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EDITORIAL

New evidence on birth spacing: promising findings for improving newborn, infant, child, and maternal health

M. Norton

Office of Population and Reproductive Health, Bureau for Global Health, United States Agency for International Development, Ronald Reagan Building Rm. 3.6, 1300 Pennsylvania Avenue, N.W., Washington, DC 20523-3600, USA

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Abstract

This editorial summarizes new evidence, some of which is published in this supplement, on birth spacing and newborn, infant, child and maternal health, as well as the demand for birth spacing services in the developing world. The article points to the high number of annual infant, child and maternal deaths, low birth weight infants and malnourished infants and children in developing countries. It highlights several new findings on birth spacing relevant to these conditions:

— for infants and children under five years of age, births spaced at least 36 months apart are associated with the lowest mortality risk;
— birth to conception intervals of less than 6 months, as well as abortion-pregnancy intervals of less than 6 months, are associated with increased risk of pre-term births, low birth weight and small for gestational age;
— birth to conception intervals of less than 6 months are associated with increased risk of maternal mortality and morbidity.

It argues that, in light of the new evidence, birth spacing is an important, feasible and practical intervention to address these conditions and should be included in developing country health programs.
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1. Introduction

Current trends in child and maternal survival point to a quiet, global health tragedy: 10 million infants and children and over 500,000 women die annually,

E-mail address: mnorton@usaid.gov.

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due mainly to preventable causes. One-hundred and fifty million children around the globe are malnourished. Each year, an estimated 20 million infants are born with low birth weight, a condition directly linked to infant mortality. These immense and heartbreaking numbers have remained roughly static since the early 1990s. Sadly, the international community has yet to mobilize the resources, infrastructure, and political will needed to address this often unnoticed, perennial international catastrophe. And no region, with the possible exception of Latin America and the Caribbean, is on track to achieve the Millennium Development Goal of reducing, by 2015, under-five mortality rates by two-thirds of their 1990 level [1].

In the summer of 2003, the authors of the landmark child survival series, published in *The Lancet*, set forth a laudable and compelling challenge: the scaling-up of proven interventions throughout the developing world. Advocating for a second child survival revolution, they made a persuasive case that such a strategy can effectively address the myriad health conditions that hinder improvements in child health. In outlining potential evidence-based interventions ready for scale-up, the authors noted that "health-related behaviors, such as birth spacing, are also important risk factors for child mortality [2]." But in estimating the number of preventable under-5 deaths, they excluded birth spacing, because cause-specific evidence of effect was unavailable [3].

Birth spacing is a well-known, underutilized, and admittedly not fully understood health intervention. Despite lack of data on underlying biological mechanisms, longer birth intervals are associated with multiple health and nutrition benefits for both mother and child, and could play a significant role in helping countries achieve maternal and child health Millennium Development Goals. As new analyses show, longer birth intervals are associated with reduced risk for:

- all categories of infant/child mortality (including neonatal, which now accounts for 40—60% of infant mortality in the developing world);
- maternal mortality and complications of pregnancy;
- low birth weight, preterm births, and small for gestational age; and
- child stunting and underweight.

The new evidence, some of which we present in this supplement, makes child spacing compelling as a health issue of global importance. The rationale for increased attention to birth spacing is evidence-based, the magnitude of the problem of too closely spaced births is enormous, and the demand and unmet need for birth spacing services are considerable. Gaps in birth spacing education and counseling (on risks and benefits) are global in scale [4].

The researchers whose work is presented here diverge in their choice of independent variable. Often depending upon data availability, some choose inter-pregnancy interval (IPI), others select birth interval (BI). The reader will need to make a mental note of this methodological factor as s/he proceeds through the literature. In the pages that follow, the researchers define inter-pregnancy interval as the "time elapsed between the woman's last pregnancy outcome and the date of the last menstrual period for the index pregnancy [5]." The preceding birth interval is defined as the "number of months between the birth of the child under study (index child) and the immediately preceding birth to the mother [6]." Inter-pregnancy interval can be converted to birth interval by adding 9 months, e.g., a 6 month inter-pregnancy interval is the approximate equivalent of a 15 month birth interval. In discussing the research, below, we use the independent variable as defined by the researcher.

2. New evidence

The new research, more methodologically rigorous than previous studies, underscores the critical role that the length of the inter-pregnancy/birth interval plays in pregnancy outcomes, newborn, infant, child and maternal mortality and morbidity, and nutrition status.

