



CATALYST
consortium

Optimal Birth Spacing: New Research from Latin America on the Association of Birth Intervals and Perinatal, Maternal and Adolescent Health

July 31, 2002





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The CATALYST Consortium is a global activity funded by the U.S. Agency for International Development (USAID). CATALYST is a five-year activity (2000-2005) with the strategic objective of increasing the use of sustainable, quality family planning and reproductive health services and healthy practices through clinical and non-clinical programs.

CATALYST brings together five organizations as equal partners: Academy for Educational Development (AED), Centre for Development and Population Activities (CEDPA), Pathfinder International, PROFAMILIA/Colombia, and Meridian Group International, Inc., contributing expertise in a wide range of areas.

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Glossary of Terms

Anemia: A condition in which the blood is deficient in red blood cells, in hemoglobin, or in total volume.

Apgar Score: An index used to evaluate the condition of a newborn infant based on a rating of 0, 1, or 2, for each of five characteristics: color, heart rate, response to stimulation on the sole of the foot, muscle tone, and respiration, with 10 being a perfect score.

Birth Interval: The time elapsed between two consecutive births, or the measure of time between one child's birth date and the birth date of the next child. (Add nine months to the interpregnancy interval to get the birth interval).

Child: A young person between infancy and youth, unusually referring to age less than five years.

Eclampsia: Convulsions or coma occurring to women affected with Preeclampsia.

Episiotomy: Surgical enlargement of the vulval orifice for obstetrical purposes.

Infant: A child under one year of age.

Interpregnancy Interval: The time elapsed between the woman's last delivery and the date of the last menstrual period for the index pregnancy (birth-conception).

Low Birth Weight (LBW): Weight of newborn less than 2500 grams.

Maternal Mortality: A maternal death is the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and the site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes.

Multiparous: A woman who has borne more than one child.

Neonatal: Referring to or affecting the newborn, especially pertaining to the period during the first month after birth.

Nulliparous: A woman who has never given birth to a child.

Parity: The number of times a woman has given birth, counting multiple births as one and usually considering stillbirths.

Perinatal: Occurring in, concerned with, or being in the period around the time of birth.

Perinatal Mortality: A death that may occur during the period around the time of birth.

Postpartum: The period following the birth of a child, usually lasting six weeks.

Postpartum Hemorrhage: A complication of pregnancy where a copious and often uncontrollable discharge of blood is lost in the postpartum period.

Pre-Term Birth (PTB): Relating to, being or born by premature birth, usually less than 37 weeks. Very pre-term birth is usually less than 32 weeks. Pre-term birth and prematurity are often treated as synonyms.

Preeclampsia: A condition that arises in late pregnancy that is characterized by a sharp increase in blood pressure, excessive gain in weight, generalized edema, albuminuria (albumin in the urine), severe headache, and visual disturbances.

Premature Rupture of Membranes (PROM): A rupture of the membranes (the placenta) prior to the onset of labor. The severity of this condition varies with gestational age of the fetus, and management of the condition.

Small for Gestational Age (SGA): Birth weight below 10th percentile for the gestational age and gender, according to Williams et al. reference curve.

Third Trimester Bleeding: Bleeding from the vagina after the 28th week is considered an emergency. The most common causes of late-pregnancy bleeding are problems with the placenta (placental previa, placental abruption), uterine rupture, fetal bleeding, or lower genital tract injury.

Introduction

A Risky births have been categorized in the reproductive health and family planning literature by the “four too’s”: those that occur to women who are too young or too old, or for births that are too many or too close together. Having children too close together has long been associated with increased risk of various adverse health outcomes, including mortality for infants, children and mothers. A review of the sociodemographic and medical research literature, as well as print and internet sources from the major international health organizations (WHO, UNICEF, UNFPA) and medical governing bodies, has revealed an apparent agreement that a birth interval of at least two years is important for infant, child and maternal health. Although it appears that the “two year” concept has consensus, in reality it is rarely recognized at the policy or programmatic levels. And, although birth spacing is at the heart of reproductive health/family planning, it is rarely addressed directly.

The CATALYST Consortium¹ has developed the Optimal Birth Spacing Initiative (OBSI) to revive birth spacing as a key reproductive health and comprehensive health concept; and one that has the potential to significantly improve the health and well-being of women, children, men, families, and communities worldwide. The term “birth spacing,” when used by The CATALYST Consortium, refers to the use of family planning to obtain a birth interval² that will achieve the most favorable health and non-health outcomes for mothers, children, and their families.

¹ The CATALYST Consortium is a global activity funded by the U.S. Agency for International Development (USAID). CATALYST is a five-year activity (2000-2005) with the strategic objective of increasing the use of sustainable, quality family planning and reproductive health services and healthy practices through clinical and non-clinical programs. CATALYST brings together five organizations as equal partners: Academy for Educational Development (AED), Centre for Development and Population Activities (CEDPA), Pathfinder International, PROFAMILIA/Colombia, and Meridian Group International, Inc., contributing expertise in a wide range of areas.

²Terminology used to describe birth spacing intervals varies in the literature. CATALYST uses the birth interval to measure birth spacing. Dr. Conde-Agudelo and researchers in this field use the interpregnancy interval to measure birth spacing. In order to convert the interpregnancy interval to birth interval, simply add nine months to the interpregnancy interval.

Groundbreaking new research from Latin America and the Caribbean commissioned by CATALYST has shown that both too short and too long birth intervals are a key risk factor for maternal and perinatal morbidity and mortality. Research by Dr. Augustin Conde-Agudelo³ indicates that spacing births for three to five years has substantially more health benefits than the previously recommended two-year spacing interval. Dr. Conde-Agudelo's findings are supported by research from Africa, Latin America, and Asia by Shea Rutstein, PhD, and research from North America by Dr. Bao-Pang Zhu and by Dr. Fuentes-Afflick. These findings provide compelling evidence for creating birth spacing policy and strengthening birth spacing messages, counseling, and programming.

In order to address the Initiative, a fundamental shift needs to be made regarding how we (the policy makers, program planners and health care providers) perceive and promote birth spacing. Historically, family planning programs have placed greater emphasis on the ability of women to avoid unwanted births than on promoting optimal birth spacing. Stronger emphasis has been placed on limiting the number of births than on lengthening the time between births. In many countries, contraceptive use for spacing has not been fully utilized, and permanent contraceptive methods, such as sterilization, have often been the choice for clients once desired family size has been met. Opportunities to lengthen birth intervals through strengthened contraception and other health programs are often lost. Individuals are not fully informed about the impact of their birth spacing decisions. And, although the majority of unmet need for family planning among women of reproductive age is for spacing births, this demand is met at a much lower level than demand for limiting births.

Addressing these issues is exciting because unlike many other risk factors for unfavorable pregnancy outcome, lengthening the birth interval is potentially within the control of individuals and couples. Moreover, birth spacing is a public health intervention that uses existing and available technology in the form of modern contraceptive methods. Birth spacing programming, using contraception in combination with revised and strengthened birth spacing messages, can be mainstreamed into existing family planning/reproductive health and primary care programs. Additionally, birth spacing programming can bridge fertility reduction and maternal/child survival goals, and thus be a model for program integration.

³ Augustin Conde-Agudelo, MD is the Director of the Department of Obstetrics and Gynecology of the Clinical Foundation Valle del Lili Cali, Colombia and a consultant for WHO/PAHO/CLAP.

The Catalyst Consortium's Optimal Birth Spacing Initiative (OBSI)

The arrival of these groundbreaking research findings providing support for an optimal birth spacing interval has led USAID and the CATALYST Consortium to revisit birth spacing as a key reproductive health and comprehensive health concept. There is a need to develop appropriate birth spacing guidance, review programmatic opportunities, improve service delivery, and strengthen birth spacing messages and counseling for women, men and couples. Most importantly, there is a need to empower individuals with knowledge on optimal birth spacing so that they can make fully informed reproductive health/family planning decisions.

The Optimal Birth Spacing Initiative (OBSI) will include a series of activities designed to:

1. Create awareness about the importance of optimal birth spacing;
2. Encourage consensus building on the part the donor, private, public and NGO communities about the need to make three to five years the optimal birth spacing recommendation;
3. Produce research in order to better understand the socioeconomic, cultural and religious determinants of birth spacing behaviors;
4. Develop concrete guidance and recommendations for international institutions and national governments to adopt three to five years as the optimal interval for birth spacing; and
5. Develop programmatic actions on birth spacing including training of providers and updating service delivery manuals.

Most importantly, the Optimal Birth Spacing Initiative will be designed to reach individuals with optimal birth spacing messages, counseling and services.

New Research on the Optimal Birth Spacing Interval

As part of the Optimal Birth Spacing Initiative (OBSI), the CATALYST Consortium commissioned research by Dr. Conde-Agudelo on the association between birth intervals and maternal, perinatal health outcomes. The database used for Dr. Conde-Agudelo's research is unique in its size and scope; it provides information on over two million pregnancies in 18 Latin American and Caribbean countries. This database is also potentially representative of the population, in that it is comprised of women delivering at public hospitals and institutions.

1. Maternal Morbidity and Mortality Associated with Birth Interval

BACKGROUND

In many developing countries, complications of pregnancy and childbirth are the leading causes of death and disability among women of reproductive age. The World Health Organization estimates that as many as 585,000 maternal deaths occur each year. And as many as 300 million women – more than one quarter of all adult women living in the developing world – suffer from long-term and short-term illnesses and injuries related to pregnancy and childbirth.

The research on maternal health outcomes was requested by CATALYST because there is at present a relative paucity of data on the association of birth intervals and maternal health outcomes. Although much has been learned in the past decade regarding the causes of maternal death, there is little evidence of significant progress towards the goal set by WHO/UNICEF/UNFPA to reduce maternal mortality by half. Optimal birth

spacing is a simple measure that has the potential to produce great strides towards this goal. Since the health of an infant and the family depends largely on the health of the mother, CATALYST determined that the health outcomes of mothers were a necessary subject for study. The WHO/PAHO Latin American and Caribbean Perinatal Information System database, which comprises information on maternal sociodemographic characteristics and outcomes of pregnancy, provides an opportunity to study the effects of birth intervals on maternal morbidity and mortality.

