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IMPACTS OF FAMILY PLANNING ON NUTRITION

This publication was prepared by Reshma Naik and Rhonda Smith of the Health Policy Project.

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[1] Population Reference Bureau

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EXECUTIVE SUMMARY

Current evidence suggests that family planning (FP) can have a significant influence on achieving key nutrition outcomes. Thus, national and local programs aiming to improve nutrition may benefit from strengthening FP services and integrating FP strategies into multisectoral development policies and implementation plans.

Family planning affects nutrition in myriad direct and indirect ways. By helping women and couples have the number of children they want at the healthiest times in life, family planning can benefit mothers, infants, and children. Well-spaced births allow women's bodies to recuperate and replenish essential nutrients and lead to better nutritional outcomes, such as healthy birth weight for their infants. The benefits of optimal birth spacing also have far-reaching effects into childhood, reducing the prevalence of one key measure of malnutrition—stunting—among children under five. Family planning can help women avoid high-risk pregnancies and have children at the healthiest times in life, for example, when they are 18–34 years old and both physically and psychologically mature enough for motherhood. For adolescents, delaying pregnancy until a healthy age (>18 years) can improve their own growth and development and also reduces the risk of poor nutritional outcomes for their infants. A growing body of evidence shows that pregnancy intention can also influence nutritional outcomes. Namely, children from unintended pregnancies may be at risk of poor nutrition, underscoring the important role of family planning.

Family planning indirectly affects nutrition via its impact on infant and young child feeding practices. When births are well spaced, mothers have more time, energy, and resources to adequately breastfeed and feed their young infants and children. Research shows that when pregnancies are planned and occur when women are older than 18 years, breastfeeding practices improve, leading to improved nutrition. And when unplanned pregnancies are avoided, women are less exposed to the risks of dying due to pregnancy and child birth. Since mothers play a crucial role in feeding their families, reductions in maternal death can positively influence infant and child nutrition. And finally, family planning can have an indirect impact on nutrition by reducing unintended pregnancies among adolescents, allowing them to stay in school and complete more years of education. Research shows that greater education among women leads to greater productivity, empowerment, and control of resources—allowing them to make better choices that ultimately benefit the health and nutrition of children and families.

ABBREVIATIONS

AA	Assistant Administrator
AFR	Bureau for Africa
ARP	Office of Agricultural Research and Policy
BFS	Bureau of Food Security
CCP	Center for Communication Programs
CSI	Country Strategy and Implementation
DCHA	Bureau for Democracy, Conflict, and Humanitarian Assistance
DHS	Demographic and Health Survey
FAO	Food and Agriculture Organization of the United Nations
FFP	Food for Peace
FP	family planning
GH	Bureau for Global Health
HIDN	(Office of) Health, Infectious Diseases, and Nutrition
HIV	human immunodeficiency virus
HT	Health Team
IFPRI	International Food Policy Research Institute
IYCF	infant and young child feeding
LAM	lactational amenorrhea method
MUAC	mid-upper arm circumference
NUT	Nutrition Division
PEC	Policy, Evaluation, and Communication
PRH	Office of Population and Reproductive Health
PTD	Policy and Technical Division
RHR	Reproductive Health and Research (Department)
RTU	Research, Technology, and Utilization Division
SD	Office of Sustainable Development
SGA	small-for-gestational age
USAID	United States Agency for International Development
UNFPA	United Nations Population Fund
UNICEF	United Nations Children's Fund
USAID	U.S. Agency for International Development
WHO	World Health Organization

INTRODUCTION

Background

The 2013 *Lancet Nutrition Series on Maternal and Child Nutrition* highlighted the scope, gravity, and consequences of worldwide undernutrition, particularly among women, infants, and children. Undernutrition—including conditions such as stunting, underweight, and wasting—contributes to nearly half of all childhood deaths. This means that about 3.1 million children under age five die each year from malnutrition-related causes.[1] Even when children do survive, undernutrition can curb physical growth and intellectual development, ultimately reducing productivity in adulthood and preventing nations from achieving their full economic potential.

Tackling the challenge of undernutrition will require cross-sector collaboration, innovative approaches, and optimizing the use of all available interventions. In 2014, the USAID-funded Health Policy Project conducted a rapid review of empirical evidence on the linkages between one of these interventions—family planning—and nutritional status. The review is part of an overall effort that includes a complementary review on the impacts of family planning on food security, also conducted by the Health Policy Project, as well as a companion desk review synthesizing the programmatic experiences of integrating family planning with food security and nutrition, conducted by the Food and Nutrition Technical Assistance III Project (FANTA).

This review focused on the unidirectional impacts of family planning on the nutrition of women, infants, and children (excluding any links mediated by HIV). In addition, the review identified important gaps in current understanding, revealing areas where further research or investigation may be warranted. The findings presented in this report should help to both further policy dialogue and inform policy and programmatic decisions on how family planning can be better leveraged to improve nutrition outcomes.

Definitions

The below terms related to family planning and nutrition are referenced throughout this document.

Family planning: The use of contraceptive methods to attain the desired number of children and to plan and space the timing of births.[2]

Unintended pregnancy: Pregnancies reported to have been either unwanted (i.e., they occurred when no children, or no more children, were desired) or mistimed (i.e., they occurred earlier than desired).[3]

Unwanted pregnancy: A pregnancy reported as not having been wanted at the time or later.[4]

Mistimed pregnancy: A pregnancy reported as having been wanted later.[5]

Unmet need: Women have unmet need when they want to postpone their next birth for two years or more, or not have any more children, but they are not using any modern method of contraception.[6]

Undernutrition: The outcome of insufficient food intake and repeated infectious diseases, which includes being underweight for one's age, too short for one's age (stunted), dangerously thin for one's height (wasted), and deficient in vitamins and minerals (micronutrient malnutrition).[7] When individuals are undernourished, they can no longer maintain natural bodily capacities, such as growth, resisting infections and recovering from disease, learning and physical work, and pregnancy and lactation in women.[8]

Stunting: A condition in which children fail to gain sufficient height, given their age. Stunting is often associated with long-term factors such as chronic undernutrition and frequent illness[9] and is defined as a

height- (or length)-for-age that is more than two standard deviations below the World Health Organization (WHO) Child Growth Standards median.[10] It is recognized as one of the key indicators of child undernutrition.[14]

Wasting: One of two forms of acute malnutrition (the other being nutritional edema), it is a condition in which children fail to achieve sufficient weight, given their height. Wasting may be the consequence of starvation or severe disease and can also be due to chronic conditions or a combination of both.[11] Wasting is defined as a weight-for-height/length that is more than two standard deviations below the WHO Child Growth Standards median or a mid-upper arm circumference of 125 mm or less.[12] This condition, particularly when it is severe, can put children at increased risk of death.

