analysis. *JAMA*, 288, 728–737.

Centers for Disease Control and Prevention (CDC). (2006). Recommendations to improve preconception health and health care—United States: A report of the CDC/ATSDR Preconception Care Work Group and the Select Panel on Preconception Care. *MMWR*, 55, 1–23.

Diabetes Prevention Research Group. (2002). The diabetes prevention research group: Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. *New England Journal of Medicine*, 346, 393–403.

Downs, D. S., Feinberg, M., Hillemeier, M. M., Weisman, C. S., Chase, G. A., Chuang, C. H., et al. (2008). Design of the Central Pennsylvania Women's Health Study (CePAWHS) Strong Healthy Women intervention: Improving preconceptional health. *Maternal and Child Health Journal*. Feb 13 [Epub ahead of print].

Gilbert, W. M., Nesbitt, T. S., & Danielsen, B. (2003). The cost of prematurity: quantification by gestational age and birth weight. *Obstetrics and Gynecology*, 102, 488–492.

Haas, J. S., Fuentes-Afflick, E., Stewart, A. L., Jackson, R. A., Dean, M. L., Brawarsky, P., et al. (2005). Prepregnancy health status and the risk of preterm delivery. *Archives of Pediatric and Adolescent Medicine*, 159, 58–63.

Hamilton, B. E., Martin, J. A., & Ventura, S. J. (2007a). Births: Preliminary data for 2006. *National Vital Statistics Reports*, 56, 1–18.

Hamilton, B. E., Minino, A. M., Martin, J. A., Kochanek, K. D., Strobino, D. M., & Guyer, B. (2007b). Annual Summary of Vital Statistics: 2005. *Pediatrics*, 119, 345–360.

Hillemeier, M. M., Weisman, C. S., Chase, G. A., & Romer, M. (2006). Preterm delivery and low birthweight among rural women: The importance of preconception physical and mental health status. In R. T. Coward, L. A. Davis, C. H. Gold, H. Smiciklas-Wright, L. E. Thorndyke, & F. W. Vondracek (Eds.), *Rural women's health: Mental, behavioral, and physical issues*. New York: Springer.

Institute of Medicine (IOM). (2006). *Preterm birth: Causes, consequences, and prevention*. Washington, DC: National Academies Press.

Korenbrot, C. C., Steinberg, A., Bender, C., & Newberry, S. (2002). Preconception care: A systematic review. *Maternal and Child Health Journal*, 6, 75–88.

Martin, J. A., Hamilton, B. E., Sutton, P. D., Ventura, S. J., Menacker, F., & Kirmeyer, S. (2006). Births: Final data for 2004. *National Vital Statistics Report*, 55, 1–101.

Miller, K., Yost, B., Flaherty, S., Hillemeier, M. M., Chase, G. A., Weisman, C. S., et al. (2007). Health status, health conditions, and health behaviors among Amish women. Results from the Central Pennsylvania Women's Health Study (CePAWHS). *Womens Health Issues*, 17, 162–171.

Misra, D. P., Guyer, B., & Allston, A. (2003). Integrated perinatal health framework. A multiple determinants model with a life span approach. *American Journal of Preventive Medicine*, 25, 65–75.

Moos, M. K. (2004). Preconceptional health promotion: progress in changing a prevention paradigm. *Journal of Perinatal and Neonatal Nursing*, 18, 2–13.

Pate, R. R., Pratt, M., Blair, S. N., Haskell, W. L., Macera, C. A., & Bouchard, C., (1995). Physical activity and public health. A recommendation from the Centers for Disease Control and Prevention and the American College of Sports Medicine. *JAMA*, 273, 402–407.

Petrou, S. (2003). Economic consequences of preterm birth and low birthweight. *British Journal of Obstetrics and Gynecology*, 110(Suppl 20), 17–23.

RAND. (1998). *Preventing very low birthweight births: a bundle of savings. Research highlights*. Santa Monica, CA: RAND.

Salganicoff, A., Ranji, U. R., & Wyn, R. (2005). *Women and health care: a national profile*. Melona, CA: Kaiser Family foundation.

Singh, G. K., & Yu, S. M. (1995). Infant mortality in the United States: trends, differentials, and projections, 1950 through 2010. *American Journal of Public Health*, 85, 957–964.

Velott, D.L., Baker, S.A., Hillemeier, M.M., & Weisman, C.S. (2008). Participant recruitment to a randomized trial of a community-based behavioral intervention for pre- and interconceptional women: findings from the Central Pennsylvania Women's Health Study (CePAWHS-II). Women's Health Issues 18(3):217–224.

Viadro, C. I., Farris, R. P., & Will, J. C. (2004). The WISEWOMAN projects: Lessons learned from three states. *Journal of Womens Health (Larchmont)*, 13, 529–538.

Weisman, C. S., Hillemeier, M. M., Chase, G. A., Dyer, A. M., Baker, S. A., Feinberg, M., et al. (2006). Preconceptional health: risks of adverse pregnancy outcomes by reproductive life stage in the Central Pennsylvania Women's Health Study (CePAWHS). *Womens Health Issues*, 16, 216–224.

Weisman, C. S., Hillemeier, M. M., Chase, G. A., Misra, D. P., Chuang, C. H., Parrott, R., et al. (2008). Women's perceived control of their birth outcomes in the Central Pennsylvania Women's Health Study: Implications for the use of preconception care. *Womens Health Issues*, 18, 17–25.

Will, J. C., Farris, R. P., Sanders, C. G., Stockmyer, C. K., & Finkelstein, E. A. (2004). Health promotion interventions for disadvantaged women: Overview of the WISEWOMAN projects. *Journal of Womens Health (Larchmont)*, 13, 484–502.

Will, J. C., Massoudi, B., Mokdad, A., Ford, E. S., Rosamond, W., Stoddard, A. M., et al. (2001). Reducing risk for cardiovascular disease in uninsured women: Combined results from two WISEWOMAN projects. *Journal of the American Medical Womens Association*, 56, 161–165.

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WELFARE REFORM AND INSURANCE COVERAGE DURING THE PREGNANCY PERIOD
Implications for Preconception and Interconception Care

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Welfare reform has had far-reaching consequences for unmarried women and their children, including effects on their health insurance status. Those who would be receiving cash assistance absent welfare reform may have lower rates of health insurance if they failed to enroll separately for Medicaid (whose rules did not tighten over this time period), or if the new employment they entered did not provide health insurance. Administrative difficulties involved in accessing Medicaid separately from cash welfare may also have been a factor in the short run. Our research uses data from a large and nationally representative household survey that tracks the same individuals over time, the Survey of Income and Program Participation, to examine the effect of welfare reform (AFDC waivers and TANF implementation) on the health insurance status of unmarried mothers with High School completion or less (the population whose health insurance we expect would be affected by the welfare reform, or the "treatment group") in the time period surrounding a particularly important life event, pregnancy. We look at the effects of these policies over the time period 1990-1999, as well as over the time period 1990-2003, to explore the short run vs. long run impact. Our "control group", those who should not be affected by welfare reform itself but are expected to be affected by other national or state events that are happening contemporaneously, consists of married mothers with High School completion or less; the insurance experience of these women is used to control for the other forces that might otherwise lead us to attribute too little or too large an effect to welfare reform. Given the importance of access to health care at all points in the period surrounding and during pregnancy, we look at how welfare reform has affected insurance status before conception, during pregnancy, and after the birth of the child. We find that the Aid to Families with Dependent Children (AFDC) waivers of the 1990s as well as Temporary Assistance for Needy Families implementation have decreased access to Medicaid health insurance, increased access to employer health insurance, and led to a decrease in overall insurance, depending on the point in pregnancy considered and the time period of the study, with the largest effects found in coverage after the birth of a child. These findings have particular implications for the increasing emphasis on preconception and interconception care as a strategy to improve women's and infant's health.

Introduction and Background

The US health and welfare policies to improve maternal and infant health status have typically focused on the importance of adequate health care during pregnancy. Over the last 2 decades in particular, increasing access to health care during pregnancy has been the major focus of policies related to improving

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pregnancy outcomes (Howell, 2001), including expansions of the Medicaid program, which paid for 41% of all deliveries in the United States in 2002 (Kaiser Family Foundation, 2007a). More recently however, improving access to health insurance both before (preconceptional period) and after pregnancy (interconceptional period) has been gaining increased attention, because it is recognized that improving the health of a woman when she is not pregnant has significant potential to reduce adverse pregnancy outcomes and their associated short- and long-term costs (Johnson et al., 2006).

Having health insurance before pregnancy may be especially important for very low-income women who are at elevated risk for health problems regardless of pregnancy. In particular, uninsured women are less likely to access family planning and to receive sexually transmitted disease and HIV services, and are at increased risk of unintended pregnancies (Kaiser Family Foundation and Alan Guttmacher Institute, 2005). Becoming pregnant with unmanaged health conditions increases the likelihood of health problems during pregnancy, and therefore the likelihood of adverse pregnancy outcomes (Atrash, Johnson, Adams, Cordero, & Hoswe, 2006; Johnson et al., 2006). Moreover, being uninsured before pregnancy may affect the timeliness of a woman's entrance into prenatal care (Egerter, Braveman, & Marchi, 2002; Braveman, Marchi, Sarnoff, Egerter, & Rittenhouse, 2003); women without insurance before pregnancy may delay entry into prenatal care or forgo care altogether.

Welfare reform, brought on by the passage of the Personal Responsibility and Work Opportunity Reconciliation Act of 1996 and similar policies enacted by states during the early 1990s lead to a dramatic decrease in the welfare caseload (Temporary Assistance for Needy Families [TANF] replaced Aid to Families with Dependent Children [AFDC]; US Department of Health and Human Services, 2004). Because of the close historic ties between cash assistance and Medicaid, a number of studies have analyzed how welfare reform has affected the health insurance status of women and children. Studies of women leaving welfare generally find that exiting welfare is associated with large decreases in Medicaid receipt (Acs & Loprest, 2001; Guyer, Broaddus, & Dude, 2002). Two studies based on aggregate Medicaid rolls (Chavkin, Romero, & Wise, 2000; Garrett & Holohan, 2000) also found declines in Medicaid after welfare reform.

Several econometric studies of welfare reform and health insurance status using individual data also have been conducted. Kaestner and Kaushal (2003) found that the decline in caseloads overall lead to an increase in the uninsurance rate of 2%–9% among women and 6%–11% among children; however, the portion of this effect due to welfare reform was estimated to be smaller than the effect due to the improving economy during this time period. Bitler, Gelbach, and Hoynes (2005) examined how welfare reform (AFDC waivers and TANF implementation) affected health insurance status (as well as health care use and health status) among single women and found statistically insignificant effects on insurance status associated with AFDC waivers or TANF for African-American women and for their overall low-educated sample; however, there was a statistically significant negative association between health insurance status and TANF implementation among the sample of single Hispanic women (relative to married Hispanic women). Deleire, Levy, and Levine (2006) found that welfare reform increased the health insurance status of women with less than a high school degree, relative to higher educated women. Cawley, Schroeder, and Simon (2006) examined the effect of welfare reform on health insurance status for mothers and children using longitudinal monthly Survey of Income and Program Participation (SIPP) data from 1993 to 2000 that allowed them to track changes in insurance for the same individuals over time. Cawley et al. (2006) found that the negative impact of welfare reform on women and children in the SIPP was much larger than the estimates from prior studies.

Of particular interest for health care policy for women of reproductive age is whether welfare reform had an impact on the health insurance of low-income pregnant women; this group theoretically should have been protected by the pregnancy-related Medicaid expansions of the late 1980s and early 1990s and by the fact that the very lowest-income women remained eligible for Medicaid even if not receiving cash assistance, if they met the eligibility standards in place for AFDC on July 16, 1996. Even though expansions in Medicaid eligibility rules were not reversed during the period after welfare reform, the changing welfare policy climate, administrative difficulties brought about by the policy changes (Chavkin et al., 2000; Greenstein & Guyer 2001; Hill & Lutzky, 2003), the added marginal cost of enrolling in Medicaid without the automatic enrollment in cash assistance (Currie, 2004), and the economic changes that resulted for those women making the shift from welfare to work may have led many low-income women to become eligible for or to seek Medicaid coverage only during pregnancy rather than during the entire period during which their children are <18 years old. To the extent that new jobs gained by women made then ineligible for Medicaid even during pregnancy (despite the existence of short-term transitional Medicaid that would still be available; Kaiser Commission on Medicaid and the Uninsured, 2002), they may have remained uninsured during pregnancy if the new employment did not provide health benefits, or if there were preexisting conditions clauses for the coverage of a pregnancy that were not met. On the other hand, many of these same conditions may have led to an increase in employer health insurance for this group of women relative to the situation before reform.

Because of the particular nature of pregnancy-related insurance, there are several studies that have focused specifically on the effect of welfare reform on low-income women's insurance status in the prepregnancy and pregnancy/delivery periods. Adams, Gavin, Handler, Manning, and Raskind-Hood, (2003), Adams, Gavin, Manning, and Handler (2005), Handler, Rosenberg, Rankin, Zimbeck, and Adams (2006), and Gavin, Adams, Manning, Raskhind-Hood, and Urato, 2007 used PRAMS data from 8 (2005, 2006, 2007 studies) or 9 states (2003 study) to examine the prepregnancy insurance status and insurance transitions surrounding pregnancy in the periods before and after welfare reform. Adams et al. (2003) demonstrated that the percentage of low-income women uninsured before pregnancy increased in 5 (of the 9) states between 1996 and 1999, with significant increases in South Carolina and Washington. In their second paper, Adams et al. (2005) extended this work (using only 8 states) to a multivariate context and found that for "welfare-eligible" women (women eligible for Medicaid under 1996 welfare-related income levels), the odds of being Medicaid enrolled versus uninsured prepregnancy declined after welfare reform, with an absolute effect of a 7.9-percentage point decline in the probability of welfare-eligible women being insured before pregnancy. In a similar effort focused only on women reporting the receipt of cash assistance during their pregnancy, Handler et al. (2006) found that the prevalence of women in what they term the *Medicaid Gap* (having no prepregnancy coverage despite having Medicaid payment for delivery) increased from 16.1% in 1996 to 36.5% in 1998–2000; the adjusted odds ratio for falling into the *Medicaid Gap* for low-income women on cash assistance during their pregnancy in the 8 states was 4.5 (95% confidence interval, 2.1–9.6).

Together these studies suggest that one of welfare reform's most notable effects associated with pregnancy was decreasing prepregnancy insurance coverage. Importantly, in a subsequent paper, Rosenberg, Handler, Rankin, Zimbeck, and Adams (2007) found that in the period after welfare reform (1998–2000), the likelihood of delaying entry into prenatal care if a woman was in the *Medicaid Gap* was almost 3 times greater than for women not in the *Medicaid Gap*. Likewise, Gavin et al. (2007) found that welfare reform had a significant negative impact on the initiation of prenatal care in the first trimester among women eligible for Medicaid through their eligibility for cash assistance (estimated).

Building on this prior work, the current study makes a number of contributions to the existing literature. First (to the best of the authors' knowledge), there has been no published tabulation of insurance coverage at multiple points surrounding a woman's pregnancy using nationally representative data since information published by the March of Dimes in 1999 (Thorpe, 1999). The SIPP is ideal for this task because it follows the same woman over a long period of time (over the length of a panel, each of which follows a different group of individuals) and, as such, is used for the analysis presented here. Second, there has been no nationally representative econometric study of the effect of welfare reform on the insurance status of women in the period surrounding and during pregnancy. Although the studies using PRAMS demonstrated a decrease in prepregnancy health insurance, these studies did not include a large sample of states, or provide information on insurance coverage during specific time points surrounding pregnancy. A final contribution is the longer time period of the study presented here; given the availability of more recent data, we are able to examine whether some of the impacts that were noticed soon after welfare reform still persist by extending our data horizon to 2003.

Methods

To explore the effect of welfare reform on the health insurance status of women in the months before, during and after pregnancy, this analysis uses data from the 1990–1993, 1996, and 2001 panels of the SIPP, a survey conducted by the US Census Bureau that provides comprehensive information about individuals and households in the United States, including information about topics such as participation in government transfer programs, and health insurance coverage. Relative to surveys used in the prior studies described (Current Population Survey and Behavioral Risk Factor Surveillance System), the SIPP provides health insurance information that is specific to a point in time rather than referring to the previous year in general. The SIPP is also more detailed than the Behavioral Risk Factor Surveillance System in that the SIPP identifies whether a woman is a mother (and thus potentially eligible for welfare as a parent), and records the type of health insurance held (rather than simply recording whether someone is uninsured or not). In addition, SIPP data are available for the periods before and after welfare reform.