METHODS

The Perinatal Information System database in Montevideo, Uruguay was devised by the Latin American Centre for Perinatology and Human Development (CLAP) in 1983. From 1985 to 2000, the database has recorded pregnancies of over two million women who were born in Uruguay, Argentina, Peru, Colombia, Honduras, Paraguay, El

Salvador, Chile, Bolivia, Costa Rica, Panama, Dominican Republic, Nicaragua, Brazil, Ecuador, Mexico, Bahamas, and Venezuela.

Only parous women delivering singleton infants and whose previous pregnancy ended in live birth or fetal death after 19 weeks' gestation were included in the study. From the first antenatal visit until discharge of both mother and neonate, the attending physicians or nurses collect data on demographic information, reproductive history, maternal characteristics, prenatal care, labor management, maternal complications during pregnancy, delivery, and the puerperium, and neonatal outcomes. Data are then entered and cleaned in an on-site computer by a data clerk and queries are checked immediately with the attendant physicians or nurses. Data are later sent to the Latin American Centre for Perinatology and Human Development where further data entry, quality control check and validation are performed.

DEFINITIONS

Gestational age was estimated from the date of last menstrual period and amended by means of ultrasonography in a quarter of women. Birth interval was defined as the time elapsed between the woman's last delivery and the date of the last menstrual period for the index pregnancy. Intervals were computed in weeks and then converted to months. Birth intervals were categorized as ≤ 15 , 15-20, 21-26, 27-32, 33-68, and ≥ 69 months.

Adverse maternal outcomes were classified according to ICD-10 (International Classification of Diseases, 10th revision). Rates of adverse maternal outcomes were calculated for each birth interval. Estimates of crude odds ratio with 95% confidence interval were computed as measures of association between each birth interval and adverse maternal outcome considered. The interval 27-32 months was used as the referent category because this was the interval during which maternal death was least likely to occur. Adjusted odds ratios were derived through logistic regression models. Multiple logistic regression analysis was used to evaluate the association between birth interval and adverse maternal outcomes. The estimates were adjusted for 16 major confounding factors⁴.

RESULTS

A total of 520,689 parous women who delivered singleton infants between 1985 and 1997 were recorded on our database. The final study population included 456,889 women whose records contained complete data on birth interval and adverse maternal outcomes.

⁴ The potentially confounding factors controlled for were: maternal age; number of previous deliveries; history of abortion; stillbirth and early neonatal death; previous caesarean delivery; marital status; education; cigarette smoking; body mass index before pregnancy; trimester during which prenatal care began; number of prenatal care visits; geographic area; hospital type; year of delivery.

MATERNAL DEMOGRAPHIC AND OBSTETRIC CHARACTERISTICS OF THE STUDY GROUP

Sixty-one percent of the women had a birth interval of less than 45 months. Younger maternal age, history of miscarriage, fetal death, early neonatal death, lower rate of previous caesarean delivery, later onset of prenatal care, lower number of prenatal visits, and lower body mass index before pregnancy were associated with short intervals between pregnancies. Conversely, women with a long birth interval were more likely to be older, with greater body mass index before pregnancy and with a history of chronic hypertension. Start of prenatal care and number of prenatal visits correlated with birth interval: the shorter the interval, the later care started and the lower number of prenatal visits. There were no obvious differences

among the birth interval groups with regard to number of previous deliveries, mother's education, marital status and cigarette smoking during pregnancy.

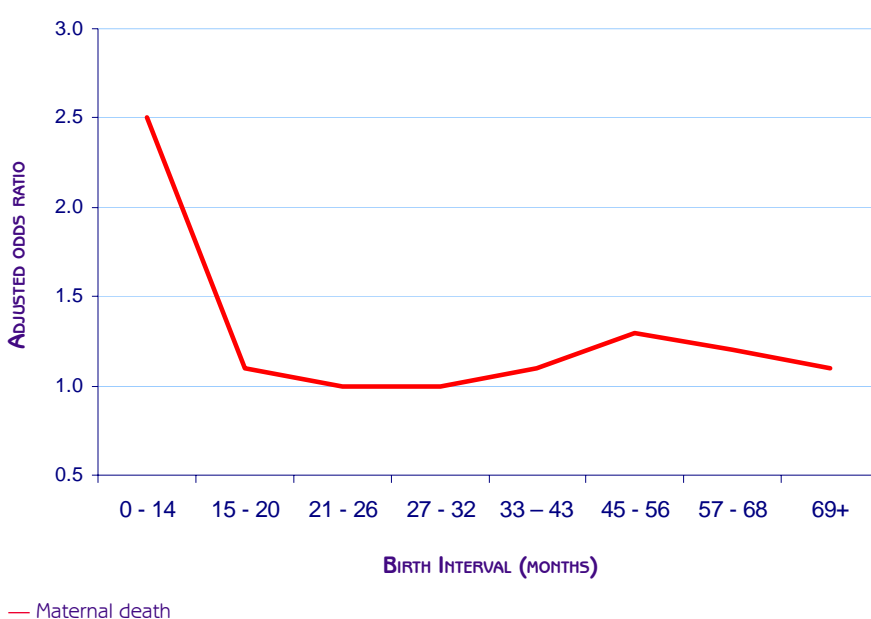
RATES OF ADVERSE PREGNANCY OUTCOMES

Women with short birth intervals had the highest rates of third trimester bleeding, premature rupture of membranes, puerperal endometritis, anemia and maternal death. There were 220 maternal deaths in the study population. The rates of preeclampsia, eclampsia and gestational diabetes mellitus were highest among women with intervals longer than 68 months. A slight increase in the rates of third trimester bleeding and maternal death was also seen in women with this birth interval.

ADJUSTED ODDS RATIOS FOR THE ASSOCIATION BETWEEN BIRTH INTERVALS AND ADVERSE PREGNANCY OUTCOMES

As Figure 1 shows, the risk of maternal mortality is greatest at the shortest birth interval. The risks drop to a low at 27-32 months and remain statistically low throughout the three to five year period. As Figure 2 shows, the risks for adverse maternal outcomes sharply

FIGURE 1. RISK OF MATERNAL MORTALITY



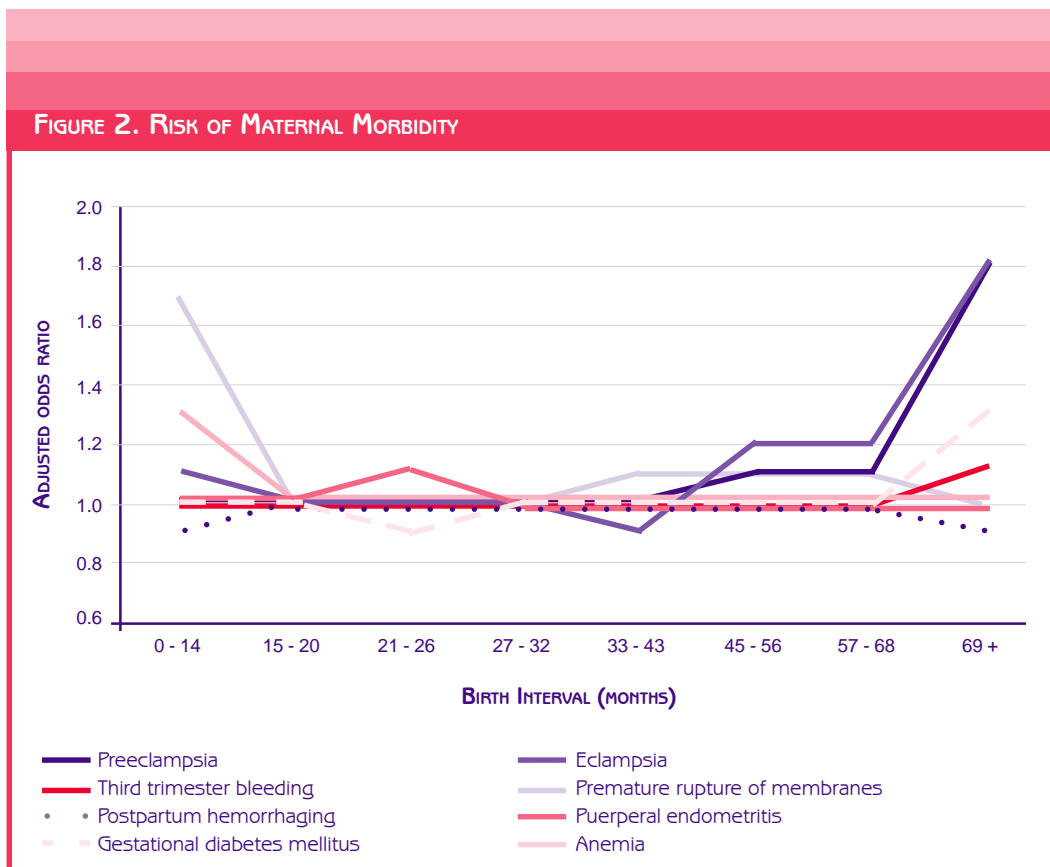
decline after the shortest birth intervals and tend to level out between 27 to 60 months. The risks for eclampsia and preeclampsia rise sharply after 60 months, illustrating the risks associated with birth intervals longer than the optimal interval of three to five years.

As shown in Figure 2, after controlling for major confounding factors, women with birth intervals of 15 months or less compared with a birth interval of 27-32 months had increased risk of third trimester bleeding (relative risk, 1.73 ; 95% confidence interval, 1.42 to 2.24), premature rupture of membranes (relative risk, 1.72 ; 95% confidence interval, 1.53 to 1.93), puerperal endometritis (relative risk, 1.33 ; 95%

confidence interval, 1.22 to 1.45), and anemia (relative risk, 1.30; 95% confidence interval, 1.18 to 1.43). As Figure 2 shows women with birth intervals greater than 60 months had significant increase risks of preeclampsia (relative risk, 1.83; 95% confidence interval, 1.72 to 1.94), and eclampsia (relative risk, 1.80 ; 95% confidence interval, 1.38 to 2.32).

