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The Global Action Report on Preterm Birth

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CARE BEFORE PREGNANCY

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Chapter 3. Care before and between pregnancy

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The importance of preconception health and care before pregnancy

Preconception care has, until recently, been a weak link in the continuum of care. Providing care to women and couples before and between pregnancies (interconception care) improves the chances of mothers and babies being healthy, and awareness is growing. Preconception care may be defined as "any intervention provided to women and couples of childbearing age, regardless of pregnancy status or desire, before pregnancy, to improve health outcomes for women, newborns and children" (Bhutta et al., 2011a), or "a set of interventions that aim to identify and modify biomedical, behavioral and social risks to a woman's health or pregnancy outcome through prevention and management" (Johnson et al., 2006). An expanded scope and definitions for preconception care are provided in Box 3.1.

Box 3.1: Scope and definitions of preconception care

Preconception care "Any intervention provided to women of childbearing age, regardless of pregnancy status or desire, before pregnancy, to improve health outcomes for women, newborns and children."

Periconception care "Any intervention provided to women of childbearing age preceding, including and immediately following conception to improve health outcomes for women, newborns and children."

Interconception care "Any intervention provided to women of childbearing age between pregnancies, to improve health outcomes for women, newborns and children."

Reproductive age encompasses adolescent girls age 15 and older, and women up to age 49.

Preconception Care envisages a continuum of healthy women, healthy mothers and healthy children; and promotes reproductive health for couples. Preconception care recognizes that boys and men are affected by, and contribute to, many health issues and risk factors that influence maternal and child health, such as sexually-transmitted infections, smoking and partner violence. Preconception care must reach girls and women, boys and men so that they are healthy in their own right, and so that they promote the health of mothers and newborns.

Source: Bhutta et al., 2011a

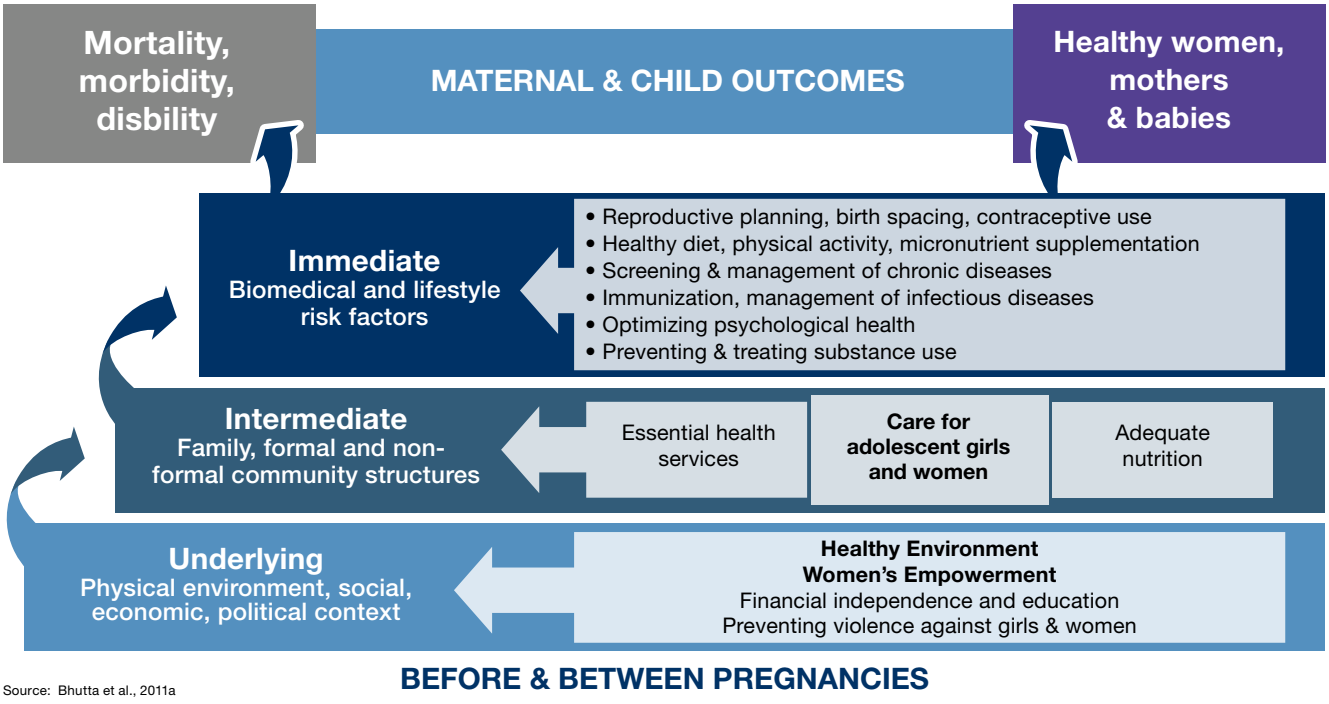
Preconception care emphasizes maternal and child health; however, it is vital to recognize that all girls and boys have the right to grow and develop in good health, just as all women and men have the right to be healthy—physically, psychologically and socially. Extending the RMNCH continuum to the preconception period improves the health and wellbeing of mothers, newborns and children as well as the health and wellbeing of girls and women, and boys and men, in their own right.

As shown in Figure 3.1, the conceptual framework for preconception care encompasses broader initiatives such as women's education and empowerment, and more targeted health interventions such as vaccination and micronutrient supplementation. Preconception care allows the time necessary for behavioral interventions to take effect. In various countries, it has been provided in schools, primary health care facilities or community centers, and has involved husbands, health care providers, youth leaders and community volunteers in achieving healthier outcomes for mothers and babies.

