

APPLICATION OF A LIFECOURSE AND MULTIPLE DETERMINANTS FRAMEWORK TO IMPROVE MATERNAL HEALTH

Holly Grason, MA and Dawn P. Misra, MHS, PhD



Public health practitioners are increasingly recognizing the importance of preconceptional and interconceptional care for improved maternal and child health, but the practice and structures of women's health care have not yet evolved to reflect this knowledge.¹⁻³ Barriers include fragmented health care financing and variable levels of women's engagement with health care providers throughout different life stages. An examination of demographic and health trends calls attention to the need for a paradigm shift in the ways we address perinatal and women's health issues and demands attention to a set of implementation strategies that will overcome existing barriers. An evidence-based framework that encompasses multiple determinants across the lifespan may prompt development of new strategies to improve health outcomes.

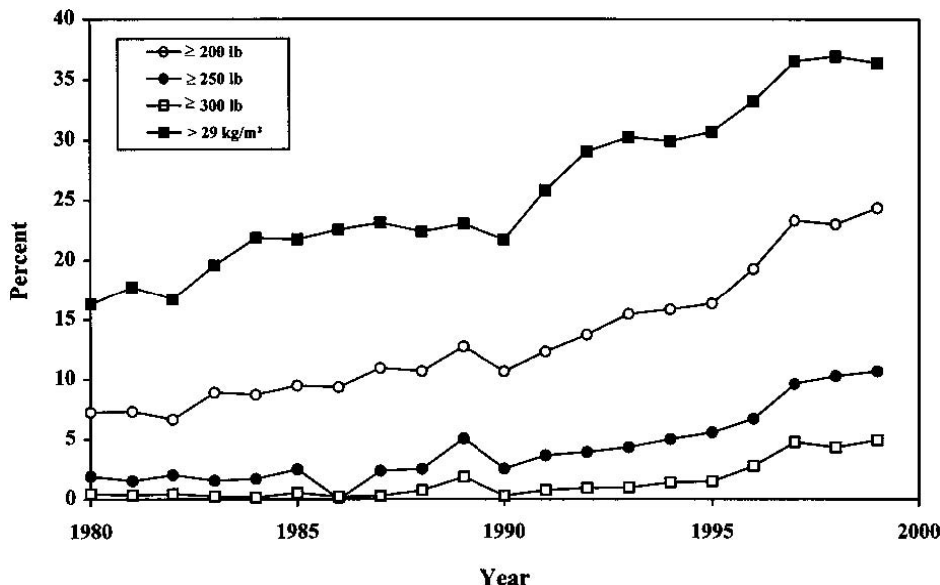
This brief focuses on one maternal factor, obesity, to illustrate how such a framework can form the basis for strategies at each level of the multiple determinants, lifecourse framework. Emphasis is given to how public policies and public and private sector professional practice can be re-examined to improve outcomes for women of all ages and stages of reproductive potential, which in turn might enhance outcomes for their offspring, both at birth and beyond. This brief is intended to help synthesize a wealth of biomedical, developmental, and social science information that can be brought to bear in planning interventions. Our hope is that the framework will be a useful tool for state and local MCH practitioners in assessing gaps in knowledge, programs, and policies, and in thinking about and planning for new ways of approaching perinatal and women's health across the lifespan.

Changing Demographics of Pregnancy

Trends in the demographic and health characteristics of the U.S. childbearing population compel us to develop a contemporary framework for effective strategies addressing maternal morbidity and mortality. The age composition of the childbearing population has changed dramatically in the last few decades.⁴⁻⁶ For example, women are increasingly postponing childbearing until their 30s and 40s. The birth rates for women 30-44 years of age have been increasing since the 1970s with the rates in 2003 the highest since the advent of modern contraception. As a result, while women in their twenties still delivered the majority of live births in 2003, nearly forty percent of births were to women 30 years and older.⁷ This shift in age presents challenges to maternal health goals,

as there are both theoretical and empirical arguments that older mothers are at greater risk for maternal morbidity and mortality. First, the risk of most chronic diseases increases with age. Second, the longer a woman has had a chronic condition, the more likely it is that her health has been adversely affected so that she enters pregnancy in poorer health than a younger woman. Third, rates of maternal mortality and morbidity increase with maternal age.⁸⁻¹⁶ Some studies suggest that even healthy older mothers experience increased rates of antenatal and intrapartum complications.^{9, 13, 17} One condition that has changed the health of U.S. women strikingly in the past two decades – obesity – is discussed below to illustrate these points.