CONCLUSIONS

Birth intervals shorter than 15 months and longer than 60 months are associated with an increased risk of adverse maternal outcomes. No statistically significant differences were found in the effect of birth interval on maternal outcomes among birth



intervals 33-44 and 48-56 months and the reference 27-32 months.¹² *New Research on the Optimal Birth Spacing Interval*

2. Effect of Birth Intervals on Adverse Perinatal Outcomes in Latin America

BACKGROUND

The World Health Organization estimates that each year there are 4 million stillbirths and another 4 million newborns die in the first month of life. Of these deaths, an estimated 98% occur in developing countries.

METHODS

The methods for perinatal outcomes are similar to those described in Section 1 for maternal outcomes. Dr. Conde-Agudelo analyzed the effects of birth intervals on low birth weight (LBW; <2500 g), very LBW (<1500 g), preterm delivery (<37 weeks), very preterm delivery (<32 weeks), small for gestational age (birth weight below the 10th percentile for the gestational age and gender, according to the Williams et al. reference curve), fetal death (fetal death occurring at 20 or more weeks of gestation), and low Apgar scores at 5 minutes (less than 7) by analyzing data

from 1,080,650 singleton infants born to multiparous mothers in Latin America from 1985 to 2000. Only parous women delivering singleton infants and whose previous pregnancy ended in live birth after 19 weeks' gestation were included in the study. Rates of adverse perinatal outcomes were calculated for each birth interval. Odds ratios were computed as measures of association between birth interval and adverse perinatal outcomes considered. The estimates were adjusted for potentially confounding factors through multiple logistic regression analysis. Multiple potentially confounding factors were controlled for the following: maternal age, parity, mother's education, marital status, cigarette smoking, pre-pregnancy body mass index, history of miscarriage, history of stillbirth, history of early neonatal death, history of low birth weight, gestational age at first antenatal care visit, number of antenatal care visits, geographic area,

hospital type, year of delivery, and neonatal death and low Apgar score were adjusted for birth weight and gestational age.

RESULTS

Infants with a birth interval of 27 to 32 months had the lowest risks of adverse perinatal outcomes. Shorter and longer birth intervals were associated with higher risks. These associations persisted when the data were stratified according to and controlled for the biologic, sociodemographic, and behavioral risk factors.

ADJUSTED ODDS RATIOS FOR THE ASSOCIATION BETWEEN BIRTH INTERVALS AND ADVERSE PREGNANCY OUTCOMES

As shown in Figure 3, compared with infants with a birth interval of 27-32 months, infants with a birth interval less than 15 months had odds ratios of 2.14 (95 percent confidence interval, 2.02 to 2.28) for low birth weight, 1.15 (1.10-1.21) for very low birth weight, 2.31 (2.20-2.43) for preterm delivery, 3.27(2.98-3.58) for very preterm delivery, 1.25 (1.20-1.31) for small for gestational age, 2.40 (2.14-2.69) for fetal death, and 2.02 (1.48-2.63) for neonatal death. Moreover, infants with a birth

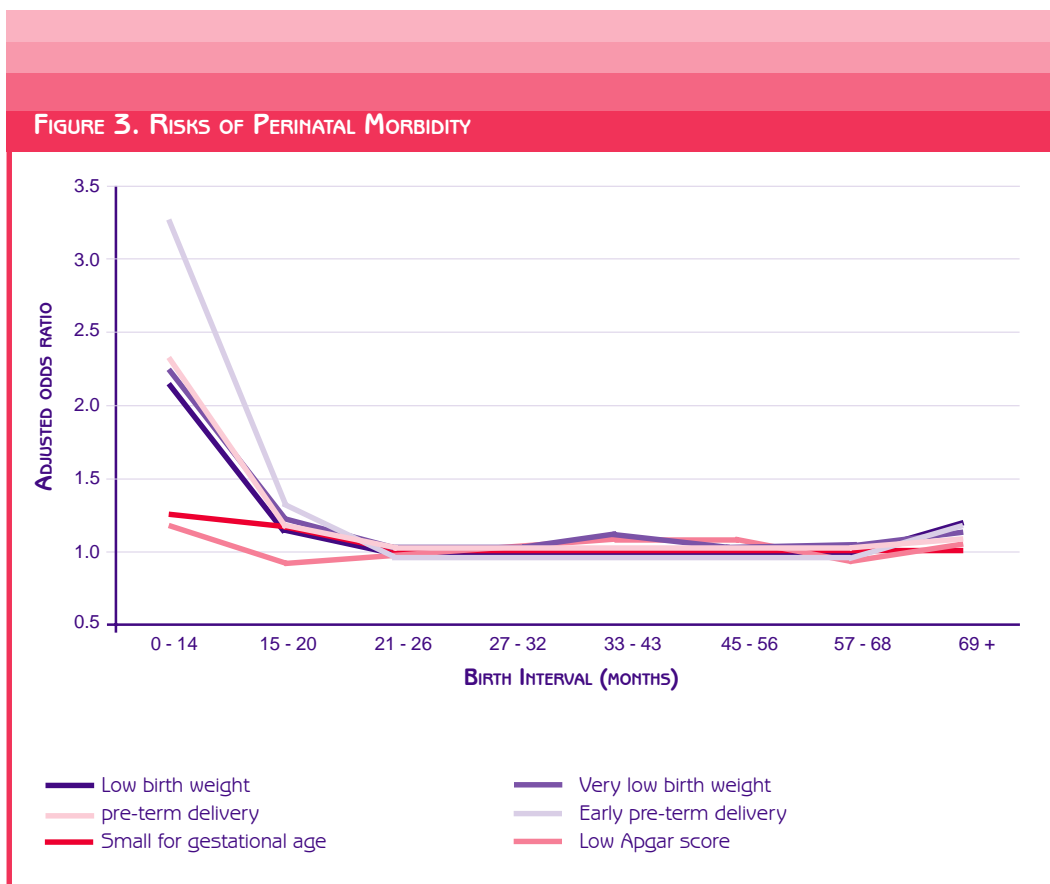
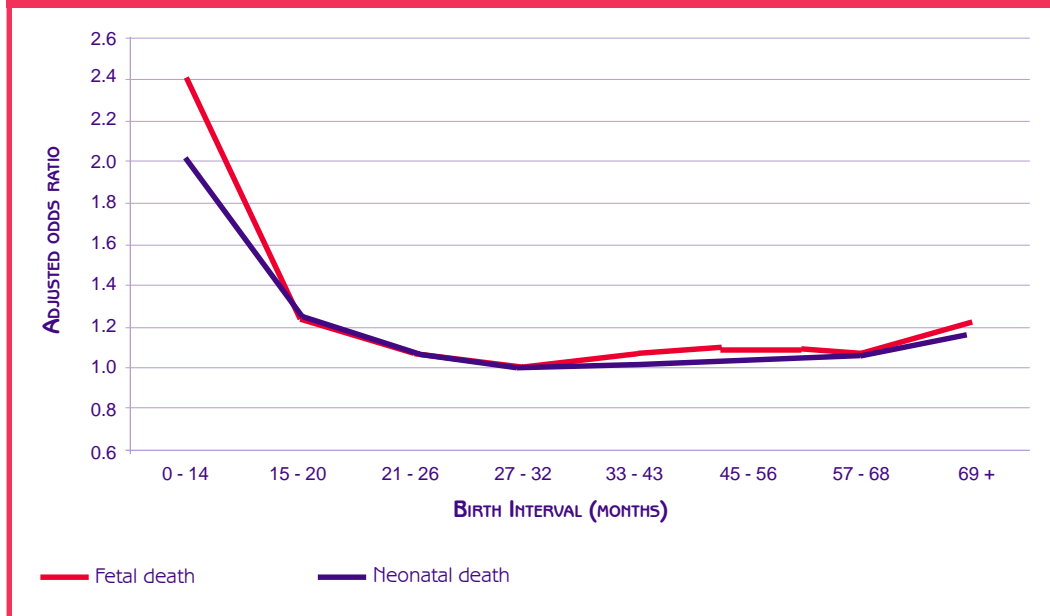


FIGURE 4. RISK OF PERINATAL MORTALITY



interval less than three years had higher risks of adverse perinatal outcomes than those with a birth interval greater than three years.

As Figures 3 and 4 show, perinatal risks sharply decline after the shortest birth intervals and tend to level out at a low between 27 to 60 months. The perinatal risk indicators climb from their low after 60 months, illustrating a “J-shape” pattern. This pattern is consistent for each risk factor studied. Infants with a birth interval of 69 months or more had odds ratios of 1.19 (1.15-1.24) for low birth weight, 1.15 (1.06-1.25) for very low birth weight, 1.09 (1.05-1.14) for preterm delivery, 1.16 (1.09-1.24) for very preterm delivery, 1.21 (1.15-1.27) for fetal death, and 1.18 (1.06-1.31) for neonatal death, when risk factors were controlled for with logistic regression.

CONCLUSIONS

Birth intervals shorter than 20 months and longer than 68 months are associated with an increased risk of adverse perinatal outcomes. After controlling for multiple biologic, sociodemographic, and behavioral variables, Dr. Conde-Agudelo concluded that a short birth interval is a key risk factor for morbidity and

The Case of Latin America: Currently, the number of births per year in Latin America is about 11 million with a perinatal mortality rate (year 2000) of 39 x 1000 live births. Thus, the total number of perinatal deaths in Latin America during year 2000 was 429,000. If families chose to delay a new birth for 27-32 months after the preceding birth, it is estimated that perinatal mortality would drop 14.1%. Therefore, the total number of perinatal deaths would fall by 60,500 annually.

mortality independently associated with socioeconomic status. In fact, research from both developing and developed countries, and data comparing racial and ethnic minorities with non-minority groups, all consistently indicate that a short birth interval is a key risk factor for perinatal, neonatal, infant and child morbidity and mortality, and that it is a risk factor independently associated with socioeconomic status.