2.1. Newborn, infant, and child mortality and nutrition status

Shea Rutstein's study, *Effects of preceding birth intervals on neonatal, infant, and under-five years mortality and nutritional status in developing countries: evidence from the Demographic and Health Surveys*, presented in this supplement, was based on Demographic and Health Survey (DHS) data from 17 countries in four regions. It controlled for 15 socio-economic and demographic variables, and assessed outcomes of more than 270,000 pregnancies.

The study found that:

- for neonatal and infant mortality, the risk of dying decreases with increasing interval lengths up to 36 months, at which point the risk plateaus, and thus birth intervals of 24 to

36 months are still associated with mortality risk;
- because of the large number of births occurring between 24 and 36 months, helping women to avoid risks during this interval is especially important from a public health perspective;
- for under age 5 years, the longer the birth interval, the lower the risk, even for intervals of 48 or more months;
- the relationship between chronic malnutrition and birth interval, and general undernutrition and birth interval, is statistically significant in some countries (Bangladesh, Guatemala, India, Kenya, Peru, Zambia, Bolivia, and Nigeria) and there is a clear pattern of increasing chronic and general undernutrition as the birth interval becomes shorter. These findings are important given that malnutrition plays a role in more than one-half of all child deaths. The study concludes that, in some countries, children face double threats to a healthy life due to short preceding birth intervals: the risk of dying and the risk of malnutrition and recommends that mothers space births at least 36 months apart.

2.2. Neonatal and perinatal morbidity and mortality

The second study presented in this supplement, *Effect of inter-pregnancy interval on birth outcomes: findings from three recent U.S. studies*, by Bao-Ping Zhu, analyzed U.S. data to examine the relationship between pregnancy intervals and adverse pregnancy outcomes. Zhu's study presents three separate but linked analyses, each meticulously correcting for the methodological limitations of the preceding analysis. Zhu concludes that short and long pregnancy intervals are indeed linked to three adverse birth outcomes: low birth weight, preterm birth, and small for gestational age. This study highlights the important fact that adverse birth outcomes, as determined by short pregnancy intervals, are not confined solely to developing countries.

An additional analysis (not included in this supplement) by Conde-Agudelo and others, based on a sample of over 1 million pregnancies in Latin America, and which controlled for 15 variables, found that infants conceived less than 6 months after a birth (15 month birth interval) faced an approximate 50% increased risk of fetal death and early neonatal death, and 80—100% increased risk of very low birth weight, low birth weight, very preterm delivery, preterm delivery, and small for gestational age ($p<0.05$). Infants conceived 6—11 months after a birth (15—20 month birth interval) were 15—33% more likely to suffer any of the adverse perinatal outcomes considered [7].

A third study included in this supplement, *Effect of the interpregnancy interval after an abortion on maternal and perinatal health in Latin America*, by Agustin Conde-Agudelo and others, breaks new ground. The study examined the length of the pregnancy interval after a spontaneous or induced abortion and the risk of adverse maternal and perinatal outcomes in the next pregnancy. It defined the post-abortion pregnancy interval (PAII) as the time elapsed between the day of the spontaneous or induced abortion and the first day of the last menstrual period for the index pregnancy. Taking into account 17 potentially confounding variables, the study found that, compared to PAIIs of 18—23 months, abortion—pregnancy intervals of less than 6 months are associated with an array of adverse pregnancy outcomes, both maternal and perinatal. Given the estimated number of induced abortions (35 million) and miscarriages (28 million) in developing countries annually, helping post-abortion clients to avoid pregnancy for at least 6 months after the abortion or miscarriage is a potentially new area for intervention to improve perinatal and maternal health [8].

Considered together, these three studies bring new evidence to bear on the question of the causal pathways between pregnancy intervals and mortality [9]. Equally important, they suggest that helping women achieve healthy birth intervals may be a new (albeit untested) intervention to reduce the risk of low birth weight, a condition with lifelong and potentially "devastating" [10] consequences for all age groups—infant, child, adolescent, and adult, and for which there exist few, effective programmatic interventions. A 2004 report concluded that the identification of effective and practical interventions to prevent low birth weight could have an "enormous impact on the health and productivity of individuals and society [11]."