Figure 1. Weight at First Prenatal Care, 1980-1999



Lu, G., Rouse, D., DuBard, M., Cliver, S., Kimberlin, D., & Hauth, J. (2001). The effect of the increasing prevalence of maternal obesity on perinatal morbidity. *Am J Obstet Gynecol*, 185, 845-849.

Epidemiology of Women, Weight, and Maternal Health

RIISING RATES OF OVERWEIGHT AND OBESITY IN WOMEN. Overweight and obesity both have increased over the past 25 years.* Based on the most current National Health and Nutrition Examination Survey (NHANES) data, the percentage of obese women 20-39 years old has risen from 12.3 percent from 1976–1980 to 29.1 percent from 1999-2002.^{18,19} Analysis of the perinatal database at the University of Alabama showed a twenty percent increase in average body weight at the first prenatal visit between 1980 and 1999, an equal increase in the percent of women weighing over 200 pounds, and a ten fold increase in the proportion of patients weighing 300 or more pounds.²⁰ Even more troubling are the increased rates of overweight and at risk for overweight being seen in children

and adolescents, our future “mothers.” Among girls 6-19 years old in 1999-2002, 30.3 percent were at risk for overweight or were already overweight.¹⁹

EFFECTS OF OVERWEIGHT ON MATERNAL HEALTH. A recent study has raised the possibility that the effectiveness of oral contraceptives is reduced for overweight and obese women, increasing their risk of unintended pregnancy.²¹ Obesity increases the likelihood that a woman will enter pregnancy with a chronic disease,²² thereby increasing maternal morbidity and mortality. Obese women also are at increased risk for complications of pregnancy (e.g., gestational diabetes, hypertensive disorders of pregnancy), regardless of their health prior to pregnancy.²³⁻³⁰

* Weight typically is considered in the form of Body-Mass Index (BMI). Adults are considered overweight with a BMI between 25 and 30, and obese with a BMI over 30. Children are considered overweight if their BMI is in the 95th percentile or above for their sex and age, and they are considered “at risk” for overweight if their BMI falls between the 85th and 95th percentiles.

Labor and delivery problems are correlated with maternal BMI, and risks for cesarean deliveries are elevated for obese women.^{23, 26, 28-30} These outcomes appear to be a function of a longer length of labor,³¹ increased frequency of macrosomia in the infant,^{23, 27, 29, 30} and other complications that require delivery to be expedited (e.g. preeclampsia). Recent studies suggest that overweight and obesity may even limit a woman's ability to successfully breastfeed.³²⁻³⁶ The mechanisms for lower rates of breastfeeding initiation and duration in obese women have not yet been definitively determined, but physiologic, physical, and psychologic factors all appear to play a role.³²⁻³⁶

The cost of prenatal care for overweight women has been reported to be between 5 and 16 times higher than for normal weight women, increasing with level of obesity.³⁷ The duration of prenatal and postnatal hospitalization is approximately 4.5 days longer for obese women than for normal weight women.³⁸

Obesity is also related to the risk of maternal death. While studies of maternal mortality have not focused on obesity as a determinant, obesity has been identified as an important risk factor for the clinical conditions that account for the majority of maternal deaths (i.e. thromboembolic disease, hemorrhage, infections, and preeclampsia).³⁹

EFFECT OF PREGNANCY ON POSTPARTUM WEIGHT.

The extent to which pregnancy may contribute to obesity in women who were not obese prior to pregnancy is not fully understood but may be an underappreciated long term consequence of pregnancy for women. Recent studies using longitudinal designs strongly confirm the notion that pregnancy weight gain can lead to increases in women's weight and risk of obesity.

Gunderson and Abrams, reviewing the literature in this area, estimated that between 14 and 20 percent of women weigh at least 5 kg more at 6-18 months postpartum.⁴⁰ Rooney et. al. reported that the most

important predictors of long term weight gain and higher BMIs at ten⁴¹ and fifteen years⁴² after the study pregnancy were excess (over recommended amounts) pregnancy weight gain and the failure to lose pregnancy weight gain in the first six months postpartum.⁴¹ The potential risk that retained pregnancy weight gain may pose to the health of women has not yet been measured and examined but should be monitored and addressed within the context of women's health in the reproductive years and beyond.