SUPPORTING RESEARCH FINDINGS

Research findings by Dr. Conde-Agudelo, Shea Rutstein, Dr. Bao-Ping Zhu and Dr. Fuentes Afflick clearly show that perinatal, neonatal, infant, and child health is affected by the timing and frequency of pregnancies and births.

Using the most recent Demographic and Health Survey (DHS) data from developing countries in Africa, Latin America, Caribbean, and Asia Near East regions⁵, Shea Rutstein analyzed the relationship between birth intervals and child mortality. After controlling for several

sociodemographic variables⁶, the analysis revealed that neonates, infants, and children born less than three years apart are significantly more likely to die than those born after a three-year birth interval. Among the significant findings, the lowest perinatal mortality occurred at 36-47 month (3.0-3.9 year) intervals; the fewest miscarriages (spontaneous abortions) occurred at 24-35 month (2.0-2.91 year) birth intervals; and the lowest stillbirth mortality occurred at 36-47 month (3.0-3.9 year) birth intervals (Rutstein: 2002).

Rutstein's analysis also shows that as compared to a birth interval of 36-47 months, infants born 24-35 months after a previous birth had 1.2 times the relative risk of neonatal mortality, and infants born less than 24 months after a preceding birth had 2.2 times the relative risk of neonatal death. Similar results were found for infant mortality and mortality of children aged under five years. An infant born after a birth interval of 24-35 months had 1.31 times the relative risk of mortality, as compared to an infant born after a 36-47 month interval. Data show that children born 24-35 months after a previous birth had 1.41 times the relative risk of under five mortality, and children born less than 24 months after a preceding child had 2.44 times the risk of dying, as compared to children born after a 36-47 month interval.

⁵ The analysis of the effects of birth intervals on child mortality by Shea Rutstein is from the following 17 countries: Bangladesh, Bolivia, Egypt, Ghana, Guatemala, Cote d'Ivoire, Kenya, Morocco, Nepal, Nigeria, Peru, Philippines, Tanzania, Uganda and Zambia. The analysis of the effects of birth intervals on miscarriages and stillbirths is from the following 18 countries: Bangladesh, Bolivia, Brazil, Colombia, Dominican Republic, Egypt, Guatemala, Indonesia, Jordan, Kazakstan, Kyrgyzstan, Morocco, Paraguay, Peru, Philippines, Turkey, Ubekistan, and Zimbabwe.

⁶ The analysis of the effects of birth intervals on perinatal mortality, miscarriages and stillbirths by Shea Rutstein controlled for the following: mother's age at pregnancy, mother's parity at pregnancy, results of previous pregnancy (if known), mother's education, urban-rural residence, survey phase, and country.

Research from the United States supports the findings from developing countries by Rutstein and Conde-Agudelo, confirming the health benefits of birth spacing longer than the previously recommended two years. A 1999 Centers for Disease Control and Prevention study evaluating birth intervals in relation to low birth weight, preterm delivery and small size for gestational age for almost 175,000 infants in the state of Utah, concluded that a birth interval of 27-32 months (2.25-2.67 years) was associated with the lowest risk of adverse perinatal outcomes (Zhu et al.: 1999). In another study, Zhu et al. (2001) analyzed birth records for over 400,000 white and black women in Michigan, evaluating

the interpregnancy interval in relation to adverse perinatal outcomes. The researchers found that a birth interval of 27-32 months (2.25-2.67 years) was associated with the lowest risk of adverse perinatal outcomes, confirming the results of the Utah study⁷. An analysis of the relationship between birth intervals and the risk of premature infants by Fuentes-Afflick and Hessol (2000) was undertaken on almost 300,000 infants of both Hispanic and non-Hispanic white origin in California⁸. The researchers concluded that a birth interval of 27-69 months (2.25- 5.75 years) to be associated with the lowest risk of severely and moderately premature infants in both groups.

⁷ Zhu et al. (1999) and Zhu et al. (2001) controlled for several sociodemographic variables for the analysis of perinatal outcomes, including: age at delivery, marital status, education, race or ethnic group, residence (rural or urban), utilization of prenatal services, and self-report of tobacco and alcohol use during pregnancy.

⁸ The analysis of the effects of birth intervals on prematurity by Fuentes-Afflick and Hessol was controlled for the following: maternal age, education, place of birth, parity, previous premature or small for gestational age infant, utilization of prenatal services and infant sex.

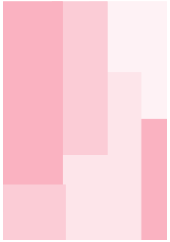
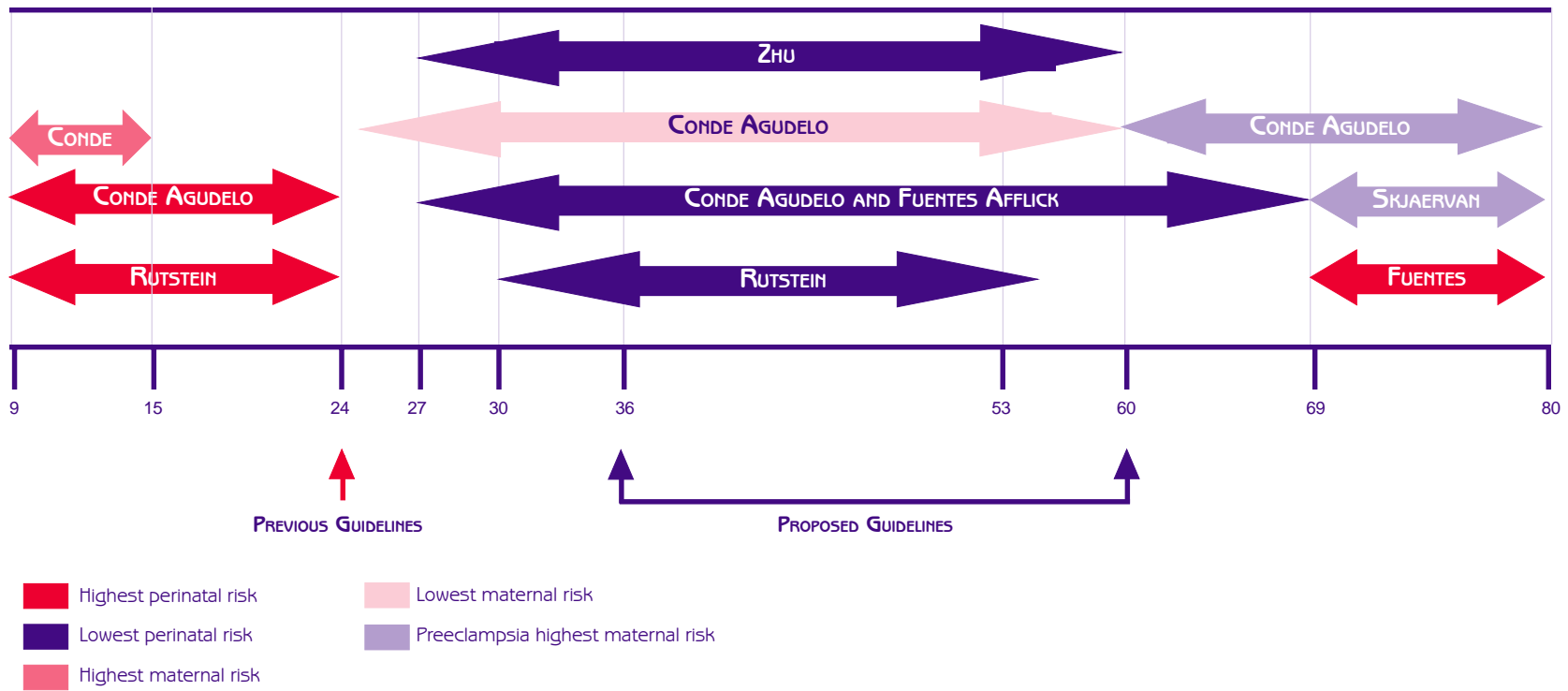
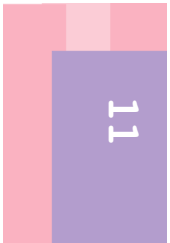


FIGURE 5. THE OPTIMAL BIRTH SPACING INTERVAL: MATERNAL-PERINATAL RISKS IN MONTHS ACCORDING TO BIRTH INTERVAL



Definition of the Optimal Birth Interval: The optimal birth spacing interval has been defined by CATALYST as the period associated with the most favorable outcomes for both **mothers and children**. Based on the new research findings, CATALYST and Dr. Conde-Agudelo crafted Figure 1 in order to illustrate the recommended revision of optimal birth spacing guidelines.



3. Maternal-Perinatal Morbidity and Mortality Associated with Adolescent Pregnancy in Latin America

BACKGROUND

Adolescent pregnancy is alarmingly common in many countries. The sexual education needs of adolescents are rarely met, and adolescents seldom have access to reproductive health care or contraceptive services. Because adolescent childbearing is so frequent, and carries such high health risks, pregnancy-related complications are the main cause of death for 15-19 year old girls worldwide.

In order to determine the characteristics of the birth intervals experienced by adolescent mothers, and to investigate whether adolescent pregnancy is independently associated with increased risk of adverse pregnancy outcomes, Dr. Conde-Agudelo analyzed data on the pregnancies of over 344,000 adolescents (aged 15-19) from 18 Latin American and Caribbean countries.

METHODS

The methods for adolescent morbidity and mortality are similar to those described in Sections 1 and 2. Retrospective cross sectional studies were conducted using data from 854,377 Latin American pregnancies recorded at the Perinatal Information System database of the Latin American Centre for Perinatology and Human Development, Montevideo, Uruguay over the period 1985-2000. Only women aged 10-24 years delivering singleton infants of at least 20 weeks gestation or at least 400g-birth weight were included in the study. The relative risks of adverse pregnancy outcomes associated with adolescent pregnancy were estimated as odds ratios by means of logistic regression analysis. The estimates were adjusted for major confounding factors through multiple logistic regression analysis.