2.3. Maternal morbidity and mortality

Abdur Razzaque, Julie Da Vanzo, and others' study, *Pregancy spacing and maternal morbidity in Matlab, Bangladesh*, included in this supplement, helps us understand the risks that women themselves confront when intervals between pregnancies are too short. The study found that, after controlling for relevant variables, pre-eclampsia and high blood pressure are significantly more

likely for women with preceding pregnancy intervals of less than 6 months (15 month birth intervals) and more than 75 months, compared to those with intervals of 27—50 months (36—59 month birth intervals). Those with pregnancy intervals of 6—14 months (15—23 month birth intervals) had significantly higher risk of premature rupture of the membranes.

We should also mention one 2000 study by Conde-Agudelo and Belizan, *Maternal morbidity and mortality associated with interpregnancy interval: cross sectional study*, which examined pregnancy interval and adverse maternal pregnancy outcomes. The study assessed outcomes of over 1 million pregnancies and adjusted for 15 socio-economic, health, and demographic factors, including miscarriage and induced abortion. It found that pregnancy intervals less than 6 months apart (15 month birth intervals) are associated with a 150% increased risk of maternal death, as well as related maternal health complications: elevated risk of third trimester bleeding (70%); premature rupture of membranes (70%); puerperal endometritis (30%); and anemia (30%) [12]. Pregnancy intervals greater than 59 months were also associated with increased risk for eclampsia and preeclampsia.

Interestingly, the two studies, based on data from different geographic regions (Bangladesh and Latin America), are consistent in their findings: that births spaced less than 15 months apart are associated with grave risks to women's health.

2.4. Demand for spacing services

William Jansen's study, included in this supplement, *Existing demand for birth spacing in developing countries: perspectives from household survey data*, highlights the potential for influencing mortality and morbidity trends—by educating families about the role that pregnancy intervals play in health outcomes. Jansen's analysis indicates that the demand and unmet need for spacing services around the world is substantial. And, we should note, that many couples are motivated by lifestyle, education or income-related reasons to space births, rather than health-related reasons, since the health benefits are not well-known. Jansen's analysis suggests the considerable scope for influencing infant and maternal mortality in the years ahead.

Among younger age groups, spacing is, by far, the main reason for any demand for family planning. Among married women 29 years of age or younger, the portion of total demand for family planning for spacing reasons represents from 65% to over 90% in 12 of the 17 countries examined. In the remaining five countries, the demand for birth spacing represented at least 50% of the total demand for family planning. Jansen's analysis also reveals a surprising finding: some recently-married, young women, who have not yet given birth, are indeed interested in delaying the birth of their first child, including in those countries where, consistent with tradition, policymakers and providers assume that such demand is non-existent.

3. Rationale/magnitude of the problem

The magnitude of the problem of too short birth intervals in developing countries is considerable.

The majority of non-first births in developing countries occur after too short an interval. In 55 developing countries, 57% of women report spacing non-first births shorter than 3 years. And 26% report spacing births less than 2 years apart. While national, country-specific data often suggest that the majority of births are spaced at healthy intervals, data disaggregated by age group reveal a strikingly different pattern—globally, among those age 29 and younger, 60—80% of births are spaced less than 3 years apart [13].

In many developing countries, the percentage of married women of reproductive age experiencing short birth intervals has declined minimally, or not at all. For example, over the past 5 to 10 years, in Burkina Faso, Madagascar, Niger, Tanzania, Uganda, Zambia, Nepal, Philippines, Bolivia, and Yemen, there has been a reduction of only 1—2% in women reporting birth intervals under 3 years. In India, Mali, Madagascar, and Haiti, the percentage reporting intervals under 3 years has increased [14].

Many women want longer birth intervals, but are not achieving them. Global data show that only 2—3% of post-partum women report wanting another birth within 2 years, yet only 40% are using family planning [15]. In five sub-Saharan African countries, women prefer much longer birth intervals than those they experienced. It is estimated that if women could achieve the birth intervals they want, child mortality would decline. In Kenya, for example, under-five mortality would drop by 17% [16].

In many developing countries, the poor and the marginalized, especially, are uninformed of the mortality risks of annual childbearing. They often understand in general terms that spacing is a healthy behavior, but most do not know that

mortality, morbidity, and poor nutritional status are often associated with short birth intervals, and are preventable. Some women are unaware that they can control the pace of births. Many families lack knowledge of the array of options to achieve the longer intervals they prefer, including: breastfeeding; modern contraceptive methods; abstinence; and natural family planning.