Many women, however, are unaware of how their health before conception may influence their risk of having an adverse outcome of pregnancy. As shown by the RMNCH continuum of care described in Chapter 1, health education and other programs delivered to all women during adolescence, before conception and between pregnancies can improve women's own health

1. Unless otherwise specified, the term preconception care in this chapter refers to both preconception and interconception care.

Figure 3.1: Conceptual framework for preconception care



Source: Bhutta et al., 2011a

during pregnancy as well as that of their babies (Institute of Medicine, 2007; Wise, 2008; Kerber et al., 2007). The imperative for preconception health is even greater given that 41% of all women report that their pregnancies were unplanned (Singh et al., 2010). Thus, waiting to provide needed health interventions until a woman and her partner decide to have a child will be too late in 4 out of 10 pregnancies.

Preconception care simultaneously promotes reproductive planning and interventions to reduce risk, allowing women to enter pregnancy in the best possible health and to have the best possible chance of giving birth to a healthy newborn. Outreach and awareness must begin in adolescence if it is to truly improve the health of women and newborns and reduce the rates of prematurity and low birthweight (Box 3.2). The contextual and individual risks that increase the likelihood of preterm births and other adverse pregnancy outcomes are present from the time a girl reaches adolescence, and they continue during and between pregnancies.

Priority packages and evidenced-based interventions

There is growing evidence that reducing risks in the preconception period improves the health of the pregnant woman and also contributes to the prevention of preterm birth. Table 3.1 presents risk factors associated with an increased risk of preterm birth. These estimates were derived from a detailed review of the evidence base on preconception risk factors for all adverse outcomes of pregnancy and landmark reviews on the causes of preterm birth (Barros et al., 2010; Bhutta et al., 2011a; Goldenberg et al., 2008; Iams et al., 2008).

Factors that have been shown to be strongly predictive of preterm risk, but cannot be modified, include history of previous spontaneous preterm birth, cervical procedures (including biopsies), primiparity, grand multiparity and multiple gestations. Factors associated with socioeconomic and racial disadvantage (see Chapter 2) will, hopefully, be amenable to positive transformation over the longer term, but this will require fundamental structural changes to society and a deep-seated shift in social values and norms.

Table 3.2 presents the priority packages and evidence-based interventions during the preconception period and

2. Although RMNCH is the accepted term for the continuum of health, as noted in Chapter 1, preconception health extends beyond reproductive health (the "R") encompassing a broad range of interventions.
3. Until now, preconception care has focused primarily on women since their health more directly impacts pregnancy outcomes, and in many contexts their needs are not adequately addressed. There is now a growing realization that involving men in preconception care is critical since the health of both the potential father and mother determines pregnancy outcome. Further, preconception care that engages men can help to make them supportive partners who promote healthy behaviors and increase women's access to care.

Box 3.2: Importance of preconception care for adolescent girls

It has been estimated that 16 million adolescent girls between the ages of 15 and 19 give birth each year, representing approximately 11% of all births worldwide (WHO, 2007). These girls are not physically prepared for pregnancy and childbirth and without the nutritional reserves necessary are at disproportionately greater risk of having premature and low-birthweight babies (Haldre et al., 2007; Mehra, and Agrawal 2004; Paranjothy et al., 2009; WHO, 2007). Both hospital- and population-based studies in developed and developing countries show that adolescent girls are at increased risk for preterm birth compared with women ages 20 to 35 (Ekwo and Moawad, 2000; Hediger et al., 1997; Khashan et al., 2010). The risk is especially high for younger adolescent girls (Khashan et al., 2010; Sharma et al., 2008).

Married and unmarried adolescent girls often lack education, support and access to health care that would allow them to make decisions about their reproductive health (WHO, 2001). One in 5 pregnant adolescent girls report shaving been abused in pregnancy (Parker et al., 1994). Violence against girls and women, not only has been shown to result in adverse physical, psychological and reproductive consequences for them, but also is reported to increase the risk for prematurity and low birthweight (Krug et al., 2002). Adolescent girls, in particular, are more likely to experience violence than adult women, and are less likely to seek care or support during pregnancy as a result (Jejeebhoy, 1998). Additionally, adolescent girls are more likely to have multiple risk factors for adverse pregnancy outcomes, including being socially disadvantaged, undernourished and having higher rates of sexually transmitted and other infections.

Despite the increased risks for adolescent mothers and their newborns, social and cultural norms in developing countries perpetuate early marriages with 60 million women reporting that they were married below the age of 18 (UNICEF, 2007). Married or unmarried adolescents are less likely to use any contraceptive method during sexual activity than adults in sexual partnerships (Blanc et al., 2009). Although adolescence is a period of increased risk, it also provides a unique opportunity to influence the development of healthy behaviors early on. Preconception interventions to promote reproductive planning, improve nutrition, encourage healthy sexual behaviors and prevent substance use and partner violence are likely to have greater benefit if targeted towards adolescent girls and boys.

before pregnancy that have potential to reduce preterm birth rates. These include interventions currently recommended by the WHO in the preconception period (e.g., family planning and prevention and treatment of STIs) (PMNCH, 2011). Only interventions with evidence of strong or moderate effectiveness are described in the section below. Efforts are now underway to develop guidelines for preconception care and expand the package of interventions to include those listed in Table 3.2—for example, optimizing pre-pregnancy weight, screening for and treating mental health disorders and other chronic diseases like diabetes and hypertension, preventing intimate partner violence and promoting cessation of tobacco use and exposure to secondhand smoke in the home and workplace. It should be noted that because preconception care is a relatively new concept, the evidence base for risks and interventions before conception is still being strengthened. Thus, broad consensus regarding a package of evidence-based interventions for care in the preconception period has yet to be decided.