In the SIPP, each panel follows the same set of participants continuously for multiple years (typically 2.5 years; 4 years for the 1996 panel only). Interviews are conducted every 4 months, asking monthly information. This is essential for our analysis because this allows us to look at different points in time relative to the birth of the child. Using the longitudinal data within SIPP panels, we identify births to low-income women, and then examine changes in insurance status at different points around the pregnancy in the time periods before and after the implementation of welfare reform policy. Data from 1990 to 1999 are used to examine short-term effects; data from 1990 to 2003 are used to examine long-term effects. SIPP data produce national-level estimates for the US resident population and subgroups.

We use a standard "treatment-comparison group" approach; in this case, our treatment group is unmarried mothers aged 15–45 years with high school completion or less (surrogate for low-income women; Dubay, Joyce, Kaestner, & Kenney, 2001). Our control group is married mothers aged 15–45 years with high school completion or less, a group theoretically not affected by welfare reform because of their expected higher incomes associated with marriage; in addition, recent studies suggest that welfare reform did not significantly affect rates of marriage (Bitler, Gelbach, Hoynes, & Zavodny, 2004; Kaushal & Kaestner, 2001).

The difference in differences approach allows us to control for factors that may have occurred in pregnancy-related health insurance/health insurance markets (be it at the national or state level) for all women during the time period under study, assuming that the experience of the control group reflects these effects as they would be experienced in the treatment group, had welfare reform not happened. We also control for other factors which may affect a woman's pre-pregnancy insurance status. This is similar to the assumptions and methods used in prior econometric studies of the effects of welfare reform on women and children in general; these prior papers provide evidence to support the assumptions made here (Cawley et al., 2006; Kaestner & Kaushal 2003). We also evaluate our results using alternate specifications and assumptions.

We estimate difference-in-differences models of the following form:

$$\begin{aligned} \mathrm{Y}_{ist} &= \alpha + X_{it}\beta + Z_{st}\gamma + P\delta + TREAT_{ist}\varphi \\ &\quad + P_{st} * TREAT_{ist}\lambda + \varepsilon ist \end{aligned}$$

where i indexes people, s states, and t time. Y stands for an indicator variable for insurance status (alternatively, any health insurance, Medicaid, own employer health insurance, and non-group health insurance), specifically, whether a person i has any health insurance coverage at time t (we look at 4 distinct points: 12 months before birth, 7 months before birth,1 month before birth, and 10 months post birth).[1] X represents a set of individual characteristics (education, measured as high school dropout vs. high school completer [to differentiate between the 2 education groups included in a sample of those with high school completion or less], age and age squared [allowing a flexible form for the association between aging and health insurance], race and ethnicity [White, African-American, Hispanic, Asian, and other], and whether the pregnancy is associated with the woman's first child). Because marital status is what separates the treatment from the control group, it is not included in the X vector. In our dataset, a row of data represents 1 woman at a particular point in her pregnancy (e.g., in the regression for 7 months before delivery, 1 row represents a woman's data at the point she is 7 months before delivery).[2] The next item, vector Z, represents a set of state-level characteristics that vary over time, including a measure of Medicaid generosity for pregnancy-related insurance, the real minimum wage in the state, Earned Income Tax Credit generosity, the real benefit standard for cash assistance, the real per capita state income, and the unemployment rate and its 12-month lag (further descriptions and sources are available upon request). Vector P represents a set of variables reflecting welfare policy, specifically, an indicator for whether state s had an AFDC waiver at time t, and an indicator for whether state s had implemented TANF at time t. $TREAT$ is an indicator that equals 1 if the respondent is a member of the treatment group, and equals 0 if the respondent is a member of the control group. The coefficient λ on the interaction term $P*TREAT$ is our difference-in-differences measure of the effect of welfare reform on prepregnancy, pregnancy, and postpartum insurance status. We include fixed effects for state, year, and panel.[3] Other details of the estimation appear in notes under Table 3.

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[1] We have estimated, but do not report for the sake of brevity, the results at all other months in between the ones reported, such as 5 months prebirth.

[2] We calculate the timing before the birth of a child as follows. First, individuals are asked about the dates of birth of children in the household. That means we miss any pregnancies that did not produce live births or where the young child (one under about 2–3 years of age) does not live with the mother. On the other hand, some of the young children we might identify as birth children could be adopted (step or foster children are identified separately in the SIPP) because in pre-1996 panels, adopted children were not separately identified. However, our checks with the later panels suggest there are very few cases of miscoding that may occur in this way. We report results by month of pregnancy rather than by trimester because it involves no assumptions about exact length of gestation. For example, depending on the length of gestation being 10, 9, or 8 months, 7 months before birth could theoretically be the first or the second trimester. Nationally, almost 88% of babies are born at full term (Martin et al., 2007), although this rate is likely lower among women with less education given the inverse association between lack of education and adverse pregnancy outcomes (Kramer, Seguin, Lydon, & Goulet, 2000). Further details of the data creation are available from the authors.

[3] The SIPP does not identify certain small states separately; thus, we are unable to use SIPP data for the following states and time periods: the 1990–1993 panels for Maine, Vermont, Iowa, North Dakota, South Dakota, Alaska, Idaho, Montana, and Wyoming; and the 1996 and 2001 panels for Maine, Vermont, North Dakota, South Dakota, and Wyoming. These states represent a very small fraction of the US population (Maine, Vermont, North Dakota, South Dakota, and Wyoming together account for 1.3% of the US nonelderly population in 2000 based on author calculations using US Census Bureau Population data).

Because the SIPP is not a survey of pregnant women, it is important to determine that the number of pregnancies found in the SIPP survey is representative of the number of pregnancies in the United States nationally. When we use the responses to a SIPP interview from early 2000 (this sample should include information about all individuals who were born in 1999) and produce a weighted frequency of those children with a birth year of 1999, there are 3,842,560.5 births, which is very close to the 3,959,417 infants born in 1999 (Centers for Disease Control and Prevention, 2006), indicating that the SIPP provides a representative sample of the annual number of US births. This provides confidence that the births in the other years are also representative samples of all births in that year as 2000 was picked at random.

Results

We first show data on the insurance coverage of US women during different points relative to the birth of a child, for pregnancies occurring in 1990–2003 (Table 1). Of all women age 15–45 years who gave birth at some point during the SIPP 1990–2001 panels and were observed $\geq$12 months before that, 81.9% were insured 12 months before birth. Women's insurance coverage increased as their pregnancy progressed, and reached a peak at 3 to 1 months before birth. Their health insurance coverage even 10 months after birth was higher than it was a year before birth. The trend is toward increased rather than decreased Medicaid coverage, increased dependent employer coverage, and decreased own employer insurance over the course of the pregnancy–postpartum period, which likely primarily reflects reductions in labor force involvement that have health insurance consequences. The trends are in the same direction but of different magnitudes for women giving birth for the first time (data not shown). For these women, the initial level of "own employer health insurance" is higher, and the initial level of Medicaid coverage is lower. The final level of Medicaid coverage is also lower, presumably reflecting the differences in socioeconomic status between all first time mothers versus all higher birth order mothers. The trends are also similar by panel, although again exact magnitudes vary (data not shown).

Table 2 presents the same insurance information by treatment and control group separately. Treatment group women have insurance levels that are about 7 percentage points lower than control women 12 months before the birth of a child, but this differential shrinks to about 3 percentage points 1 month before birth. However, treatment group women are about 40 percentage points more likely to have Medicaid coverage at this point. In the regressions that follow, we examine employer health insurance through one's own employer as well as any health insurance coverage as 2 separate outcomes.

For the difference in differences estimates for the effect of welfare reform on the insurance status of women in the period surrounding pregnancy, we first generate results for the 1990–1999 time period. The effects are shown at four points relative to the pregnancy, for 2 different types of health insurance (Medicaid, own employer) as well as any health insurance. We show coefficients and standard errors for "Treatwaiver" and "Treattanf" corresponding to P*Treat in our estimation equation. These show the causal impact of AFDC waivers and TANF on insurance status of the treatment group. For example, the coefficients and standard errors for the variable "Treatwaiver" in Table 3 show that there is no statistically significant relationship between AFDC waivers and insurance status at any of the points considered. The coefficients are usually in the direction one might expect (negative effects of welfare reform on Medicaid and positive effects on own employer health insurance), but standard errors are always fairly large leading to no precise statistical relationship.

In contrast with the results for waiver implementation, TANF implementation is associated with statistically significant reductions in Medicaid coverage and increases in employer provided health insurance for multiple points under study. Medicaid reductions

Table 1. Insurance Status: Points Relative to Childbirth, SIPP Panels, 1990–2001, (Data covering pregnancies 1990–2003), US Women 15 to 45 years of Age

	Any Health Insurance	Medicaid	Own Employer Coverage	Dependent Employer Coverage	Nongroup	*n*
12 months before birth	0.819	0.117	0.320	0.332	0.040	7,422
9 months before birth	0.828	0.130	0.314	0.335	0.036	8,605
7 months before birth	0.856	0.172	0.309	0.334	0.035	9,421
6 months before birth	0.874	0.198	0.302	0.336	0.036	9,902
3 months before birth	0.904	0.244	0.284	0.339	0.037	11,475
1 month before birth	0.901	0.253	0.274	0.341	0.037	12,596
1 month post birth	0.898	0.267	0.254	0.345	0.038	13,428
3 months post birth	0.867	0.236	0.236	0.356	0.042	13,280
10 months post birth	0.838	0.206	0.224	0.364	0.039	10,475

Note: Uninsured not shown; complement of any health insurance. Sample weights are used. *Source*: Author calculations from SIPP panels 1990–2001.

Table 2. Insurance Status: Points relative to Childbirth, SIPP Panels, 1990–2001 (Data covering pregnancies 1990–2003), US Women 15 to 45 years of Age

Treatment and Control Groups						
	Any Health Insurance	Medicaid	Own Employer Coverage	Dependent Employer Coverage	Nongroup	*n*
Insurance status: points relative to childbirth						
Control women aged 15–45 (married, high school or less)						
All panels						
12 months before birth	0.750	0.091	0.249	0.360	0.027	1,820
1 month before birth	0.865	0.254	0.216	0.353	0.031	3,609
10 months post birth	0.753	0.153	0.170	0.372	0.035	3,193
Insurance status: points relative to childbirth						
Treatment women aged 15–45 (unmarried, high school or less)						
All panels						
12 months before birth	0.680	0.337	0.162	0.179	0.026	1,704
1 month before birth	0.837	0.634	0.111	0.136	0.016	2,611
10 months post birth	0.784	0.609	0.106	0.088	0.016	2,042

Notes: Sample weights are used.

associated with TANF implementation are statistically significant at every point we consider. There is an increase in employer health insurance in 3 of the periods surrounding pregnancy (7 months before, 1 month before, 10 months after birth; Table 3). For example, 12 months before birth, TANF is associated with a 6.5-percentage-point decrease in Medicaid that is statistically significant, a small nonsignificant positive coefficient on employer health insurance, and a marginally significant negative coefficient on overall coverage. One month before birth, there is a 11.5-percentage-point reduction in Medicaid coverage and a 8.6-percentage-point increase in employer health insurance, both of which are significant, which leads to a statistically insignificant but negative effect on health insurance overall. Ten months after birth there is a 15-percentage-point decrease in Medicaid coverage, an 8-percentage-point increase in employer health insurance, and overall a decrease in any health insurance that is statistically significant.

Next we consider the long vs. short run effects of policy in Table 4. These results use the same model specifications, but the time period is now expanded to include data through 2003. When examining this longer time period, the results for AFDC waivers are in the same direction and of essentially the same magnitude as the results for the shorter time period; again, there are no significant effects. However, the results for TANF show effects that for the most part are not as robust as the short-term results for Medicaid coverage, but show stronger effects for own employer health insurance. For example, at 12 months before birth, there is now a significant increase in own employer health insurance of 7.5 percentage points (relative to a statistically insignificant effect in the short run). At 7 months before birth there is a 9.7-percentage-point increase in own employer health insurance (compared with 7.7 percentage points in the short run). At 1 month before birth, Medicaid drops 7.4 percentage points (relative to 11.5 percentage points in the short run); the effect on own employer health insurance is also larger at this time point than in the short-run results. The exception to this pattern of results is that at 10 months after birth, there are larger effects for Medicaid

Table 3. Difference in Differences Results for the Relationship Between Welfare Reform and Insurance Status of Women 15–45 in the Period Surrounding Pregnancy 1990–1999

Data 1990–1999			*n*
12 months before birth			2,958
	Any health insurance	Medicaid	Own employer
treatwaiver	0.03	0.014	0.013
	[0.042]	[0.031]	[0.028]
treattanf	−0.074*	−0.065**	0.042
	[0.040]	[0.029]	[0.048]
7 months before birth			3805
	Any health insurance	Medicaid	Own employer
treatwaiver	0.002	−0.055	0.033
	[0.034]	[0.039]	[0.027]
treattanf	−0.008	−0.072**	0.077*
	[0.037]	[0.028]	[0.038]
1 month before birth			5188
	Any health insurance	Medicaid	Own employer
treatwaiver	−0.006	−0.002	0
	[0.019]	[0.045]	[0.026]
treattanf	−0.036	−0.115***	0.086**
	[0.033]	[0.035]	[0.034]
10 months post birth			4367
	Any health insurance	Medicaid	Own employer
treatwaiver	0.015	−0.054	0.059
	[0.049]	[0.032]	[0.036]
treattanf	−0.098**	−0.151***	0.080***
	[0.038]	[0.032]	[0.026]

Robust standard errors in brackets

*Significant at 10%; **significant at 5%; ***significant at 1%.

Note: Sample weights are used; standard errors are clustered at the state level. A woman could be in the dataset more than once. For example, if she gives birth twice during the 1996 panel (4 years), each birth is counted as a separate event; the impact of this on standard errors is already accounted for by clustering at the state level.

Table 4. Difference in Differences Results for the Relationship Between Welfare Reform and Insurance Status of Women 15–45 in the Period Surrounding Pregnancy 1990–2003

Data 1990–2003			*n*
12 months before birth			3,524
	Any health insurance	Medicaid	Own employer
Treatwaiver	0.035	0.017	0.014
	[0.043]	[0.032]	[0.028]
Treattanf	−0.012	−0.021	0.075**
	[0.041]	[0.024]	[0.034]
7 months before birth			4552
	Any health insurance	Medicaid	Own employer
treatwaiver	0.005	−0.052	0.032
	[0.033]	[0.039]	[0.027]
treattanf	0.017	−0.038	0.097***
	[0.031]	[0.023]	[0.029]
1 month before birth			6220
	Any health insurance	Medicaid	Own employer
treatwaiver	−0.008	−0.003	0.002
	[0.019]	[0.045]	[0.026]
treattanf	−0.008	−0.074**	0.092***
	[0.026]	[0.032]	[0.026]
10 months post birth			5235
	Any health insurance	Medicaid	Own employer
treatwaiver	0.016	−0.05	0.054
	[0.048]	[0.033]	[0.034]
treattanf	−0.102***	−0.171***	0.078***
	[0.031]	[0.032]	[0.021]

Robust standard errors in brackets.
*Significant at 10%; **significant at 5%; ***significant at 1%.
Note: Sample weights are used; standard errors are clustered at the state level. A woman could be in the dataset more than once. For example, if she gives birth twice during the 1996 panel (4 years), each birth is counted as a separate event; the impact of this on standard errors is already accounted for by clustering at the state level.

and any health insurance, and a slightly smaller effect (7.8 vs. 8 percentage points) for own employer health insurance in the longer term compared with the short-term results.