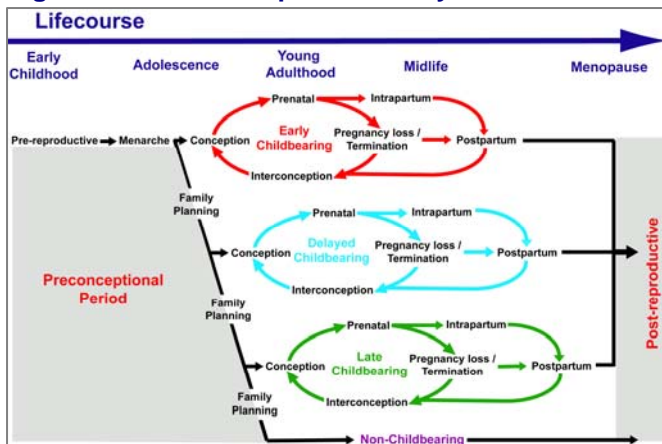
RACIAL/ETHNIC DISPARITIES. The racial/ethnic and socioeconomic disparities seen for so many health conditions are also mirrored for obesity and overweight in both adults and children. Based on 1999-2002 NHANES data, nearly half of non-Hispanic black women 20-39 years of age were classified as obese (46.6 percent) compared with one-quarter of non-Hispanic whites (24.9 percent) and nearly one third (31.2 percent) of Mexican-American women in this age group.¹⁹ In a study of all registered New York City births from 1998-1999, black women were disproportionately represented among those with prepregnant weights of 200-299 and over 300 pounds.²⁸ In that same time period, the proportion overweight among non-Hispanic white girls (12.9) was lower than that of Mexican-American girls (18.5) and nearly half that of non-Hispanic black girls (23.2).¹⁹

In a recent longitudinal study of postpartum weight changes,⁴³ all women experienced declines in their BMI in the first six weeks postpartum. However, only white women experienced declines in BMI in the second six months, while Hispanic and African-American women had small increases or no changes between measurements. This is consistent with an earlier study by Parker and Abrams demonstrating differences in postpartum weight retention between black and white women.⁴⁴

A Lifecourse Perspective for Perinatal Health

Strategies to improve perinatal health have primarily focused on the prenatal, intrapartum, and immediate postpartum periods, but these strategies have failed to adequately address the impact of child, adolescent, and women's health on maternal and infant outcomes. Experts are increasingly recognizing that improving maternal and infant outcomes requires strategies that target factors *across the lifecourse* and not exclusively in the prenatal period.

Figure 2. Women's reproductive cycles



Source: Misra, Guyer, and Allston, 2002.

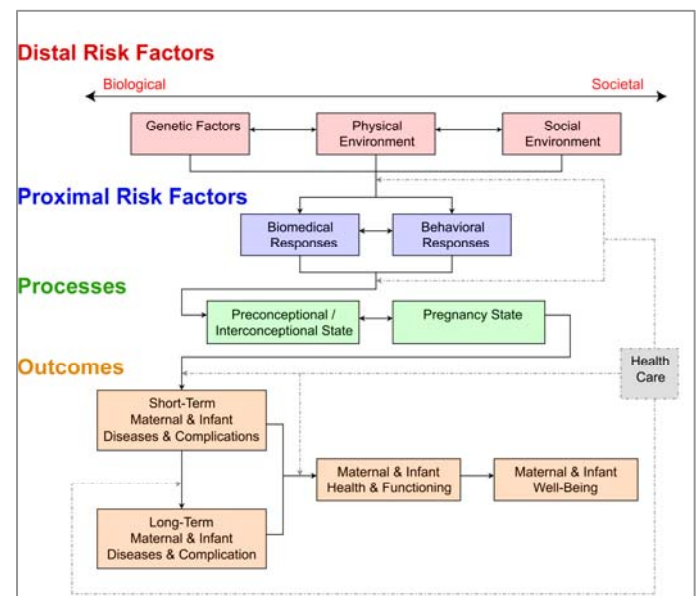
The importance of preconception care has been noted in a number of reports published in the last two decades. However, there have been difficulties with operationalizing this notion and approaching perinatal health from the lens of women's health. While many of these frameworks have called attention to the preconceptional period, the factors and strategies identified have been limited in scope.