Underweight: A condition where a child weighs less than expected, given his or her age; underweight can reflect acute as well as chronic undernutrition[13] and is defined as a weight-for-age that is more than two standard deviations below the median of the WHO Child Growth Standards. The mortality risk of children who are even mildly underweight is increased, and severely underweight children are at even greater risk.[14]

Low birth weight: Weight at birth of less than 2,500 grams; low birth weight contributes to a range of poor health outcomes and is closely associated with fetal and neonatal mortality and morbidity, inhibited growth and cognitive development, and chronic diseases later in life.[15]

Preterm birth: A live birth that takes place before 37 weeks of pregnancy. Preterm birth is the leading cause of newborn deaths (deaths among babies in the first 28 days of life) and the second leading cause of death after pneumonia in children under five.[16]

Small-for-gestational age (SGA): Weight at birth below the 10th percentile for gestational age and gender;[17] infants born SGA are at greater risk for death and poor nutritional outcomes, such as stunting during childhood and metabolic diseases later in life.[18]

Parity: The number of children previously born alive to a woman.[19]

The following feeding practices are referred to as outcomes within the review, given their direct association with infant and child nutrition:

Exclusive breastfeeding: The WHO recommends exclusive breastfeeding for the first six months of life, which means feeding only breast milk to infants, with the exception of oral rehydration solution—for the treatment of diarrhea—or drops/syrups of vitamins, minerals, or medicines.[20] Breast milk from well-nourished mothers contains all the nutrients an infant needs in the first six months of life and protects against common childhood diseases such as diarrhea and pneumonia.

Complementary feeding: The transition from exclusive breastfeeding to the feeding of solid foods; complementary foods should be given in amounts, frequency, variety, and consistency to cover the nutritional needs of the growing child while maintaining breastfeeding. The WHO recommends complementary feeding along with breastfeeding from 6 months to 24 months of life, as this represents a critical period of growth during which nutrient deficiencies and illnesses can lead to undernutrition.[21]

METHODS

The methods used to identify relevant literature were

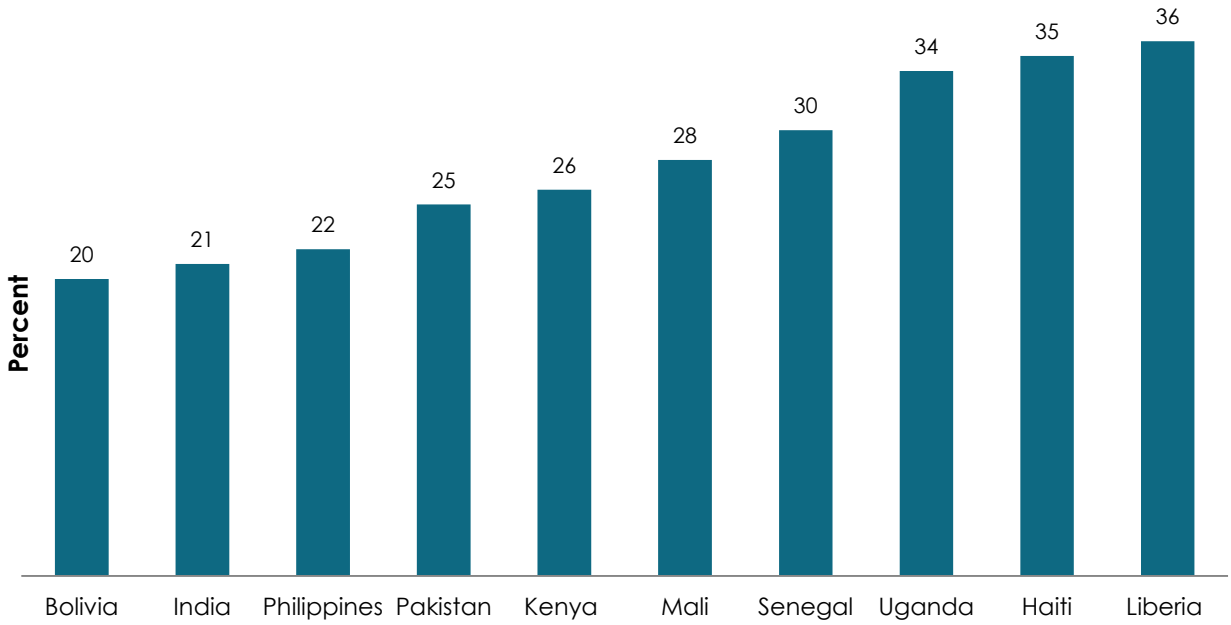
- Searches via electronic databases such as Pub Med and Medline
- Searches in 16 topic-specific journals, including the Journal of Nutrition, Advances in Nutrition, Studies in Family Planning, International Perspectives on Sexual and Reproductive Health, and Social Science and Medicine
- Follow-up on recommendations from technical experts regarding completed or ongoing research
- Searches on websites of key agencies or organizations engaged in research and programming in the areas of family planning, nutrition, child survival, and gender, among other topics
- Review of articles referenced by key sources
- Searches on specific topics identified or suggested by the literature

Key thematic areas of the linkage between family planning and nutrition were identified and summarized. The review sought to understand the direct nutrition outcomes that can result when family planning is used to help women avoid unintended high-risk pregnancies (having babies too young or too old or too closely spaced or having too many). In addition, the review looked at how family planning can affect nutrition via more indirect pathways such as reductions in maternal mortality and increases in education and empowerment of women. Finally, after synthesizing the available literature, the authors aimed to identify key gaps in the evidence and areas for further research.