Specification checks

We estimated alternative (unreported) models to investigate the sensitivity of our results. First, we reestimated the models using data on first births; these mothers may be more socioeconomically advantaged than the cohort experiencing later births and thus not affected as much by welfare reform, or might be more affected if they have less of a previous connection to the labor force. Overall, the results for first births are a little larger than for non-first births for some specifications, possibly supporting the second alternative. Second, we estimated models that did not use a control group. This is to determine the extent to which the results we observe are due to comparisons of changes in insurance experienced by both the control versus treatment groups in the time periods surrounding the welfare reform incidents. In those specifications, the direction of the effects is consistent with the results that included the control groups, although there are substantial differences in the sizes of the coefficients. Depending on whether one believes there is a need for a control group (and whether the control group is adequate), this could be interpreted as indicating smaller effects than those resulting from models that do use a control group. We also reran our models including only women under 100% of the federal poverty level as 1 way to crudely approximate a welfare recipient or a welfare-eligible group using only the treatment group. Women in this group represent those most likely to have remained on welfare and/or to be eligible for Medicaid when nonpregnant owing to very low income. However, there are no statistically significant results for this group, even where we had earlier seen the largest changes in Tables 3 and 4, the period 10 months after birth. In our last 2 robustness checks, we first limited the sample to individuals who report always receiving AFDC or cash welfare; as with the group below 100% of the federal poverty level, we see few significant changes in their insurance status. However, when we limit the sample to those who were on welfare at the start of the SIPP but end their survey data off welfare (welfare leavers), we see a different pattern. Although few of the results are statistically insignificant owing to small sample sizes, the magnitudes of the coefficients are very large and in the expected direction (decreases in Medicaid and increases in own employer health insurance). In other words, those who are most at risk of the effects of welfare reform (those who were on cash assistance and subsequently moved off welfare) seem to be the low-income women most affected, although we note that this specification involves a small sample of welfare leavers.

Discussion

This study uses a nationally representative data set covering 1990–2003 to investigate the effect of welfare reform on the health insurance status of pregnant women. We compared the impact of welfare policy on a group of women expected to be affected (women who are single mothers with high school or less) compared with an otherwise similar group we do not expect to be affected by the policy (married mothers with similar education), and found that there is in general a negative effect of welfare reform on Medicaid coverage and an increase in own employer health insurance in the period surrounding pregnancy. This supports prior evidence that welfare reform increased labor force attachment and also reduced access to Medicaid. Our results depended somewhat on the time period used and whether the analysis focused on the implementation of TANF or the AFDC waivers. When examining the short run (1990–1999), we found larger negative (and significant) effects associated with TANF for Medicaid coverage before pregnancy relative to results using longer run data (1990–2003).

Our findings provide more current and more detailed information on the insurance coverage of women in the period surrounding pregnancy than has been available in the past (work conducted by Thorpe [1999] for the March of Dimes). From the descriptive statistics provided here, it is clear that pregnancy remains a pivotal point for women in terms of obtaining health insurance coverage. However, for women who are eligible for Medicaid coverage, increased coverage during pregnancy is followed by a decrease postpregnancy; this postpregnancy decrease is similar to the experience of women with their own employer coverage (who actually seem to lose coverage throughout the pregnancy period) and distinct from the experience of women with dependent employer coverage who seem to retain the coverage that they gained during pregnancy (Table 1). For the Medicaid population, these findings reflect the fact that although Medicaid now pays for >40% of all US births (and associated immediate postpartum care; Kaiser Family Foundation, 2007a), this coverage often is not available to women in the period before or between pregnancies unless they are extremely low income. Importantly, in the last 15 years, 26 states have adopted family planning waivers that allow Medicaid coverage for family planning and associated services for women not Medicaid eligible for other reasons (Kaiser Family Foundation, 2007b); however, significantly fewer states extend Medicaid funds to cover parents of children eligible for coverage through their Medicaid and State Children's Health Insurance Programs (Kaiser Commission on Medicaid and the Uninsured, 2008). With increasing financial pressures faced by the states associated with economic changes that began earlier in the decade, the shrinkage of the federal budget, and recent legislative and administrative changes in the rules governing Medicaid and State Children's Health Insurance Programs, the ability to sustain expanded coverage for nonpregnant adults is of concern (Kaiser Commission on Medicaid and the Uninsured 2008).

Similar to several prior studies focused on the effects of welfare reform on pregnant women in particular, it seems that welfare reform's most important impact on the health coverage of low-income pregnant women is not during the pregnancy itself. In the current study, the strongest effect of welfare reform for women with Medicaid coverage was on coverage in the months after a pregnancy (15.1% decline in the shorter term analysis, 17.1% decline in the longer term analysis). For policy makers who are increasingly focusing on the health care of nonpregnant women as a strategy to improve the health outcomes of mothers and infants, it is essential to not only consider the period before a first birth (strictest definition of "preconception" care) but the period after a pregnancy, which for many women may become an interconception period. Ensuring women's health in both the preconception and interconception periods requires a life-course approach to the financing of women's health care; the emphasis on coverage during pregnancy, which has been the major public policy strategy for improving pregnancy outcomes over the last 2 decades, although necessary has clearly not been sufficient. Studies of the effect of the Medicaid expansions of the late 1980s and early 1990s on improving pregnancy outcomes have shown equivocal results (Baldwin et al., 1998; Braveman, Bennett, Lewis, Egerter, & Showstack, 1993; Dubay et al., 2001; Haas, Udvarhelyi, Morris, & Epstein, 1993; Howell, 2001; Long and Marquis, 1998; Piper, Ray, & Griffin, 1990; Ray, Mitchel, & Piper, 1997), ushering in the current emphasis on interventions during the preconception and interconception periods. However, understanding the Medicaid expansion policy "failure" requires acknowledging that the Medicaid expansion legislation did not ensure prepregnancy coverage for expansion women or coverage early enough in pregnancy to allow women to reap many of the potential benefits of accessing prenatal care.

The analysis presented herein also examined the experiences of women living in poverty at the time of childbirth—women ever on welfare as well as women who left welfare over the course of a SIPP panel—as a way to determine which group of very low-income women has been most affected by welfare reform. Prior research by Adams et al. (2005) and Gavin et al. (2007) suggests that the effects of welfare reform have been greatest for these welfare-eligible rather than expansion-eligible women. Likewise, Handler et al. (2006) and Rosenberg et al. (2007) suggest that the experience of women who before welfare reform would have been on Medicaid before pregnancy because they were cash assistance recipients has become similar to that of the Medicaid expansion women, those who are only eligible for Medicaid when they are pregnant. In the current analysis, the effect of AFDC waivers/TANF on insurance status, although not statistically significant owing to the small sample size, seemed to be most important for those very low-income women who began their SIPP panel experience as cash assistance recipients but left over time.

Our results on the effect of welfare reform on insurance coverage during, before, and after pregnancy are obtained from a robust research design in which we compare the women at multiple points surrounding a pregnancy using a nationally representative sample. To our knowledge, this is the first published data since 1999 to portray women's insurance coverage at multiple time points surrounding pregnancy. Importantly, because we use data from multiple SIPP panels beginning with the 1990–1993 panel and following through to the 2001 panel, we are able to examine the experiences of women in the pre- and post-welfare reform time periods.

There are several limitations to our study. First, sample size limitations prevented us from analyzing the results by race and ethnicity, which would have provided a national overview of differential rates of insurance in the period surrounding pregnancy for minority women who are at higher rates of adverse pregnancy outcomes (particularly, African Americans and Puerto Ricans) and whether their coverage has been affected by welfare reform. Second, there may be variables that affect insurance coverage that we do not include in our model, such as health status during pregnancy. Unless these omitted variables are correlated with the passage of welfare reform and are different between treatment and control groups, there is no reason to expect that our results are biased. The most significant limitation is the assumptions used in any study that attempts to draw out the causal effect of a policy change such as welfare reform using nonexperimental data. One is that we assume the policy affected women who are single mothers with a high school education or less, whereas married mothers with similar education were not affected. Moreover, we assume that the married women with similar education would be affected by any other state trends in insurance coverage that would have affected the unmarried mothers, absent welfare reform. This is an assumption made in most other econometric papers on welfare reform, but it is nevertheless important to keep in mind, because our robustness checks indicate the magnitude of our results are sensitive to this assumption.

Conclusion

This study demonstrates that pregnant women were not insulated from the negative effects on health insurance of welfare reform in either the short or long run. Although the impact on prepregnancy insurance seems to be less severe in the long run, of interest for further study and discussion are the effects of declines in insurance coverage 10 months after birth, particularly Medicaid coverage, as the interconceptional period gains increased attention as a point of intervention. In particular, as maternal and child health professionals put forth arguments for new health care financing policies such as reimbursement of medical/nursing providers for time spent offering preconception and interconception care, mandating Medicaid coverage for all women at a certain income or below after birth for a period of years, and/or increased private sector coverage of an annual obstetric/gynecologic visit (Atrash et al., 2006; Klerman, 2005), these calls for change must be considered within the context of previous policy changes that may have reduced access to insurance coverage for low-income women around the time of pregnancy.

References

Acs, G., & Loprest, P. (2001). *Final synthesis report of findings from ASPE's 'Leaver' Grants*. Washington, DC: Urban Institute.

Adams, K., Gavin, N., Handler, A., Manning, W., & Raskind-Hood, C. (2003). Transitions in insurance coverage from before pregnancy through delivery in nine states, 1996–1999. *Health Affairs*, 22, 219–229.

Adams, K., Gavin, N., Manning, W., & Handler, A. (2005). Welfare reform, insurance coverage pre-pregnancy, and timely enrollment: An eight-state study. *Inquiry*, 42, 129–144.

Atrash, H., Johnson, K., Adams, M., Cordero, J. F., & Hoswe, J. (2006). Preconception care for improving perinatal outcomes: the time to act. *Maternal and Child Health Journal*, 10, S3–S11.

Baldwin, L. M., Larson, E., Connell, F., Nordlund, D., Cain, K. C., Cawthon, M. L., et al. (1998). The effect of expanding Medicaid prenatal services on birth outcomes. *American Journal of Public Health*, 88, 1623–1629.

Bitler, M. P., Gelbach, J. B., & Hoynes, H. (2005). The impact of welfare reform on health insurance and health outcomes. *Journal of Human Resources*, 40, 309–334.

Bitler, M. P., Gelbach, J. B., Hoynes, H. W., & Zavodny, M. (2004). The impact of welfare reform on marriage and divorce. *Demography*, 41, 213–236.

Braveman, P., Bennett, T., Lewis, C., Egerter, S., & Showstack, J. (1993). Access to prenatal care following major Medicaid eligibility expansions. *Journal of the American Medical Association*, 269, 1285–1289.

Braveman, P., Marchi, K., Sarnoff, R., Egerter, S., & Rittenhouse, D. (2003). Promoting access to prenatal care: Lessons from the California experience. Washington DC: The Henry J. Kaiser Family Foundation. Available at: http://www.kff.org/womenshealth/loader.cfm?url=/commonspot/security/getfile.cfm&PageID=14290.

Cawley, J., Schroeder, M., & Simon, K. (2006). How did welfare reform affect the health insurance coverage of women and children? *Health Services Research*, 41, 486–506.

Centers for Disease Control and Prevention. (2006). Live births, birth rates, and fertility rates, by race: United States, 1909–99. Available at: http://www.cdc.gov/nchs/data/statab/t991x01.pdf. Accessed October 2006.

Chavkin, W., Romero, D., & Wise, P. (2000). State welfare reform policies and declines in health insurance. *American Journal of Public Health*, 90, 900–908.

Currie, J. (2004). The take-up of social benefits. NBER Working Paper #10488 Available at http://www.nber.org/papers/w10488.

Deleire, T., Levine, J., & Levy, H. (2006). Is welfare reform responsible for low-skilled women's declining health insurance coverage in the 1990's? *The Journal of Human Resources*, 41, 495–528.

Dubay, L., Joyce, T., Kaestner, R., & Kenney, G. M. (2001). Changes in prenatal care timing and low birth weight by race and socioeconomic status: Implications for the Medicaid expansions for pregnant women. *Health Services Research*, 36, 373–403.

Egerter, S., Braveman, P., & Marchi, K. (2002). Timing of insurance and use of prenatal care among low-income women. *American Journal of Public Health*, 92, 423–427.

Garrett, B., & Holohan, J. (2000). Health insurance coverage after welfare. *Health Affairs*, 19, 175–184.

Gavin, N., Adams, K., Manning, W., Raskhind-Hood, C., & Urato, M. (2007). The impact of welfare reform on insurance coverage before pregnancy and the timing of prenatal care initiation. *Health Services Research*, 42, 1564–1588.

Greenstein, R., & Guyer, J. (2001). Supporting work through Medicaid and Food Stamps. In R. Blank, & R. Haskins (Eds.), *The New World of Welfare*. Washington, DC: Brookings Institution Press.

Guyer, J., Broaddus, M., & Dude, A. (2002). Millions of mothers lack health insurance coverage in the United States. *International Journal of Health Services*, 32, 89–106.

Handler, A., Rosenberg, D., Rankin, K., Zimbeck, M., & Adams, K. (2006). The effect of welfare reform on the pre-pregnancy insurance status of public aid recipients: Women in the Medicaid GAP. *Journal of Health Care for the Poor and Underserved*, 17, 162–179.

Haas, J., Udvarhelyi, S., Morris, C., & Epstein, M. (1993). The effect of providing health coverage to poor uninsured pregnant women in Massachusetts. *Journal of the American Medical Association*, 269, 87–91.

Hill, I., & Lutzky, A. W. (2003). *Getting in, not getting in, and why: Understanding SCHIP enrollment. Assessing the New Federalism, Occasional Paper #66*. Washington, DC: Urban Institute.

Howell, E. (2001). The impact of the Medicaid expansions for pregnant women: A synthesis of the evidence. *Medical Care Research and Review*, 58, 3–30.

Johnson, K., Posner, S., Bierman, J., Cordero, J., Atrash, H. K., Parker, C. S., et al. (2006). Recommendations to improve preconception health and health care—United States. A report of the CDC/ATSDR Preconception Care Work Group and the Select Panel on Preconception Care. *Morbidity and Mortality Weekly Reports Recommendations and Reports*, 55(RR06), 1–23.

Kaestner, R., & Kaushal, N. (2003). Welfare reform and health insurance families. *Journal of Health Economics*, 22, 959–981.

Kaestner, R., & Kaushal, N. (2001). Immigrant and native responses to welfare reform. NBER Working Paper #8541.

Kaiser Commission on Medicaid and the Uninsured. (2002). Transitional Medical Assistance (TMA): Medicaid issue update. Washington, DC: Kaiser Commission on Medicaid and the Uninsured, The Henry J. Kaiser Family Foundation. Available at: http://www.kff.org/medicaid/loader.cfm?url=/commonspot/security/getfile.cfm&PageID=14130.

Kaiser Commission on Medicaid and the Uninsured. (2008). Health coverage for children and families in Medicaid and SCHIP: State efforts face new hurdles: A 50-state update on eligibility rules, enrollment and renewal procedures, and cost-sharing practices in Medicaid and SCHIP in 2008. Washington, DC: Kaiser Family Foundation. Available at: http://www.kff.org/medicaid/upload/7740.pdf. Accessed February 21, 2008.

Kaiser Family Foundation. (2007a, October). Medicaid's role for women. Issue brief. An update on women's health policy. Available at: http://www.kff.org/womenshealth/upload/7213_03.pdf. Accessed February 14, 2008.

Kaiser Family Foundation. (20007b, October). Medicaid's role in family planning. An update on women's health policy. Available at: http://www.kff.org/womenshealth/upload/7064_03.pdf. Accessed February 21, 2008.

Kaiser Family Foundation and Alan Guttmacher Institute. (2005). Medicaid: A critical source of support for family planning in the United states. Issue Brief KFF/AGI/ New York and Washington, April. 2005.

Klerman, L. (2005, June 21). Interconception care. Presentation to the National Summit on Preconception Care.

Kramer, M., Seguin, L., Lydon, J., & Goulet, L. (2000). Socio-economic disparities in pregnancy outcome: why do the poor fare so poorly? *Paediatric and Perinatal Epidemiology*, 14, 194–210.

Long, S., & Marquis, M. S. (1998). The effects of Florida's Medicaid eligibility expansion for pregnant women. *American Journal of Public Health*, 1998(88), 371–376.

Martin, J., Hamilton, B., Sutton, P., Ventura, S., Menacker, F., Kirmeyer, S., & Munson, M. (2007). *Births: Final data for*, 2005(56), 6.