Misra and colleagues (2002) proposed a perinatal health framework (Figure 3) based on the Evans and Stoddart⁴⁵ model of the determinants of health. Three of the four groups of outcomes from Evans and Stoddart are included here: (1) diseases and complications, (2) health and functioning, and (3) well-being. There are two levels of risk factors described in the framework. At the *distal level*, the framework brings focus to risk factors that place an individual or population at greater

susceptibility to proximal risk factors. While having the potential to directly influence individual health status, distal factors are more relevant in terms of increasing or decreasing an individual's predisposition towards developing compromising health conditions, engaging in high-risk behaviors, or being exposed to potential toxins. The primary categories of distal risk factors are genetic factors, the physical environment, and the social environment. At the *proximal level* of the framework, risk factors that have a direct impact on individual health status are represented by two categories, behavioral and biomedical responses.

Figure 3 also shows that health care can modify the relationships between the various components of the framework. Health care, in this context, is defined as the broad range of activities from primary prevention—societal-level programs that could be targeted to preventing young adolescents from having unplanned pregnancy—to medical interventions that screen for or treat specific disease processes.

Figure 3. Perinatal Health Framework



Source: Misra, Guyer, and Allston, 2002.

Application of the Framework to Obesity in Women

Many public health and medical professionals have called for increased attention to obesity as an important risk factor that jeopardizes maternal health. Obesity is a good example of a risk factor that is difficult to deal with in prenatal care and for which prevention in childhood and adolescence is far more effective than are attempts at change in adulthood. No single strategy appears to be effective in the long term for weight loss in adulthood. The ideal approach to obesity is prevention, and childhood and adolescence are critical periods for prevention strategies. We focus here on obesity as an example of how the proposed framework can be applied to the wider range of proximal factors that can be more effectively addressed in the preconceptional and interconceptional periods.

A range of public health and clinical care policy and practice strategies can be applied, including communication and information strategies, administrative strategies, provider strategies, financing strategies, non-governmental strategies, and environmental strategies.

GENERAL CATEGORIES OF INTERVENTION STRATEGIES

1. **Information strategies:** These can be used to reach: (a) the population at risk, (b) providers, and (c) those who influence the larger system(s). This includes finding ways to present data to influence health behaviors, health care practices, and health policy. Broadly conceptualized, information strategies might also include data-driven policy change, which may be effective tools to circumvent current political conservatism that rejects use of governmental interventions in the marketplace.
2. **Administrative strategies:** Options in this category might entail changing the current categorical, disease- and population-defined organizational schemes and practices of state and local health agencies to improve content, availability, and delivery of services. This strategy arena also entails consideration of implementing targeted interventions in non-traditional (or typically non-public health) settings, such as colleges or workplaces.
3. **Financing strategies:** While clearly politically and technically difficult to address, this area is important. Extending Medicaid coverage to low-income non-pregnant women (through Family Planning or other waivers) and/or for providing family coverage through the State Children's Health Insurance Program⁴⁶ would allow for preconception care and adequate post partum and interconceptional care for women otherwise unable to access health insurance. Two additional concerns to address within the category of financing are 1) whether insurance plans (public or private) include coverage of services such as weight reduction programs and 2) whether, if covered, these services are adequately reimbursed.
4. **Provider strategies:** Publication of clinical research findings and provider guidelines are tools routinely applied to promote behavior change in physician practice. Where changing provider practice routines appears infeasible, other approaches might include: a) encouraging all providers of women's health care -- not just physicians and nurse midwives -- to address these issues (perhaps focus on nurses and nurse practitioners)⁴⁷, or b) pursue changes that are not dependent (exclusively, or at all) on medical professionals.
5. **Non-governmental strategies:** Methods used in nongovernmental strategies frequently include communication efforts utilizing mass market media. Groups such as the Media Project (a program of Advocates for Youth) and the CDC work with the entertainment industry to accurately portray a variety of health issues.
6. **Environmental strategies:** Environmental strategies most familiar in the public policy arena are interventions such as clean up of toxic waste, or engineering the structural design of automobiles to make them more crash resistant. In many cases, what are considered to be environmental strategies are implemented through regulation, such as with food labeling.

Figure 4 lays out a broad range of such strategies for addressing obesity prevention and intervention in women across several life stages and its effects on perinatal health. A spectrum of determinants—from the most distal to the most proximal—are arrayed along the left side of the figure. Each stage of the lifecourse, beginning with childhood,[†] is identified across the top. Examples of interventions are mapped out for different combinations of determinants and life stages.