FINDINGS

It should be noted that the discussion around increasing FP use in this review relates to women with unmet need (those who say they would like to postpone their next birth, or stop childbearing all together, but are not using any modern method of family planning to avoid pregnancy). In developing countries, 225 million women of reproductive age have unmet need for a modern method of family planning.[22] Figure 1 shows the rates of unmet need (for any method) among a sample of 10 countries.

Figure 1. Unmet Need for Family Planning Among Married Women, Ages 15–49



Source: Population Reference Bureau, Family Planning Worldwide 2013 Data Sheet.

Increasing the use of voluntary family planning among those with unmet need can help women achieve their own reproductive health goals and fertility intentions and also lead to additional nutrition benefits for women, infants, and children. Some links between family planning and nutrition are direct, while some are mediated by other factors. When women exercise their freedom and right to access family planning to meet their fertility intentions, there is a natural decline in the prevalence of high-risk and unintended pregnancies. Research illustrates that by averting such pregnancies, improvements in key maternal, infant, and child nutrition outcomes can be achieved. In addition, increased use of family planning can lead to substantial declines in maternal mortality, as well as improvements in women's empowerment—all of which can have profound impacts on infant and child nutrition. The specific pathways or linkages between family planning and nutrition are described below.

High-Risk Pregnancies and Nutrition

The rapid review considered the relationship between undernutrition and four types of high-risk pregnancies, including those that are (1) too closely spaced; (2) among mothers who are too young (< 18 years); (3) among mothers who are too old (> 34 years); and (4) among mothers who have high parity.[23] High-risk pregnancies adversely affect maternal and child health and nutrition outcomes in the following ways.

Closely spaced pregnancies

Birth spacing, the practice of timing the period between births, has important implications for the health and nutritional status of mothers and their children. According to the WHO, an optimal birth-to-pregnancy (or inter-pregnancy) interval is a period of at least 24 months between the birth of one child and conception of another. This suggests an optimal birth-to-birth (or birth) interval—the interval between successive live births—as a period of at least 33 months (24 months of not conceiving + 9 months of pregnancy).[24] The evidence shows that when women voluntarily choose family planning to lengthen these intervals, there is a strong positive impact on maternal, infant, and child nutrition.

Impact on maternal health and nutrition. Studies show that when birth or inter-pregnancy intervals are too short, mothers' health and nutritional status are adversely affected. Though the exact causal mechanisms have not been fully validated, one common theory is maternal depletion, whereby women experience a negative change in nutritional status due to the mobilization of nutritional reserves during pregnancy and lactation.[25] Optimally spaced pregnancies allow the mother's body to adequately recuperate and replete these reserves.[26] When intervals are too short, mothers are at risk of undernutrition, resulting in negative changes in maternal weight and body mass index.[27] Short intervals can also place mothers at risk of nutritional anemias and other micronutrient deficiencies.[28] Undernutrition among mothers can then lead to poor birth outcomes, which are further described in the following section.

Impact on perinatal outcomes. The impact of adequate birth spacing on the survival and nutritional status of infants is well established. Three key sources of evidence include (1) a 2008 report by S.O. Rutstein that pools data from 52 Demographic and Health Surveys (DHS) conducted between 2000-2005;[29] (2) a 2006 meta-analysis by Conde-Agudelo et al., which pools data from 67 different studies worldwide;[30] and (3) a 2012 systematic review by Wendt et al., which assessed the impact of short inter-pregnancy intervals on infant nutrition outcomes.[31] All the papers conclude that suboptimal inter-pregnancy intervals are associated with increased odds of low birth weight. This is particularly the case for children conceived within less than six months of a prior birth. According to Rutstein, these children face 42 percent greater odds of having low birth weight compared to those conceived during a 36–47 month interval. Those conceived within a 6–11 month interval face 16 percent greater odds.[32] Conde-Agudelo et al. found that compared to mothers with intervals of 18–23 months, the odds of low birth weight for infants conceived within a six-month interval increased by 61 percent.[33]

A well-spaced family in Burkina Faso.
© Marie Stopes International/Ina Sotirova

The authors further highlight the increased risks of other poor pregnancy outcomes due to suboptimal spacing. Their findings show that inter-pregnancy intervals of less than 18 months are associated with significantly increased risks of infants being born preterm and small-for-gestational age (SGA). For those conceived within a six-month interval, the odds of being born preterm and SGA increase by 40 percent and 26 percent, respectively, compared with those born within an 18–23 month interval.[34] Wendt et al. found that infants born within an inter-pregnancy interval shorter than 6 months face 58 percent greater odds of extreme preterm birth and 41 percent greater odds of moderate preterm birth.[35] An earlier study by Conde-Agudelo[36] and several subsequent studies by other

researchers further corroborate these findings and the strong relationship between short inter-pregnancy intervals and poor perinatal outcomes.[37]

Impact on child nutrition. Adverse birth outcomes perpetuate a cycle of poor health. Recent evidence shows that SGA and low birth weight are associated with key indicators of childhood undernutrition. Findings published from a study in Tanzania by Mamiro et al. looking at complementary feeding practices indicate that low birth weight is one of the strongest predictors of stunting and anemia.[38] Another study published in 2013 by Christian et al. suggests that childhood undernutrition may have its origins in the fetal period. The authors pooled estimates from 19 cohorts in low- and middle-income countries. They found that compared to infants who were adequately sized for age and born at term, those who were born SGA at term had well over a two-fold increase in the odds of stunting. Infants who were both preterm and SGA had over a four-fold increase in the odds of stunting. A similar level of risk was found for wasting and underweight. The same analysis also found that low birth weight was associated with 2.5- to 3.5-fold higher odds of wasting, stunting, and underweight.[39]