Piper, J., Ray, W., & Griffin, M. (1990). Effects of Medicaid eligibility expansion on prenatal care and pregnancy outcome in Tennessee. *Journal of the American Medical Association*, 264, 2219–2223.

Ray, W., Mitchel, E., Jr., & Piper, J. (1997). Effect of Medicaid expansions on preterm birth. *American Journal of Preventive Medicine*, 13, 292–297.

Rosenberg, D., Handler, A., Rankin, K., Zimbeck, M., & Adams, K. (2007). Prenatal care initiation among very low-income women in the aftermath of welfare reform: Does pre-pregnancy Medicaid coverage make a difference? *Maternal and Child Health Journal*, 11, 11–17.

Thorpe, K. (1999). *The distribution of health insurance coverage among pregnant women, 1990–1997*. Washington, DC: March of Dimes.

US Department of Health and Human Services. (2004). U.S. Welfare Caseloads Information.'' Available at: http://www.acf.dhhs.gov/news/stats/newstat2.shtml.

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PREVALENCE OF CHRONIC ILLNESS IN PREGNANCY, ACCESS TO CARE, AND HEALTH CARE COSTS

Implications for Interconception Care

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Purpose. **Access to health care after pregnancy is especially important for pregnant women with chronic illness. The purpose of our study was to describe the prevalence of chronic illness in pregnant women and factors affecting the receipt of ongoing care.**

Methods. **We conducted a cross-sectional analysis of 6,294 women between 19 and 45 years of age from the Medical Expenditure Panel Survey (MEPS). Chronic illness was defined using aggregate clinical classification codes in the MEPS. Women were divided into 4 groups: pregnant and currently not pregnant, with and without chronic illness. We analyzed group differences in demographic variables, socioeconomic status, and access to health care. We also estimated inpatient, outpatient, emergency room, and pharmacy expenditures for the 4 study groups. All analyses accounted for the complex survey design of MEPS.**

Main Findings. **Overall, 27% of pregnant women and 39% of nonpregnant women reported a chronic illness. There were no differences in race/ethnicity, poverty, or health insurance status between pregnant women with and without chronic illness. Women with chronic illness were more likely to have a usual source of care. Among pregnant women, the presence of a chronic condition did increase out-of-pocket expenditures, but did not increase total average health care expenditures, even after adjusting for other characteristics.**

Conclusion. **Pregnant women with chronic illness were similar to pregnant women without chronic illness in terms of access to care and total health care costs. Further research is needed to determine whether these similarities persist after delivery, given the relatively high prevalence of women with chronic illness who are of childbearing age.**

Introduction

Recently, increasing attention has been given to the importance of health care before or between pregnancies—termed "preconception" or "interconception" care—and the role of such care in improving pregnancy and birth outcomes (American College of Obstetricians and Gynecologists 2005; Atrash, Johnson, Adams, Cordero, & Howse, 2006; Johnson et al., 2006; Lu et al., 2006; Posner, Johnson, Parker, Atrash, & Biermann, 2006). Preconception guidelines developed by the Centers for Disease Control and Prevention emphasize management, before pregnancy, of chronic illnesses with adverse effects on perinatal outcomes. Subsequently, recommendations for preconception or interconception care include broaden-

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ing access to health care for women of childbearing age (Johnson et al., 2006). One facet of such a strategy is continuing care for pregnant women with a chronic illness beyond the postpartum period (Misra, Grason, & Weisman, 2000). Ongoing care may ameliorate the impact of chronic illness on future pregnancies in addition to contributing to women's health. Little is known, however, about the prevalence of chronic illness in pregnant women or how many women with chronic illness have access to care after delivery—either through a continuous source of insurance or a regular provider of health care. It is also not known how much chronic illness adds to health care costs in women of childbearing age.

Pregnant women with a chronic illness may be at increased risk of not receiving needed interconception or internatal care. Diabetes, for example, is a chronic condition 1) associated with poor obstetric and neonatal outcomes that can be prevented by adequate health care before pregnancy (Fuhrmann et al., 1983; Kitzmiller et al., 1991; Mills et al., 1988) and 2) found disproportionately in minorities (National Institute of Diabetes and Digestive and Kidney Diseases, 2005). Minority women are more likely to be publicly insured, uninsured, or lack a usual source of care in comparison with white women (Altman & Taylor, 2001). Public insurance programs such as Medicaid, which require renewal, can further increase the risk of periods of no insurance coverage (Summer & Mann, 2006). Subsequently, minority women may be at increased risk of not receiving care for potentially harmful perinatal conditions during the interconception period.

The purpose of our study was to describe factors associated with chronic illness in pregnancy that could decrease the likelihood of receiving interconception care. We presumed that both chronic illness and decreased access to care during pregnancy would persist postpartum and could be expected to characterize the interpartum as well as perinatal time periods. Using a nationally representative study of households, the Medical Expenditure Panel Survey (MEPS), we extracted information on chronic conditions, sociodemographic variables, insurance status, regular source of care, medical costs, and payer source for pregnant and nonpregnant women, with and without chronic illness.

Our first aim was to describe the prevalence of chronic illness in pregnant women. We examined both physical and mental health conditions common among women in the United States. Our second aim was to describe sociodemographic and health care access differences between pregnant women with and without chronic illness. Our third aim was to describe differences in health care costs between these 2 groups. We used nonpregnant women (with and without chronic illness) for comparison in each analysis, because there is no baseline information on either prevalence of chronic illness or health care costs in this population of relatively young women of childbearing age.

Methods

Data

Data are from the household component of the 2004 MEPS, an annual nationally representative survey of households representative of the U.S. noninstitutionalized civilian population. MEPS contains information on medical conditions, health service utilization, health status, access to care, and charges and source of medical payments (MEPS, 2006). Details regarding MEPS and the rationale and construction of the MEPS survey can be found online at http://www.meps.ahrq.gov/mepsweb/.

Sample

Our sample was drawn from the 2004 Household Component of the MEPS survey. We defined women as being of childbearing age, between 19 and 45 years (N = 6,294). We excluded women <19 years old because we presumed that the risk of chronic illness in this group would be relatively low and that women <19 could have differential access to care (versus older women) through pediatric health insurance programs.

Identification of Pregnancy and Chronic Illness: Creation of Study Groups

In our study we used both 3-digit *International Classification of Diseases—9th edition—Clinical Modification* (ICD-9-CM) and aggregate clinical classification codes provided in the medical care event files in MEPS to identify presence of any chronic illness and pregnancy. Pregnancy was broadly defined using codes for pregnancy, delivery, or any pregnancy or delivery-related condition (i.e., "forceps delivery" or "twin gestation").

The chronic illness categories were selected based on chronic conditions that are prevalent among women in the United States, conditions that may affect perinatal health, and MEPS "priority conditions," for 2004. The latter conditions are chosen based on their prevalence, expense, and relevance to policy. The list of priority conditions includes long-term "life-threatening" conditions such as cancer or diabetes; "chronic manageable" conditions such as asthma or arthritis; and mental health conditions such as mood disorders (MEPS HC-087, 2006). We used all MEPS 2004 priority conditions with the exception of gallbladder disease and back problems.

We also reviewed published data from 2 other national surveys (Misra et al., 2000; Salganicoff, Ranji,

& Wyn, 2005) to derive the most common chronic conditions among women. With the exception of headache and allergy-related conditions, the MEPS priority conditions represented the most common chronic conditions in US women. We additionally included chronic conditions such as dementia, cerebrovascular accident (CVA), and osteoporosis to ensure that our comparison group of nonpregnant women with chronic illness did not have a disease profile that was markedly different from pregnant women. Finally, we added 5 conditions that had particular relevance for interconception care and perinatal outcomes. These were thyroid disorders, human immunodeficiency virus (HIV) disease, schizophrenia, substance abuse, and anxiety disorders. The resulting list of physical and mental conditions that we included to define "chronic illness" were asthma, arthritis, cancer (all cancer categories), chronic obstructive pulmonary disease (COPD; includes bronchiectasis and emphysema), CVA, diabetes, heart disease (includes valvular and congenital conditions, coronary artery disease, and ischemia), HIV infection, hypertension, osteoporosis, thyroid disorders, anxiety, dementia, mood disorders (depression and bipolar disorders), schizophrenia, and substance abuse disorders.

Based on the presence of pregnancy and chronic illness, we created 4 study groups: 1) pregnant women with a chronic condition; 2) pregnant women without a chronic condition; 3) nonpregnant women with a chronic condition; and 4) nonpregnant women without a chronic condition.

Dependent Variables: Health Care Expenditures

Total and Type of Expenditures. We created variables for 1) type of expenditure and 2) total 2004 annual expenditures for each individual. The MEPS expenditure categories we included in this study were inpatient, outpatient, pharmacy, emergency room, and "other" (e.g., dental care and vision services).

Out-of-pocket Expenditures. MEPS also reports expenditures that were spent by an individual or family on behalf of the individual for health care services. We refer to this spending as out-of-pocket (OOP) expenditures. Our measure of OOP expenditures did not include expenditures for health care insurance premiums.

Out-of-pocket Expenditures Burden. At the individual level, we also measured the burden of OOP expenditures as percent of income spent OOP on health care services. This variable ranged from 0% to 100%. For those who reported zero income and positive expenditures, OOP burden was top-coded at 100%. Similarly, for those with OOP spending exceeding income, OOP burden was top-coded at 100% (Crystal, Johnson, Harman, Sambamoorthi, & Kumar, 2000).

Independent Variables

Source of Care. We categorized the MEPS source of care variables as 1) care by a primary care physician; 2) care by a non–primary care physician; 3) care by non-physician provider (other); and 4) no usual source of care.

Other Independent Variables. These consisted of race/ethnicity, age, marital status, region of residence, education, employment status, poverty status, health insurance, and perceived mental and physical health status.

Statistical Techniques

To examine the bivariate group differences in the presence of chronic illness among pregnant women and among all 4 study groups, chi-square tests were used. Multinomial logistic regression on the odds of belonging to 1 of the 3 groups compared with the reference group (pregnant women without chronic illness) was performed to examine group differences in sociodemographic variables and access to care. Parameter estimates from logistic regressions were converted to odds ratios and 95% confidence intervals for these adjusted odds ratios (AOR) are presented for ease of interpretation. To examine health care costs, bivariate group differences in average, total, and OOP expenditures among groups were tested with the *t* statistic. Again, among the 4 study groups, 3 groups were compared with the reference group (pregnant women without chronic illness). Ordinary least-squares regressions were used to test subgroup differences in annual, total, and components OOP expenditures. For analysis related to expenditures (except OOP spending burden), expenditures were transformed to a logarithmic scale to reduce skewness. Effect estimates for continuous independent variables on the log of annual expenditures can be interpreted as percentage change for each unit of change in the independent variable. The effect of dummy variables in terms of percentage of expenditures can be estimated by exponentiating the regression coefficients of dummy variables and subtracting 1 (i.e., percent change $= e^{\beta} - 1$; Halvorsen & Palmquist, 1980).

MEPS has a complex sample design, with strata and weights provided for calculation of national estimates. For the present study, all analyses were conducted in SUDAAN 8.0 to appropriately handle study weights and clustering (Shah, Barnwell, & Bieler, 1996).

Table 1. Prevalence of Chronic Illness in Study Sample (N = 6,294): Medical Expenditure Panel Survey, 2004*

Sample	Nonpregnant Women		Pregnant Women	
	n	wt %	*n*	wt %
	5.439	100	855	100
Any chronic condition	2,055	39.1	215	26.6
Mood disorder	678	12.3	74	9.8
Anxiety**	478	9.5	47	5.9
Arthritis***	339	6.3	22	3.0
Hypertension***	344	5.7	24	2.4
Asthma	260	5.0	32	4.5
Thyroid disorder**	229	4.6	17	2.2
Chronic obstructive pulmonary disease†	202	4.0	21	3.4
Heart disease‡	197	3.6	21	3.0
Diabetes**	180	3.0	18	1.5
Cancer	141	2.7	12	1.8
Substance abuse	22	0.5	2	0.3
Osteoporosis***	16	0.3	0	0.0
CVA§**	15	0.2	0	0.0
Schizophrenia	11	0.1	2	0.1
HIV infection**	12	0.1	0	0.0
Dementia	2	0	0	0.0

Note. Table shows actual sample size but weighted percentages. The percentages may not add up to the percent with any chronic illness because the categories are not mutually exclusive.

***p <.001; **.001 < p < .01; *.01 < p <.05.

†Chronic obstructive lung disease includes self-reported diagnoses of emphysema and bronchiectasis.

‡Includes valvular and congenital conditions, coronary artery disease and ischemia.

§History of cerebrovascular accident.

Results

Prevalence of Chronic Conditions

The study sample consisted of 6,294 women ages 19–45. Although the number of pregnant women with chronic illness was relatively small in our study (n = 215), 26.6% of all pregnant women reported a chronic illness (vs. 39.1% of nonpregnant women). For all chronic conditions, the prevalence among pregnant women was lower than in nonpregnant women (Table 1). However, prevalence was only significantly lower (p < .05) for anxiety, hypertension, arthritis, thyroid disorder, diabetes, osteoporosis, CVA, and HIV infection. There were no significant differences among pregnant and nonpregnant women in the prevalence of mood disorder, asthma, chronic lung or heart disease, cancer, substance abuse, schizophrenia, or dementia.

Among chronic physical conditions in nonpregnant women, arthritis was the most prevalent, using weighted percentages (6.3%), followed by hypertension (5.7%), asthma (5.0%), and thyroid disorder (4.6%). In pregnant women, the most common physical condition was asthma (4.5%), followed by COPD (3.4%), arthritis (3.0%), and heart disease (3.0%). Mental illness was more common than physical illness in both groups—the prevalence of any mood disorder was 12.3% in nonpregnant women and 9.8% in pregnant women. The prevalence of anxiety was 9.5% in nonpregnant women and 5.9% in pregnant women. We found only a small percentage of women (both pregnant and not pregnant) reporting diagnoses of osteoporosis, HIV disease, or dementia.

Differences in Demographics and Access To Care

Table 2 describes the characteristics of the study sample by the 4 groups of women with and without pregnancy and with and without chronic illness. In the entire sample, 13.3% of women were pregnant. All variables were significant in chi-square analysis, at the 5% level, with the exception of education, region, or likelihood of living in a metropolitan area.

Using multinomial regression (Table 3), we compared the pregnant with no chronic illness group with the other groups of women. We did not observe any significant differences in socioeconomic characteristics between pregnant women with and without chronic illness, except age and marital status. Pregnant women with chronic illness were more likely to be older (age 35–45) than younger (age 19–24; AOR, 2.31; 95% confidence interval [CI], 1.17–4.57) and less likely to be married than pregnant women without a chronic illness (AOR, .52; 95% CI, .30–.91). There were no differences in education, employment status, poverty status, or health insurance between the 2 groups. However, pregnant women with chronic conditions were significantly less likely to have no usual source of care (AOR, 0.50; 95% CI, 0.28–0.90).

Nonpregnant women (with and without chronic illness) were significantly older than pregnant women and less likely to be covered by public insurance. Nonpregnant women without a chronic illness were significantly more likely to be uninsured (AOR, 3.06; 95% CI, 1.85–5.06).

Health Care Expenditures

The top panel of Table 4 reports average, total, and type of expenditures (inpatient, outpatient, prescription drugs, emergency room, and other). The comparison group for average expenditures was pregnant women without chronic illness. Average total expenditures were not significantly different among pregnant women with and without chronic illness ($5,180 vs. $5,914). There were no significant differences in inpatient, emergency, or other medical costs between the 2 groups. However, outpatient and prescription drug expenditures were higher for pregnant women with chronic illness ($2,189 for outpatient vs. $706 for prescription drug expenditures) compared with pregnant women without chronic illness ($1,433 outpatient, $242 prescription drug expenditures). These results remained unchanged even after controlling for all MEPS covariates, including poverty, insurance status, smoking, and exercise (bottom panel of Table 4).