Preconception care services for prevention of preterm birth for all women

Prevent pregnancy in adolescence

Preconception care that begins early on and continues between pregnancies will help to ensure that women have a reproductive life plan and are able to decide when to have children, how many children they desire and methods used to prevent unintended pregnancy. In some regions, cultural norms promote early marriage, which is a factor in high rates of adolescent pregnancy. Regulations to increase the legal age at marriage and educating communities to change cultural norms that support early marriage may be ways to prevent adolescent pregnancy in those countries. In an effort to discover what interventions are most effective to prevent adolescent pregnancy, a wide variety of programs carried out in low-, middle-, and high-income countries has revealed that the most successful programs are responsive to the unique educational, social, economic, nutritional,

Table 3.1: Risk factors associated with an increased risk of preterm birth and the effectiveness of intervention arrayed according to the strength of evidence

How Great Is The Risk?		
Pregnancy in adolescence	+	Increased prevalence of anemia, pregnancy-induced hypertension, low birthweight, prematurity, intra-uterine growth retardation and neonatal mortality
Birth spacing	+	
Short intervals		PTb: OR 1.45, LBW: OR 1.65
Long intervals		PTb: OR 1.21, LBW: OR 1.37
Pre-pregnancy weight status	+	
Underweight		PTb: OR 1.32, LBW: OR 1.64
Overweight & obesity		PTb: OR 1.07 Maternal overweight is a risk factor for many pregnancy complications including hypertensive disorders, gestational diabetes, postpartum hemorrhage, stillbirth, congenital disorders Both underweight and overweight women have a higher chance for requiring obstetric intervention at delivery
Micronutrient deficiencies	+/-	
Folic acid		Folic acid deficiency is definitively linked to neural tube defects (NTDs) in newborns
Iron		Anemia increases the risk for maternal mortality, low birthweight, preterm birth and child mortality
Chronic diseases	+	
Diabetes mellitus		Babies born to women with diabetes before conception have a much higher risk of stillbirths, perinatal mortality, congenital disorders, as well as spontaneous pregnancy loss, preterm labor, hypertensive disorders, and delivery by cesarean birth
Hypertension		
Anemia		A study shows that anemia before conception increases the risk of low birthweight (OR 6.5)
Poor mental health (especially depression) **and Intimate partner violence**	++	Increased risk for preterm birth, low birthweight and depression during pregnancy and the postpartum period IPV-PTb OR: 1.37, LBW OR: 1.17 Also increased risk for spontaneous pregnancy loss, stillbirth, gynecological problems including sexually-transmitted infections, depression
Infectious diseases	++	
STIs - syphilis HIV/AIDS Rubella		Infectious diseases increase the risk for spontaneous pregnancy loss, stillbirths and congenital infection
Tobacco use	++	A single study shows risk for PTb OR: 2.2 Smoking increases the risk for spontaneous pregnancy loss, placental disorders, congenital malformations, sudden infant death syndrome, stillbirths and low birth weight

For magnitude of risk:

++ means strong evidence of risk and implicated in biological pathways leading to preterm birth and low birthweight

+ means moderate evidence of risk on preterm birth and low birthweight

+/- means weak evidence of risk on preterm birth and low birthweight

Acroynms used: PTb = preterm birth; OR = odds ratio; IPV = intimate partner violence

Source: Barros et al., 2010; Bhutta et al., 2011a; Goldenberg et al., 2008; Iams et al., 2008

psychological and medical needs of adolescents (Gavin et al., 2010). Particular emphasis must also be placed on ensuring universal access to primary and secondary education for girls through increasing formal and informal opportunities, because girls who complete their education are less likely to become pregnant in adolescence (Guttmacher Institute, 1998). While expanded sexual education programs increase adolescents' knowledge of risk, they have not been shown to change behaviors. In a combined analysis, personal development programs that incorporated skills-building and include contraceptive provision were shown to prevent 15% of first adolescent pregnancies (DiCenso et al., 2002; Origanje et al., 2009), and programs that taught parenting skills and enabled teen mothers to complete their education decreased repeat adolescent pregnancies by 37% (Corcoran and Pillai, 2007; Bhutta et al., 2011a; Harden et al., 2006). Across all contexts, programs demonstrated greater success if they were holistic in scope rather than solely focused on sexual education and STI/teen pregnancy prevention. It is important to note that programs with a longer duration were more effective since adolescents require time to integrate new information, practice the skills that will

Table 3.2: Priority interventions and packages during the preconception period and before pregnancy to reduce preterm birth rates

Preconception care services for the prevention of preterm birth for all women
• Prevent pregnancy in adolescence • Prevent unintended pregnancies and promote birth spacing and planned pregnancies • Optimize pre-pregnancy weight • Promote healthy nutrition including supplementation/fortification of essential foods with micronutrients • Promote vaccination of children and adolescents
Preconception care services for women with special risk factors that increase the risk for preterm birth
• Screen for, diagnose and manage mental health disorders and prevent intimate partner violence • Prevent and treat STIs, including HIV/AIDS • Promote cessation of tobacco use and restrict exposure to secondhand smoke • Screen for, diagnose and manage chronic diseases, including diabetes and hypertension

allow them to negotiate safe behaviors and develop confidence in themselves to broaden their life options (Bhutta et al., 2011a; Corcoran and Pillai, 2007; DiCenso et al., 2002; Harden et al., 2006; Origanje et al., 2009).