RESULTS

Over the 16-year period, 2,005,500 pregnancies were recorded in the database. 35,698 multiple pregnancies were excluded, 1,001,666 pregnancies to mothers greater than 24 years old were excluded, and 113,759 were excluded for whom information on adverse pregnancy outcomes was missing. The remaining 854,377 women constituted the study population of which 344,626 were adolescents. There were no significant differences between the women excluded because of incomplete information and those with complete information with regard to maternal age, parity, education and marital status. Overall, adolescents accounted for 20.2% of all deliveries in the database.

MATERNAL DEMOGRAPHIC AND OBSTETRIC CHARACTERISTICS OF THE STUDY GROUPS

Compared with women aged 20-24 years, adolescent mothers were more likely to be nulliparous, without permanent partner, to have lower body mass index before pregnancy, to have begun prenatal care later, to have lower number of prenatal visits, to have a lower proportion of previous miscarriages, low birth weight infants and perinatal deaths, and to have shorter birth intervals. There were no striking differences with regard to cigarette smoking and illiteracy.

RATES OF ADVERSE PREGNANCY OUTCOMES

There was a clear trend toward increasing rates of preeclampsia, eclampsia, postpartum hemorrhage, puerperal endometritis, operative vaginal delivery, episiotomy and anemia as maternal age decreased. Rates of third trimester bleeding, gestational diabetes mellitus and premature rupture of membranes increased progressively with increasing maternal age. Overall, the rate of caesarean delivery was lower in adolescents than in women aged 20-24 years. There were 584 maternal deaths in the study population. The youngest adolescents (≤ 15 years) had the highest maternal fatality rate whereas the rates for older adolescents were similar to those of adult women.

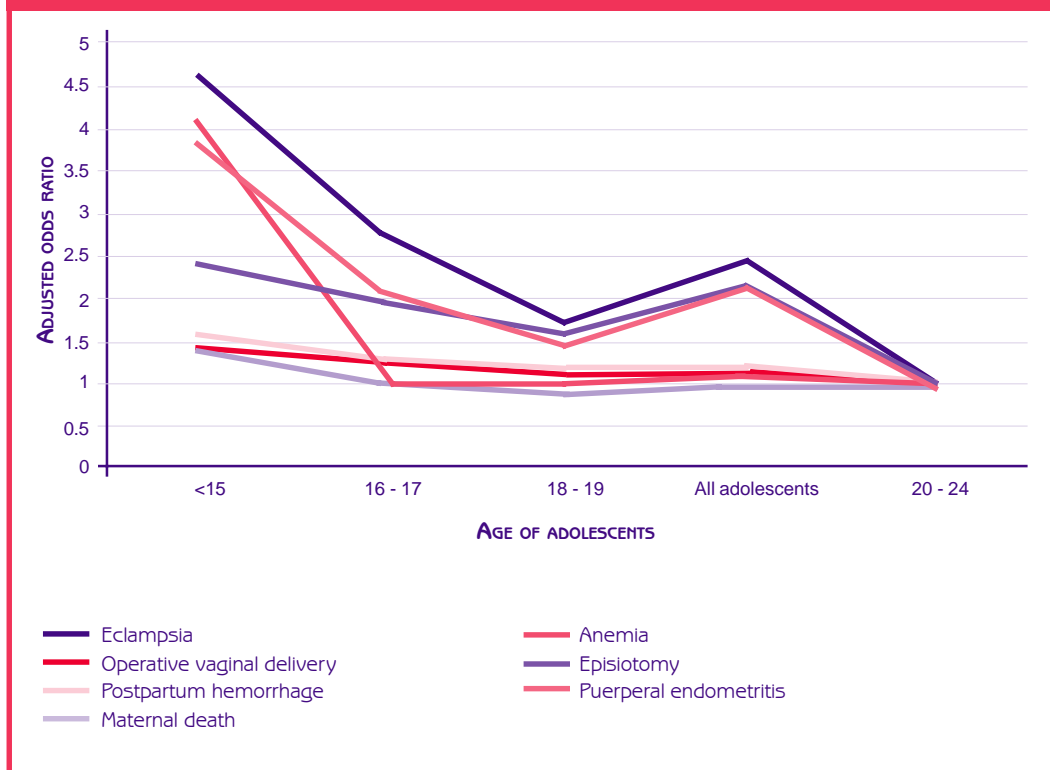
The rates of low birth weight, very low birth weight, preterm delivery, very preterm delivery, small for gestational age, and neonatal death consistently increased with decreasing maternal age and were always highest among infants born to mothers aged ≤ 15 years. Adolescents did not differ from the control group in the rates of fetal death and low Apgar scores at five minutes.

ADJUSTED ODDS RATIOS FOR THE ASSOCIATION BETWEEN MATERNAL AGE AND ADVERSE PREGNANCY OUTCOMES

The data show that the youngest mothers faced the highest risks while mothers aged 16-17 and 18-19 years had smaller, but significant, increases in risks. As Figure 6 shows, among the significant findings on health outcomes of adolescent pregnancy, adolescents under age 15 had 4.5 times the risk for preeclampsia, as compared to women

aged 20-24 years. When adolescents were considered as a whole, they were not at significantly increased risk of death. Nevertheless, adolescent mothers aged under 16 years had 4.09 times the risk of maternal death as compared to women aged 20-24 years. With respect to gestational diabetes mellitus, third trimester bleeding and caesarean delivery, all age groups of adolescents had decreased risks compared with adult women.

FIGURE 6. MATERNAL MORBIDITY AND MORTALITY ASSOCIATED WITH ADOLESCENT PREGNANCY

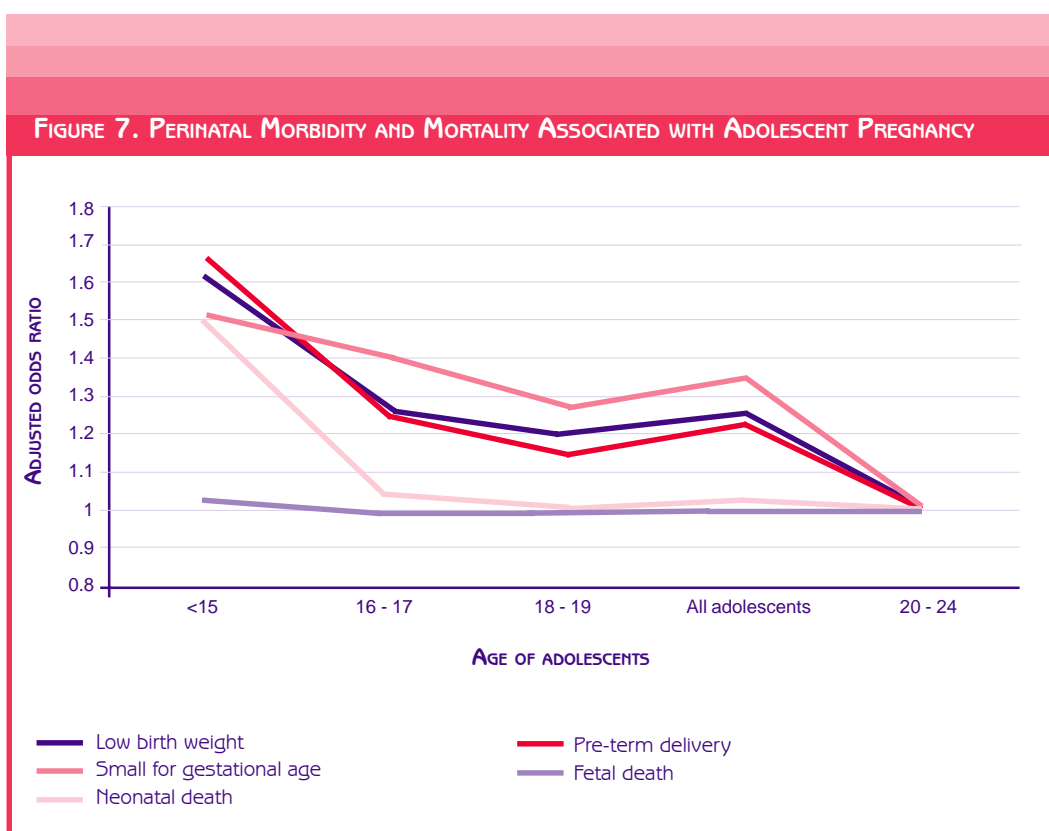


The data in Figure 7 show a clear trend towards increasing rates of perinatal morbidity and mortality as maternal age decreased. Infants of the youngest mothers had more than a 50% increased chance of low birth weight, preterm delivery, small for gestational age, and neonatal death. No statistically significant differences were found in the effect of low maternal age on fetal death and low Apgar scores at five minutes. When the data were analyzed separately for nulliparous and

parous women, the results were similar to those obtained in the analyses of the entire population.

CONCLUSIONS

The data show that adolescent pregnancy is independently associated with adverse maternal and perinatal outcomes. The risks are more striking among youngest adolescent pregnancies, and therefore adolescents should be treated as high risk for maternal and perinatal complications.



4. Birth Intervals among Adolescents Whose Previous Pregnancy Ended in Miscarriage in Latin America

In order to further understand the birth interval patterns of adolescents, Conde-Agudelo looked at the difference in birth interval after a live birth and after a miscarriage⁹. The data in Figure 8 show that birth intervals of adolescents whose previous pregnancy ended in a miscarriage were likely to be shorter than a birth interval following a live birth.

MATERNAL DEMOGRAPHIC AND OBSTETRIC CHARACTERISTICS OF THE STUDY GROUPS

The results of the analysis show that 87% percent of adolescents under age 15 years, 83% of adolescents aged 16-17, and 75% of adolescents aged 18-19 experience a birth interval less than three years. The data clearly show that the short birth intervals are heavily concentrated within the age group 15-19. Thus, there is evidence that repeat childbearing is occurring among adolescents, many of whom are without regular partners.