Table 2. Profile of Women in the Age Group 19–45 Years By Pregnancy and Chronic Illness: Medical Expenditure Panel Survey, 2004

	Not Pregnant No Chronic Illness		Not Pregnant Chronic Illness		Pregnant No Chronic Illness		Pregnant Chronic Illness	
	n	wt %	*n*	wt %	*n*	wt %	*n*	wt %
All	3,384	52.8	2,055	33.9	640	9.8	215	3.5
Age								
19–24	779	58.6	287	24.8	207	12.7	59	3.9
25–29	633	56.3	267	22.6	171	15.3	64	5.7
30–34	641	51.3	349	29.0	164	14.9	50	4.7
35–45	1,331	49.2	1,152	45.2	98	3.7	42	1.9
Race/ethnicity								
White	1,411	49.1	1,177	37.9	272	9.2	113	3.7
African American	579	57.8	322	29.7	90	9.1	35	3.4
Latino	1,116	58.1	437	25.8	235	12.4	60	3.6
Other	278	63.9	119	24.3	43	9.9	7	1.9
Marital status								
Married	1,681	50.1	977	31.9	428	13.6	133	4.4
Widowed	29	48.1	24	46.0	1	3.6	1	2.3
Divorced/separated	376	42.1	402	50.6	39	4.6	21	2.7
Never married	1,298	60.8	652	31.1	172	5.6	60	2.5
Metro								
Metro	2,848	53.4	1,670	33.2	544	9.8	183	3.6
Nonmetro	535	49.7	385	37.5	96	9.4	32	3.4
Region								
Northeast	471	53.7	328	32.9	92	10.3	30	3.1
Midwest	580	50.5	433	36.3	123	9.3	45	3.8
South	1,418	54.2	813	33.7	232	8.8	83	3.3
West	914	52.2	481	32.6	193	11.2	57	4.0
Education								
Less than high school	828	51.3	463	32.8	212	11.5	60	4.5
High school	1,083	52.5	659	35.2	170	8.6	72	3.8
Above high school	1,460	53.4	928	33.6	254	9.9	83	3.1
Employed								
Yes	2,504	53.6	1,498	34.6	383	8.6	136	3.1
No	878	49.8	557	31.4	257	13.7	79	5.1
Poverty status								
Poor	712	45.3	477	37.1	186	12.4	62	5.3
Near poor	901	54.5	479	31.4	174	10.5	51	3.6
Middle income	955	53.2	593	34.7	147	8.9	53	3.1
High income	816	54.7	506	33.1	133	9.0	49	3.2
Health insurance								
Private	1,974	52.0	1,287	34.8	357	9.7	126	3.5
Public	433	36.8	450	40.6	205	16.5	74	6.1
Uninsured	977	69.2	318	24.2	78	4.9	15	1.7
Usual source of care								
PCP	849	48.8	686	38.8	160	8.9	63	3.6
Non-PCP	26	35.7	33	51.2	4	5.1	5	8.0
Other	1,332	49.8	966	36.2	290	9.9	105	4.0
No USC	1,134	63.3	360	23.2	183	11.2	41	2.4
Perceived health								
Excellent/very good	2,224	60.2	888	26.1	413	10.8	107	2.9
Good	959	44.6	733	42.2	191	9.0	74	4.2
Fair/poor	201	25.3	434	64.0	36	4.5	34	6.1
Mental health								
Excellent/very good	2,497	58.8	1,091	27.4	474	10.8	120	3.0
Good	799	43.8	684	44.5	147	8.1	64	3.6
Fair/poor	88	19.0	280	67.6	19	4.3	31	9.1

Note. Based on 6,294 women aged between 19 and 45 years and alive as of the end of 2004. All variables except education, metro, and region were significant at the 5% level based on chi-square test statistic.

Table 3. Adjusted Odds Ratios (AOR) and 95% Confidence Interval From Multinomial Regression on Pregnancy and Chronic Illness Categories: Medical Expenditure Panel Survey, 2004

	Not Pregnant No Chronic Illness			Not Pregnant Chronic Illness			Pregnant Chronic Illness		
	AOR	95% CI	Sig	AOR	95% CI	Sig	AOR	95% CI	Sig
Age									
19–24									
25–29	1.38	1.00–1.91	*	1.42	0.97–2.08		1.70	0.89–3.25	
30–34	1.63	1.16–2.29	**	2.31	1.57–3.42	***	1.43	0.75–2.75	
35–45	7.21	4.88–10.6	***	15.58	10.1–23.9	***	2.31	1.17–4.57	*
Race/ethnicity									
White									
African American	0.97	0.64–1.47		0.54	0.35–0.82	**	0.66	0.29–1.47	
Latino	0.98	0.71–1.34		0.69	0.48–0.99	*	0.78	0.44–1.37	
Other	1.31	0.83–2.05		0.63	0.40–0.99	*	0.44	0.17–1.17	
Marital status									
Married	0.17	0.13–0.23	***	0.13	0.09–0.19	***	0.52	0.30–0.91	*
Other									
Metro									
Metro									
Nonmetro	1.04	0.72–1.51		1.12	0.74–1.71		0.88	0.44–1.79	
Region									
Northeast									
Midwest	1.09	0.74–1.61		1.23	0.83–1.83		1.48	0.80–2.75	
South	1.39	0.93–2.10		1.70	1.13–2.56	*	1.47	0.74–2.90	
West	0.95	0.65–1.39		1.18	0.77–1.80		1.59	0.81–3.10	
Education									
Less than high school	1.14	0.81–1.61		1.00	0.69–1.45		1.19	0.65–2.20	
High school	1.23	0.91–1.66		1.08	0.80–1.44		1.30	0.81–2.08	
Above high school									
Employed									
Yes	1.30	0.98–1.72		1.60	1.18–2.18	**	1.03	0.65–1.65	
No									
Poverty status									
Poor	0.49	0.31–0.78	**	0.63	0.38–1.03		1.05	0.55–2.01	
Near poor	0.73	0.52–1.03		0.73	0.50–1.08		0.86	0.45–1.64	
Middle income	0.90	0.65–1.26		1.00	0.69–1.44		0.93	0.53–1.65	
High income									
Health insurance									
Private									
Public	0.44	0.29–0.67	***	0.58	0.40–0.85	**	0.66	0.37–1.16	
Uninsured	3.06	1.85–5.06	***	1.63	0.97–2.75		0.88	0.33–2.36	
Usual source of care									
PCP	1.03	0.74–1.42		1.11	0.81–1.53		0.95	0.57–1.60	
Other									
No USC	0.96	0.70–1.30		0.59	0.42–0.82	**	0.50	0.28–0.90	*
Perceived health									
Excellent/very good									
Good	0.92	0.66–1.29		1.64	1.17–2.29	**	1.47	0.80–2.70	
Fair/poor	1.06	0.57–1.98		4.10	2.30–7.30	***	3.15	1.34–7.39	**
Mental health									
Excellent/very good									
Good	1.03	0.72–1.46		1.54	1.05–2.26	*	1.16	0.61–2.19	
Fair/poor	0.91	0.43–1.96		3.38	1.59–7.16	**	4.64	1.60–13.4	**

Note. Based on 6,294 women aged between 19 and 45 years and alive as of the end of 2004. Asterisks denote significant group differences compared to the reference group based on multinomial logistic regression on the presence of chronic illness and pregnancy. The regression also includes an intercept term. The reference group for the dependent variable is "Pregnant with no chronic illness."
***$p < .001$; **$.001 < p < .01$; *$.01 < p < .05$.

Unadjusted OOP expenditures and OOP expenditures as a percentage of income did not differ significantly between the 2 groups of pregnant women. The average OOP spending for health care was $697 for pregnant women with a chronic illness compared with $598 for pregnant women without a chronic illness. In the adjusted analysis, OOP spending was significantly higher among pregnant women with chronic illness versus those without, but spending as percent of income was not significantly different between the 2 groups. In both groups of pregnant women, OOP expenditures as a percentage of in-

Table 4. Average Total, Type, and Out-of-Pocket Expenditures and Out-of-Pocket Spending and Adjusted Parameter Estimates From Separate Ordinary Least-Squares Regressions on Total, Type of Expenditures, Out-of-Pocket Expenditures, and Out-of-Pocket Spending Burden: Medical Expenditure Panel Survey, 2004

	Sample Size with Positive Dollars and Average Dollars Among Those with Positive Dollars by Pregnancy Categories										
	Not Pregnant No Chronic Illness			Not Pregnant Chronic Illness			Pregnant No Chronic		Pregnant Chronic Illness		
	n	Mean	Sig	*n*	Mean	Sig	*n*	Mean	*n*	Mean	Sig
Expenditures											
Total	2,393	1,446	***	1,946	4,288		618	5,180	215	5,914	
Inpatient	72	9,769	*	173	8,838	*	322	6,336	102	6,628	
Outpatient	1,823	706	***	1,727	1,690	†	591	1,433	209	2,189	**
Prescription drugs	1,554	331	†	1,783	1,070	***	465	242	193	706	***
Emergency room	293	791		407	890		142	846	78	632	
Other	1,426	472		1,123	1,380		248	469	115	503	
Out-of-pocket											
Spending	2,150	421	***	1,876	883	***	537	598	197	697	
Percent income	2,150	13.01	***	1,876	15.45	*	537	20.63	197	20.38	
Adjusted parameter estimates from ordinary least squares regressions											
	Beta	SE	Sig	Beta	SE	Sig			Beta	SE	Sig
Expenditures											
Total	−2.38	0.14	***	−0.74	0.13	***	Reference group		0.16	0.17	
Inpatient	−4.05	0.3	***	−3.65	0.32	***	Reference group		−1.12	0.57	
Outpatient	−2.71	0.14	***	−1.00	0.15	***	Reference group		0.52	0.17	**
Prescription Drugs	−0.37	0.18	*	2.13	0.17	***	Reference group		1.8	0.27	***
Emergency Room	−0.47	0.16	**	−0.05	0.20		Reference group		0.54	0.29	
Other	0.46	0.23		0.84	0.25	**	Reference group		0.68	0.32	*
Out-of-pocket											
Spending	−0.69	0.14	***	0.43	0.14	**	Reference group		0.56	0.18	**
Percent income	−3.56	2.01		1.44	2.00		Reference group		2.73	3.05	

***$p < .001$; **$.001 < p < .01$; *$.01 < p < .05$; †$.05 < p < .1$.

come were higher than in the 2 groups of nonpregnant women.

Nonpregnant women with chronic illness were not significantly different from pregnant women with chronic illness in terms of total, emergency room, and other expenditures. In the adjusted analysis, however, nonpregnant women with chronic illness had lower inpatient, outpatient, and total expenditures than pregnant women with chronic illness, but greater prescription drug expenditures.

Discussion

To our knowledge, this is the first study using a national database to describe the prevalence of chronic illness in pregnant women and its relationship to health care access and expenditures. Although we found that the prevalence of chronic illness overall was lower in pregnant women than in nonpregnant women age 19–45 years, the differences in prevalence rates were very narrow, suggesting that chronic illness is not uncommon in pregnancy. We did not find that the presence of chronic illness in this age group was associated with either decreased access to care or significantly higher health care costs.

Our results, although somewhat consistent with existing literature, are not directly comparable with prior studies of chronic illness in the interconception period, which have used a variety of distinct methodologies to estimate prevalence. For example, in the Central Pennsylvania Women's Health Study, Weisman et al. (2006) found 11% of a study sample age 18–45 had a diagnosis of hypertension in the last 5 years and 28% had a diagnosis of depression or anxiety. This pattern is consistent with our study, in that we also found a greater number of women reporting mental versus physical conditions.

Among women in our sample, the prevalence of mood disorders was especially striking. More than 12% of nonpregnant women and 9.8% of pregnant women reported a mood disorder—the highest of any chronic illness. The MEPS category for mood disorders contains ICD-9-CM codes for both depression and bipolar disease. In a study of MEPS data from 2000, Harman, Edlund, and Fortney (2004) found that the majority of respondents in this category had an ICD-9-CM code for depression ("311") rather than other disorders.

Subsequently, the overall percentage of depression in our sample is consistent with prior studies of primary care and prenatal populations (Dietz et al., 2007; Gaynes et al., 2005). The prevalence of depression in relation to the other study disorders, however, is concerning, because depression is a possible risk factor for preterm birth (Conway & Kennedy, 2004; Orr, James, & Prince, 2002), and has been linked to nicotine dependence in pregnancy (Goodwin & Simuro, 2007). Depression during pregnancy is also linked to postpartum depression and depression in future pregnancies. Moreover, ongoing maternal depression and anxiety have significant effects on child and family well-being (Murray, Fiori-Cowley, Hooper, & Cooper, 1996; Stowe & Nemeroff, 1995).

With regard to the demographic and health care access differences between pregnant women with and without chronic illness, we found few differences between these 2 groups. Perceived health and perceived mental health did differ between women with and without chronic illness, with lower perceived health corresponding, as expected, to the presence of chronic disease. We also found that pregnant women with a chronic illness were more likely to have a usual source of care, which was reassuring.

Overall, our findings suggest that chronic illness in pregnancy may not be associated with decreased access to care. It is not clear though, for women funded by public insurance plans, whether access to care during pregnancy can be equated with access before and after pregnancy. For example, a study of data reported from 8 states using the Pregnancy Risk Assessment Monitoring System found that 50%–69% of women with Medicaid at delivery were uninsured before pregnancy (Adams et al., 2003). An earlier study of Medicaid data in California also found that up to 50% of women delivering with Medicaid were uninsured before pregnancy (Egerter, Braveman, & Marchi, 2002). Our findings show a similar pattern. The percentage of women using private insurance was relatively consistent across all 4 groups. In both pregnant groups, the percentage of public insurance coverage was higher, possibly representing cross-over during pregnancy from uninsured to publicly insured status. Further studies are needed to document the proportion of pregnant women with chronic illness who lose publicly funded insurance after pregnancy. Moreover, in our analysis, these women were less likely to be married than pregnant women without chronic illness, and after pregnancy, may be less likely to have access to insurance through a spouse.

A significant number of women of childbearing age in our study were uninsured. Moreover, 24% of uninsured women and 23% of women without a usual source of care had a chronic illness. Public policy trends, such as the expansion of Medicaid eligibility for pregnant women, although limiting eligibility for young women who are not pregnant or disabled, may be especially problematic for the delivery of preconception health care to women with chronic illnesses The continued bias toward coverage of pregnant women, to the exclusion of low-income women with chronic illness who could potentially become pregnant, may not lead to the cost-effective pregnancy outcomes for which public coverage for maternity care is currently mandated (Hughes & Runyan, 1995).

Privately insured women may have a separate set of risks limiting access to care in the interconception period, in the form of OOP expenditures. Although total expenditures were not different, pregnant women with chronic illness spent more on OOP expenditures than pregnant women without chronic illness. We saw a similar pattern in nonpregnant women with chronic illness in whom total expenditures were lower than in pregnant women with chronic illness, but OOP spending was higher. Prior analysis has shown that privately insured women have higher OOP expenses during pregnancy than women covered by public programs (Machlin & Rohde, 2007). Despite health care coverage, the presence of a chronic illness may create an additional financial burden on families, especially those families relying on private insurance, who comprised the majority of respondents in MEPS.

Further research is needed to clarify reasons for higher OOP spending in women with chronic illness, which may be related to a lack of comprehensive insurance coverage for expenses such as prescription drugs. It is currently not clear what the sources of OOP spending are for pregnant women. Previous studies of health care costs in pregnancy have analyzed only those costs related to “standard” prenatal care and excluded complicated pregnancies or medication related to conditions such as hypertension (Machlin & Rohde, 2007). Further research is needed on the types of health care expenses born by women with chronic illness in private versus public plans, while taking into account state variations in coverage for maternity care.

As in the analysis of access to care variables, our cost analysis also demonstrated few differences between pregnant women with and without a chronic illness. A noteworthy finding is that the average total expenditures and inpatient expenditures were not significantly different between the 2 groups. Additionally, we found that nonpregnant women with chronic illness had lower total, inpatient, and outpatient expenditures compared with pregnant women with chronic illness, although pharmacy and other medical expenditures were higher. This was an expected finding, given the relatively high hospital costs associated with delivery of a child (Machlin & Rohde, 2007).