Prevent unintended pregnancies and promote optimal birth spacing

One way to ensure that mothers and babies have good outcomes is to encourage pregnancy planning. Women who have very closely spaced pregnancies (within 6 months of a previous live birth or pregnancy) are more likely to have preterm or low-birthweight babies (Conde-Agudelo et al., 2006). This may be because they have not had enough time to replenish their nutritional reserves or treat an infection or other systemic illness. The correct, consistent use of family planning methods leads to more women spacing their pregnancies 18 to 24 months apart, which is ideal (Tsui et al., 2010). Encouraging family planning and the use of contraceptive methods (hormonal and barrier methods) has other advantages including reductions in maternal and infant mortality, lower rates of unintended pregnancies, and prevention of STIs, including HIV (Conde-Agudelo et al., 2006; Tsui et al., 2010).

Breastfeeding promotion for 24 months can prevent closely spaced pregnancies, a method that continues to be underused despite strong evidence of its positive effect on maternal and newborn health. On its own, 12 months of contraception-only coverage in the preceding birth interval can reduce the mortality risk for the next newborn by 31.2%, whereas 12 months of contraceptive use overlapping with breastfeeding reduces the risk by 68.4% (Tsui, 2010). Programs to make effective contraception available to women and couples of reproductive age must also include counseling and follow-up to determine if the chosen method of contraception is being used correctly, and so that the method may be changed if necessary. It has been demonstrated that contraceptive counseling by trained care providers in the immediate postpartum period, or as part of comprehensive care after pregnancy loss, increases women's uptake and their partner's support for contraceptives (Bhutta et al., 2011a). Appropriate birth spacing after a previous live birth or pregnancy loss decreases the risk for prematurity in subsequent pregnancies (Shah and Zao, 2009; Conde-Agudelo et al., 2005).

Although contraceptive use, particularly amongst adolescents, currently falls far short of the optimal with only 56% of the demand for family planning satisfied among the Countdown to 2015 priority countries (Requejo et al., 2012), the renewed interest in family planning and contraceptive commodity security (UK Govt Family Planning Summit forthcoming July 2012, UN Commission on Life-saving Commodities for Women and Children) gives an unprecedented opportunity to scale up use of contraception and allows for women and partners to plan their pregnancy. Strategies for improving coverage, especially

Photo: Susan Warner/Save the Children

in low-resource settings, are urgently needed and require vigorous research.

Optimize pre-pregnancy weight

Optimizing weight before pregnancy is recommended, since weight gain or loss during pregnancy increases the risk of adverse pregnancy outcomes. Monitoring nutritional status through measurement of women's body mass index prior to pregnancy is feasible, even in low-income contexts, and should be used as a baseline to develop a regimen for healthy eating and physical activity to optimize their weight.

Women who are underweight before pregnancy (body mass index less than 18.5 kg/m2) are at significantly greater risk of having premature, low birthweight newborns (Han et al., 2011). Given that maternal undernourishment is a risk factor for being underweight, improving food security could reduce the rates of preterm birth, especially in impoverished nations. It is important, therefore, to evaluate whether local and national food programs largely targeted towards children could be replicated for adolescent girls and women.

Obesity is a problem of increasing magnitude globally with estimated 300 million women of reproductive age who are obese (WHO, 2011). Overweight and obese women (body mass index greater than 25 kg/m2) have a higher risk for preterm births (McDonald et al., 2010; Torloni et al., 2009). While existing evidence indicates that weight loss at any age is difficult to achieve and sustain, successful programs for women in their reproductive years reaffirm that women can overcome environmental pressures like easy access to low-cost, high-calorie foods and develop healthy eating habits. These programs promote dietary modification and increased physical activity through sustained daily changes, with the help of a support system and regular monitoring (Eiben and Lissner, 2005; Faucher and Mobley, 2010; Amorim et al., 2007; Chang et al., 2010; Galtier et al., 2008; Kinnunen et al., 2007; Mediano et al., 2010; Ostbye et al., 2009; Rock et al., 2010). Women should be encouraged to include moderate physical activity in their daily routine to improve weight and cardiovascular status before pregnancy and reduce the likelihood of developing weight-related complications during gestation (Gavard and Artail, 2008). Programs should be tailored to women's weight at baseline and their lifestyle, to build motivation and increase the chances of sustaining weight loss.

Promote healthy nutrition including supplementation/fortification of essential foods with micronutrients

Studies of the biological mechanisms leading to preterm birth indicate that more severe congenital disorders, including neural tube defects, might result in preterm delivery (Honein et al., 2009). Consuming a multivitamin containing 400 µg of folic acid in the preconceptional period is the best way to ensure adequate micronutrient intake to help prevent neural tube and other birth defects (Christianson et al., 2006). Multivitamin supplementation reduces the risk of congenital malformations (e.g., neural tube, congenital heart, urinary tract and limb defects) by 42-62% and the risk

