

MDG 4: Reduce child mortality

Target 5: To reduce by two thirds, between 1990 and 2015, the under 5 mortality rate

Three main indicators have been used to monitor child health under MDG 4: the under 5 mortality rate (U5MR), infant mortality rate (IMR), and the proportion of one year-old children immunised against measles. The IMR and U5MR are widely recognised as important indicators of the level of child health and overall development:

“Infant mortality rate (IMR), a measure of child survival, is considered to be one of the strongest indicators of a country’s wellbeing, as it reflects social, economic and environmental conditions in which children (and others in society) live, including their health care.” (Alderman & Behrman, 2004: vii)

In the last few years, the LAC region has made considerable progress with respect to infant health, and the region as a whole is on track to meet this Target – except for Haiti and Paraguay. Even though the LAC region is still far behind the industrialised countries’ average of 6 child deaths per 1,000 live births, it has the lowest under 5 mortality rate of any of the world’s developing regions (UNICEF, 2005 a). Unlike other regions, LAC has maintained a steady pace of progress during the 1990s, posting an average annual reduction of 4% over the course of the decade, which is more than double the world average (UNICEF, 2004 a). Between 1990 and 2003, the region’s under 5 mortality rate fell from about 56 to 33 deaths per 1,000 live births. Brazil and Mexico are countries with large child populations, which have managed reductions of just fewer than 4.3% and 3.8% p.a., respectively. Several countries have reached rates close to or lower than 25 per 1,000. Nevertheless, there are countries which still exceed 40 deaths per 1,000 live births – such as Haiti (123), Guyana (72), Bolivia (71), Guatemala (49), Honduras (42), and Nicaragua (41) (ECLAC, 2005 a). The regional (LAC) averages thus mask wide disparities between countries:

“Latin American and Caribbean countries have seen the most substantial improvement on average, although alarming gaps are opening up within countries there. The worsening poverty situation in some communities is preventing large groups of children within these countries from accessing basic health services and care. At the service level, poor access and utilization of health services, poor quality of care, and the lack of skilled attendants during delivery and in the immediate postpartum period cause the largest proportion of preventable deaths.” (Mukelabai, 2004: XVII-1)

The LAC region reached the goals related to measles immunisation coverage, and their coverage is also better than that of any other region, surpassing that of industrialised

countries (UNICEF, 2005 a). Routine measles immunisation coverage has increased from 76% in 1990 to 93% in 2003, and the region had the largest average annual rate of increase in coverage between 1990 and 2003: 1.3 percentage points. Worldwide, the coverage has slowly risen to 75% in 2003 and it is estimated that about 4% of the deaths among children under 5 are due to measles (WHO, 2005 c). ECLAC (2005 a) suggests that the region has both the ability to make major strides with regard to health care and the need to sustain successful policies. Ecuador and Peru are high-performing countries, having improved, since 1990, at average annual rates of 3.0 and 2.4 percentage points, respectively (UNICEF, 2005 a). Two thirds of the region's countries have already achieved 90% coverage against measles, and another three - Guyana, Trinidad and Tobago, and Venezuela - are likely to achieve it by 2010. Bolivia, the Dominican Republic, Guatemala, Haiti, Jamaica, Panama and Suriname, on the other hand, still require major investments in the measles immunisation coverage.

The ICPD PoA addresses child health issues in its chapter devoted to health, morbidity and mortality (Chapter 8), and it is very emphatic regarding the need to include child health services, safe motherhood, child survival programmes, and family planning services within the framework of primary health care – particularly for the most vulnerable and under-served groups. Special attention is given to the promotion of breastfeeding as a child survival strategy.

This chapter will examine the potential contribution of population, reproductive health, and gender processes and policies to the achievement of MDG 4, and it is oriented by the following schedule:

- 4.1. Health care versus economic determinants of infant and child mortality
- 4.2. Reproductive patterns and child mortality
 - 4.2.1. The causal link between high fertility / short birth intervals and infant and child mortality
 - 4.2.2. The causal link between very early or very late fertility and infant and child mortality
 - 4.2.3. The link between the desire for children and their survival chances
- 4.3. Other life-saving effects of SRH
- 4.4. Women's roles and child health
 - 4.4.1. Women's education
 - 4.4.2. Women's employment
 - 4.4.3. Violence against women
- 4.5. Migration and child mortality

Historically, there have been remarkable debates over the determinants of infant and child health. The text presents some of the main positions and their arguments in order to give a brief overview of these controversies. To some, social and economic transformations, rather than specific health interventions, were the primary driving forces behind the historical decline of mortality. Others regard the quality of child care and public health services as chief elements in determining infant and child mortality. Yet, some of the current perspectives have incorporated multidisciplinary approaches and applied both social and biomedical variables.

It has been broadly recognised that there is a close association between reproductive patterns and the health outcomes of infants and children. In this chapter, the following reproductive determinants are analysed: fertility, birth intervals, maternal age, and the wantedness of births. Recent data and research studies from developing countries are presented, as well as some of the primary arguments and positions adopted by national MDGRs. Changes in reproductive patterns, which depend on the implementation of SRRs and health, may considerably improve child health and survival.

Broader access to SRH services plays a key role in reducing child mortality. Adequate antenatal care, delivery assistance, and attention to neonatal health, including breastfeeding, nutrition, rehydration, and immunisation, are some of the more immediate determinants of infant and child health. Studies that analyse data from Bolivia, Brazil, and Jamaica emphatically support the need to improve antenatal and delivery care in developing countries.

Since women are assigned the major responsibilities in taking care of children, some of their skills appear to impact on child health outcomes. The mother's education, for example, greatly influences proactive initiatives related to prevention and management of childhood diseases. Employment of mothers is also associated with children's health and survival. Another important issue investigated is to what extent violence against women affects infant and child health status.

One last determinant examined is the relation between migration and child mortality. The findings point to the social and economic situation of the emigrants' household as one of the most important variables affecting infant and child survival chances. Research studies also describe the role played by remittances and the vulnerability of children in transit area municipalities.