There are several limitations to our analysis. First, to obtain a sufficient number of women for our sample we grouped a diverse set of chronic illnesses with widely varying effects on maternal health and future pregnancies. Moreover, we did not include all chronic illnesses in our study; we excluded chronic neurologic, renal, hematologic, and liver diseases. Rather than compile a list of all conditions that could adversely affect pregnancy, we used only common conditions that we thought would be relevant to an initial descriptive study. Second, women reporting a diagnosis of a chronic illness, will, at some point, have received sufficient health care for a diagnosis to be made, making chronic illness a marker for receipt of health care. Women who do not have regular health care or access to a regular provider may not be receiving these diagnoses. Third, our data were cross-sectional, capturing women at various points in their pregnancy. Therefore, we may have underestimated some costs associated with delivery. Finally, nonpregnant women are a diverse group—including women who are recently postpartum, have never been pregnant, or may not become pregnant.

Despite these limitations, our findings have significance in the context of priorities to provide preconception and interconception care, especially for high-risk women. We found that chronic illnesses are relatively common in pregnancy and in childbearing women in general. This is important given the widely held assumption that pregnant women are relatively young, healthy, and have pregnancy-limited problems that can be resolved during the prenatal time period only. Because we found few significant cost differences between pregnant women with and without chronic illness, it is interesting to speculate that extension of regular insurance coverage to women postpartum could be a potentially reasonable and cost-effective solution to preventing complications in future pregnancies. However, further studies are needed to examine the association between interconception health care access and pregnancy outcomes in women with chronic conditions.

In the United States, increased age at first pregnancy, increasing ethnic diversity, and a changing pattern of illness (Strobino, Grason, & Minkovitz, 2002) all demand an emphasis on the appropriate internatal care of chronic illness. Moreover, many studies emphasizing the importance of women's health before childbearing, including the persistent intergenerational effect of low birth weight, lend greater importance to a life-course model of health for women versus a more narrow focus on prenatal health and prenatal health care utilization (Halfon & Hochstein, 2002; Lu & Halfon, 2003; Misra, Guyer, & Allston, 2003). Focusing on the health of women with chronic illness throughout their lives, versus during pregnancy only, allows us to combine the goals of maternal child health and women's health in a way that benefits both women and their families.

References

Adams, E. K., Gavin, N. I., Handler, A., Manning, W., & Raskind-Hood, C. (2003). Transitions in insurance coverage from before pregnancy through delivery in nine states, 1996–1999. *Health Affairs,* 22, 219–229.

Altman, B., & Taylor, A. K. (2001). *Women in the health care system: Health status, insurance, and access to care.* (MEPS Research Findings No. 17. AHRQ Pub. No. 02-0004). Rockville, MD: Agency for Healthcare Research and Quality.

American College of Obstetricians and Gynecologists (2005). The importance of preconception care in the continuum of women's health care (ACOG Committee Opinion No. 313). *Obstetrics & Gynecology*, 106, 665–666.

Atrash, H., Johnson, K., Adams, M. M., Cordero, J. F., & Howse, J. (2006). Preconception care for improving perinatal outcomes: the time to act. *Maternal Child Health Journal*, 10 (Suppl. 5), 3–11.

Conway, K., & Kennedy, L. D. (2004). Maternal depression and the production of infant health. *Southern Economic Journal,* 71, 260–286.

Crystal, S., Johnson, R. W., Harman, J., Sambamoorthi, U., & Kumar, R. (2000). Out-of-pocket health care costs among older Americans. The Journals of Gerontology. Series B Psychological Sciences and Social Sciences, 55, S51–62.

Dietz, P. M., Williams, S. B., Callaghan, W. M., Bachman, D. J., Whitlock, E. P., & Hornbrook, M. C. (2007). Clinically identified maternal depression before, during, and after pregnancies ending in live births. *American Journal of Psychiatry,* 164, 1515–1520.

Egerter, S., Braveman, P., & Marchi, K. (2002). Timing of insurance coverage and use of prenatal care among low-income women. *American Journal of Public Health,* 92, 423–427.

Fuhrmann, K., Reiher, H., Semmler, K., Fischer, F., Fischer, M., & Glockner, E. (1983). Prevention of congenital malformations in infants of insulin-dependent diabetic mothers. *Diabetes Care,* 6, 219–223.

Gaynes, B., Gavin, N., Meltzer-Brody, S., Lohr, K. N., Swinson, T., Gartlehner, G., et al. (2005). *Perinatal depression: Prevalence, screening accuracy, and screening outcomes* (Evidence Report/Technology Assessment No. 119. AHRQ Publication No. 05-E006-2). Rockville, MD: Agency for Healthcare Research and Quality.

Goodwin, R., & Simuro, K. K. (2007). Mental disorders and nicotine dependence among pregnant women in the United States. *Obstetrics & Gynecology,* 109, 875–883.

Halfon, N., & Hochstein, M. (2002). Life course health development: An integrated framework for developing health, policy, and research. *Milbank Quarterly,* 80, 433–479.

Halvorsen, R., & Palmquist, R. (1980). The interpretation of dummy variables in semilogarithmic equations. *American Economic Review,* 70, 474–475.

Harman, J., Edlund, M. J., & Fortney, J. C. (2004). Disparities in the adequacy of depression treatment in the United States. *Psychiatric Services,* 55, 1379–1385.

Hughes, D., & Runyan, S. J. (1995). Prenatal care and public policy: Lessons for promoting women's health. *Journal of the American Medical Womens Association,* 50, 156–160.

Johnson, K., Posner, S. F., Biermann, J., Cordero, J. F., Atrash, H. K., Parker, C. S., et al. (2006). Recommendations to improve preconception health and health care—United States. *Morbidity and Mortality Weekly Report,* 55, 1–23.

Kitzmiller, J., Gavin, L. A., Gin, G. D., Jovanovic-Peterson, L., Main, E. K., & Zigrang, W. D. (1991). Preconception care of diabetes. Glycemic control prevents congenital anomalies. *JAMA,* 265, 731–736.

Lu, M., & Halfon, N. (2003). Racial and ethnic disparities in birth outcomes: A life-course perspective. *Maternal Child Health Journal*, 7, 13–30.

Lu, M., Kotelchuck, M., Culhane, J. F., Hobel, C. J., Klerman, L. V., & Thorp, J. M., Jr. (2006). Preconception care between pregnancies: The content of internatal care. *Maternal Child Health Journal*, 10 (Suppl. 7), 107–122.

Machlin, S., & Rohde, F. (2007). Health care expenses for uncomplicated pregnancies. Available: http://www.meps.ahrq.gov.

Medical Expenditure Panel Survey (MEPS). Survey background. (2006). Available: http://www.meps.ahrq.gov. Accessed August 29, 2007.

MEPS HC-087: 2004 Medical Conditions. Appendix 4: List of priority conditions. (2006). Available: http://www.meps.ahcpr.gov. Accessed February 29, 2008.

Mills, J., Knopp, R. H., Simpson, J. L., Jovanovic-Peterson, L., Metzger, B. E., Holmes, L. B., et al. (1988). Lack of relation of increased malformation rates in infants of diabetic mothers to glycemic control during organogenesis. *New England Journal of Medicine*, 318, 671–676.

Misra, D., Grason, H., & Weisman, C. (2000). An intersection of women's and perinatal health: The role of chronic conditions. *Women's Health Issues*, 10, 256–267.

Misra, D., Guyer, B. D., & Allston, A. (2003). Integrated perinatal health framework: a multiple determinants model with a lifespan approach. *American Journal of Preventive Medicine*, 25, 65–75.

Murray, L., Fiori-Cowley, A., Hooper, R., & Cooper, P. (1996). The impact of postnatal depression and associated adversity on early mother-infant interactions and later infant outcome. *Child Development*, 67, 2512–2526.

National Institute of Diabetes and Digestive and Kidney Diseases. National Diabetes Information Clearinghouse (NDIC) (2005). National diabetes statistics. Available: http://diabetes/niddk.nih.gov. Accessed August 29, 2007.

Orr, S., James, S. A., & Prince, C. B. (2002). Maternal prenatal depressive symptoms and spontaneous preterm births among African-American women in Baltimore, Maryland. *American Journal of Epidemiology*, 156, 797–802.

Posner, S., Johnson, K., Parker, C., Atrash, H., & Biermann, J. (2006). The national summit on preconception care: A summary of concepts and recommendations. *Maternal Child Health Journal*, 10 (Suppl. 5), 199–207.

Salganicoff, A., Ranji, U. R., & Wyn, R. (2005). Women and health care: A national profile. Menlo Park, CA: Kaiser Family Foundation.

Shah, B., Barnwell, B., & Bieler, G. (1996). *SUDAAN user's manual, release 7.0*. Research Triangle Park, NC: Research Triangle Institute.

Stowe, Z., & Nemeroff, C. B. (1995). Women at risk for postpartum-onset major depression. *American Journal of Obstetrics and Gynecology*, 173, 639–645.

Strobino, D., Grason, H., & Minkovitz, C. (2002). Charting a course for the future of women's health in the United States: Concepts, findings and recommendations. *Social Science and Medicine*, 54, 839–848.

Summer, L., & Mann, C. (2006). *Instability of public health insurance coverage for children and their families: Causes, consequences, and remedies.* New York: The Commonwealth Fund.

Weisman, C., Hillemeier, M. M., Chase, G. A., Dyer, A., Baker, S. A., Feinberg, M., et al. (2006). Preconceptual health: Risks of adverse pregnancy outcomes by reproductive life stage in the Central Pennsylvania Women's Health Study (CePAWHS). *Women's Health Issues*, 16, 216–224.

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THE EFFECT OF PRECONCEPTION COUNSELLING ON LIFESTYLE AND OTHER BEHAVIOUR BEFORE AND DURING PREGNANCY

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Background. **Recent studies suggest that the basis for adverse pregnancy outcomes is often established early in pregnancy, during organogenesis. It is therefore important to take preventive action as early as possible, preferably before pregnancy. Because most adverse pregnancy outcomes occur in women who are unaware of being at risk, we conducted a randomized controlled trial, "Parents to Be." With this study, we sought to assess the extent to which women who have participated in preconception counseling (PCC) increase their knowledge on pregnancy-related risk factors and preventive measures and change their behavior before and during pregnancy and to provide an overview of adverse pregnancy outcomes among such women.**

Methods. Knowledge: **Women aged 18–40 who attended PCC and women who received standard care were matched on previous pregnancy, time since last pregnancy, age, country of birth, and educational achievement. They were sent a questionnaire on knowledge about pregnancy-related risk factors and preventive measures.** *Behavior:* **Data on pregnancies and outcomes were collected. Two months after pregnancy, a questionnaire was sent regarding behavior before and during pregnancy.**

Results. **Knowledge of women who received PCC (81.5%; $n = 211$) exceeded that of women who did not (76.9%; $n = 422$). Levels of knowledge in women who were not yet pregnant after PCC were comparable to those in women who became pregnant after PCC, indicating that, even before pregnancy, PCC increased knowledge in women contemplating pregnancy. After PCC, significantly more women started using folic acid before pregnancy (adjusted odds ratio [OR], 4.93; 95% confidence interval [CI], 2.81–8.66) and reduced alcohol use during the first 3 months of pregnancy (adjusted OR, 1.79; 95% CI, 1.08–2.97). Among the group receiving standard care, about 20% of all pregnancies ended in an adverse outcome; in the group with PCC this was 16% (OR, 0.77; 95% CI, 0.48–1.22).**

Conclusion. **After PCC, women have more knowledge about essential items. Importantly, they gained this greater knowledge before pregnancy and more women changed their behavior to reduce adverse pregnancy outcomes.**

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Introduction and Background

There has been much debate on the prevention of adverse pregnancy outcomes (e.g., miscarriage, preterm birth, or congenital malformations), especially those related to maternal and infant morbidity and mortality (Frishman, 2003; Gottesman, 2004; Konchak, 2001; Kuller & Laifer, 1994; Moos, 2004; Muchowski & Paladine, 2004; Taysi, 1988). Over time, the optimization of care during pregnancy and labor has reduced morbidity and mortality rates, especially in women known to have a high risk of adverse pregnancy outcomes (e.g., those with diabetes; Grubbs& Brundage, 2002; Herman, Janz, Becker, & Charron-Prochownik, 1999; McElvy et al., 2000). But, despite the continued improvements in care, these rates have stabilized during the past 3 decades (Bennebroek Gravenhorst et al., 2001; Garssen & van der Meulen, 2004; Schuitemaker, 1998).

Recent studies suggest that the basis for adverse pregnancy outcomes is often established early in pregnancy, during organogenesis. It is therefore important to take preventive action as early as possible, preferably before pregnancy, as organogenesis takes place from days 17 to 56 after conception, a period during which women are often unaware of their pregnancy (Brundage, 2002; Moos, 2002, 2003).

Women contemplating pregnancy have limited knowledge about risk factors and preventive measures regarding adverse pregnancy outcomes (de Jong-Potjer et al., 2008). To minimize such risks, they and their partners can attend preconception counseling (PCC), which provides information on general and personal risk factors and preventive measures (Cefalo & Moos, 1995). Pregnancy can be influenced by a number of risk factors and preventive measures. A well-known example of the latter is folic acid use, which reduces the risk of neural tube defects. To obtain maximum benefit, folic acid use should start as early as 4 weeks before conception—an example that stresses the need for early action (Centers for Disease Control and Prevention, 1993).

Because most adverse pregnancy outcomes occur in women who are unaware of being at risk, we conducted a randomized controlled trial, "Parents to Be," which was intended to study the effects of general practitioner (GP)-initiated PCC in the general population. During this project, PCC provided women with information on a healthy lifestyle before and during pregnancy. It also provided information on risk factors specific to their own medical, reproductive, and family histories (Elsinga et al., 2006). The results showed that the prevalence of risk factors among couples contemplating pregnancy was high, even in couples assumed to be at low risk, suggesting that PCC is beneficial for the general population (van der Pal-de Bruin et al., 2008).

On the basis of earlier research showing that personal counseling increased risk-reducing behavior (e.g., stopping smoking) and the increased awareness and use of folic acid (Lumley & Waters, 1999; Pastuszak, Bhatia, Okotore, & Koren, 1999; Sayers, Hughes, Scallan, & Johnson, 1997), we hypothesized that personal counseling causes women to increase their knowledge on risk factors and preventive measures, thus enabling them to adapt their risk behavior toward a favorable pregnancy outcome.

We therefore studied the possible effects of PCC on women's knowledge as well as behavior before and during pregnancy. To determine whether attendance in PCC would increase women's knowledge before pregnancy, we compared knowledge among women who attended PCC with that of women who received standard care, matching the 2 groups on previous pregnancy, time of last pregnancy, age, country of birth, and educational level. To determine whether attendance in PCC would change women's behavior, we compared the behaviors before and during pregnancy of women who attended PCC with the behaviors of women who had received standard care. Furthermore, we present the pregnancy outcomes of the 2 latter groups.

Methods

Design

This project is part of "Parents to Be," a randomized controlled trial in which randomization occurred at the level of general practices. The study design was published elsewhere (Elsinga et al., 2006).

The intervention consisted of an annual invitation for PCC to women aged 18–40. A risk-assessment questionnaire was sent to women who were interested in PCC and who were also contemplating pregnancy within 1 year. GPs then invited these women and their partners for PCC, where they provided the couple with information on general risk factors and on their personal risk factors identified in the risk-assessment questionnaire. This study was approved by the Medical Ethics Committee at Leiden University Medical Center.

Knowledge assessment

In 2000, knowledge of pregnancy-related risk factors and preventive measures was assessed among a random selection of half the women aged 18–40 registered at the general practices prior to their offer of PCC (de Jong-Potjer et al., 2008). In 2003, knowledge was assessed among all women who attended PCC during the trial and among a random selection of half of the women who received standard care.

Knowledge assessment procedure

GPs excluded women with adverse social circumstances. Knowledge levels were assessed in a questionnaire[1] consisting of 94 questions on pregnancy-related knowledge, to which 12 questions on socioeconomic factors and family planning had been added.

A distinction was made between essential items, that is, subjects that should always be addressed during PCC, and items indicating the extent to which a woman was aware of specific risk factors that needed to be discussed because they were relevant to her lifestyle, medical history, or family history.

Twenty items divided over 4 categories were defined as essential. The first category was composed of items related to different aspects of timing of conception. The 3 other essential categories were composed of items about infectious diseases, folic acid need, and exposure to harmful substances, covering risks that were applicable to all women, or risks that a woman might easily run (Mullen, Ramirez, & Groff, 1994).