Findings from a 2014 Rutstein study, which illustrate the relationship between birth-to-pregnancy intervals and undernutrition during childhood, further affirm some of these cyclical relationships. He observed that children conceived after an interval of 12–17 months have a 27 percent greater likelihood of being stunted and a 23 percent greater likelihood of being underweight than those conceived after a 36–47 month interval.[40] A 2009 study by Gribble et al. analyzed data from a family health survey in El Salvador. They found that children born within 24 months after the birth of an older sibling had 52 percent increased odds of stunting compared to those born within a 36–59-month interval.[41] A 2013 study published in the *Bulletin* of the World Health Organization analyzed data from three successive Cambodian DHS to determine the contribution of various factors in reducing the prevalence of stunting between 2000 and 2010. The authors found that birth spacing played an important role, with increases in the odds of stunting ranging from 19 to 48 percent as preceding birth intervals progressively decreased from 30–35 months to less than 18 months. Although increased household wealth made the largest contribution to decreasing the prevalence of stunting, the modest contribution of birth spacing was among the top four factors.[42]

Studies have also found relationships between birth spacing and other measures of nutrition. A study in India found that children of mothers having more than two children with a birth interval less than or equal to two years had nearly a five-fold increase in the odds of undernutrition, measured as protein energy malnutrition.[43] Another study in Bangladesh, which used mid-upper arm circumference (MUAC) to assess child nutrition, found that children born with at least a 24-month preceding birth interval and who were breastfed for two to three years were less likely to be severely malnourished than those who were born with a shorter birth interval or who terminated breastfeeding prior to two years of age.[44]

Stunted, underweight, and wasted children face numerous adverse effects, including an increased risk of death from infectious diseases.[45] In fact, it is estimated that stunting and underweight each account for 17 percent of child deaths and wasting for 11.5 percent.[52] Stunting is one key indicator of childhood undernutrition and often marks the beginning of a cycle of adverse health and development outcomes. Stunted children face poor health during both childhood and adulthood, and this condition is associated with cognitive delays and impairment,[46] reduced schooling and poorer school performance and achievement,[47] poorer emotional and behavioral outcomes in late adolescence,[48] and lower economic productivity during adulthood.[49] Further, women who were stunted as children grow up to be short adults and face significant risks during their reproductive years, including pregnancy complications, poor birth outcomes, and perinatal mortality; these outcomes perpetuate an intergenerational cycle of undernutrition.[50]

Impact on feeding and caretaking. Spacing births too closely can also affect nutrition outcomes through other pathways. For instance, the ability to adequately care for and feed children could be compromised when birth intervals are too short. The 1,000-day period from pregnancy to a child's second birthday represents an important window of opportunity to prevent stunting and promote cognitive development. Children of this age are also at a greater risk of acute malnutrition; therefore, ensuring adequate nutrition during this period is critical.[51] Two key practices for ensuring optimal nutrition include (1) exclusive breastfeeding for the first six months and (2) beginning appropriate complementary feeding at six months and continuing breastfeeding up to two years and beyond.[52] The lactational amenorrhea method (see Box 1) is one family planning method that achieves dual outcomes of appropriate infant feeding and delayed fecundity.

If family planning is not used to optimally space births, mothers are likely to face challenges employing adequate feeding practices during the first two years of their children's lives, putting them at risk for undernutrition and subsequent illness and death. If a woman becomes pregnant soon after giving birth, she may prematurely remove the older infant from the breast.[53] A study in Guinea-Bissau looked at the reasons mothers reported for why they weaned their infants after 12 months of breastfeeding. Nineteen percent of mothers reported weaning due to a new pregnancy. Infants that were weaned for this reason had two times higher mortality than those who had been weaned because the mothers felt they were "healthy."[54] Further, when births are too closely spaced, there is not enough time for a mother's nutrient reserves to be replenished,[55] and thus she will be overstretched to adequately satisfy the nutritional needs of both the nursing baby and the newly conceived fetus. Appropriate complementary feeding is also likely to be compromised for both children due to time, energy, and other resource constraints.

The 2008 *Lancet Series on Maternal and Child Undernutrition* notes that suboptimum breastfeeding leads to significantly increased risks of diarrhea and pneumonia, as well as death from these illnesses. Compared to six-month exclusively breastfed infants, for those who are not breastfed, the relative risk of death from diarrhea and pneumonia increases over 10 and 15 times, respectively. Beyond the period of exclusive breastfeeding, the Lancet Series authors further assert that infants can still become stunted if they do not receive an adequate quality and quantity of foods after six months of age.[56]

Box 1. Lactational Amenorrhea Method (LAM)

The lactational amenorrhea method (LAM) is one method of family planning that can be used to achieve dual reproductive and nutrition outcomes. Based on the well-established effects of breastfeeding to delay fecundity in the early months following delivery, this temporary contraceptive method can be used in the first six months postpartum and is 98 percent effective when typically used.[1] Requisite criteria for LAM include (1) exclusive breastfeeding; (2) absence of menses; and (3) infant < 6 months. Once any of these criteria are unfulfilled, it is necessary to transition to another method. Proper use of LAM can help mothers extend birth intervals and ensures that their infants benefit from the well-established nutritional advantages of exclusive breastfeeding during the first six months of life.[2]

Despite the promise of LAM to achieve dual objectives, evidence suggests that considerable work is needed to ensure that women have a full understanding of the method and the support to use it effectively. A 2013 study looking at self-reported LAM use across 73 DHS between 1998 and 2011 found that only 26 percent of self-reported LAM users actually met the correct practice criteria. Among those who failed to practice LAM correctly, the most common reason was not meeting the criteria for exclusive breastfeeding, since most women reported giving infants food or liquid other than water. The second most common problem was the use of LAM beyond the six-month postpartum time frame. In fact, more than 80 percent of incorrect LAM users gave birth six or more months prior to the survey, and half had given birth more than 12 months prior.[3] The high rate of incorrect LAM practice underscores the need to improve LAM-related programming and to ensure knowledge of and access to other methods of contraception.

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[1] Hatcher, R., J. Trussell, A. Nelson, W. Cates. 2011. *Contraceptive Technology, Revised 20th edition.* England: Bridging the Gap Foundation; and World Health Organization Department of Reproductive Health and Research (WHO/RHR) and Johns Hopkins Bloomberg School of Public Health/Center for Communication Programs (CCP) KfHP. 2011. *Family Planning: A Global Handbook for Providers (2011 update)*. Baltimore and Geneva: CCP and WHO.