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of preeclampsia by 27%. Folic acid supplementation or fortification reduces the risk of neural tube defects by 53% (Bhutta et al., 2011a). Although folic acid is known to protect against neural tube defects, there is little evidence to show that folic acid supplementation alone reduces the risk for preterm birth (Bukowski et al., 2009). In addition, providing folic acid supplementation to all women of childbearing age poses a major logistical challenge. In middle- and low-income countries, iron and folic acid supplementation reaches fewer than 30% of women (PAHO, 2004). Even in the United States where there are aggressive promotional campaigns, only 1 in 3 women of childbearing age takes a vitamin with folic acid daily (March of Dimes, 2003). For this reason, iron and folic acid fortification of foods for mass consumption is considered an important strategy to increase micronutrient levels in the population. A number of countries have already opted to increase population folic acid intake through inexpensive, large-scale fortification, which has proven to be moderately effective and safe (CDC, 2004; Calvo and Biglieri, 2008; Blencowe et al., 2010; De Wals et al., 2003; Gucciardi et al., 2002; Honein et al., 2001; Liu et al., 2004; Lopez-Camelo et al., 2005; Persad et al., 2002; Ray et al., 2002; Sadighi et al., 2008; Sayed et al., 2008; Simmons et al., 2004; Williams et al., 2002, 2005). However, legislation for mandatory fortification of food staples has still not been enacted in many countries.

Promote vaccination of children and adolescents

Infections transmitted around the time of conception or during pregnancy may result in preterm birth (Goldenberg et al., 2000). Not only does infection, especially with rubella virus, increase the risk for prematurity, but it may also lead to other devastating consequences such as congenital rubella syndrome or miscarriage (Christianson et al., 2006; Cutts et al., 1997; Robertson et al., 1997). Many of these infections could be prevented through routine childhood vaccinations. However, the rubella vaccine can also be given at least 3 months prior to pregnancy to women who are not already immune (Coonrod et al., 2008). Vaccination campaigns against rubella have been able to increase coverage for adolescent girls and women (Gudnadottir, 1985; Su and Guo, 2002; Menser et al., 1985; Miller et al., 1985; Wang et al, 2007).

Preconception care services for women with special risk factors that increase the risk for preterm birth

Screen for, diagnose and manage mental health disorders and prevent intimate partner violence

Maternal stressors such as depression, socioeconomic hardship and intimate partner violence have been linked to preterm birth (Austin and Leader, 2000; Coker et al., 2004; Copper et al., 1996; Hegarty et al., 2004; Sharps et al., 2007). It has been hypothesized that physical and psychological stress acts through inflammatory pathways involving maternal cortisol to cause premature birth (Challis and Smith, 2001; Wadhwa et al., 2001). Importantly, when such risks are present before pregnancy, they are likely to continue throughout pregnancy as well. Moreover, women with psychosocial stressors have a greater likelihood of engaging in risky behaviors such as smoking and alcohol use and are less likely to seek health care (Schoenborn and Horn, 1993; Zuckerman et al., 1989). Risky sexual behaviors also put these women at greater risk for unintended pregnancies and STIs (Bauer et al., 2002; Bonomi et al., 2006; Seth et al., 2010). Interventions to improve the psychological health of women before conception have included group counseling and development of coping and economic skills. These have shown some promise in reducing risk, but so far have not demonstrated reductions in adverse birth outcomes including prematurity. Further research in this area is needed since the burden of mental health disorders—particularly depression, anxiety and somatic disorders—is high in women, and the safety of some medications used to manage these conditions during pregnancy is unclear. A Joint Statement by the American Psychiatric Association and American College of Obstetrics and Gynecology indicates that the higher risk of preterm birth may be related to depression itself, or the antidepressants used for treatment (Yonkers et al., 2009). Behavioral therapy for couples before marriage, for men who have been violent with their partners, and for married couples in a violent relationship has shown a reduction in aggression, largely in more severe forms of violence (Feder and Forde, 2000; Markman et al., 1993; O'Leary et al.,

1999; Simpson et al., 2008). Two programs that integrated interventions for domestic violence and substance use also showed some success, however, the effect generally faded with time (Rychtarik and McGillicuddy, 2005; Scott and Easton, 2010).

Prevent and treat STIs, including HIV/AIDS

Reducing the incidence of infectious diseases, particularly syphilis, is a high priority to lowering the rates of stillbirths and preterm birth (Donders et al., 1993). A number of interventions have been piloted in various countries to prevent and treat STIs, especially since such interventions also impact teen pregnancy, HIV/AIDS and contraceptive use. Focusing interventions on high-risk groups, including women, adolescents and intravenous drug users, can effectively reduce the transmission of STIs to the population in general and subsequently reduce preterm births and stillbirths (Over and Piot, 1993; Wasserheit and Aral, 1996). Behavioral and counseling interventions may lead to a 25% rise in the practice of safe sexual behaviors and a 35% drop in the incidence of STIs (Bhutta et al., 2011a). Mass treatment interventions with antibiotics also have been shown to decrease the prevalence of STIs by one-fifth (Kamali et al., 2003; Maynaud et al., 1997; Wawer et al., 1999). Counseling and behavioral interventions that focus on educating women are especially crucial, given that women are physically more vulnerable to contracting a STI during intercourse than men, and are less likely to have the ability to negotiate safe behaviors with their partners such as condom use (Mize et al., 2002). Focused interventions for preventing the broad range of STIs may be helpful in preventing preterm births, though more research is needed.