Comparisons between groups

Of the 353 women who received PCC, GPs excluded 59 women because they registered with another general practice or adverse social circumstances. Of the remaining 294 women, 72% returned the questionnaire. A total of 211 questionnaires could be used for analysis.

To assess whether knowledge was influenced by PCC, each woman who had attended PCC and completed the knowledge questionnaire after the intervention was matched with 2 women from general practices offering standard care. Each of these 3 women was selected for the similarity of her demographic characteristics (previous pregnancy (yes/no), year of last pregnancy (2000, 2001, 2002, 2003, or before entering trial), age (in years), country of birth (Netherlands, Surinam/The Antilles, Turkey/Morocco, or other) and educational level (basic, intermediate, or high).

Some of the women who attended PCC completed the questionnaire both in 2000 and 2003 ($n = 74$), so their knowledge over these 3 years could be compared. Forty-six of these women had become pregnant since attending PCC. All women who attended PCC also completed a risk assessment questionnaire beforehand. To determine whether PCC had increased these women's knowledge about personal risk factors for adverse pregnancy outcomes, the reported presence or absence of these personal risk factors was linked with their knowledge about these risk factors in 2000 and 2003.

Assessment of pregnancy outcomes and behavioral changes

Data were collected from all participating practices on pregnancies in women whose first day of the last menstrual cycle had occurred between April 2000 and April 2003. Pregnancy was defined as any new entry of W78, namely, the code for pregnancy under the International Classification of Primary Care, in the electronic patient file (Rodgers, Sherwin, Lamberts, & Okkes, 2004). Parity, first day of last menstruation, term date, date of the end of the pregnancy, and outcome of pregnancy were recorded. Birth announcement cards sent to the general practice were checked for missing pregnancies or data about pregnancy. Each practice was visited every 2 months to collect these data. We ensured that newly registered female patients had an opportunity to receive PCC before they were included in the trial.

Provided the GP gave his or her approval, we sent a questionnaire[1] to all women within 2 months after delivery, enquiring about their pregnancy outcome and about their behavior before and during pregnancy. The GP could exclude women for social reasons, such as a recent divorce. A postage-free envelope addressed to the researchers was included with the questionnaire. A reminder was sent after 2 months.

The questionnaire contained 27 questions. As well as questions on lifestyle factors before and during the whole pregnancy, there were questions on pregnancy complications, pregnancy outcome, and 7 questions on socioeconomic factors, anxiety, and family planning. The variable "folic acid use" also elaborated into a question on multivitamin supplements specifically meant for pregnant women.

A total of adverse pregnancy outcomes was calculated on the basis of the following definitions: miscarriage, extrauterine pregnancy, still birth, premature birth, low birth weight (<2,500 g), small for gestational age (<p2.3), and congenital anomalies. Abortions for either social or medical reasons have not been taken into account. When a pregnancy had multiple adverse outcomes (e.g., both preterm birth and low birth weight), it was counted only once. Live births where data were lacking about duration, low birth weight, and weight related to gestational age were assumed to be in the normal range, because abnormal outcomes are almost always accompanied by a letter from a specialist or a remark from the GP in the file. An odds ratio (OR) was calculated for adverse pregnancy outcomes among women with PCC versus women with standard care.

Statistics

Analyses were performed using SPSS 11.0 for Windows.

Knowledge assessment

For comparisons between the knowledge level of women with PCC and their matched controls analysis of variance was used, with a fixed group effect and a random factor indicating the matching group.

Paired Student's *t*-tests were used to test for changes in the knowledge of women who completed the

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[1] Questionnaires available on request from the corresponding author.

questionnaire both in 2000 and 2003. Changes in knowledge between 2000 and 2003 were compared in a multiple linear regression, adjusting for country of birth, educational level, and parity in a multivariate regression analysis. p-values $< .05$ were considered significant.

Assessment of pregnancy outcomes and behavioral changes

Actual PCC attendance was lower than expected (Elsinga et al., 2006). Because of the low numbers, an intention-to-treat analysis, which is the recommended method of analysis of randomized controlled trials, could not be performed. To gain insight into the efficacy that PCC might have had on risk-reducing behavior, we analyzed the results as we would have analyzed those of an observational study in which women with PCC (the intervention group) were compared with women receiving standard care (the control group), adjusting for confounders. ORs were calculated for behavioral changes in women with PCC versus women with standard care, with 95% confidence intervals (CI). An OR > 1 indicates that women who received PCC more often showed risk-reducing behavior. Multiple logistic regression was used to calculate ORs, which were adjusted for the possible confounders, age (continuous), country of birth (Dutch/non-Dutch), and educational level (low, intermediate, high). ORs with 95% CIs not containing 1 were considered statistically significant.

Results

Knowledge assessment

Table 1 compares the knowledge of women after PCC with that of the matched women who received standard care. Women who had received PCC had significantly more knowledge of the 20 essential items in total and of the subgroups infection prevention and folic acid. Compared with the matched women receiving standard care, women of lower educational level who had attended PCC also had greater knowledge of hazardous substances (+10.4%; $p = .04$), folic acid (+17.6%; $p = .01$), and the 20 essential items (+6.5%; of $p = .03$). The knowledge of women who had attended PCC but had never been pregnant (73.5%) was substantially higher than that of matched control women who had never been pregnant (62.2%; $p < .01$). This difference was smaller, but remained significant among women who had been pregnant before ($p = .01$).

Women who attended PCC and completed both knowledge questionnaires (2000/2003) were divided into 2 groups: women who became pregnant after PCC and women who were not pregnant when they completed the second knowledge assessment (Table 2). Regarding the 20 essential items, the knowledge of both groups increased substantially after they had attended PCC (23.4% [95% CI, 17.5–29.2] and 12.0% [95% CI, 2.9–21.0], respectively). Among women who had not become pregnant after PCC, there was a substantial increase in knowledge regarding 2 subgroups: the prevention of infection (17.9% [95% CI, 5.9–29.8]) and folic acid (28.6% [95% CI, 13.0–44.1]).

Table 1. Percentage of Items Answered Correctly by Women Who Attended Preconception Counseling (PCC) and by Those Who Received Standard Care Matched by Age, Country of Birth, Educational Level, Previous Pregnancy, and Time of Last Pregnancy (with 2 matched standard care women per PCC woman)

	PCC	Standard care	Difference in knowledge level(95% CI)
Total, *n*	211	422	
Hazardous substances	73.0	69.2	3.8 (−0.1 to 7.6)
Prevention of infection	94.2	89.8	4.4 (2.0–6.8)*
Folic acid	91.9	80.6	11.3 (7.3–15.3)*
Timing of conception	77.0	74.4	2.6 (−0.2 to 5.3)
Total for 20 essential items	81.5	76.9	4.6 (2.6–6.6)*
Educational level, *n*			
Low	30	59	
Hazardous substances	72.2	61.9	10.4 (−0.5 to 20.2)
Prevention of infection	86.7	83.1	3.7 (−3.5 to 10.8)
Folic acid	86.7	68.9	17.6 (4.1–31.1)*
Timing	70.0	70.0	0.0 (−8.9 to 8.9)
Total for 20 essential items	76.5	70.0	6.5 (0.7–12.2) *
Intermediate, *n*	86	179	
Hazardous substances	70.7	71.1	−0.4 (−6.8 to 6.0)
Prevention of infection	93.9	89.7	4.3 (0.5–8.0)*
Folic acid	91.5	81.6	9.9 (3.6–16.1)*
Timing	76.7	72.9	3.8 (−0.3 to 7.9)
Total for 20 essential items	80.6	77.0	3.5 (0.5–6.6)*
High, *n*	94	182	
Hazardous substances	75.9	70.2	5.6 (0.2–11.1) *
Prevention of infection	97.1	92.7	4.4 (1.0–7.7)*
Folic acid	94.3	84.4	9.9 (4.3–15.5)*
Timing of conception	79.8	77.7	2.1 (−1.8 to 6.0)
Total for 20 essential items	84.3	79.5	4.8 (1.9–7.8)*
Pregnant			
Never, *n*	40	80	
Hazardous substances	63.3	52.9	10.4 (0.2–20.6)*
Prevention of infection	87.5	76.6	11.9 (3.5–20.2)*
Folic acid	85.8	49.2	36.7 (22.5–50.9)*
Timing of conception	68.9	68.0	0.9 (−6.7 to 8.5)
Total for 20 essential items	73.5	62.2	11.3 (4.6–18.0)*
More than once, *n*	171	342	
Hazardous substances	75.2	73.1	2.2 (−1.8 to 6.2)
Prevention of infection	95.8	93.1	2.6 (0.4–4.8)*
Folic acid	93.4	88.0	5.4 (2.0–8.7)*
Timing of conception	78.9	75.9	3.0 (0.1–5.8)*
Total for 20 essential items	83.3	80.3	3.0 (1.2–4.84)*

* Statistically significant ($p < .05$).

There is also a relation between risky behavior and knowledge as an increase in the proportion of women responding correctly to risk-related knowledge statements was found (data not shown). For example, before attending PCC, only 50% of women who smoked could correctly indicate that passive smoking by a pregnant woman for 2 hours a day can be harmful to the baby in her womb. After PCC, 85.5% of smokers answered this item correctly. Similarly, more women could correctly answer statements regarding personal

Table 2. Percentage Increase in Items Answered Correctly by Women Who Attended Preconception Counseling (PCC)

	Total PCC ($n = 74$)			Not Pregnant After PCC ($n = 28$)			Pregnant After PCC ($n = 46$)		
	2000	2003	Change in Knowledge Level (95% CI)	2000	2003	Change in Knowledge Level (95% CI)	2000	2003	Change in Knowledge Level (95% CI)
Hazardous substances	55.4	74.5	19.1 (11.5–26.8)*	63.1	71.4	8.3 (−5.2 to 21.9)	50.7	76.4	25.7 (16.6–34.8)*
Prevention of infection	72.6	94.9	22.3 (15.4–29.2)*	74.1	92.0	17.9 (5.9–29.8)*	71.7	96.7	25.0 (16.5–33.5)*
Folic acid	57.7	94.1	36.5 (26.3–46.7)*	65.5	94.0	28.6 (13.0–44.1)*	52.9	94.2	41.3 (27.8–54.8)*
Timing of conception	68.7	78.4	9.7 (4.2–15.1)*	70.9	75.5	4.6 (−4.9 to 14.1)	67.4	80.1	12.7 (5.9–19.5)*
Total for 20 essential items	63.9	82.9	19.1 (14.1–24.1)*	68.4	80.4	12.0 (2.9–21.0)*	61.1	84.5	23.4 (17.5–29.2)*

* Statistically significant ($p < 0.05$).

risk factors (age and non-use of folic acid), indicating that PCC increases not only essential knowledge, but also knowledge regarding personal risk factors.

Assessment of pregnancies and behavioral changes

There were 150 pregnancies among these women after they received PCC. Among women who received standard care, 1,914 pregnancies were registered. Questionnaires about behavior and pregnancy outcome were sent for 139 (92%) pregnancies after PCC and for 1,703 (82%) pregnancies with standard care. Of the questionnaires returned, 114 (82%) were usable for pregnancies after PCC and 1,158 (68%) for pregnancies with standard care. A higher number of women with PCC had been born in the Netherlands and had a high educational level compared with women with standard care (Table 3).

Table 4 shows that tobacco use before pregnancy did not differ between women who received PCC and women who received standard care (24.8% vs. 26.8%). Women who received PCC used alcohol slightly more often before pregnancy (71.7% vs. 61.7%), although this difference was not significant. There were no differences with regard to reported hereditary diseases with possible consequences for future pregnancies.

Table 3. Distribution of Demographic Characteristics

	PCC ($n = 114$)		Standard care ($n = 1{,}158$)	
	n[a]	%	n[a]	%
Age (yrs)				
<20	0	0	2	0.2
20–24	1	0.9	60	5.3
25–29	29	25.9	260	23.0
30–34	53	47.3	479	42.5
35–39	22	19.6	259	23.0
≥40	7	6.3	68	6.0
Country of birth				
The Netherlands	108	94.7	1,017	87.8
Other	6	5.3	141	12.2
Educational level				
Basic	11	9.8	259	23.2
Intermediate	51	45.1	438	39.2
High	51	45.1	420	37.6
Marital status				
Married/cohabiting	111	99.1	1,081	94.3
Permanent relationship	1	0.9	30	2.6
Single	0	0	35	3.1
Medical insurance				
Public	69	61.6	787	68.3
Private	6	5.4	35	3.0
Employment based	37	33.0	330	28.6
None	0	0	1	0.1

[a] Numbers may vary owing to missing data.

Table 5 shows behavioral changes before and during pregnancy. Compared with women receiving standard care, more women with PCC quit smoking before pregnancy (10% vs. 18%; unadjusted OR, 3.04 [95% CI, 0.95–9.69]), and used folic acid in the recommended period (53% vs. 86%; unadjusted OR, 5.40 [95% CI, 3.15–9.28]). Fewer of these women used alcohol in the first 3 months of pregnancy (32% vs. 45%; unadjusted OR, 1.68 [95% CI, 1.03–2.75]). After adjustment for possible confounders, changes in behavior remained statistically significant for folic acid use and for not drinking alcohol in the first 3 months of pregnancy (OR, 4.93; 95% CI, 2.81–8.66, respectively, OR, 1.79 [95% CI, 1.08–2.97]). For other behavior during pregnancy, it was also found that more women who had had PCC reported a healthy lifestyle than women with standard care, although none of these differences were significant.

Compared with women receiving standard care, folic acid use in the recommended period increased strongly among women with PCC (53.1% vs. 86.0%;

Table 4. Reported Risk Factors for Adverse Pregnancy Outcome Before Pregnancy

	PCC ($n = 114$)		Standard Care ($n = 1{,}158$)	
	n[a]	%	n[a]	%
Smoking before pregnancy				
Yes	28	24.8	309	26.8
No	85	75.2	842	73.2
Alcohol use before pregnancy				
Yes	81	71.7	711	61.7
No	32	28.3	442	38.3
Reported hereditary diseases with possible consequences for future pregnancies				
(Future) mother	2	1.8	20	1.7
(Future) father	2	1.9	16	1.4
Offspring	0	0	9	0.8

[a] Numbers may vary owing to missing data.

Table 5. Behavioral Factors in Relation to Pregnancy

	PCC		Standard Care			
	n[a]	%	*n*[a]	%	OR[b](95% CI)	Adjusted OR[c](95% CI)
Smoking during pregnancy (given that tobacco was used before pregnancy)						
Quit before pregnancy	5	17.9	30	9.7	3.04 (0.95–9.69)	2.94 (0.70–8.84)
Quit when pregnancy known	14	50.0	115	37.2	2.22 (0.93–5.30)	1.85 (0.74–4.60)
Smoked until few months, then quit[d]	0	0	18	5.8		
Smoked entire pregnancy[d]	7	25.0	115	37.2	1.0	
Other[d]	2	7.1	31	10.0		
Binge drinking on ≥1 occasion just before or during pregnancy (given that alcohol was used before pregnancy)						
Yes[d]	6	7.4	77	10.8	1.0	
No	75	92.6	634	89.2	1.52 (0.64–3.60)	1.51 (0.63–3.63)
Alcohol use during first 3 months of pregnancy (given that alcohol was used before pregnancy)						
Yes[d]	26	32.1	315	44.3	1.0	
No	55	67.9	396	55.7	1.68 (1.03–2.75)[g]	1.79 (1.08–2.97)[g]
Alcohol use during rest of pregnancy (given that alcohol was used before pregnancy)						
Yes[d]	37	45.7	295	41.5	1.0	
No	44	54.3	395	58.5	0.84 (0.53–1.34)	0.95 (0.59–1.54)
Drug use during pregnancy						
Yes[d]	0		7	0.6	NA	
No	114		1,151	99.4		
Folic acid use						
Yes, started before pregnancy	98	86.0	612	53.1	5.40 (3.15–9.28)[g]	4.93 (2.81–8.66)[g]
No[d,e]	16	14.0	540	46.9	1.0	
Medication during pregnancy[f]						
Yes, safe medication	50	47.6	470	45.3	1.35 (0.64–2.82)	1.31 (0.62–2.77)
Yes, (possibly) harmful medication[d]	9	8.6	114	11.0	1.0	
No	46	43.8	454	45.7	1.28 (0.61–2.70)	1.40 (0.66–2.99)

[a] Numbers may vary owing to missing data.