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Mothers who are too young

According to the United Nations Population Fund (UNFPA), in developing countries, girls under age 18 give birth to 7.3 million babies each year, and 2 million of these babies are born to girls under age 15. The vast majority of adolescent pregnancies occur within the context of marriage or a union. The UNFPA report states that adolescent pregnancy is not the result of deliberate choice but rather the "absence of choices and of circumstances beyond a girl's control."[57] It then goes on to state that "Under the Convention on the Rights of the Child, anyone under age 18 is considered a 'child.' Girls who become pregnant before 18 are often unable to enjoy or exercise their rights, such as their right to an education, to health and an adequate standard of living, and thus are denied these basic rights."[58]

Unmet need for family planning among adolescents is high. A 2014 analysis of data from 16 low- and middle-income countries found that unmet need among adolescents ages 15–19 ranges from 34–67 percent for the unmarried and from 7–62 percent for the married.[59] Young women face particular barriers to accessing FP methods, often due to issues related to stigma, confidentiality, and affordability.[60] When FP services are scaled up and tailored to meet the needs of adolescents, this enables young people to exercise their rights to bear children at a time in their lives when they are both emotionally and physically

mature. Delaying pregnancy until a healthy age also has additional benefits for maternal, infant, and child nutrition.

Impact on adolescent growth and nutrition. Because adolescents are still growing and are often undernourished in settings where early childbearing is the norm,[61] they are particularly vulnerable to malnutrition, and pregnancy and lactation can increase this risk.

Adolescence represents a critical period of growth and development, during which 50 percent of adult body weight and 15–20 percent of final adult height is attained.[62] For undernourished populations, this also represents a potential window of opportunity for catch-up growth.[63] When adolescents are still growing, pregnancy can induce competition for nutrients between the mother and fetus, which can result in adverse outcomes for both.[64] In a study of numerous middle-income Central and South American countries, Conde-Agudelo et al. found that mothers 15 years and younger have 41 percent greater odds of anemia compared to 20–24-year-old mothers.[65]

Recent studies show that pregnancy during adolescence compromises growth of the adolescent and can have adverse impacts on the mother's nutritional status. This effect may be particularly pronounced in resource-constrained settings where chronic malnutrition is prevalent. Findings from two independent studies, one in Mexico and one in Bangladesh, show that as a means to adjust for increased energy needs, linear growth (gains in height) ceases during adolescent pregnancy.[66] This impact on growth during a critical period of development could contribute to stunting and adversely heighten the risk of perinatal and maternal morbidity and mortality during future pregnancies. The same Bangladesh study found that while never-pregnant adolescents gained body mass, MUAC, and percent body fat, pregnant adolescents had declines in each of the same measures.[67] Another study in rural Nepal also found that mothers under age 16 lost more MUAC than older women of the same parity.[68] These declines could put young mothers and their infants at risk of other adverse health and nutritional outcomes.

Vulnerability and impact on perinatal outcomes. It is well established that pregnancy during adolescence increases the risk of adverse perinatal outcomes such as preterm birth, low birth weight, and SGA.[69] In fact, many recent studies call for a renewed focus on developing interventions to delay age at first birth.[70] Kozuki et al. analyzed pooled data from 14 cohort studies in low- and middle-income countries to compare girls/teens under age 18 with no previous children to women ages 18–34 years who have one or two children. Adolescents in the former group were found to be the most vulnerable to the risks of neonatal and infant mortality, and they also had 52 percent higher odds of preterm birth and 80 percent higher odds of SGA.[71] A 2012 meta-analysis also concludes that very young maternal age contributes to low birthweight and pre-term birth.[72] Similarly, a 2013 study by Gravena et al. in Brazil found that compared to mothers ages 20-34, mothers ages 10-19 had 35% and 22% increased odds of preterm birth and delivery of a low-birth-weight baby, respectively.[73]

Impact on child nutrition. Finlay et al. pooled data from 55 low- and middle-income countries across 118 DHS. They report that the relative risk of poor child health and nutrition outcomes is lowest for women ages 27–29 years and highest for teen mothers (<18 years), particularly those ages 12–14 years. For example, compared to children born to mothers ages 27–29, those born to adolescent mothers ages 12–14 face a 51 percent increase in the risk of stunting, a 35 percent increase in the risk of underweight, and a 32 percent increase in the risk of moderate to severe anemia. Using the same comparison group, children born to adolescents ages 15–17 similarly face a 34 percent increase in the risk of stunting, a 22 percent increase in the risk of underweight, and a 36 percent increase in the risk of moderate to severe anemia.[74] Further emphasizing the importance of delaying the age at first birth, Yount et al. analyzed DHS data from 60–75 poorer countries. Their findings indicate that a one-year increase in median age at first birth was associated with declines in the prevalence of underweight new mothers and stunted and underweight children ages 0–3 years.[75]

Impact on breastfeeding. In high-income countries, adolescents are the cohort least likely to initiate and continue exclusively breastfeeding their infants.[76] A sizeable body of evidence illustrates the unique challenges to breastfeeding that teen mothers in these settings face due to their age and circumstances.[77] This topic has been less well explored in low- and middle-income country contexts. However, some evidence suggests that younger mothers have poor knowledge and practices when it comes to infant and young child feeding (IYCF). Hackett et al. conducted a qualitative study among teens and young women ages 15–23 years in Bangladesh, where 60 percent of rural girls become mothers before age 18. They found that young mothers had limited knowledge about IYCF and were no more knowledgeable on this topic than their childless peers.[78] Another study in West Bengal, India, assessed knowledge and practice of five core IYCF indicators among new mothers. While teen mothers (< 20 years) had comparable and even greater knowledge of IYCF than older mothers, their practice scores were considerably lower. For example, only 40 percent of teen mothers implemented more than three of the five recommended feeding practices, compared to about 70 percent of those ages 20–29 and 100 percent of those > 30 years.[79]

A qualitative study by Ijumba et al. in a peri-urban area of South Africa found that poor IYCF, in particular early breastfeeding cessation, is related to the limited involvement of teenage mothers in the care of their infants.[80] Namely, teen mothers in this setting often transferred full responsibility of raising their infants to their own mothers and grandmothers, who then bought formula or provided other alternatives. This was generally common but particularly so for those girls who returned to school. This study also shed further light on why teen mothers either did not breastfeed at all or stopped early. Common themes included (1) uneasiness to take on a mother's role; (2) breastfeeding as a constraint to freedom and maintaining a "teenage" lifestyle; (3) perceptions of negative changes to physical attractiveness due to unfashionable or milk-stained clothing; (4) concerns about losing boyfriends; (5) body image concerns related to losing weight and sagging or shrinking breasts; and (6) peer pressure. The themes raised in the Ijumba et al. study echo many of those commonly found in high-income countries. However, further research on this is warranted in diverse country, socio-economic, and geographic contexts.