[†] While evidence is accumulating that the prenatal period is an important window for exposures that may have independent influences on adult health, with some suggesting even further that fetal programming may occur during this critical period and determine postnatal growth and health resulting in adult health problems, we do not explicitly discuss strategies as they relate to this life course period. While we recognize the importance of the prenatal period in this regard, we wish to avoid being circular and would also assert that this life course stage has long been the focus of attention, albeit for different reasons.

Figure 4. Lifespan Approach to Maternal Health Intervention as Applied to Obesity

	Child	Adolescent	20s	30+
<u>Distal Factors</u>				
Genetic	Assessment of family history		Genetic screening	
Physical Environment	Food security			
	School food policies, nutrition			
	Neighborhood safety to allow physical activity			
			Workplace promotion of physical activity	
Social			Workplace food policies, offerings	
	Teach stress management			
			Insurance coverage for all women of reproductive age, regardless of pregnancy status	
			Teach health literacy and skills for navigating the health system	
			Weight reduction support networks	
			Address domestic violence	
<u>Proximal Factors</u>				
Risk				
Biomedical	Training for pediatric, family practice, and obstetric clinicians			
	Screening and monitoring		Training for internists, other subspecialists	
Behavioral	School based education and interventions			
			College and workplace interventions	
Processes				
Pre- Inter Conceptional			Medication management	
			Training for exercise and diet clinicians	
			Screening and monitoring	
Pregnancy State			Medical information transfer, coordination care	
			Medication management	
Postnatal			Breastfeeding education, support specific to weight management	

Grason, H. Applying a Lifespan Approach to Safe Motherhood Interventions. Presented at “Expecting Something Better” Jacobs Institute Conference, Washington, DC. May 2005.

This holistic approach illustrates the necessity to work across various public health and clinical specialties and the importance of continuity and communication. A number of typically discrete areas of expertise (e.g., child health, adolescent health, maternal health, chronic disease, STDs) and professional disciplines (e.g., educators, physicians, policymakers) are called into play. More detailed description of sets of interventions at each life stage follow.



GIRLS IN CHILDHOOD. The emphasis in childhood is on distal determinants and reduction of biomedical and behavioral risk. Public

health recently has begun to focus more intently on ensuring that environments where children live are safe and amenable to physical activity (e.g., bike paths, open space and “built communities” concepts, etc.) and to attend to enforcement of statutes (Title IX) to optimize opportunities for girls to be engaged in sports. More can and should be done in this regard. Recognizing the role of genetic factors in obesity, consideration might be given to including a family history specific to obesity in pediatric health assessment and providing ongoing anticipatory guidance and health monitoring where indicated. Such history-taking could be incorporated in requirements for the Medicaid Early Periodic Screening, Diagnosis and Treatment (EPSDT) program and in *Bright Futures* practice standards for pediatricians. Because young girls spend much of their time in school settings, health professionals must become more influential with regard to school policies about foods offered in school buildings (including vending machines) and physical exercise. There is further opportunity to enhance health education provided in schools by incorporating messages about the importance of weight management for maternal health and perinatal outcomes.



ADOLESCENT GIRLS.

During adolescence, the need for attention to distal determinants continues. Given developmental changes, however, the teenage years imply different influences on behavior (peers rather than families), different activities, and different places where teens spend time (e.g., workplaces in addition to schools). School-sponsored activities could include peer support groups in weight reduction programming, and school health curricula might include health education messages about the scientific links between obesity and compromised maternal and infant health and/or difficulty with childbearing. Information on the benefits of breastfeeding might also be considered. Consideration must be given to issues of particular salience to adolescents. An unintended and undesirable consequence of focusing on obesity may be the development of negative body images for young women, possibly triggering eating disorders.⁴⁸ Additionally, obesity and depression may be associated, though the direction of causality is unclear.⁴⁹ Adolescence is a common time for these problems to emerge.

Adolescence brings other age-specific concerns as well, such as access to the health care system and inclination towards risky behavior (especially related to use of tobacco, alcohol and illicit drugs). Teenage girls’ contraceptive needs may influence where they seek care, thereby affecting the ability to deliver services and information resources. Beliefs about oral contraceptive use leading to weight gain also may need to be addressed. While the “lore” of oral contraceptive-induced weight gain is discussed among teen girls, in a recent review of the literature, Gallo and colleagues reported that there is insufficient evidence linking weight gain and oral contraceptive use and that a large effect seems unlikely.⁵⁰

The need for attention to preconceptional concerns begins in this age range as well. We can anticipate that, at some future point, genetic testing for obesity will become available and will be targeted in this age stage, as obesity-related conditions are increasingly appearing in adolescent populations.^{51,52}

A woman-centered approach to medical information may be especially important for adolescents, as they “age out” of pediatric care and into family practice, internal medicine, and reproductive health practices. For example, if Type 2 diabetes develops during adolescence as a result of childhood obesity, management of the disease must be planned and communicated across medical specialties and over time. The young woman and each of her healthcare providers will need to be aware of the implications should she plan to or actually become pregnant.