4.1. Health care versus economic determinants of infant and child mortality

In one of the classical debates in the demography and history of health care, McKeown (1976) argued that medical advances played only a minor role in the mortality reductions that occurred in England since the 18th century. Social and economic transformations, rather than specific health interventions, would thus have been the primary driving forces behind the historical decline of mortality in England and, more generally, in Europe. Later work has diminished the relevance of this thesis, first, because mortality decline during the 20th century has undoubtedly been spurred to a major extent by specific developments in the health area, and second because even in the 18th and 19th centuries more public health measures were implemented than McKeown recognises. Preston (1996 a: 532), for example, agrees that "specific therapeutic medical treatments have played a minor role in mortality reduction in Western countries", but considers that:

"Relatively little else of the McKeown thesis has survived. The weight of evidence suggests that public health measures, such as smallpox vaccination and the purification of milk, played an important role."

More recently, however, the thesis that social and economic transformations, rather than interventions in the health area, are responsible for the current reduction of infant and child mortality has resurfaced in the work of World Bank economists like Ravallion (1997), Dollar and Kraay (2002), and Filmer and Pritchett (1997). The latter argue that virtually all inter-country variation in child mortality is explained by a set of development indicators, including GNP per capita. They also state that adding health expenditure to the model adds little explanatory power.

Hanmer, Lensink and White (2003) have contested this position by testing the robustness of the determinants of infant and child mortality. They estimated over 420,000 equations which show that, while income per capita is a robust determinant of infant and child mortality, so are indicators of health, education, and gender inequality. Some health spending, such as immunisation, is thus shown to be a cost-effective way of saving lives. Their results are consistent with the view that much health spending in developing countries may be poorly targeted or otherwise ineffective, but do not support the position that public health strategies should not be given too great a role in pursuing improvements in human welfare. Unfortunately, their analysis includes the percentage of deliveries attended by trained personnel as the only SRH variable. This variable is not consistently significant in the model specifications. No other SRH variables, such as the contraceptive prevalence rate, total fertility rate, adolescent fertility rate, or percentage of unwanted pregnancies were included, so it is not possible to know what their effect would be.

Alves and Belluzzo (2005), who used panel regression to analyse infant mortality trends and differentials in Brazil during a 40 year period, found that both per capita growth and the increase of education levels are important determinants. Their set of variables, however, is even more restricted than the one used by Hanmer, Lensink, and White and includes no reproductive health variables. White (2004) notes that, as mortality rates fall, the bulk of under 5 mortality is infant rather than child death, and these deaths are more sensitive to health provision than general socioeconomic conditions. Countries or regions with low rates of antenatal care, attended delivery, and breastfeeding can expect substantial returns from changing parental behaviour.

The well-known analytical framework by Mosley and Chen (1984) incorporates both social and biomedical variables and integrates research methods employed by social and medical scientists to clarify the understanding of the many factors involved in infant and child survival. It offers a scheme that treats socioeconomic factors (individual productivity of fathers and mothers; income/wealth; ecological setting; political economy; health system) as the independent variables that must act through five proximate variables to have their effects (maternal factors, such as age, parity, and birth interval; environmental contamination; nutrient deficiency; injury; and personal illness) controlled. This model makes the integrated analysis of the biological and social determinants of mortality feasible and suggests that a multidisciplinary approach to the study of child survival could provide guidance for health policy makers in the developing world.

UNICEF's framework is frequently used in nutritional analysis (UNICEF, 1990). It is often called the triple-A approach – Assessment, Analysis, and Action – and it offers conceptual guidance in studying the immediate, underlying, and basic causes of malnutrition in infants. The immediate causes include inadequate dietary intake and disease. The underlying causes are identified as the outcome conditions necessary for adequate nutrition, such as: adequate access to food; adequate care of children and women; and adequate access to preventive and basic health services, together with a healthy environment. Finally, the basic causes are considered the historical processes in society related to the availability and control of human, economic, and organisational resources: ecological/technical conditions of production; social conditions of production; political and ideological factors, including habits, beliefs, cultural preferences, and all ideas that legitimise social actions.

Charmarbagwala, Ranger, Waddington and White (2003) developed a meta-analysis, exploring the existing literature on both mortality and malnutrition. Their study indicates that income is a central variable in models of the determinants of child health and nutrition outcomes. Socioeconomic conditions would be important for child survival, whereas that of infants depends on factors related to medical care and childbearing, which can be independent of household income. The authors also suggest that there is limited empirical evidence that the mother's income is more important in the feeding of children, but so far not enough research has been done to subject this line of argument to a meta-analysis. Availability of clean drinking water and sanitation, on the other hand, would be strongly associated to child health and nutrition outcomes, as well as to birth in a health facility, antenatal care, immunisation and reproductive patterns. Finally, the findings confirm that both growth and poverty reduction strategies, and the expansion of health services, must be balanced in country policies.

4.2. Reproductive patterns and child mortality

The ICPD PoA recognises reproductive patterns as closely linked to the health of children, as expressed in Para. 8.14:

“Child survival is closely linked to the timing, spacing and number of births and to the reproductive health of mothers. Early, late, numerous and closely spaced pregnancies are major contributors to high infant and child mortality and morbidity rates, especially where health-care facilities are scarce.”

In order to improve child health and survival, attention to SRRs and health is required. The National Research Council (1989: 55) summarises the interactions as follows:

“Previous research suggests that the risk of mortality and poor health are higher for children who are born to mothers with particular reproductive histories. Results of bivariate studies usually show that infant and child mortality rates are higher for those who are:

- the firstborn, born to a young mother, or a combination;
- a higher-order birth, born to an older mother, or a combination;

- born into a family with a large final number of children ever born;
- born before or after a short birth interval.”

The following will discuss these risk factors more systematically and in more detail.

4.2.1. The causal link between high fertility / short birth intervals and infant and child mortality

A large number of studies from around the world, particularly using data from the World Fertility Survey (WFS) and DHS surveys, has consistently demonstrated that infant and child mortality levels are related to births spaced too close to one another, to large families, and to high birth orders (Hobcraft et al., 1985; Palloni & Millman, 1986; Pebley & Millman, 1986; Pebley & Stupp, 1987; Curtis et al., 1993; Palloni et al., 1994; United Nations, 1994 b).

“When women can plan when and how many children to have, the number of ‘high-risk’ pregnancies and births is reduced, and infant and child health and survival improve.” (Alan Guttmacher Institute, 1998 a: 1)

“High fertility reduces the provision of health care to children.” (UNFPA, 2002 a: 7)

Better timing and spacing of pregnancies improve child health outcomes and evidence from developing countries links improved child survival with smaller family size and well-timed pregnancies (Alan Guttmacher Institute, 1998 a). Frequently, women with large families have had many pregnancies in rapid succession and the number of children has a negative impact on the attention given to each of them.