Mothers > 34 years and women with high parity

Aside from pregnancies that are too closely spaced and those to young mothers, two other high-risk conditions include births to mothers who are older (> 34 years) and who have high parity. An increase in FP use can reduce such high-risk births and have a strong impact on nutrition since these births are directly associated with poor birth outcomes.

With regard to older age, a study in South Africa found that compared with women ages 20–34, women > 34 years had 37 percent higher odds of preterm birth and 67 percent higher odds of delivering a low-birth-weight baby.[81] Studies in Brazil and other low- and middle-income countries had similar findings.[82]

Further elucidating the effect of age, a retrospective study in Cameroon found that women with advanced maternal age (> 40 years) and at least one child had increased risks of preterm birth compared to their younger counterparts (ages 20–29) of the same respective parity. For example, compared with mothers ages 20–29 years with two or more children, mothers ages 40 or older with two or more children had increased risks of preterm birth (12% vs. 9.2%) and low birth weight (11% vs. 7.7%).[83]

Other studies have explored the influence of parity on adverse nutrition outcomes. A study of 996 children in Ethiopia found that compared with children of mothers with two or fewer children, children of mothers with three or more children had 46 percent greater odds of subclinical vitamin A deficiency.[84] Another recent study that included data from 14 cohorts, found that women ages 18–34 with high parity ≥ 3 had 20 percent greater odds of preterm birth compared with women of the same age with parity of 1 or 2.[85]

The link between parity and adverse birth outcomes is not clearly understood. One 2013 study using DHS data from several countries in Africa, Asia, and Latin America found that compared to parity 3 women, parity 6 women had significantly lower coverage of key maternal and child health services. The authors suggest that this may provide a partial explanation for mortality associated with high-parity births.[86] Another 2013 study, however, suggests that the apparent relationship between parity and poor outcomes such as infant and child mortality may in fact be entirely due to confounding—meaning that there is no true relationship between them and that it only appears so due to other factors such as the mother's level of completed fertility.[87]

Unintended Pregnancies and Nutrition

Birth outcomes

Family planning also affects child health and nutrition via its role in helping women meet their fertility desires by preventing unintended pregnancies and their associated health burdens.[88] A recent 2011 systematic review by Shah et al. of studies from both developed and developing countries found that unintended pregnancies ending in a live birth had significantly higher odds of low birth weight. The odds of low birth weight increased by 51 percent and 31 percent for unwanted and mistimed pregnancies, respectively. Those with unwanted pregnancies also had 50 percent greater odds of preterm birth.[89] Among the included studies was one from Ecuador using the 1994 Ecuador Demographic and Maternal-Child Health Survey. After controlling for potential confounding factors, they found that infants from unwanted pregnancies had 64 percent greater odds of low birth weight compared to infants from planned pregnancies.[90] Although two other studies from South America did not detect the same association, similar associations between unintended pregnancy and preterm birth have also been found among minority and immigrant populations in the United States.[91]

Further research is still needed to affirm the strength of this association in developing countries and to explain the causal pathways that might explain the relationship between pregnancy intention and birth outcomes. One potential explanation is that women with unintended pregnancies may not adequately utilize prenatal care, which is an important determinant of nutrition outcomes, particularly with regard to anemia, low birth weight, and preterm birth.[92] A few recently published studies show the strength of this association. Wado et al. found that in southwestern Ethiopia, mothers with unwanted pregnancies had 25 percent lower odds of accessing prenatal care and were 33 percent less likely to have had four or more antenatal care visits.[93] Another study by Singh et al. found that mothers from four rural states in India who prospectively reported unwanted births were more than two times as likely as mothers who reported wanted births to receive inadequate prenatal care.[94] A 2013 study by Exavery et al. in Tanzania found that late initiation of antenatal care (in the 2nd or 3rd trimesters) was far more likely among women with unintended versus intended pregnancies.[95]

Stunting

Some evidence suggests that unintended pregnancies are associated with a higher risk of stunting during childhood. A DHS report by Montgomery et al. found a statistically significant relationship between unwanted pregnancy and stunting in the Dominican Republic, one of the five countries assessed.[96] Another five-country DHS study by Marston et al. found that in Peru, children who were unwanted at the time of conception had significantly worse outcomes in relation to child growth as measured by stunting.[97]

The potentially important role of parental intentions on nutrition outcomes is further emphasized by a study in Bolivia that found that among maternally unwanted children, the rate of stunting was 29 percent, compared with 19 percent among those who were classified as maternally wanted. More specifically, the study indicates that among toddlers 12–35 months, the risks of stunting increase about 30 percent for those from mistimed or unwanted pregnancies. When both parents reported the pregnancy as unwanted,

the risks of stunting increased for both infants and toddlers.[98] Finally, a recent 2012 study by Singh et al. using nationally representative data from India also found that unwanted children faced 30 percent greater odds of stunting than those who were wanted. The authors suggest that this estimate may be somewhat modest due to mortality selection because those most heavily affected and with the worst anthropometric outcomes may have died and thus were not included in the sample.[99]

The classification of "unwanted" is a complex concept and has been the subject of considerable debate and discussion. Thus, measurement challenges may play an important role in explaining the discrepant results.[100] However, because the associations between unwanted or unintended pregnancy and stunting were not found in all instances when the analysis was conducted, these findings should be viewed with some caution. The evidence does still highlight an important potential linkage that warrants attention and further exploration.