⁹ Data on miscarriages includes both spontaneous and therapeutic abortion.

RESULTS

The data in Figure 8 show that compared with birth intervals of adolescents whose previous pregnancy ended in live birth, birth intervals of adolescents whose previous pregnancy ended in abortion were more likely to be shorter. About 95% of youngest adolescents (<16 years) had birth intervals shorter than 2 years after a previous abortion. For the whole of adolescents (<20 years), this value was 82.2%.

CONCLUSIONS

Adolescent mothers are having short birth intervals after an abortion, and are hence experiencing repeat pregnancy. It is striking that even after a presumably mistimed or unintended pregnancy, adolescents are still experiencing the shortest birth intervals. These data show the urgent need to address the reproductive health needs of adolescents.





*A*ppendices

Appendix 1.

Maternal Morbidity and Maternal Mortality Associated with Birth Intervals

TABLE 1.1. THE DISTRIBUTION OF SOCIODEMOGRAPHIC AND OBSTETRIC MATERNAL CHARACTERISTICS ACCORDING TO BIRTH INTERVAL AMONG A COHORT OF 456,889 MULTIPAROUS LATIN AMERICAN AND CARIBBEAN WOMEN GIVING BIRTH TO A SINGLE CHILD, 1985-1997

Characteristics	Birth Interval (Months)					
	9 - 14 (N = 12,704)	15 - 20 (N = 63,415)	21 - 26 (N = 67,327)	27 - 32 (N = 59,372)	33 - 68 (N = 164,781)	>69 (N = 89,290)
	Percent					
Maternal age (years)						
<19	20.0	18.0	14.7	9.7	4.5	0.6
20 - 34	72.3	74.2	75.9	79.3	81.6	68.9
>35	7.7	7.8	9.4	11.0	13.9	30.5
Number of previous births						
1	38.7	40.6	40.3	36.4	39.6	36.3
2	26.1	23.0	23.9	23.9	24.7	29.4
>3	35.2	36.4	35.8	39.7	35.7	34.3
History of abortion						
Yes	40.7	27.4	23.3	22.7	24.3	27.1
No	59.3	72.6	76.7	77.3	75.7	72.9
History of fetal death						
Yes	5.7	5.5	4.4	4.2	3.3	2.7
No	94.3	94.5	95.6	95.8	96.7	97.3
History of neonatal death						
Yes	4.4	4.2	3.2	3.8	2.9	2.8
No	95.6	95.8	96.8	96.2	97.1	97.2
Previous birth by Caesarian						
Yes	11.7	16.2	15.5	16.9	15.8	13.5
No	88.3	83.8	84.5	83.1	84.2	86.5
Stable relationship						
Yes	85.7	86.3	85.2	85.8	85.6	86.7
No	14.3	13.7	14.8	14.2	14.4	13.3

TABLE 1.1. THE DISTRIBUTION OF SOCIODEMOGRAPHIC AND OBSTETRIC MATERNAL CHARACTERISTICS ACCORDING TO BIRTH INTERVAL AMONG A COHORT OF 456,889 MULTIPAROUS LATIN AMERICAN AND CARIBBEAN WOMEN GIVING BIRTH TO A SINGLE CHILD, 1985-1997 (CONT.)

Characteristics	Birth Interval (Months)					
	9 - 14 (N = 12,704)	15 - 20 (N = 63,415)	21 - 26 (N = 67,327)	27 - 32 (N = 59,372)	33 - 68 (N = 164,781)	>69 (N = 89,290)
	Percent					
Mother's education level						
None	3.7	3.7	4.6	4.5	4.4	3.6
Elementary	51.9	54.5	54.6	54.6	51.2	52.0
Secondary	40.0	37.1	35.5	36.5	39.2	40.2
College	4.4	4.7	5.3	4.4	5.2	4.2
Gestational age at first prenatal visit						
1 - 13	17.6	22.0	24.8	25.5	31.0	34.5
14 - 26	44.2	45.7	43.7	44.6	43.3	44.6
>27	38.2	32.3	31.5	29.9	25.7	20.9
Number of prenatal visits						
0	27.7	23.2	21.7	21.2	17.3	12.8
1 - 4	37.2	39.2	37.0	36.5	32.1	27.3
>5	35.1	37.6	41.3	42.3	50.6	59.9
Cigarette smoker						
Yes	12.4	11.5	11.3	11.7	11.8	12.6
No	87.6	88.5	88.7	88.3	88.2	87.4
Pre-pregnancy body mass index (kg/m ²)						
<19.8	16.2	16.4	16.9	16.8	16.5	10.2
19.8 - 26.0	64.8	61.8	61.9	63.8	61.5	61.0
26.1 - 29.0	10.9	13.4	11.5	9.5	11.1	14.2
>29.0	8.1	8.4	9.7	9.9	10.9	14.6
History of chronic hypertension						
Yes	0.9	1.2	1.2	1.6	1.6	3.3
No	99.1	98.8	98.8	98.4	98.4	96.7

TABLE 1.2. RATES OF ADVERSE MATERNAL OUTCOMES ACCORDING TO BIRTH INTERVAL IN A COHORT OF MULTIPAROUS LATIN AMERICAN AND CARIBBEAN WOMEN GIVING BIRTH TO A SINGLE CHILD, 1985-1997

Outcome	Birth Interval (Months)								Total
	9 - 14	15 - 20	21 - 26	27 - 32	33 - 43	45 - 56	57 - 68	>69	
	Percent								
Preeclampsia	3.4	3.2	3.3	3.4	4.0	4.2	4.5	6.6	4.3
Eclampsia	0.12	0.10	0.12	0.11	0.09	0.10	0.12	0.20	0.13
Third trimester bleeding	1.9	1.2	1.1	1.1	1.1	1.1	1.1	1.5	1.2
Premature rupture of membranes	9.8	5.9	5.6	5.6	6.3	6.8	6.8	6.5	6.7
Postpartum hemorrhage	5.1	5.6	5.4	5.5	5.2	5.4	5.2	5.3	5.3
Endometritis puerperal	5.1	4.2	4.4	4.0	3.9	4.0	3.8	4.3	4.1
Gestational diabetes mellitus	1.4	1.2	1.0	1.4	1.4	1.4	1.3	2.4	1.6
Anemia	7.9	6.5	6.3	6.1	6.2	6.2	6.1	6.2	6.3
Maternal death*	9.5	4.4	4.2	3.7	4.3	5.5	5.3	5.5	4.8

*Rate per 10,000 women

TABLE 1.3. ADJUSTED ODDS RATIO (95% CONFIDENCE INTERVAL) OF ADVERSE MATERNAL OUTCOMES ACCORDING TO BIRTH INTERVAL IN A COHORT OF MULTIPAROUS LATIN AMERICAN AND CARIBBEAN WOMEN GIVING BIRTH TO A SINGLE CHILD, 1985-1997*

Outcome	Birth Interval (Months)							
	9 - 14	15 - 20	21 - 26	27 - 32 ⁺	33 - 43	45 - 56	57 - 68	>69
	Odds ratio (95% confidence interval)							
Preeclampsia	1.0 (0.9 - 1.1)	1.0 (0.9 - 1.1)	1.0 (0.9 - 1.1)	1.0	1.0 (0.9 - 1.1)	1.1 (1.0 - 1.1)	1.1 (1.0 - 1.1)	1.8 (1.7 - 1.9)
Eclampsia	1.1 (0.6 - 2.3)	1.0 (0.7 - 1.4)	1.0 (0.8 - 1.2)	1.0	0.9 (0.6 - 1.2)	1.2 (0.8 - 1.4)	1.2 (0.8 - 1.4)	1.8 (1.4 - 2.3)
Third trimester bleeding	1.7 (1.4 - 2.2)	1.0 (0.9 - 1.2)	1.0 (0.9 - 1.1)	1.0	1.0 (0.9 - 1.1)	1.0 (0.9 - 1.1)	1.0 (0.9 - 1.2)	1.1 (1.0 - 1.2)
Premature rupture of membranes	1.7 (1.5 - 1.9)	1.0 (1.0 - 1.1)	1.0 (0.9 - 1.1)	1.0	1.1 (1.0 - 1.2)	1.1 (1.0 - 1.2)	1.1 (1.0 - 1.2)	1.0 (0.9 - 1.1)
Postpartum hemorrhage	0.9 (0.8 - 1.1)	1.0 (0.9 - 1.1)	1.0 (0.9 - 1.1)	1.0	1.0 (0.9 - 1.1)	1.0 (0.9 - 1.1)	1.0 (1.0 - 1.1)	0.9 (0.8 - 1.0)
Endometritis puerperal	1.3 (1.2 - 1.4)	1.0 (0.9 - 1.1)	1.1 (1.0 - 1.2)	1.0	1.0 (0.9 - 1.1)	1.0 (0.9 - 1.1)	1.0 (0.9 - 1.0)	1.0 (0.9 - 1.2)
Gestational diabetes mellitus	1.0 (0.7 - 1.4)	1.0 (0.8 - 1.1)	0.9 (0.7 - 1.1)	1.0	1.0 (0.9 - 1.1)	1.0 (0.9 - 1.1)	1.0 (1.0 - 1.1)	1.3 (0.9 - 1.6)
Anemia	1.3 (1.2 - 1.4)	1.0 (1.0 - 1.1)	1.0 (1.0 - 1.1)	1.0	1.0 (1.0 - 1.1)	1.0 (1.0 - 1.1)	1.0 (1.0 - 1.1)	1.0 (1.0 - 1.1)
Maternal death	2.5 (1.2 - 5.4)	1.1 (0.5 - 2.3)	1.0 (0.6 - 2.2)	1.0	1.1 (0.6 - 2.1)	1.3 (0.6 - 2.4)	1.2 (0.6 - 2.6)	1.1 (0.7 - 2.7)

*Adjusted for maternal age, number of previous births, history of abortion, fetal death, and early neonatal death, prior cesarean section, marital state, mother's education, smoking, pre-pregnancy body mass index, trimester in which prenatal care was initiated, number of prenatal care visits, geographic area, type of hospital, and year of birth. Preeclampsia, eclampsia, gestational diabetes mellitus, and third trimester bleeding were also adjusted for a history of chronic hypertension.