Desai (1995) examines the relation between family size and the welfare of individual members of the family, focusing particularly on the nutritional status of children aged between six and 36 months, based on data collected in DHS around 1986-90 in Bolivia, Northeast Brazil, Colombia, the Dominican Republic, Guatemala, Trinidad and Tobago, Egypt, Morocco, Sri Lanka, Thailand, Burundi, Ghana, Mali, Senegal, and Zimbabwe. The effect of family size on children’s height-for-age was examined by using multivariate regression, controlling for the education of the mother and her partner, urban residence, mother’s marital status and type of housing. The findings indicate that the number of children in the same age bracket has a negative effect on the nutritional status in 13 out of the 15 countries. The greatest competition is posed by children close in age; the impact of a sibling aged more than 5 years is much weaker, and the presence of children aged 12 or older almost always seem to have a positive impact on the index child’s physical growth. However, the author suggests that in some societies, such as in Mali and Senegal, the link between sibling and kinship size and individual welfare is neutral or positive. Social organisations, like extended kin networks or child fostering, can alleviate some of the resource competition generated by a large number of siblings; similar effects are also related to governmental subsidies of some child-related expenditures.

It has long been known that babies born less than two years apart are much more likely to die than those born after longer intervals. Among other factors, this occurs because

women who have closely spaced childbirths are more likely to discontinue breastfeeding too early, thereby increasing the risk of infant mortality. If all births occurring within less than two years of each other could be more widely spaced, one in four infant deaths in developing countries might be prevented (Alan Guttmacher Institute, 1998 a). The World Bank (1993) has estimated that family planning programmes could prevent 20-40% of all infant deaths by preventing mistimed and under-spaced births. Víctora and Barros (2001) suggest, more conservatively, that reducing by half the proportion of birth intervals that are under 24 months can prevent 9.5% of infant deaths in Brazil.

In recent years, there has been a growing awareness that even birth intervals between 24-36 months are associated with a higher mortality risk (see also section 6.2. of the chapter on MDG 1). DaVanzo et al. (2004), using data from the Matlab area of Bangladesh, have carried out a rigorous multivariate analysis, in which they controlled for a variety of intervening factors. Their analysis indicates that if all birth intervals were between 3-5 years long, early neonatal mortality would fall by 5.8%, late neonatal mortality by 9.4%, post-neonatal mortality by 7.6%, and mortality in the 1-4 years age group by 8.7%. In the LAC region, there are no detailed data of the kind collected in the Matlab project. However, from 1985 to 2000, the Latin American Centre for Perinatology and Human Development (CLAP), in Montevideo, has recorded pregnancies of over two million women in Argentina, the Bahamas, Bolivia, Brazil, Chile, Colombia, Costa Rica, the Dominican Republic, Ecuador, El Salvador, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay, and Venezuela. Based on these data, Conde-Agudelo (2002) analysed the pregnancies of 456,889 women, whose records contained complete data on birth intervals and adverse maternal outcomes, as well as other conditioning factors (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, and year of delivery). Using these controls, the neonatal death rate was found to be 102% higher among children with retrospective birth intervals of 9-14 months, 27% higher among children with 15-20 month birth intervals, and 8% higher among children with 21-26 month birth intervals, compared with children born 27-32 months after the previous birth. Low birth weight displayed a similar behaviour, with excess risks of 114%, 15%, and 2%, respectively.

More recent research has yielded more dramatic results with respect to the U5MR. After discounting confounding variables, multivariate analyses by Rutstein (2005) on DHS data from Bolivia, Guatemala, and Peru (as well as from countries outside the LAC region) suggest that children born after birth intervals of 24-29 months still face under 5 mortality risks that are 70-90% higher than in children born after intervals of 36-41 months. If all births with retrospective birth intervals under 36 months were postponed, the results of this study suggest that, after controlling a large number of factors (sex of child, birth order, multiplicity of deliveries, mother's age at delivery, survival of preceding child by date of conception, prenatal care provider, timing of first prenatal care visit, number of prenatal

tetanus toxoid vaccinations, delivery attendant, urban-rural residence, mother's education, and index of household wealth), the under 5 death rate would have fallen by 37.7% in Bolivia (1994), by 36.3% in Guatemala (1995), and by 42.6% in Peru (1996).

Pinto (1995) analysed reproductive patterns and child mortality in La Paz, Cochabamba, and Santa Cruz, based on data from the "Women's Economic Activity and Human Reproduction Survey", carried out in 1986 by the National Population Council (CONAPO) of Bolivia. The study applied multivariate statistical techniques for event history analysis to estimate the simultaneous effects of reproductive pattern variables as well as education and other controls on child survival. Unfortunately, it did not control per capita household income. In line with previous research, it found that increasing birth order, short preceding birth intervals, and short durations of breastfeeding increase the risk of death during the first two years of life and suggested that the adverse effects of short birth spacing are causally related to maternal depletion, sibling competition, and risk of cross-infection (Pinto, 1995). The risk of death increased by 75% in children with birth orders higher than 3 and by 89% in children with less than 24 months of spacing in relation to the previous sibling. The risk also decreased with the age of the mother and, particularly, with the length of breastfeeding. Forste (1994) also suggests a similar result for Bolivia, based on DHS data. Short birth intervals (less than 18 months) doubled the relative odds of dying during the first two years of life, compared with a long birth interval (more than 30 months).

Curtis, Diamond and McDonald (1993) used random effects logistic models¹ to analyse the effects of the preceding birth interval on post neonatal mortality in Brazil, using data from the 1986 DHS and controlling for the correlation of survival outcomes between siblings. The study introduces an alternative statistical model that incorporates familial correlation. The results confirm that birth interval effects are highly significant in Brazil, particularly in the Northeast, the less developed region in the country. The odds of post neonatal death for a child born after an interval of less than 12 months are 5.5 times as great as those the child would have experienced had it been born after an interval of at least two years. Nevertheless, a considerable amount of variation across families in the probability of death for children with identical characteristics is observed, even after controlling for socioeconomic characteristics.