Breastfeeding

There is a body of evidence addressing the relationship between pregnancy intentions and breastfeeding practices. Collectively, the findings are inconclusive; however, they do suggest that this may be an important area for further exploration. Two studies in Peru and Ghana show that unplanned pregnancy is associated with poorer breastfeeding practices.[101] For example, Chinebuah and Perez-Escamilla analyzed DHS data from Ghana and found a significant difference in the median duration of breastfeeding among women with one child with planned vs. unplanned pregnancies (21.1 vs. 18.5 months, respectively).[102] In a separate study, Perez-Escamilla et al. also found that mothers in Peru with unwanted pregnancies were at risk for earlier discontinuation of breastfeeding.[103]

A mother breastfeeding her baby in Sierra Leone.
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Other recent studies have more tentative findings regarding the relationship between pregnancy intention and breastfeeding. Fiedler and Perez-Escamilla analyzed DHS data from 18 countries. The pooled analysis found that mothers with unintended pregnancies had 10 percent lower odds of prolonged breastfeeding beyond the first year of life compared to mothers with intended pregnancies. However, this general trend was not found in one-third of the countries, and the association was significant in only three individual countries. This heterogeneity suggests that more research is needed to better understand how this relationship may play out in different settings.[104] A 2007 study by Shapiro-Mendoza analyzing DHS data from Bolivia and Paraguay did not find a significant relationship between pregnancy intention and breastfeeding duration.[105]

Finally, a recent study in the Philippines shows that pregnancy intention has different effects on breastfeeding practices and that this relationship varies by socioeconomic status. For example, in households with low socioeconomic status, children born from mistimed pregnancies had 44 percent higher odds of late breastfeeding initiation compared to those born from wanted pregnancies. Meanwhile, in households with high socioeconomic status, the authors found a surprising relationship, which negated

their initial hypothesis. In these households, children born from wanted pregnancies were significantly more likely to be breastfeed for a shorter duration. The authors postulate that this may be because mothers with wanted pregnancies are more excited and keen to ensure that their babies receive what they perceive as the "best." It is possible that formula feeding was perceived as superior due to misconceptions of breastfeeding as insufficient or that mothers of high socioeconomic status with wanted pregnancies had increased exposure to external influences or information sources that encourage formula feeding.[106]

Indirect Relationships Between Family Planning and Nutrition Mediated by Other Factors

Maternal mortality

Mothers are often the primary caretakers and purchasers and preparers of food for children; thus, their own survival is an important determinant of child survival, health, and nutritional status. Pregnancy and childbirth are important causes of maternal deaths, particularly in developing countries where 99 percent of maternal deaths occur[107] and where women face a 1 in 150 lifetime probability of death due to maternal causes such as hemorrhage, hypertensive disorders, sepsis, and complications from unsafely performed abortion.[108] In Africa, the lifetime risk of dying during pregnancy or childbirth is 1 in 40, compared with a risk of 1 in 3300 in Europe.[109] A recent report by the Guttmacher Institute estimated that in 2012, 291,000 women in developing countries would die from pregnancy-related causes; 36 percent of these women would not have wanted to get pregnant.[110]

Expanding use of family planning can help women meet their fertility desires and will naturally lead to declines in maternal deaths since women will be exposed less often to the risks of pregnancy, childbearing, and abortion. In fact, a 2012 Lancet study found that in 2008, contraceptive use averted 272,040 maternal deaths (a 44% reduction) and that by fulfilling unmet need for family planning, maternal mortality could be further reduced by 29 percent.[111] Another study by Stover et al. further illustrates that family planning also lowers the risk of maternal death by preventing high-risk, high-parity births.[112]

When mothers die, infants lose the opportunity to be breastfed, and the nutritional needs of older children also often go unmet. Ronsmans et al. analyzed data from a well-established and respected population surveillance system in Matlab, Bangladesh.[113] Their findings indicate that for children whose mothers die before their 10th birthdays, the cumulative probability of survival to age 10 is 24 percent, compared with 89 percent for children whose mothers remained alive. The effect is most pronounced within the first six months of life, and many infants in the study died soon after their mothers died. Median times to death from the mother's death ranged from 20 days for neonates to two months for infants ages 1–5 months to 2.5 months for infants ages 6–11 months.

Importantly, the Ronsmans study underscores the underlying associations between maternal mortality and child nutrition. Infants whose mothers died were significantly more likely to die from diarrheal diseases and nutritional deficiency than were those whose mothers survived. Further, among children ages 12–119 months, undernutrition was much more common among those whose mothers had died. The authors suggest that the increased risk of infant death due to maternal death is largely due to the termination of breastfeeding, and that the persistent effect among older children also shows the importance of the mother's role as a primary source of nutrition.[114]

Women's education and empowerment

The ability of women to choose the number and spacing of their children and decide what type of FP method to use is a factor that relates to and increases women's empowerment and autonomy.[115] A positive impact on nutrition outcomes may be mediated by improvements in women's status due to increased use of family planning. This relationship is shown by linking two separate but related bodies of evidence. The

first shows that fertility declines that result from increased contraceptive use lead to increases in women's status and empowerment via increased participation in the labor force,[116] increased levels of education,[117] receipt of critical maternal and child health services,[118] and personal satisfaction with household status.[119] The second body of evidence shows that increases in women's status positively benefit women's own nutritional well-being and the nutritional status of their young children.[120]

An improvement in women's status via education is one of the strongest mediating factors for the link between family planning and nutrition. The evidence suggests that adolescent pregnancy can lead to disruptions in schooling.[121] Preliminary results of a 2012 study by Chalasani et al. exploring the education trajectory of girls in Malawi indicate that pregnancy is a common reason for not attending school and further that when girls miss a term or more of school due to pregnancy, they are less likely to return than their peers who drop out for other reasons.[122] Recent research from Iran also shows that the use of family planning can increase educational attainment even after marriage.[123] Evidence shows that maternal education is a strong determinant of child health and nutrition. A 2013 DHS report indicates that increased maternal education reduced the odds of childhood stunting, wasting, and underweight in three sub-Saharan African countries (Malawi, Tanzania, Zimbabwe). Importantly, significant differences are only seen at higher levels of schooling; the threshold in Malawi is junior secondary school, while in Tanzania and Zimbabwe, it is senior secondary school. For example, compared with women who had no education, Tanzanian women with senior secondary or greater education had 69 percent lower odds of having a stunted child. Among Malawian and Zimbabwean women, the odds were reduced by 44 percent and 49 percent, respectively.[124] A study by Abuya et al. found a similar association between maternal education and childhood stunting among residents of Nairobi slums; children of mothers with education levels of primary or below had 28 percent higher odds of being stunted compared with children of mothers with secondary education or greater.[125]