Promote cessation of tobacco use and restrict exposure to secondhand smoke

Cigarette smoking approximately doubles the threat of preterm birth (Andres and Day, 2000). Despite the risk of fetal growth restriction and preterm birth (Cnattingius, 2004; Honein et al., 2007; Siero et al., 2004), a survey of women in low- and middle-income countries found that many pregnant women currently used tobacco or were exposed to secondhand-smoke (Bloch et al, 2008). A few studies have shown, however, that preconception counseling and the involvement of husbands or partners in smoking cessation programs can increase the number of women who quit smoking before pregnancy (Elsinga et al., 2008; Park et al., 2004). In many instances even when women themselves do not use tobacco, they are exposed to environmental tobacco smoke and indoor air pollution; interventions and regulatory measures must therefore target male partners and behavioral change on a wider level to minimize women's exposure.

Screen for, diagnose and manage chronic diseases

In the United States alone, 12% of women of reproductive age suffer from diabetes and hypertension (Dunlop et al., 2008). Although testing and treatment for women diagnosed with such medical problems prior to pregnancy are cost-effective and prevent further complications for the mother and baby, they do not necessarily lower the incidence of preterm births (Iams et al., 2008). For example, achieving good control of diabetes through counseling, weight management, diet and insulin administration could reduce the risk of perinatal mortality and congenital disorders by approximately 70%, but does not significantly lower the rate of preterm birth among diabetic mothers (Bhutta et al., 2011a). At any contact with health care services, women of reproductive age should, therefore, be asked about other medical conditions and the use of medications. Until adequate control of the medical condition is achieved, women should be educated about the possible risks to themselves and their newborn, and be encouraged to use effective contraception (Tripathi et al., 2010). Multivitamin supplementation for women with chronic medical conditions is especially important because it has been shown to lower their risk for adverse pregnancy outcomes (Mahmud and Mazza, 2010). For women with other chronic conditions, such as cardiorespiratory disease, systemic lupus erythematosus, hypertension and renal disease, a cesarean birth may be indicated, leading to a baby being born prematurely; however, even in such cases, achieving optimal control of the condition before pregnancy may lead to better long-term outcomes for the mother and newborn.

Limitations of the evidence

The growing interest in preconception care is fairly recent; thus, there are limited data specific to the period prior to and between pregnancies, particularly relating to preterm birth risks and outcomes. Risk factors and interventions that have been studied only in adolescents or only during pregnancy also may be relevant in the preconception period. For instance, exposure to indoor air pollution during pregnancy leads to 20% more stillbirths and low birthweight babies (Pope et al., 2010). Yet many women are exposed to biomass smoke and second-hand tobacco smoke long before pregnancy is established. Similarly, interventions such as smokeless stoves or smoking cessation programs that reduce overall levels of exposure also would benefit women who later become pregnant. For many women, a positive pregnancy test is a stimulus to cease smoking, yet most women require multiple attempts to quit. Smoking cessation programs for adult men and women have been evaluated and demonstrate higher rates of women who quit before or during the first trimester (Floyd et al., 2008). Given the strong evidence of risk for preterm birth and low birthweight with tobacco use in pregnancy, it may be inferred that fewer women smoking translates to lower rates of preterm birth.

Many interventional studies in the preconception period report different health outcomes, which is also the case for studies on pregnancy and childbirth (Chapter 4). This precludes a complete assessment of the impact that an intervention could have on multiple pregnancy outcomes. For instance, research to reduce the prevalence of STIs among women may assess safe sexual behaviors or rates of transmission as outcomes; however, many studies do not indicate how many women later became pregnant or change in rates of preterm birth.

Until now, preconception care has been provided through three avenues: pre-pregnancy health visits for couples contemplating pregnancy; programs to increase awareness, screening and management for a particular risk; or participatory women's groups in the community. The diversity of contexts and risks among adolescent girls and women will require that preconception care be tailored to different settings and groups. The approaches used are a step in the right direction; but could be broadened to include earlier health care and health promotion for women and couples and address risks more holistically.

Program opportunities to scale up

There is widespread agreement that in order to reduce maternal and childhood mortality, a continuum of care needs to be provided and that actions are needed at the community, primary care and referral care levels to deliver this continuum (Chapter 1). Packages of interventions to improve maternal and newborn health have been developed; however, these focus largely on care during pregnancy and after birth (WHO, 2010). Tracking progress and scaling up delivery of preconception interventions has been a challenge, with preconception initiatives in individual countries delivering different services to different segments of the population (women, couples or adolescents).

In some high-income countries, such as the United States, Hungary, Australia and the Netherlands, an attempt has been made to provide preconception care to couples of reproductive age through family physicians or a special preconception clinic (Czeizel, 1999; Lumley and Donohue, 2006; Elsinga et al., 2008; Hillemeier et al., 2008; Jack et al., 1998; Moos et al., 1996). Evidence-based recommendations for the content of preconception care also have been published (Jack et al., 2008, Berghella et al., 2010; Johnson et al., 2006; Korenbrot et al., 2002), and components have been incorporated into major national and international health guidelines (Victora et al., 2010; PMNCH, 2011). In the United States, a website has been developed to support clinical education and practice in this area (www.beforeandbeyond.org).