+Reference group

Appendix 2. The Effect of Birth Intervals on Perinatal Outcomes in Latin America

TABLE 2.1. THE DISTRIBUTION OF SOCIODEMOGRAPHIC AND OBSTETRIC MATERNAL CHARACTERISTICS ACCORDING TO BIRTH INTERVAL AMONG A COHORT OF 1,080,650 LATIN AMERICAN WOMEN WHO HAVE RECENTLY GIVEN BIRTH TO A SINGLE CHILD, 1985-2000. THE DATA REPRESENT THE PERCENTAGE OF WOMEN.

Characteristics	Birth Interval (Months)							Percent
	9 - 14	15 - 20	21 - 26	27 - 32	33- 43	45 - 56	57 - 68	
Maternal age (years)								
<19	19.3	18.1	15.1	10.4	6.6	3.3	1.8	0.6
20-34	73.2	73.9	74.7	78.3	80.8	82.3	83.5	68.9
>35	7.5	8.0	10.2	11.3	12.7	14.9	15.7	30.5
Parity								
1	38.3	39.3	39.9	37.5	38.6	40.3	40.0	35.7
2	26.8	25.3	24.7	24.1	23.9	25.0	27.2	29.4
>3	34.9	35.4	35.4	38.4	37.5	34.7	32.8	34.9
Stable relationship								
Yes	85.5	85.9	85.2	85.8	84.7	86.2	87.2	87.7
No	14.5	14.1	14.8	14.2	15.3	13.8	12.8	12.3
Mother's education (years)								
<12	56.5	59.0	58.9	59.1	56.6	56.8	57.5	58.1
>12	43.5	41.0	41.1	40.9	43.4	43.2	42.5	41.9
Gestational age at first prenatal visit (weeks)								
1-13	17.5	21.7	24.4	26.1	28.2	32.5	34.7	34.5
14-26	44.3	44.3	43.6	44.3	45.9	40.1	42.2	44.6
>27	38.2	34.0	32.0	29.6	25.9	27.4	23.1	20.9
Number of prenatal visits								
0	29.0	23.8	22.0	20.9	19.1	16.7	14.0	12.8
1-4	36.6	37.8	36.5	34.9	34.3	30.9	28.8	27.3
>5	34.4	38.4	41.5	44.2		52.5	58.0	59.9

TABLE 2.1. THE DISTRIBUTION OF SOCIODEMOGRAPHIC AND OBSTETRIC MATERNAL CHARACTERISTICS ACCORDING TO BIRTH INTERVAL AMONG A COHORT OF 1,080,650 LATIN AMERICAN WOMEN WHO HAVE RECENTLY GIVEN BIRTH TO A SINGLE CHILD, 1985-2000. THE DATA REPRESENT THE PERCENTAGE OF WOMEN.(CONT.)

Characteristics	Birth Interval (Months)							Percent
	9 - 14	15 - 20	21 - 26	27 - 32	33- 43	45 - 56	57 - 68	
History of smoking								
Yes	11.9	11.7	11.4	10.3	9.9	10.9	12.5	13.4
No	88.1	88.3	88.6	89.7	90.1	89.1	87.5	86.6
Pre-pregnancy body mass index (kg/m²)								
<19.8	7.9	8.7	9.5	10.1	6.3	7.1	4.5	4.4
19.8-26.0	64.1	61.8	61.8	63.1	56.9	51.8	50.4	45.4
26.1-29.0	11.8	13.3	12.0	10.3	19.8	18.3	22.0	22.4
>29.0	16.2	16.2	16.7	16.5	10.9	22.9	19.7	27.8
History of miscarriage	41.5	27.3	22.9	23.0	26.5	24.0	24.9	7.1
History of fetal death	5.9	5.4	4.6	4.4	3.3	3.4	2.8	2.7
History of early neonatal death	4.5	4.3	3.4	3.6	2.9	2.8	2.5	n/a
History of low birth weight	10.7	7.8	6.9	6.0	6.3	6.5	7.1	6.2

TABLE 2.2. RATES OF ADVERSE PERINATAL OUTCOMES ACCORDING TO BIRTH INTERVAL IN A COHORT OF 1,080,650 MULTIPAROUS LATIN AMERICAN WOMEN WHO HAVE RECENTLY GIVEN BIRTH TO A SINGLE CHILD, 1985-2000.
THE DATA REPRESENT THE PERCENTAGE OF INFANTS.

Outcome	Birth Interval (Months)							
	9 - 14	15 - 20	21 - 26	27 - 32	33- 43	45 - 56	57 - 68	>69
	Percent							
Low birth weight	15.3	8.0	7.3	6.9	7.2	7.2	7.3	8.4
Very low birth weight	3.1	1.5	1.1	1.1	1.3	1.3	1.3	1.5
Pre-term delivery	18.9	9.3	8.2	8.2	8.2	8.3	8.5	9.0
Early pre-term delivery	5.2	1.9	1.5	1.4	1.4	1.4	1.4	1.7
Small for gestational age	15.4	14.3	12.9	12.5	12.6	12.6	12.7	12.7
Fetal death	4.91	1.98	1.80	1.49	1.64	1.74	1.77	1.83
Neonatal death	3.10	1.03	0.85	0.67	0.68	0.70	0.75	0.86
Low Apgar score	2.2	1.0	1.3	1.1	1.3	1.3	1.3	1.3

TABLE 2.3. ADJUSTED ODDS RATIOS (95% CONFIDENCE INTERVAL) OF ADVERSE PERINATAL OUTCOMES ACCORDING TO BIRTH INTERVAL IN A COHORT OF 1,080,650 MULTIPAROUS LATIN AMERICAN WOMEN WHO HAVE RECENTLY GIVEN LIFE TO A SINGLE CHILD, 1985-2000

Outcome	Birth Interval (Months)							
	9 - 14	15 - 20	21 - 26	27 - 32 ⁺	33 - 43	45 - 56	57 - 68	>69
	Odds ratio (95% confidence interval)							
Low birth weight	2.14 (2.02-2.28)	1.15 (1.10-1.21)	1.02 (0.98-1.06)	1.0	1.02 (0.98-1.07)	1.00 (0.96-1.04)	1.03 (0.99-1.08)	1.19 (1.15-1.24)
Very low birth weight	2.25 (1.98-2.54)	1.23 (1.12-1.35)	1.00 (0.91-1.10)	1.0	1.07 (0.97-1.18)	1.02 (0.92-1.13)	1.04 (1.94-2.05)	1.15 (1.06-1.25)
Pre-term delivery	2.31 (2.20-2.43)	1.15 (1.10-1.20)	1.00 (0.96-1.05)	1.0	1.00 (0.96-1.04)	1.01 (0.97-1.06)	1.04 (1.00-1.08)	1.09 (1.05-1.14)
Early pre-term delivery	3.27 (2.98-3.58)	1.33 (1.24-1.43)	1.03 (0.95-1.12)	1.0	1.01 (0.94-1.09)	1.00 (0.94-1.07)	0.97 (0.88-1.07)	1.16 (1.09-1.24)
Small for gestational age	1.25 (1.20-1.31)	1.17 (1.14-1.20)	1.01 (0.97-1.06)	1.0	1.00 (0.97-1.04)	1.01 (0.99-1.03)	1.00 (0.96-1.04)	1.01 (0.98-1.04)
Fetal death	2.40 (2.14-2.69)	1.24 (1.14-1.35)	1.07 (1.00-1.15)	1.0	1.06 (0.99-1.15)	1.09 (1.00-1.19)	1.08 (0.98-1.19)	1.21 (1.15-1.27)
Neonatal death	2.02 (1.48-2.63)	1.27 (1.12-1.44)	1.08 (0.96-1.21)	1.0	1.02 (0.91-1.14)	1.03 (0.92-1.15)	1.05 (0.93-1.18)	1.18 (1.06-1.31)
Low Apgar score	1.18 (0.98-1.42)	0.92 (0.85-1.00)	1.00 (0.93-1.07)	1.0	1.08 (1.00-1.17)	1.07 (0.98-1.17)	0.94 (0.86-1.03)	1.05 (0.97-1.14)

+Reference group

Appendix 3. Adolescent Maternal Mortality and Maternal Morbidity Associated with Pregnancy in Latin America

TABLE 3.1. DISTRIBUTION OF SOCIODEMOGRAPHIC AND OBSTETRIC CHARACTERISTICS IN ADOLESCENTS

Characteristics	Maternal Age (years)				
	<15 (n = 33,498)	16 - 17 (n = 119,723)	18 - 19 (n = 191,405)	All adolescents <19 (n = 344,626)	20 - 24 (n = 509,751)
	Percent				
Parity					
0	94.6	83.8	67.3	75.7	41.6
1	4.4	14.9	26.5	20.3	32.2
>2	1.0	1.3	6.2	4.0	26.2
Mother's education (years)					
None	5.8	4.2	3.2	3.8	2.9
1-5	65.1	55.2	49.7	53.1	46.8
>6	29.1	40.6	47.1	43.1	50.3
Marital state					
With partner	45.1	61.5	68.6	63.8	78.5
Without partner	54.9	38.5	31.4	36.2	21.5
Cigarette smoker					
Yes	7.5	9.4	10.0	9.5	9.0
No	92.5	90.6	90.0	90.5	91.0
Birth interval (months)					
<21	87.4	82.5	75.6	79.1	55.2
21-32					
33-56	11.4	15.9	21.6	18.6	32.1
>57	1.2	1.6	2.8	2.3	12.7

TABLE 3.1. DISTRIBUTION OF SOCIODEMOGRAPHIC AND OBSTETRIC CHARACTERISTICS IN ADOLESCENTS (CONT.)