Service delivery programs need to address the many gaps in birth spacing services. Service delivery guidelines, communication strategies, standard protocols, training, and educational materials to inform families of the risks of short and long intervals are unavailable in most programs [17]. Focus groups conducted in five countries (Bolivia, Peru, India, Pakistan, and Egypt) indicate that families, providers, and NGOs (which could potentially play an educational and outreach role) often lack understanding of the relationship between birth spacing and child and maternal survival and nutritional status. Providers stated that they usually do not discuss the benefits and risks of longer and short birth intervals due to the absence of standard guidance and protocols. They understand birth spacing as generally good for health, but lack information on the mortality, morbidity, and nutritional risks of short intervals for both mother and child [18].

4. Needed programmatic changes

The programmatic foundations for enhanced services and information already exist in most developing countries, and the demand and unmet need for such services are significant. To take meaningful next steps, programs will need to ensure that health policies recognize birth spacing as a legitimate child and maternal health intervention and work to make contraceptive commodities widely available through public and private sectors at an affordable price. The following are several practical steps that can be taken immediately to scale-up child spacing as a health intervention for child and maternal survival.

At the programmatic level, public, NGO, and private sector health service managers and providers, including those in family planning, child survival, and maternal/child health, safe pregnancy, HIV, PMTCT, VCT, and post abortion care programs, should ensure that families are educated about the benefits and risks of long and short intervals. The evidence presented in this supplement suggests that, from a public health perspective, families and communities should be educated that births spaced more than 3 years apart, but less than 5 years, are associated with the healthiest outcomes.

Programs will also need to find ways to educate families on the risks of too short and too long birth intervals. Such education is not currently included in most family planning/maternal and child health programs. Yet the international health community has witnessed the progress made in care seeking and health outcomes when Safe Motherhood programs informed families of the risks and complications of pregnancy and delivery. Similarly, family planning programs will need to initiate effective education and counseling, with appropriate monitoring and evaluation, on the risks of too closely spaced births, and other high risk fertility behaviors.

Education, counseling, and behavior change programs should focus especially on young, low-parity women, post-partum women, and newly married and engaged couples, including the 15–19 age group. There is a need to educate all women and couples about the health and nutrition benefits of birth spacing. At the same time, specific groups may warrant special attention. The higher-levels of demand for spacing services among those under age 29, including 5–19 year old, zero-parity married women, illustrate that married adolescents and young adults in several developing countries include those who are already interested in postponing a first birth. This suggests that family planning programs in developing countries may need to re-examine the extent of access to birth spacing services that these potential users are likely to have, given current service delivery protocols, counseling practices and service-provider skills.

Both clinicians and program managers should aim to educate and counsel families with clear, simple messages. Based on the research findings presented in this supplement, messages might be as follows:

- For the health of all of your children, use an effective family planning method of your choice for at least 2 years after the last birth, before trying to become pregnant again.
- For the health of your children, exclusively breastfeed for at least 6 months, and space births at least 3 years apart.
- After a spontaneous or induced abortion, use an effective family planning method of your choice for at least 6 months before becoming pregnant again.
- Women's health will also benefit with 3 to 5 year birth intervals.

5. Conclusions

Rutstein's analysis quantified the number of deaths that could be averted if more families achieved the longer intervals they desire. In 2003, if women in developing countries (excluding China) had no birth intervals less than 24 months, almost 2 million deaths to children under the age of five could have been averted. And if all women had spaced births approximately 36 months apart, an additional 1 million deaths could have been averted, accounting for about 35% of all deaths to children less than 5 years of age.

Given the quantifiable health and nutrition benefits of longer birth intervals, substantial demand among women of reproductive age, and existence of family planning programs, infrastructures, and services in the private and public sectors in many developing countries, realizing the benefits of longer birth intervals is a feasible, practical, and realistic goal. Neither new technologies nor new cadres of providers are needed.

The findings presented in this supplement underscore the importance of revitalizing birth spacing as a central reproductive health concept; redeploying it as a new and legitimate focus of maternal and child health and nutrition services, and adding it to the arsenal of interventions to be scaled-up in a second "child survival revolution" worldwide. Development agencies, ministries of health, development financing institutions, non-governmental and community-based organizations, health care provision networks, commercial health care providers, and pharmaceutical companies all have a potential role in helping to make meaningful birth spacing information and services available to families worldwide. All that is needed for the launch of a concerted effort is the support, engagement, and leadership of key stakeholders and health care professionals worldwide.

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