More than 20% of the deaths among children under 5 occur during the first week of life, most due to malnutrition of the mother and fetus, leading to low birth weights – which may be related to short birth intervals. Those low birthweight children who do survive are more likely to need extra neonatal care, to suffer subsequent illness (infants may have permanent changes in body structure and metabolism, an increased risk of cardiovascular disease, diabetes and hypertension later in life), and to suffer cognitive and neurological impairment during childhood and adulthood. Thus, in addition to contributing to excessive mortality, low birth weight is associated with lower productivity in a range of educational

¹ Logistic regression is a type of regression that relates the *probability* of experiencing a certain event to a set of explanatory variables. This is different from conventional regression in that the variable to be explained is a probability and therefore constrained to the interval from 0 to 1.

and economic activities, and others (Alderman & Behrman, 2004). Based on the 1996 DHS survey of Brazil, Victora and Barros (2001) suggest that improving birth weight might lead to an 8% reduction in infant mortality.

As Curtis et al. (1993) observed, the use of family planning could act to reduce not only fertility but also infant mortality, by reducing the incidence of short birth intervals. ICPD Chapter 8 suggests that interventions to reduce low birth weight should include the promotion of longer intervals between births and the promotion of maternal nutrition. The Alan Guttmacher Institute (2002) even suggests that the overall effect of family planning may be highly significant in explaining child mortality differentials between countries. Based on an analysis of DHS data from 49 countries, their study concludes that, in countries where fewer than 10% of the women use contraceptive methods, the average infant mortality rate is 100 per 1,000 live births, as opposed to 79 in countries where the percentage is in the range of 10-29% and 52 in countries where it is higher than 30%. Most of this difference, however, can be accounted for by regional variation (Sub-Saharan Africa, Asia, Middle East and Northern Africa, Latin America) and per capita income.

4.2.2. The causal link between very early or very late fertility and infant and child mortality

Child mortality increases, to an important extent, with births to very young or to very old mothers. Several studies from a variety of countries, relating maternal age to various aspects of pregnancy and child development, suggest that maternal age is a central variable influencing pregnancy outcome (Nortman, 1974; Petridou et al., 1996; Reynolds, Wong & Tucker, 2006).

Roughly one third of all the women ages 20-24 in 10 of 11 Latin American countries, and half in Guatemala, have their first child before their 20th birthday (Alan Guttmacher Institute, 1994). Approximately one in five young women under 18 in Mexico and Bolivia have given birth. Rural, less educated women are more likely to give birth as adolescents. The Task Force on Education and Gender Equality of the UN Millennium Project recommends the indicator of adolescent fertility rate as a way of focusing on access to reproductive health services, and as a way to help monitor progress toward achieving better child health rates. At present, this is being done as a part of the introduction of the new Reproductive Health Target under MDG 5 (see section 5.5.). Although, at the regional level, there has been a decline in the adolescent fertility rate from 87 to 76 per 1,000, between 1990 and 2000, it has increased in some countries, particularly in urban areas. In urban Colombia, it has steadily increased from 59 per 1,000 in the DHS of 1986 to 79 per 1,000, in the most recent DHS, of 2005. In the Dominican Republic, it increased from 88 per 1,000 in 1991 to 116 per 1,000 in 2002, and from 71 to 104 in urban areas. In other countries, like Chile, adolescent fertility rose during the 1990s but has declined since then.

Children born to very young mothers are more likely to be premature, to be low birth-weight, and to suffer from complications at the time of delivery – particularly if the woman is younger than 15 years. In addition, many adolescents do not know how to obtain, or

cannot afford, good prenatal and delivery care. Also, teenage births are likely to be first births, which always carry a higher risk than subsequent births (Alan Guttmacher Institute, 1998 b). However, evidence from several studies suggests that the association between higher risks of child mortality and young maternal age persists even when birth order and socioeconomic status are held constant.

Adolescent fertility is related to child mortality, in part because young (under age 16 or 17) teen mothers' bodies often have not yet fully matured: a pregnant teenager who is still growing may be competing for nutrients with the fetus (Reichman & Pagnini, 1997). Furthermore, teenagers are much more likely to have poor nutritional habits (UN Millennium Project, 2006: 9). Govindasamy et al. (1993) also emphasize that adolescent women are less likely to provide adequate care for their infants and children, because they often lack the maturity, education, and resources to do so. Adolescents frequently have poor information about sexuality and reproduction and little access to family-planning and reproductive health services. As the UN Millennium Project (2006: 2) suggests, the use of contraceptive devices among adolescents has been on the rise, but data from 94 national surveys, taken over the past decade, demonstrate that in these countries the unmet need of adolescents is over two times higher than that of the general population.

“Young married and unmarried girls are among the most underserved groups, yet their needs may be the most pressing. Many service providers – including doctors, nurses, midwives, and traditional birth attendants – do not recognize the need among this age group, particularly among unmarried adolescent girls, for reproductive health advice, information, and services. Programs for adolescents are small, with limited coverage. They need to be scaled up to provide full services to the entire adolescent population.”
(UN Millennium Project, 2005 b: 63)

Reynolds, Wong and Tucker (2006) used logistic regression analysis of DHS data for 15 developing countries and examined adolescents' use of antenatal care, delivery care, and infant immunisation services compared with the use of these services by older women. In Latin America, controlling for parity allowed differences between adolescents and older women to emerge. In the region, the proportion of teenage women who are mothers or currently pregnant is about 13–25%. Younger women may be less likely to use either antenatal care or delivery care, or to have their infants immunised. According to the authors, delay in seeking care, in reaching adequate health facilities, and in receiving appropriate care at facilities is a well-known barrier to care for all women. This may be especially pronounced for young women, who may have little knowledge and experience in seeking care. Furthermore, women who are pregnant for the first time – including most pregnant adolescents – are more susceptible than women with higher-order pregnancies to malarial parasitic infection, which is associated with anaemia, abortion, stillbirth, premature birth and low birth weight (see section 6.1. of the chapter on MDG 6). One hypothesis for explaining such differences in age, which needs to be confirmed by further analyses, is that women's status and power are disproportionately lower among adolescents than among older women (Reynolds, Wong & Tucker, 2006).