A number of pathways may explain the strong relationship between maternal education and child nutrition. Better-educated mothers are more likely to maintain their own nutritional status, which can have the cyclical effect of reducing the risk of poor birth outcomes such as SGA and low birth weight in the future. In addition, according to the World Bank, an extra year of primary school can boost a girl's eventual wages by 10 percent to 20 percent, while an extra year of secondary school could boost wages 15 percent to 20 percent.[126] Thus, better-educated mothers will not only have the knowledge but also the financial resources needed to feed themselves and their families the right quantity and quality of foods to ensure optimal nutrition.

Education and earning power can also increase other measures of women's status, such as mobility and access to markets; exposure to nutrition information and resources; and financial autonomy and decision-making power with regard to intra-household resource allocation. Research shows that all of these factors are directly correlated with improvements in key measures of childhood nutrition including wasting, stunting, and underweight.[127] For example, one study in India shows that women with greater financial autonomy (ability to keep money for discretionary purposes) had 27 percent lower odds of having a stunted child, while those with greater physical autonomy (freedom to choose to go to the market) had 41 percent lower odds.[128] Additionally, studies have found that children of more highly educated mothers are significantly more likely to have increased dietary diversity,[129] which is positively associated with growth outcomes.[130] Mothers with higher status are also more likely to have children with better nutritional status due to improved caretaking practices with regard to prenatal care, breastfeeding, complementary feeding, immunization, and treatment of illness.[131]

Increasing levels of education are also associated with a lower risk of women experiencing domestic violence,[132] which is also an important measure of empowerment. Growing evidence indicates that domestic violence has strong negative implications for nutrition.[133] Ackerson and Subramanian found that in India, increased levels of domestic violence were associated with higher odds of anemia and

underweight among women and increased odds of wasting, stunting, underweight, and low body mass index for age among children. They suggest possible mechanisms to explain these relationships might include withholding of food as a form of abuse, reduced decision-making capacity regarding choice and quantities of food, and effects mediated by psychological stress.[134] Bhagowalia et al. found a similar relationship in that women with a higher level of acceptance of domestic violence were more likely to have stunted children.[135] Interestingly, a recent meta-analysis including data from 25 sub-Saharan African countries found that women who bear children at a young age or during adolescence are more likely to have such acceptance and disempowerment, for example, believing that wife beating is justified in at least one of five particular domestic circumstances (neglecting children, burning food, arguing, refusing sex, leaving home without permission).[136] One study found that in Latin America, domestic violence also affects nutrition by significantly reducing the probability of breastfeeding.[137]

Links between women's empowerment and stunting have also been found in practice. A recent evaluation of a livelihood-based nutrition project implemented by CARE in Bangladesh found that child stunting was reduced by 16 percent in a period of 3.5 years. Notably, the evaluation showed that the women's empowerment interventions had a strong independent effect on this outcome.[138]

GAPS IN KNOWLEDGE AND CONSIDERATIONS FOR FURTHER RESEARCH

Despite the wealth of evidence that exists concerning the links between family planning and nutrition, important gaps in our understanding of key issues remain. Notably, information is needed on the magnitude of impact that family planning could have on nutrition outcomes at the aggregate level. Modeling simulations could be used to help fill this gap—for example, by projecting how many fewer infants would be born preterm, with low birth weight, or SGA if the need for family planning were fully met. Another example would be to determine how many cases of stunting or other forms of child undernutrition would be averted if birth intervals were lengthened. Costing analyses would be similarly useful to help decisionmakers understand the magnitude of savings that could be gained in nutrition due to investments in FP services. For instance, if the necessary family planning program investments for meeting unmet need were realized, what would be the cost savings in selected nutrition interventions owing to fewer malnourished women and children?

Other important gaps in knowledge relate to more specific behaviors and relationships identified in this review—for which mixed or tentative evidence may exist but more is needed:

- In low- and middle-income settings, what is the relationship between young maternal age and infant and young child feeding practices? And what are the factors that influence the feeding behaviors of young mothers?
- What is the relationship between pregnancy intention and breastfeeding practices?
- What is the association between unintended pregnancy and nutrition outcomes such as stunting and wasting?
- How exactly do short birth intervals affect children's health and survival? For example, further research is needed to validate hypotheses about maternal nutritional depletion, cervical insufficiency, and suboptimal lactation and to elucidate their precise causal mechanisms.

Researchers have also identified other specific topics for inquiry that would help broaden understanding about the potential links between family planning and nutrition:

- What is the impact of short birth intervals on maternal micronutrient status? While some evidence is available, more methodologically sound research with control of potentially confounding variables is needed.
- What is the impact of high parity on pregnancy outcomes in the context of poor maternal nutritional status?
- What role does breastfeeding (and its intensity) play in the relationship between birth spacing and poor nutrition outcomes among infants and children?
- How does the survival status of a preceding sibling affect child health and nutrition following a short birth interval? While some studies have looked at these effects, the results are inconclusive.

CONCLUSION

This review draws attention to important linkages between family planning and nutrition. It sets the stage for a crucial dialogue on how best to harness these synergies to achieve optimal nutrition outcomes. Importantly, the evidence presented can help shift the lens through which we conventionally view both family planning and nutrition. For the reproductive health community, it offers a broader view of the benefits that can be achieved by addressing unmet need. And for the nutrition community, it draws attention to the often overlooked potential of family planning to strengthen current approaches and more effectively achieve nutrition goals. Ultimately, this work aims to galvanize our collective thinking and encourage a more collaborative, integrated approach to the development of public health policies, strategies, and programs.

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