YOUNG WOMEN IN THEIR 20s. The highest rates of childbearing occur among women in their twenties. While

attention to distal determinants continues in this time period, there is an increased need to focus on risk and on processes of care. First, a woman-centered, lifecourse approach calls for different foci of public health interventions and venues for communicating health information than for young girls and teens. Over half of undergraduate students are now female.⁵³ Many young women also or alternatively participate in the workforce. Places of employment and college environments need to be engaged in health promoting policies and interventions (e.g., incentives to promote physical activity and healthy food choices)—again, with a strong emphasis on the links between behavior and maternal health and pregnancy outcomes.

A number of large employers have sought to address issues specific to pregnant employees, in addition to lifestyle health for all female employees. Public health partnerships might be pursued to enhance messages and expand the reach of interventions like these.

The provider base for health interventions might be expanded by providing training for exercise and diet clinicians (e.g., physical trainers) that would enable them to incorporate screening and monitoring into routine interactions with their clients. Young women in their 20s, while less likely than young girls or teens to participate in team sports, are more likely to spend time in gyms and athletic clubs. A provider-based strategy might be undertaken to explore new types of providers and places for providing health information, screening, and guidance.

Assuring information transfer across providers (family planning, primary care, specialists, ob/gyn) and over time is important. Within a period of just a few years, a woman in her twenties is likely to experience many changes in providers. Older adolescents and young women transition from pediatric primary care providers to internists or family practitioners, and they also may add a separate provider of family planning services. Moreover, young women tend to change jobs and relocate geographically more frequently, resulting in changes in insurance coverage and health care providers. Since infrequent and/or disrupted use of health services and frequent changes in providers may be the norm for many young women, all healthcare providers need to be educationally and attitudinally ready to provide some level of assessment/screening, counseling, and follow-up as necessary.

Information transfer across providers in real time is of high importance. Women often see multiple providers and yet none of the providers may be considering all of the woman's needs. Prepregnancy and periconceptional management of chronic diseases may minimize the effects of the condition on both mother and fetus.

Particular treatments for chronic disease that are used in nonpregnant women may be harmful to the fetus; therapies may need to be modified for women who are pregnant or are planning to become pregnant. Ongoing and prepregnancy consultation for such patients can allow for selection of an appropriate therapeutic regimen that will be

effective in managing the woman's condition both during and prior to pregnancy. Issues of medication management and optimization of management for both mother and fetus could be emphasized in training for family planning providers, internists, and medical specialists such as endocrinologists so they understand what to look for in terms of how certain conditions (e.g., obesity and sequelae like diabetes) put women at greater risk with respect to pregnancy. Innovations such as electronic portable patient records or restructuring payment schemes to encourage multidisciplinary team care could also enhance care.



Conclusions

As illustrated in the examples above, the lifespan multiple determinants approach demands attention to consistency and continuity with respect to health information and health care. Policies and program and practice interventions to improve maternal health can be envisioned along the age continuum. Currently, the system of health care for women is characterized by fragmentation, with women accessing preventive and primary care from multiple providers. Moreover, continuity of care as we have known it—having providers with whom long-term therapeutic relationships exist—has been systemically disrupted in recent decades, due to increasing specialization among medical professions and frequent disruption of long-term patient-primary care provider relationships for a host of reasons. The medical system and clinicians can not be solely relied upon to address the issues raised in this life course framework. Given the gaps across the lifespan in the frequency with which women interface with the health system for primary care, other approaches to addressing factors across the life course must be identified. Patient-based approaches complemented by population-based efforts to reach women in different stages of life are critical to assuring the health of women in and beyond childbearing. While a number of specific interventions are suggested, the framework calls for a multi-component approach applied consistently over time in order to yield the greatest potential for sustained positive impact.

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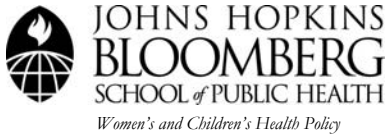
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