Postponing pregnancy and the effects on under 5 mortality: expected outcomes in the LAC region

The UN Population Division (1994) has carried out an extensive analysis, based on DHS surveys from the 1980s and early 1990s, on the potential gains to be expected from postponing first births until women reach age 18 or, alternatively, age 20. The effects on the under 5 mortality of children of all birth orders (uncontrolled for intervening variables), which are shown in the first two columns of Table 4.1, are relatively modest, rising above the 7.5% level only in Trinidad and Tobago and Guatemala. The effects on *first*-births are much greater, exceeding 20% in 5 of the 9 LAC countries investigated. Introducing controls for various covariates reduces this percentage, but as the last two columns show, the effects in most countries continue to be in the order of 10%.

Table 4.1: Expected reduction of under 5 mortality if all births or all first births *) occurred to women over age 18 or over age 20 for selected countries of the LAC region

	All births (without controls)		First births		
			Without controls	With controls	
	Over 18	Over 20	Over 20	Over 18	Over 20
Bolivia	1.2%	2.1%	13.8%	10.1%	14.4%
Brazil	4.9%	5.8%	22.5%	12.1%	10.4%
Colombia	4.7%	5.5%	22.5%	9.8%	5.9%
Dominican Republic	5.1%	5.9%	27.0%	13.4%	17.2%
Ecuador	1.5%	2.4%	12.3%	6.8%	0.6%
Guatemala	7.0%	7.8%	18.7%	10.5%	9.2%
Mexico	-0.3%	0.6%	32.4%	11.3%	21.3%
Peru	2.8%	3.7%	29.1%	12.8%	13.3%
Trinidad and Tobago	9.7%	10.5%	13.8%	1.7%	-3.9%

*) Births are limited to women under age 35.

Source: Computations based on UN Population Division, 1994: Tables 2 and 40

In most countries of the region, the percentage of women aged 15-19 who declare that their last birth was wanted and well-timed is higher than in other age groups (Guzmán et al., 2001: Cap. III), but this is not true everywhere. The percentage of wanted and well-timed births among adolescents is low in Brazil and in the Caribbean. The Alan Guttmacher Institute (1996) observes that 50% of the births to women aged 15-19, in Brazil, were unplanned, whereas Morris et al. (1995) inform that 77% of those pregnancies of young women aged 15-24, in Jamaica, had been mistimed or unwanted. In recent years, there has been a worsening trend in several countries. In Colombia, the percentage of women under 20 who declared their last pregnancy as wanted and timely fell from 58.6%, in the 1995 DHS, to 41.9% in 2005. In Peru, the percentage fell from 49.0% in 1996 to 36.0% in 2004. In the Dominican Republic, the reduction was from 68.7% in 1996 to 54.0% in 2002.² These

² There is a small difference between the criteria used to compute these numbers: in 1994 and 1995, the age of the woman is her current age, whereas in 2002, 2004, and 2005, it refers to the age at the time of childbirth. This, however, is unlikely to be the cause of the declining trends.

numbers are the reason of some concern and puzzlement, for it is hard to believe that they can be attributed to a worsening trend in knowledge and access to SRH services. A possible explanation, which needs to be explored in more detail, is that the changes are associated to modifications in the composition of adolescent mothers by socioeconomic characteristics.

A priority for governments must be to remove legal, regulatory, and cultural barriers to SRH information and services for adolescents. In addition, it is also important to design and provide sensitive and confidential RH services that respond to young peoples' particular needs; help them make informed decisions about sexuality and negotiate safer sex; and emphasize the prevention of unwanted pregnancy, unsafe abortion and STIs (Safe Motherhood, 2002). Further policies must be implemented for the integration of the youth, in particular women, into the educational system and the workforce. Neuhouser (1998) exemplifies that, in the Northeast of Brazil, the structural context of extreme poverty provided women in the Caranguejo community with virtually no alternative identities: "because these opportunities for identity are closed to women, aspirations focus on the one approved female identity – motherhood". These efforts must also be integrated into a broader socioeconomic perspective, taking into account factors like the ecological setting, the health system, and the political economy – which play a decisive role in promoting child survival.

Babies born to women older than 35 and especially 40 are also at risk. Winter, Morris and Murphy (1993) show, for instance, that there is a negative relationship between the age of the mother and child nutrition. Very early fertility, however, has received the most public attention, and little information is usually available about the problems of very late fertility. Nevertheless, older women face biological risks of poor birth outcomes, such as an increased likelihood of health conditions like hypertension and diabetes, as well as shorter duration of pregnancy (Petridou et al., 1996; Reichman & Pagnini, 1997). In addition, they often have several children already, and babies born after the mother has already had a number of children are also more likely to die in infancy than babies whose mother has had only one or two previous births (Alan Guttmacher Institute, 1998 a). They are also more likely to have stillbirths or to bear children with congenital abnormalities who may not survive childhood (Fretts & Usher, 1997). Down's syndrome, for instance, is well known to be correlated with age, but the pattern is not as conclusive for other congenital malformations (Nortman, 1974).

4.2.3. The link between the desire for children and their survival chances

Short birth intervals and extreme ages aside, the level of fertility may not be of crucial importance to the determination of infant and child mortality. It has been hypothesized that, rather than the total number of children, it is the wantedness of births that makes a difference in the children's health status.

"Children born as a result of unwanted pregnancies are likely to be in poorer health compared with children born as a result of other pregnancies." (National Research Council, 1989: 55)

This relationship is also mentioned in the 2002 *State of the World Population*: “Unwanted children are more likely to die than wanted ones.” (UNFPA, 2002 a: 7)

Jensen and Ahlburg (1999) employed DHS data for 11 countries and one Indian State to assess the links between wantedness of children under age 5 and a number of child-health outcomes. One of the countries in their sample is Peru (1996). After controlling for a number of background variables and for possible selection bias, they found large effects: for example, that unwanted children were between 10-50% more likely to become ill than wanted children and that having one more sibling decreased the likelihood of receiving treatment by 2-8% of the average level of treatment. In the case of Peru, specifically, wanted children were 10-15% less likely to contract acute respiratory infections or diarrhea, and if they did, they were 5% more likely to be treated.³ Wanted children also received a slightly (2%) larger number of vaccinations. The total number of children did not display any detectable impact on these conditions.