In some countries (India, Pakistan, Bangladesh and Nepal), women's support groups have been teaching birth preparedness to women and their partners (Midhet and Becker, 2010; Azad et al., 2010; Bhutta et al., 2011b; Manandhar et al., 2004;; Tripathy et al., 2010). Many large-scale trials for individual preconception interventions also have been carried out in low- and middle-income countries. While

Table 3.3: Research priorities for preterm outcomes related to preconception

Description
• Maintain and expand global databases on the prevalence of preconception risk factors, incidence of preterm birth • Develop indicators to evaluate progress in scaling up coverage of preconception care • Evaluate impact of preconception care programs on rates of preterm birth and other adverse pregnancy outcomes
Discovery
• Basic science research on preconception risk factors for preterm birth
Development
• Develop and test screening tool to assess risk of preterm birth based on risk factors in the preconception period • Develop ways to increase demand for and access to preconception interventions
Delivery
• Define and test preconception care guidelines and intervention package • Explore means to integrate effective preconception interventions into broader programs and initiatives • Adapt effective interventions to maximize uptake by adolescents • Improve health systems (infrastructure, management, distribution of goods, training of providers) to deliver preconception care

individual settings will require context-specific approaches to providing preconception care, a number of effective and culturally acceptable interventions already exist. An example of an opportunity to build on existing programs is the integration of interconception health into home visits during the postnatal period.

The evidence base for risks and interventions before conception is still being strengthened because preconception care, as noted, is a relatively new concept. Therefore, an agreed-upon package of evidence-based interventions and opportunities for scale up in the preconception period has yet to be decided.

Priorities for research for preconception care

The limited evidence on the effectiveness of preconception care in reducing preterm births presents a major barrier for reducing the global burden of preterm birth; thus, across the research pipeline — from description to delivery, development and discovery — there is much to be done (Table 3.3). Some important risk factors have been identified, and certain interventions have proven effective in the preconception period; however, these have limited impact on preterm birth. Replicating these interventions in larger studies of adolescent girls and women before first pregnancy, or between pregnancies, is needed to assess the relative benefit that may be obtained through preconception care across different populations. There also is a need to identify innovative ways to assess and reduce exposure to risk factors that are not amenable to medical intervention, such as environmental pollution.

The development of national and international guidelines specific to preconception care would increase the visibility of the issue for health care providers and the population in general. While there is need for a defined and tested preconception care package, that can be adapted to various settings and models of service delivery at scale, much is still undiscovered, both in terms of what works and how to integrate effective preconception interventions into broader programs and initiatives across the continuum of RMNCH. Even if there was consensus and evidence for interventions during this period for preventing preterm births, national and global data are lacking. A current initiative to maintain a database of the number of adolescent girls and women exposed to a particular risk (e.g., anemia) or receiving a particular preconception intervention (e.g., folic acid fortification) is necessary. Such a global database will allow the risk reduction for an intervention to be calculated in various populations. It will also permit assessment of tailored or packaged strategies to improve health in high-risk populations.

The interventions with proven benefit and national data, such as family planning, require further operational research including how to maximize uptake by adolescents and assessing feasibility and impact of scaling up. To monitor quality of care, mid-level health care workers providing preconception care must be evaluated and provided with additional support or training if gaps exist. Improvements to infrastructure, supply chain and health management systems also may increase coverage of preconception services.

Piloted interventions to improve the health of adolescent girls and women, which can lead to prevention of preterm birth, are often not categorized as preconception care; thus, they present a missed opportunity for linking to preterm birth research. Continued research into the etiology of preterm birth will be necessary in order to identify variations in the

Table 3.4: Actions before and between pregnancy to reduce the risk of preterm birth

Invest and plan
• Assess situational need for preconception care services and opportunities in local health system to deliver. • Use every opportunity to reach girls and women and couples with preconception messages, beginning in school and extending to health care settings and community events. Preconception health must also involve boys and men, to improve their health; and to engage them in ensuring better outcomes for women and girls.
Implement
Seize opportunities through existing programs (including non-health programs) to: • Educate women and couples of reproductive age to have a reproductive plan that includes age at first pregnancy, method to prevent unintended pregnancy, and number of children they wish to have • Scale up personal development programs and skills-building to negotiate safe sexual behavior in adolescence. Adapt preconception interventions to maximize uptake by adolescents • Implement universal coverage of childhood and booster vaccinations for infectious diseases known to cause adverse pregnancy outcomes • Screen for and treat infectious diseases, particularly sexually transmitted infections. • Promote healthy nutrition and exercise to prevent both underweight and obesity in girls and women • Promote food security for communities and households. Expand nutrition programs to include adolescent girls and women. Particularly for underweight women, provide protein calorie supplementation and micronutrients. A cost-effective way to ensure adequate levels of micronutrient consumption would be to enact large-scale fortification of staple foods. • Implement public health policy to reduce the number of men and women of reproductive age who use tobacco • Implement strategies for community development and poverty reduction, since living environments and socioeconomic constructs have a significant impact on health • Ensure universal access to education to empower girls and women with the basic knowledge and skills they need to make decisions for themselves, such as when to access care **Scale up** • Promote effective contraception for women/couples to space pregnancies 18 to24 months apart • Screen for chronic conditions, especially diabetes, and institute counseling and management as early as possible to improve neonatal outcomes
Inform and improve program coverage and quality
• Develop indicators for baseline surveillance and to monitor progress in preconception care • Include preterm birth among tracking indicators
Innovate and undertake implementation research
• Invest in research and link to action We all share in the responsibility of making sure that all women before and between pregnancies receive the care they need for healthy pregnancies and birth outcomes

risk profiles and therefore, specific interventions, for women in different contexts and from different strata within the same communities. There also is need for innovation such as the development of a screening tool to assess individual risk of having a preterm birth or technology and software to provide individualized preconception care in user-friendly ways.

Addressing contextually relevant ways to increase demand for and access to preconception care services is especially necessary in developing countries. While many countries have implemented behavior change strategies to increase awareness on birth preparedness and women's empowerment, more strategies for assessing benefit particularly for preterm birth are needed, especially culturally appropriate ways to involve adolescent boys, men and communities.