Characteristics	Maternal Age (years)				
	<15 (n = 33,498)	16 - 17 (n = 119,723)	18 - 19 (n = 191,405)	All adolescents <19 (n = 344,626)	20 - 24 (n = 509,751)
	Percent				
Body mass index (kg/m²)					
<19.8	10.9	10.4	9.7	10.1	7.7
19.8 - 26.0	72.2	68.1	65.3	66.9	61.1
26.1 - 29.0	10.9	14.6	18.0	16.1	18.5
>29.0	6.0	6.9	7.0	6.9	12.7
History of miscarriage					
Yes	2.5	4.9	7.7	6.2	14.1
No	97.5	95.1	92.3	93.8	85.9
History of perinatal death					
Yes	0.5	1.6	2.4	1.9	3.7
No	99.5	98.4	97.6	98.1	96.3
Gestational age at first prenatal visit (weeks)					
1-13	19.6	20.8	21.3	21.0	26.7
14-26	53.8	47.1	48.4	48.5	43.8
>27	26.6	32.1	30.3	30.5	29.5
Number of prenatal visits					
0	23.5	23.6	23.7	23.6	22.0
1-4	37.5	35.1	34.8	35.2	32.8
>5	39.0	41.3	41.5	41.2	45.2

TABLE 3.2. PERCENTAGE OF ADVERSE MATERNAL OUTCOMES BY AGE GROUP, UNLESS OTHERWISE NOTED

Outcome	Maternal Age (years)				
	<15	16 - 17	18 - 19	Total adolescents <19	20 - 24
	Percent				
Preeclampsia	5.9	4.9	4.3	4.7	4.2
Eclampsia	1.1	0.6	0.4	0.5	0.2
Gestational diabetes mellitus	0.9	1.0	1.2	1.1	2.9
Urinary tract infection	4.3	4.4	4.3	4.3	4.0
Premature rupture of membranes	4.9	6.4	7.0	6.6	7.2
Third semester bleeding	0.2	0.5	0.6	0.5	0.9
Anemia	8.8	7.2	6.2	6.8	6.2
Cesarean delivery	15.3	14.0	13.9	14.1	17.6
Operative vaginal delivery	4.1	3.8	3.3	3.5	2.7
Episiotomy	75.7	71.0	67.2	70.9	53.7
Postpartum hemorrhage	7.0	5.6	5.0	5.4	4.2
Puerperal endometritis	16.7	9.7	7.2	9.0	4.7
Maternal death*	18.5	4.0	4.0	5.4	4.1

*Rate per 10,000 women

TABLE 3.3. PERCENTAGE OF ADVERSE PERINATAL OUTCOMES BY AGE GROUP

Outcome	Maternal Age (years)				
	<15	16 - 17	18 - 19	Total adolescents <19	20 - 24
	Percent				
Low birth weight	12.8	10.3	9.6	10.2	8.1
Very low birth weight	1.7	1.6	1.4	1.5	1.3
Pre-term delivery	14.6	11.0	10.0	10.8	8.9
Early pre-term delivery	2.8	2.3	2.1	2.2	1.5
Small for gestational age	17.0	15.9	14.8	15.4	11.6
Fetal death	1.70	1.50	1.60	1.57	1.61
Neonatal death	1.52	1.20	0.98	1.11	0.86
Low Apgar score at five minutes	1.0	1.0	1.2	1.1	1.1

TABLE 3.4. ADJUSTED ODDS RATIOS (95% CONFIDENCE INTERVAL) FOR THE RELATIONSHIP BETWEEN MATERNAL AGE AND ADVERSE MATERNAL OUTCOMES

Outcome	Maternal Age (years)				
	<15	16 - 17	18 - 19	Total adolescents <19	20 - 24*
Odds ratio (95% confidence interval)					
Preeclampsia	1.08 (0.98 – 1.19)	1.04 (0.99 – 1.08)	1.00 (0.96 – 1.04)	1.01 (0.97 – 1.06)	1.0
Eclampsia	4.61 (3.86 – 5.42)	2.76 (2.32 – 3.21)	1.70 (1.49 – 1.93)	2.45 (2.23 – 2.68)	1.0
Gestational diabetes mellitus	0.34 (0.29 – 0.40)	0.35 (0.31 – 0.40)	0.44 (0.41 – 0.48)	0.39 (0.37 – 0.42)	1.0
Urinary tract infection	1.03 (0.95 – 1.12)	1.01 (0.96 – 1.07)	1.00 (0.96 – 1.05)	1.01 (0.98 – 1.04)	1.0
Premature rupture of membranes	0.95 (0.90 – 1.01)	0.98 (0.95 – 1.02)	1.01 (0.98 – 1.04)	0.99 (0.97 – 1.01)	1.0
Third semester bleeding	0.24 (0.17 – 0.32)	0.59 (0.53 – 0.66)	0.70 (0.64 – 0.77)	0.66 (0.62 – 0.71)	1.0
Anemia	1.41 (1.33 – 1.50)	1.05 (1.00 – 1.10)	1.00 (0.97 – 1.03)	1.04 (1.00 – 1.09)	1.0
Cesarean delivery	0.87 (0.83 – 0.92)	0.80(0.78 – 0.82)	0.83(0.81 – 0.85)	0.83 (0.81 – 0.85)	1.0
Operative vaginal delivery	1.44 (1.32 – 1.57)	1.29 (1.21 – 1.38)	1.16 (1.11 – 1.21)	1.24 (1.20 – 1.28)	1.0
Episiotomy	2.36 (2.27 – 2.46)	1.98 (1.93 – 2.04)	1.55 (1.52 – 1.59)	2.09 (2.06 – 2.12)	1.0
Postpartum hemorrhage	1.59 (1.50 – 1.70)	1.31 (1.24 – 1.39)	1.18 (1.13 – 1.24)	1.23 (1.19 – 1.27)	1.0
Puerperal endometritis	3.81 (3.64 – 4.00)	2.08 (2.01 – 2.15)	1.52 (1.46 – 1.59)	2.00 (1.95 – 2.05)	1.0
Maternal death	4.09 (3.86 – 4.34)	0.98 (0.66 - 1.32)	1.00 (0.72 – 1.30)	1.12 (0.87 – 1.37)	1.0

*Reference group

TABLE 3.5. ADJUSTED ODDS RATIOS (95% CONFIDENCE INTERVAL) FOR THE RELATIONSHIP BETWEEN MATERNAL AGE AND ADVERSE PERINATAL OUTCOMES

Outcome	Maternal Age (years)				
	<15	16 - 17	18 - 19	Total adolescents <19	20 - 24*
Odds ratio (95% confidence interval)					
Low birth weight	1.62 (1.54 – 1.71)	1.27 (1.23 – 1.32)	1.20 (1.17 – 1.24)	1.25 (1.22 – 1.28)	1.0
Very low birth weight	1.25 (1.12 – 1.39)	1.24 (1.16 – 1.33)	1.10 (1.05 – 1.15)	1.15 (1.10 – 1.21)	1.0
Pre-term delivery	1.66 (1.59 – 1.74)	1.25 (1.20 – 1.31)	1.15 (1.11 – 1.19)	1.22 (1.19 – 1.25)	1.0
Early pre-term delivery	1.51 (1.37 – 1.67)	1.35 (1.26 – 1.45)	1.31 (1.25 – 1.37)	1.40 (1.35 – 1.45)	1.0
Small for gestational age	1.50 (1.45 – 1.56)	1.41 (1.37 – 1.46)	1.27 (1.24 – 1.31)	1.35 (1.32 – 1.38)	1.0
Fetal death	1.03 (0.92 – 1.15)	0.98 (0.91 – 1.06)	1.00 (0.95 – 1.06)	0.99 (0.95 – 1.04)	1.0
Neonatal death	1.51 (1.33 – 1.70)	1.05 (0.95 – 1.16)	1.01 (0.93 – 1.10)	1.02 (0.95 – 1.09)	1.0
Low Apgar score	0.97 (0.85 – 1.10)	0.98 (0.91 – 1.06)	1.01 (0.94 – 1.09)	1.00 (0.95 – 1.05)	1.0

*Reference group

Appendix 4. Birth Intervals among Adolescents Whose Previous Pregnancy Ended Miscarriage in Latin America

TABLE 4.1. BIRTH INTERVALS AMONG ADOLESCENTS WHOSE PREVIOUS PREGNANCY ENDED IN LIVE BIRTH

Characteristics	Maternal Age (years)				
	<15 (n = 33,498)	16 - 17 (n = 119,723)	18 - 19 (n = 191,405)	All adolescents <19 (n = 344,626)	20 - 24 (n = 509,751)
	Percent				
Birth Interval (months)					
<24	18.2	8.7	5.9	8.0	3.4
24-29	25.0	33.6	30.4	31.1	17.8
30-35	25.0	28.9	24.9	26.3	17.8
36-41	13.6	16.1	15.1	15.3	16.1
42-77	15.9	10.7	22.6	17.8	38.3
>78	2.3	1.9	1.2	1.5	6.5
Previous miscarriage					
None	97.5	95.1	92.3	93.8	85.9
1	2.2	4.5	7.0	5.7	11.8
2	0.2	0.3	0.6	0.4	1.9
>3	0.1	0.1	0.1	0.1	0.4

TABLE 4.2. BIRTH INTERVALS AMONG ADOLESCENTS WHOSE PREVIOUS PREGNANCY ENDED IN MISCARRIAGE

Characteristics	Maternal Age (years)				
	<15 (n = 837)	16 - 17 (n = 5,866)	18 - 19 (n = 14,738)	All adolescents <19 (n = 21,441)	20 - 24 (n = 71,875)
	Percent				
Birth Interval (months)					
<24	38.7	31.3	12.6	18.6	7.3
24-29	34.4	30.4	32.0	31.5	20.4
30-35	12.5	16.3	21.9	20.0	16.1
36-41	10.3	11.7	12.5	12.1	15.2
42-77	4.1	10.2	19.4	16.3	35.1
>69	0.0	0.1	1.6	1.5	5.9

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