The planning status of a conception affects parental prenatal behaviour in ways that may influence the infant’s wellbeing and survival. The Alan Guttmacher Institute (1998 a) suggests that women who plan to become pregnant and want a child tend to detect that they are pregnant soon after conception, and that this early awareness has a positive impact on prenatal care. In addition, women with wanted pregnancies may receive more consideration, support, and care from family members. Similarly, Gage (1998), as well as Joyce and Grossman (1990), also suggest that women who did not intend the pregnancy, waited longer to obtain prenatal care than women who desired it, and they also had lower use of professional delivery care.

An analysis based on DHS data from Bolivia (1998), Egypt (1995), Kenya (1998), Peru (1996), and the Philippines (1998), indicates that even though the pregnancy intention status has little effect on medical supervision at delivery, child vaccination, or adequacy of growth, the intendedness does appear to affect the odds of obtaining adequate prenatal care. The investigators used logistic regression to examine whether intendedness at conception was a determinant of inadequate prenatal care (nil before the sixth month of gestation) or delivery outside of a medical institution, or without professional supervision. About 27-71% of the women who had an unwanted birth had received inadequate prenatal care, compared with 21-65% of those with a wanted birth (Marston & Cleland, 2003).

Yet, there are major gaps in the protective and supportive environment afforded to children. Undesired children may be more vulnerable to neglect and to lack of attention, which may jeopardise their mental and physical development and survival. In addition, they may be exposed to violence, corporal punishment and outright abuse, lacking basic rights to love and care (UNICEF, 2004 b). Although governments have frequently expressed their commitment to children’s rights against neglect, there is still strong reluctance to intervene in the private sphere of the family. Because not much research has been done on the subject, there is little evidence to support the idea that undesired children may be subject to systematic violence.

³ The latter effect did not reach statistical significance.

4.3. Other life-saving effects of SRH

The Cairo Agenda states that all governments should extend integrated reproductive health care and child-health services to the entire population, including prenatal care, delivery assistance, and neonatal care including exclusive breastfeeding, provision of micronutrient supplementation and tetanus toxoid vaccination, and ensuring that all children live in a sanitary environment. Broader access to SRH, independent of whether it alters reproductive patterns, holds other kinds of relationships with the reduction of child mortality.

“Prenatal care and the ability to avoid high-risk births (...) help prevent infant and child deaths.” (Singh et al., 2003: 6)

“Reductions in child mortality require, inter alia, attention to neonatal health including nutrition and immunization as well as avoidance of high-risk pregnancy and attention to the care and the wellbeing of women during pregnancy, delivery, and the post-partum period.” (UNFPA, 2004 a: XV-5)

A study by Jones et al. (2003) focused on interventions that address the more immediate determinants of child mortality – rather than distal or basic factors. It finds that breastfeeding and oral re-hydration therapy alone can prevent an estimated 13% and 15% of all under 5 deaths, respectively. Also, 6 other interventions could each further prevent a significant percentage of under 5 deaths: insecticide-treated materials (7%); complementary feeding (providing food in addition to breast milk) (6%), antibiotics for sepsis (6%); antibiotics for pneumonia (6%); anti-malarials (5%); and zinc to reduce diarrhea and pneumonia deaths (5%). Attention to the health of the mother is also paramount. In the absence of adequate pre- and post-natal care, children born to unhealthy and under-nourished mothers generally have low birth weight and suffer from debilitating diseases, even later in life (Myers, 1995).

Antenatal care attendance can reduce infant and child mortality: findings from Bolivia, Brazil, and Jamaica

Antenatal care and attention to neonatal health play a decisive role in diagnosing and treating maternal diseases, as well as in counselling and promoting vaccination. A Bolivian DHS survey analysed by Forste (1994) indicates that antenatal care received from a physician or other health care professional reduces the odds of death, including the neonatal period, by a factor 1.2, as compared with children of women who received no care at all. The author suggests that children whose mothers received the anti-tetanus injection during pregnancy, for instance, were 1.7 times less likely to die during the first two years of life than children whose mothers did not.

Víctora and Barros (2001) also state that access to SRH, especially antenatal care, can reduce infant and child mortality by having maternal diseases, such as syphilis, diabetes, hypertension, HIV, and other infections, diagnosed and treated, by improving maternal nutrition, by having infants vaccinated against tetanus, by providing health advice on smoking and drinking, by promoting family planning, and by ensuring strategies to

reduce death rates due to congenital malformation – such as adequate foliate intake, use of vitamin supplements, and treatment of diabetes before conception. The authors present a study – based on data from three other surveys conducted in Brazil – in which it is suggested that if the percentages of mothers with fewer than five antenatal care visits could be reduced by half (from 31.9% to 16.0%), one would theoretically prevent 16.2% of all perinatal-caused deaths in the country. Nevertheless, great effort would be necessary to achieve this outcome, since 13.2% of Brazilian mothers failed to attend any antenatal care sessions (according to the 1996 DHS survey). Yet, these findings must be interpreted with caution, since they are based on different studies and subject to certain assumptions. The study is very emphatic on the urgent need of quality improvement in antenatal and delivery care in developing countries.

Finally, research from Jamaica (Allen, 2000) shows a 50% greater infant mortality for children whose mother had not received any iron supplementation during pregnancy. Children born to non-anaemic mothers have higher blood volume, more red cells and circulating hemoglobin mass than those born to anaemic mothers, apart from being less likely to become anaemic themselves.

SRH improves parenting skills in hygiene, baby-feeding and childbearing practices. The effects of breastfeeding on infant and child health have been widely reported. As Forste (1994) suggests, there are at least three main reasons for that: it has immunological properties that provide protection against gastrointestinal and respiratory disease, it meets all the infant's nutritional requirements for at least the first six months of life and it is sterile. Hill (2004) recommends that mothers use exclusive breastfeeding for 6 months and continue breastfeeding until the child is 12 months old, but with food supplementation.

“Breastfeeding protects babies and infants from infectious and chronic disease – including both diarrhea and acute respiratory diseases – and helps them to recover more quickly from illness. Intensive demand feeding also provides protection against pregnancy immediately after a birth by delaying the return of menses. The promotion of exclusive breastfeeding is an important global priority for increasing the health of infants. An HIV-positive mother may reduce the risk of postnatal HIV-transmission when she breastfeeds her child exclusively, as compared with giving blended feeding.”
(UN Millennium Project, 2006: 10)

Pinto's (1995) previously mentioned study on Bolivia identified breastfeeding as the single most important determinant of infant and early child mortality. Forste (1994), also based on the DHS survey in Bolivia, indicates that infants for whom breastfeeding was stopped due to illness were 4.7 times more likely to die before their second birthday than infants who continued breastfeeding. For infants whose mothers stopped breastfeeding for other reasons, the likelihood of their dying would be 1.8% more than of infants who continued lactating.