For preconception care, there is still much that needs to be discovered, such as exploring new medical interventions for women at high risk of having a preterm birth, based on knowledge of biological pathways. Even with current tools used to diagnose disease such as hypertension, the development of simpler, cost-effective diagnostic tests will enable efficient point-of-care testing with timely results and minimize the need for multiple visits. Likewise, affordable, easy-to-administer preventive and treatment options that are woman-friendly are in demand, such as oral insulin or better female-controlled contraceptive methods. With the knowledge gaps for preconception care, there is room for testing innovative technology and for implementation research.

Prescription for action

To prevent preterm births, proven interventions need to be scaled up and integrated so that they reach more women more often. In the health care setting, an essential package of interventions (contraception, micronutrient supplements, vaccination, STI screening, etc.) and a checklist of risk factors to be screened for might be a feasible starting point. In some countries, mandatory screening for hereditary diseases before marriage drastically reduced rates of thalassemia, and whether preconception care could be delivered through a similar means has not been explored (Samavat and Modell, 2004). This must be supported by ways to educate providers of the benefits of preconception care to increase their willingness to provide it. Provision of preconception care must also be extended beyond those who are traditionally involved in women's health, by incorporating the concept into training for current and future health care providers. For some risks, such as chronic diseases, until diagnosis and treatment can become more affordable, policy-makers and donor organizations must work

in conjunction to make screening and care widely available. Increasing coverage of postpartum care would also help to improve women's health in future pregnancies, for example, through the integration of preconception care in postnatal home visits.

Also of importance will be the development of partnerships with other sectors such as education, food and agriculture, telecommunications and media, to promote greater demand for preconception care, and to reach girls, women and couples beyond the health care system. In some cases, integrated programs have already been shown to be feasible and effective, such as youth development programs, contraceptive provision in school for adolescents and incorporating maternal health into child vaccination days. It is also essential to develop a way to involve men, community leaders and volunteers in support for and provision of preconception care. Specific action points are listed in Table 3.4.

Conclusion

Until recently, the provision of care to women and couples before and between pregnancies to improve maternal and newborn health has not had sufficient priority on the RMNCH continuum of care. As with research, care must focus increasingly "upstream" from birth if the true potential for prevention of preterm birth is to be realized. Effective preconception care involves a broad variety of partners, including men, health care providers, youth leaders and community volunteers; and delivery sites such as schools, primary health care facilities and community centers. Outreach and awareness must begin in adolescence if it is to truly improve the health of women and newborns and reduce the rates of prematurity. If tackled, however, with vigorous and evidence-based interventions, preconception care offers the earliest opportunity to reduce risk, allowing women to enter pregnancy in the best possible health and to have the greatest chance of giving birth to a healthy baby.

Photo: *Ahman El-Nemr/Save the Children*

Baby Karim Kobeissy was born and admitted to the Neonatal Intensive Care Unit at the American University of Beirut Medical Center on the 2nd of June 2009 at 24 weeks of gestation and weighing 575 grams (1.3 lbs.). Mirvat and Mohamed Kobeissy did not expect the birth of their newborn so early after the normal birth of their two older children who are now 15 and 13 years old, respectively. When Mrs. Kobeissy presented to the hospital to deliver her precious baby, she was informed that her son's chances of living were minimal at best. Doctors explained how hard the situation was for such a tiny baby to be able to fight for survival, yet Mrs. Kobeissy was buoyed by her strong faith and belief that this tiny soul, her son, would be a survivor and make it through the difficult times ahead.

Due to his extreme prematurity, baby Karim had under-developed lungs and pulmonary problems requiring immediate intubation. He could not eat for nearly three months except by tube feeding. At one point, due to his critical illness, Mrs. Kobeissy was told that her son was at risk of losing his tiny fingers and toes, yet with the support of the highly experienced medical team in the NICU Mrs. Kobeissy says, baby Karim surmounted this challenge. He also developed retinopathy of prematurity, a complication common in extremely premature

I felt devastated watching my newborn fight for his life...

babies. He underwent laser surgery to correct it but, unfortunately, still lost sight in one eye. Yet by the beginning of month three of his stay in the NICU, baby Karim had reached the weight of one kilogram, a sign of real progress!

LEBANON

BABY KARIM

12 WEEKS PREMATURE

CHANCE OF SURVIVAL: MINIMAL

With all of the medical problems, financial concerns and ups and downs of hope and despair during baby Karim's first four months in the NICU, Mrs Kobeissy said it was a nightmare for her, her husband and family—one that they thought would never end. She said "I felt devastated watching my newborn fight for his life, yet our beautiful baby Karim, with the help of his dedicated medical support team, continued to fight and survive."

When he left the NICU after four months weighing 2.5 kilograms, Mrs. Kobeissy said that baby Karim's ordeal was not over. Due to his low immune level and the increased risk of infection it posed, baby Karim had to stay another three months in his room at home to avoid exposure to others. But he fought on and continued to grow. Now at 2½ years of age, Karim the little hero—born at 24 weeks of gestation and a mere 575 grams—is full of life, healthy and goes to day care, where he is loved for his energy and sense of humor. And to his family, Karim continues to be a source of joy and faith in life day after day. Baby Karim survived overwhelming odds because of his courage, the love of his family and the skill and dedication of the NICU staff. May his story be one of hope for all babies born too soon, wherever they are.

In Lebanon, the rate of preterm birth is on the rise and this is the greatest risk factor for neonatal death. Over 5,000 Lebanese babies are born premature each year.

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