[b] Each odds ratio indicates behavioral changes that are in favor of pregnancy outcome.

[c] Adjusted for age, education level and country of birth.

[d] Reference category for the calculation of the ORs. When multiple categories are marked, these have been combined into 1 reference category.

[e] The "No" category includes women who never used folic acid during pregnancy and women who started using folic acid from the moment they knew they were pregnant.

[f] According to the Swedish classification system for the safety of drugs during pregnancy, category A was considered to be safe; the other categories have been combined into the category "(possibly) harmful." Medication that could not be classified has not been taken into account.

[g] $p < .05$.

$p < .01$). This increase is present not only among women with a high educational level (90.2% vs. 56.4%; $p < .01$), but also among women with intermediate (84.3% vs. 55.1%; $p < .01$) and low educational (81.8% vs. 46.5%; $p = .02$) levels (data not shown).

Table 6 describes pregnancy outcomes of women receiving PCC versus standard care. Among women who received standard care, 20.2% of pregnancies ended in an adverse outcome. Among women who attended PCC, this was 16.2%. This reduction in total adverse pregnancy outcome was in the expected range, but was not significant (OR, 0.77; 95% CI, 0.48–1.22). Also, in the specific adverse pregnancy outcomes, a trend toward improved pregnancy outcome in the PCC group was found (miscarriage, 8.3% vs. 9.3%; preterm birth, 6.2% vs. 8.2%; low birth weight, 3.1% vs. 5.3%; congenital anomalies, 3.9% vs. 4.5%).

Discussion

Compared with matched women who received standard care, women who had attended PCC had greater knowledge about hazardous substances (73.0% vs. 69.2%), infection prevention (94.2% vs. 89.8%), folic acid intake (91.9% vs. 80.6%), timing of conception (77.0% vs. 74.4%), and the total of 20 essential items (81.5% vs. 76.9%; Table 1). These differences are all significant, with the exception of the difference in knowledge for infection prevention. Furthermore, women who attended PCC gained this knowledge before pregnancy (Table 2). Not only essential knowledge increased, knowledge of personal risk factors increased as well. For instance, women who smoked answered more items correctly regarding the possible hazards of smoking for the unborn child (data not shown).

More important, PCC resulted in behavioral changes both before and during pregnancy. Compared with the control group, more women who received PCC quit smoking before pregnancy and used folic acid in the recommended period; and fewer of these women drank alcohol in the first 3 months of pregnancy (Table 5). A somewhat lower percentage of adverse pregnancy outcomes was found when pregnancies had been preceded by PCC (Table 6).

Historically, there have been very few initiatives offering a comprehensive PCC program, covering

Table 6. Pregnancy Outcomes of All Included Pregnancies

	PCC		Standard care	
	n	%	*n*	%
No. of pregnancies with known outcome	145		1,740	
Pregnancy outcomes				
Miscarriage	12	8.3	162	9.3
Termination of pregnancy for social reasons	2	1.4	60	3.5
Termination of pregnancy for medical reason	3	2.1	2	0.1
Extrauterine pregnancy	0	0	6	0.3
Perinatal death[a]	1	0.7	14	0.8
Live birth	127	87.6	1,496	86.0
Live born children[b]	129		1,520	
Gestational age[c]				
Preterm ($<$37 weeks)	8	6.2	124	8.2
Term ($\geq$37 weeks)	119	92.2	1,356	89.2
Missing data	2	1.6	40	2.6
Birth weight[c]				
Low ($<$2,500 g)	4	3.1	81	5.3
Normal ($\geq$2,500 g)	102	79.1	1,124	73.9
Missing data	23	17.8	315	20.7
Growth $<$p2.3 (small for gestational age)[c]				
Yes	1	0.8	25	1.6
No	105	81.4	1,160	76.3
Missing data	23	17.8	335	22.0
Congenital anomalies[c]				
Yes	5	3.9	68	4.5
No	124	96.1	1,452	95.5
Total adverse pregnancy outcomes[d]	23	16.2	343	20.2

[a] Perinatal deaths are all pregnancies with stillbirth or infant death $\leq$1 month after birth.

[b] The number of live-born children exceeded the number of pregnancies ending in live birth owing to twins.

[c] Only for children who were born alive.

[d] Adverse pregnancy outcomes include miscarriage, extrauterine pregnancy, perinatal death, preterm birth, birth weight $<$2,500 g, small for gestational age ($<$p2.3), and congenital anomalies. Normal outcomes (e.g., term birth, normal birth weight, and not small for gestational age) were assumed for children born alive but on whom data were missing regarding duration of pregnancy, birth weight, and weight for gestational age. When a pregnancy had multiple adverse outcomes (e.g., preterm birth and low birth weight), it was counted only once.

multiple risk factors and a subsequent number of preventive measures. Prior initiatives have not measured women's knowledge of pregnancy-related risk factors and preventive measures or behavior both before and after PCC was provided. Effects on knowledge and behavior have only been measured for separate risk factors. For instance, several studies have described increased awareness and use of folic acid after personal counseling (Pastuszak et al., 1999; Sayers et al., 1997). This is in agreement with the finding that a higher number of items on folic acid were answered correctly after PCC as well as the increase in folic acid use before pregnancy.

The main limitation of this study is the small number of women attending PCC. This is partially explained by the GPs' large-scale exclusion of eligible women (Elsinga et al., 2006). Consequently, it was not possible to conduct an intention-to-treat analysis, but we analyzed this study as if it had been an observational study. Of the women who attended PCC, a higher proportion had an intermediate or high educational level. For the analysis of the knowledge data, women with PCC were therefore matched with women of the control group on the basis of educational level, besides other demographic characteristics. Even after adjustment, women who had attended PCC revealed a higher level of knowledge, irrespective of their educational level. For the analysis of the data on behavior before and during pregnancy and pregnancy outcomes, women after PCC were compared with those who had received standard care in the control group. To compare the results in these groups, the analysis accounted for differences in age, educational level, and country of birth.

The knowledge assessment questionnaire consisted of 94 items on a broad range of subjects. To be able to compare the knowledge applicable to all women, we selected 20 essential items comprising different aspects of timing of conception, and risks that either apply to all women, or risks woman can easily encounter. This allowed for accurate comparisons between knowledge in different groups of women.

Some women who attended PCC completed the knowledge questionnaire both in 2000 and 2003. Completing the questionnaire in 2000 may have induced a learning effect. However, comparison with the level of knowledge in 2003 did not show any differences between women who did and did not complete the 2000 questionnaire, suggesting that completing the knowledge assessment at the start of the project did not influence the level of knowledge at the end of the project.

Time in itself may have been a factor responsible for an increase in knowledge. In 2000, we assessed baseline knowledge in half the women at the general practices who were going to be offered PCC; in 2003, knowledge assessment was repeated in a similar random selection of the women registered at the general practices offering standard care. In this way, we could detect any differences in knowledge that occurred in the general population over time. After adjusting for age, country of birth, and educational level, the results show that, over time, knowledge of the 20 essential items had increased in the general population by 3.2%. Women who attended PCC and completed both questionnaires displayed a significant higher increase in knowledge than time in itself had caused.

We cannot rule out the possibility that knowledge increased and behavior changed among women who chose not to attend PCC—after all, the invitation may have induced greater awareness of the PCC issues. Whatever the case, we found that women who attended PCC attained a high level of knowledge before pregnancy, and were thus known in time to minimize risks. Furthermore, behavior during pregnancy among women who chose not to attend PCC was similar to or less favorable than that of women who received standard care (data not shown). We therefore conclude that risk reducing behavior was brought about by actual PCC attendance, and not by any increased awareness that may have been induced by the invitation to attend PCC.

Because PCC is a new concept, it is reasonable to assume that its very newness also influenced participation. First, we believe women to be hesitant toward such a new concept. Second, those women who did participate were relatively well educated and thus probably more motivated. This stronger motivation may also have contributed to a higher tendency to learn and change behavior. This suggests that the results we describe may overestimate the real impact. However, several studies have shown that, regardless of their motivational status, more people changed their risk behavior after personal counseling than people with other forms of counseling or with no counseling at all (Floyd, Rimer, Giovino, Mullen, & Sullivan, 1993; Mullen et al., 1994; Secker-Walker, Solomon, Flynn, Skelly, & Mead, 1998; Walsh & Redman, 1993). This suggests that behavioral changes would also occur if PCC were more common.

It should also be noted that in the calculations for the percentage of total adverse pregnancy outcomes, data missing on duration of pregnancy, birth weight, and weight for gestational age were recorded as "normal" because abnormal outcomes are almost always accompanied by a letter from a specialist or a remark from the GP in the file. The percentage of adverse pregnancy outcomes is, therefore, a conservative estimate.

Although this study indicates that PCC can have positive effects on knowledge and risk behavior favoring pregnancy outcomes, the target group is not easy to reach for PCC. This was not only the case in our study, but seems to be a general problem, encountered by other initiatives in the Netherlands as well. In Rotterdam, only a limited amount of women attended a preconception consultation after a door-to-door distribution of 15,000 information leaflets; various initiatives of Dutch midwives have resulted in only a few consultations as well (Aalhuizen & van der Stouwe, 2008).

It may be useful to educate students in secondary school about the aims and relevance of PCC. This can be combined with sex education and may contribute to reaching all future women of childbearing age. In addition, new national initiatives are needed to raise awareness about the value of PCC. The costs of such initiatives are substantial. However, PCC may save health care costs in the long term, for example, by reducing the number of preterm births. In our study, we also asked GPs about the impact of PCC on their time. Although GPs indicated that a preconception consultation was time consuming, the time spent on the first pregnancy consultation was reduced. Therefore, it is an option that health insurance companies will fund preconception consultations, because they will also profit from long-term cost reductions. Furthermore, the behavioral changes initiated by PCC also improve the health of the future parents themselves, another reason why funding by health insurance companies seems a reasonable option.

Because only a small number of pregnancies were preceded by PCC, we could only give a first impression of pregnancy outcomes. These seemed to be improved in the group of women who attended PCC compared with the control group, but the differences were not statistically significant (OR, 0.77; 95% CI, 0.48–1.22). Furthermore, adjustments for demographic differences were not made. Therefore, the results should be interpreted with caution. But if there are real differences and PCC attendance increases over time, PCC may prevent a considerable number of miscarriages, preterm births, babies born at a low birth weight, and congenital anomalies.

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References

Aalhuizen, I., & van der Stouwe, R. (2008). [The first experiences with preconception care]. *Tijdschr v Verloskundigen*, 33.

Bennebroek Gravenhorst, J., van Roosmalen, J., Schuitemaker, N., Briët, J. W., Visser, W., Pel, M., et al. (2001). Toename van de moedersterfte een reden tot ongerustheid? *Ned T Obstet Gyn*, 114, 75–76.

Brundage, S. C. (2002). Preconception health care. *American Family Physician*, 65, 2507–2514.

Cefalo, R. C., & Moos, M. K. (1995). *Preconceptional health promotion: A practical guide* (2nd ed.). St. Louis: Mosby-Yearbook.

Centers for Disease Control and Prevention. (1993). Recommendations for use of folic acid to reduce number of spina bifida cases and other neural tube defects. *Journal of the American Medical Association*, 269, 1233–1238.

de Jong-Potjer, L.C., Elsinga, J., le Cessie, S., Pal-de Bruin, K.M., Schoorl, E., Sneeuw, K.C.A., et al. (2008). Future mother's knowledge of pregnancy-related risk factors: The need for preconception care. (in press).

Elsinga, J., Pal-de Bruin, K. M., le Cessie, S., de Jong-Potjer, L. C., Verloove-Vanhorick, S. P., & Assendelft, W. J. J. (2006). Preconception counselling initiated by general practitioners in the Netherlands: Reaching couples contemplating pregnancy. *BMC Family Practice*, 7, 41–49.

Floyd, R. L., Rimer, B. K., Giovino, G. A., Mullen, P. D., & Sullivan, S. E. (1993). A review of smoking in pregnancy: Effects on pregnancy outcomes and cessation efforts. *Annual Review of Public Health*, 14, 379–411.

Frishman, G. (2003). Preconceptional counseling and care: A unique window of opportunity. Medicine and Health. *Rhode Island*, 86, 16–18.

Garssen, J., & van der Meulen, A. (2004). Perinatal mortality in the Netherlands. Backgrounds of a worsening international ranking. *Demographic Research*, 11, 357–394.

Gottesman, M. M. (2004). Preconception education: Caring for the future. *Journal of Pediatric Health Care*, 18, 40–44.

Grubbs, S., & Brundage, S. C. (2002). Preconception management of chronic diseases. *Journal of the South Carolina Medical Association*, 98, 270–276.

Herman, W. H., Janz, N. K., Becker, M. P., & Charron-Prochownik, D. (1999). Diabetes and pregnancy. Preconception care, pregnancy outcomes, resource utilization and costs. *Journal of Reproductive Medicine*, 44, 33–38.

Konchak, P. S. (2001). Preconception care: "VITAL MOM"—A guide for the primary care provider. *Journal of the American Osteopathic Association*, 101(Suppl. 2), S1–S9.

Kuller, J. A., & Laifer, S. A. (1994). Preconceptional counseling and intervention. *Archives of Internal Medicine*, 154, 2273–2280.

Lumley, J., & Waters, E. (1999). Interventions for promoting smoking cessation during pregnancy. *The Cochrane Library*, 2, 1–43.

McElvy, S. S., Miodovnik, M., Rosenn, B., Khoury, J. C., Siddiqi, T., Dignan, P. S., et al. (2000). A focused preconceptional and early pregnancy program in women with type 1 diabetes reduces perinatal mortality and malformation rates to general population levels. *Journal of Maternal and Fetal Medicine*, 9, 14–20.

Moos, M. K. (2002). Preconceptional health promotion: opportunities abound. *Maternal and Child Health Journal*, 6, 71–73.

Moos, M. K. (2003). Preconceptional wellness as a routine objective for women's health care: An integrative strategy. *Journal of Obstetric, Gynecologic, and Neonatal Nursing*, 32, 550–556.

Moos, M. K. (2004). Preconceptional health promotion: Progress in changing a prevention paradigm. *Journal of Perinatal and Neonatal Nursing*, 18, 2–13.

Muchowski, K., & Paladine, H. (2004). An ounce of prevention: the evidence supporting periconception health care. *Journal of Family Practice*, 53, 126–133.

Mullen, P. D., Ramirez, G., & Groff, J. Y. (1994). A meta-analysis of randomized trials of prenatal smoking cessation interventions. *American Journal of Obstetrics and Gynecology*, 171, 1328–1334.

Pastuszak, A., Bhatia, D., Okotore, B., & Koren, G. (1999). Preconception counseling and women's compliance with folic acid supplementation. *Canadian Family Physician*, 45, 2053–2057.

Rodgers, R. P., Sherwin, Z., Lamberts, H., & Okkes, I. M. (2004). ICPC multilingual collaboratory: A Web- and Unicode-based system for distributed editing/translating/viewing of the multilingual International Classification of Primary Care. *Medinfo*, 11, 425–429.

Sayers, G. M., Hughes, N., Scallan, E., & Johnson, Z. (1997). A survey of knowledge and use of folic acid among women of child-bearing age in Dublin. *Journal of Public Health Medicine*, 19, 328–332.

Schuitemaker, N. (1998). *Confidential enquiries into maternal death in the Netherlands 1983–1992 Thesis*. Leiden: Rijksuniversiteit.

Secker-Walker, R. H., Solomon, L. J., Flynn, B. S., Skelly, J. M., & Mead, P. B. (1998). Reducing smoking during pregnancy and postpartum: Physician's advice supported by individual counseling. *Preventive Medicine*, 27, 422–430.

Taysi, K. (1988). Preconceptional counseling. *Obstetrical and Gynecologic Clinics of North America*, 15, 167–178.

van der Pal-de Bruin, K. M., le Cessie, S., Elsinga, J., de Jong-Potjer, L. C., van Haeringen, A., Knuistingh Neven, A., et al. (2008). Preconception counselling in primary care: Prevalence of risk factors among couples with pregnancy wish. *Paediatric and Perinatal Epidemiology*, 22, 280–287.

Walsh, R., & Redman, S. (1993). Smoking cessation in pregnancy: Do effective programmes exist? *Health Promotion International*, 8, 111–127.

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