A WHO study (Betran et al., 2001) has estimated the effect of exclusive breastfeeding and partial breastfeeding on infant mortality from diarrhea disease and acute respiratory

infections in the LAC region. Recent nationally representative surveys for 16 of 36 countries in the region were analysed, and the results indicate that about 55% of infant deaths from diarrhea disease and acute respiratory infections could be prevented by exclusive breastfeeding among infants aged 0-3 months and partial breastfeeding throughout the remainder of infancy. Among infants aged 4-11 months, 32% of such deaths could be prevented by partial breastfeeding.

4.4. Women's roles and child health

In the LAC region, women are assigned the major responsibilities for the care of children. About 30% of the children born in Brazil have no formal recognition from their fathers, so that they do not even bear their names on the birth registration document. It is estimated that each year about 800,000 children are subject to this situation in the country (Thurler, 2004). As Neuhouser (1998) and Thurler (2004) observe, being a responsible father is an option for men, while for women, the qualification of being a "responsible" mother is generally redundant. Even when men are committed to fatherhood, gender roles mainly assign household and childbearing responsibilities to women; female care thus has a direct influence over the child or infant health.

It is often stated that children whose mother dies right after giving birth are much more likely to die themselves, but actual evidence to this effect is remarkably scant. Over et al. (1992) report data from 19th century Sweden showing that the death of a mother reduced her infant's probability of surviving its first year of life from 0.97 to 0.50, and the chances of living to age 5 from 0.94 to 0.02. Though less dramatic, studies about the effects of adult deaths on the subsequent health and socioeconomic wellbeing of rural families in the Matlab area in Bangladesh also suggest that an adult death is associated with significantly higher child mortality risk during the next 5 years, that these risks are higher if an adult female died and if the child was a female and/or aged less than 5 years old at the time of the adult death (Koenig et al., 1988; Strong, 1992; Roy et al., 2000). These conclusions are also confirmed by a handful of studies in Sub-Saharan Africa, especially from areas with high HIV incidence. To some extent, this may be because infections (HIV, malaria, and anaemia) or ill-health may be transmitted from mother to child during pregnancy, and complications of delivery may endanger the infant as well as its mother, but the available evidence is too scant to draw any solid conclusions.

In the LAC region, so far, there is only one study that has addressed the issue in any detail, namely the one by Gertler et al. (2004) based on Mexican PROGRESA data, that was already mentioned under MDG 2. After controlling for per capita consumption prior to the study period, they conclude that both the loss of a father or a mother significantly raises the risk of child mortality, but during the first semester after the event, the effect of a maternal death is stronger (a factor 3.49) than that of a paternal death (1.54). As would be expected, the effect of a paternal death becomes somewhat more important over time and, in the third semester, it reaches 2.68. The fact that the number of paternal deaths found in this study was more than two-and-a-half times greater than the number of maternal deaths

(121 compared to 45) implies that the total *number* of child deaths attributable to the loss of a father is probably greater than the number that can be attributed to the loss of a mother.

On the other hand, the Mexican study did not consider child deaths that occurred during the birth process; if these deaths, which are of a different nature, were also counted, it would obviously raise the risk factor associated with maternal deaths. From the viewpoint of reducing child mortality, however, it should also be realised that under 5 child deaths in the LAC region are over 40 times more common than maternal deaths during pregnancy or childbirth. Even if it is assumed that each maternal death results in a 5 times higher mortality risk for an average of 2.5 children under 5 left behind, the result of a 75% reduction in maternal mortality during pregnancy or childbirth, as sought under MDG 5, would diminish the under 5 mortality rate by just over half a percent.

4.4.1. Women's education

The effects associated with the mother's education probably have a much greater impact on child survival than those resulting from maternal orphanhood. As Caldwell (1979) first suggested, education, in general, and female education, in particular, exert a great influence in children's health and survival with regard to pregnancy, childbirth, immunisation, and management of childhood diseases. Children of educated mothers are less vulnerable to morbidity and mortality. He found that educated women are more likely to be proactive mothers, taking initiatives in providing the best care for their children and willing to go against traditional norms to access modern health care facilities for children, increasing their rate of survival. Mosley and Chen (1984) also agree that the mother's educational level increases her skills in health care practices related to disease treatment, preventive care, hygiene, and nutrition – thus, improving chances for child survival. This relationship has area of residence been shown to hold up even after controlling for a wide range of indicators of income, social status, and access to health services (e.g. Young, Edmonston & Andes, 1983; Ware, 1984; UN Population Division, 1985; Cleland & Van Ginneken, 1988; Forste, 1994).

In their study of child nutritional status in Bolivia, Frost, Forste, and Haas (2005) suggest that there are at least five potential pathways linking maternal education and child health:

1. Improved socioeconomic status;
2. Health knowledge;
3. Modern attitudes towards health care;
4. Female autonomy; and
5. Reproductive behaviour.

In the LAC region, some of these links have been explored by LeVine et al. (1994) and Castro Martín and Juárez (1995). The conclusion of Frost, Forste, and Haas is that the first and third effects explain most of the impact of female education, although there is a substantial portion that cannot be explained by any of the pathways. More recently, Rubalcava and Teruel (2004) used data from the Mexican Family Life Survey, which

contains information on cognitive abilities, to separate the effects of schooling, cognitive ability, and childhood background using children's (0-17 years) height-for-age scores as the long-run health outcome. They found that maternal cognitive ability is an important factor in improving child health and that, unlike schooling, the impact of this characteristic seems to be relatively independent of childhood background.

Using cross-country data, Bajracharya (2003) found that the percentage of women over age 15 that can read and write showed very high significance. The regression coefficient for this variable was -0.754. This can be interpreted as resulting from an increase in the literacy rate amongst women by 1%, *ceteris paribus* there would be a corresponding decrease in the infant mortality rate of 0.754 deaths per 1,000 live births.

Research by Elo (1992) explored the positive correlation between formal education and the use of prenatal care and delivery assistance in Peru. The general outcome is that maternal education plays a crucial role in child and maternal survival, regardless of the mother's childhood background, socioeconomic status, and access to health-care services. Another study, by Haidar, Oliveira and Nascimento (2001) estimated associations between the level of maternal education and the obstetric marker for some risk factors for the mother and infant in the city of Guaratinguetá, Brazil, in 1998. Statistically significant associations were found between low maternal educational level and low birth weight, 3 or more live births, history of stillbirth, and prenatal care including up to 6 visits. No association was found between abortions and pre-term delivery, as described in other studies, perhaps due to insufficient information.

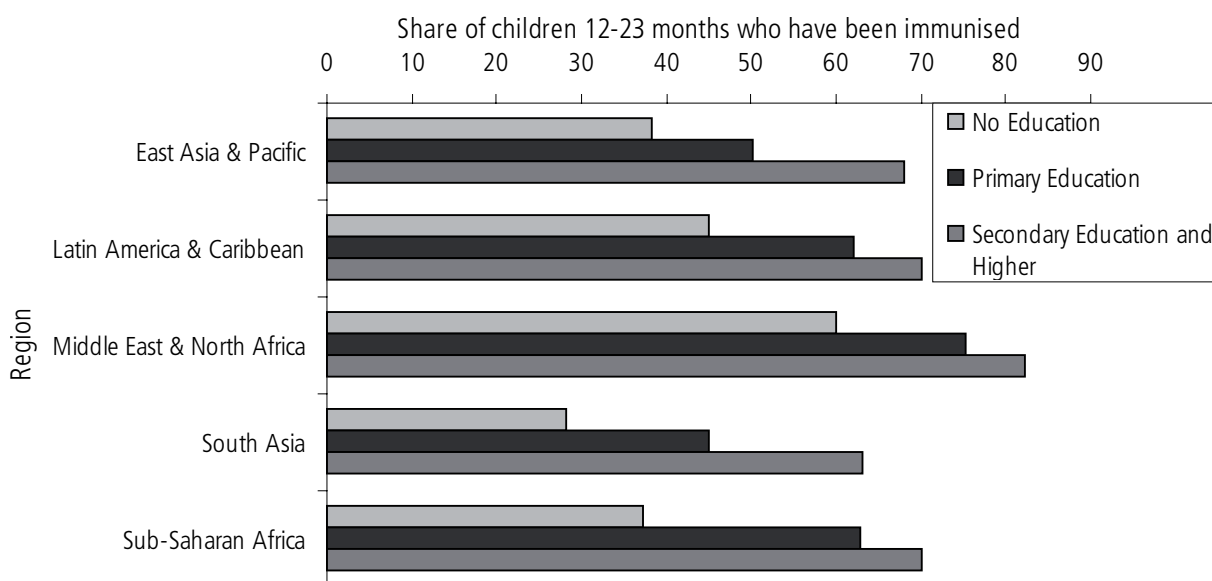
Another study by Kassouf and Senauer (1996) analysed the effects of parental education on malnutrition, among preschool children (2-5 years old) in Brazil, based on data from the 1989 Brazilian National Health and Nutrition Survey. Parental education had both a direct impact and indirect effects, via wages and full income, on child health, particularly, the mother's education. Primary education of at least 4 but less than 8 years yielded the only significant direct effect; nevertheless, higher levels of education had an even greater impact by way of the indirect effects on wages and full income. Some 25% of preschool children with mothers who had less than 4 years of schooling suffered from severe or moderate stunting (direct impact); this would fall to 15% if these mothers had a primary education of at least 4 but less than 8 years, and only 3% if these mothers had at least 11 years of secondary schooling education. Handa (1999) found analogous effects of maternal education on child nutrition, measured by the height of the child, in Jamaica.

Similarly, Thomas, Strauss and Henriques (1991), using data from the 1986 Brazilian DHS, also conclude that parental education has a significant positive impact on child health in both the rural and urban sectors of Northeast Brazil, particularly when considered together with the literacy information. Almost all of the impact of the mother's education, according to the authors, can be explained by indicators of her access to information: newspapers, television, and the radio. This suggests that the availability and processing of information plays a critical role in the transmission of the benefits of education. In an earlier article (Thomas, Strauss & Henriques, 1990), based on the analysis of the

1975 National Study on Family Expenditures (ENDEF), the same authors used parental heights and household income to control confounding background factors and concluded that, even with these controls, parental education maintained its importance for both child survival and children's height. Although the effects of the mother's education were generally greater than those of the father's, they were not very different in the case of completed secondary education or more.

Despite the weight of the evidence, the interpretation of the relationship is not without its critics. Desai and Alva (1998), for example, analysed DHS data for 22 developing countries and suggest that, although the mother's education has a statistically significant impact on infant mortality, children's height-for-age, and children's immunisation status, much of this relationship can be traced back to underlying differences in socioeconomic status and area of residence.

Figure 4.1: Child immunisation rates by mother's education for major regions (weighted by country populations)



Source: World Bank, 2001

Investments in women's education are important for lowering infant and child mortality and improving child health (World Bank, 1993). Maternal education alters some child-care patterns, leading, for instance, to the implementation of favourable behaviour and enhancing the use of modern health services (Caldwell & Caldwell, 1993).

4.4.2. Women's employment

There is some controversy regarding the way in which the health of children is affected by the employment of their mothers. In theory, the relationship may go both ways because the mother's employment means less time but more money available for child care. In a review of the literature, which is, unfortunately, somewhat dated, Leslie (1988) addressed the issue

comprehensively. Evidence from around the world suggested little indication of negative effects of women's employment on breastfeeding duration and infant feeding patterns. What it did show is that there can be a positive effect on child nutrition status, *if* women have decent employment. There are two critical issues - decent employment and/or alternative child caretakers in the home to substitute for the mother's time when she is out working.

Lamontagne, Engle, and Zeitline (1998) investigated the relationship among women's employment, child-care strategies, and the nutritional status of children 12-18 months of age. The study examines 80 Nicaraguan households sampled by randomised block design in 10 low-income urban communities. Multiple regression analysis showed that the children of employed mothers (56%) fared better in weight/height than those whose mothers were not employed, with and without controlling for socioeconomic status and maternal education, paternal financial support, child-care adequacy, and sex and age of the child. Even though maternal care time may decrease significantly when mothers work away from home, when the time of substitute caregivers is included in the total care time, no significant difference in total child-care time remains. Children with inadequate alternate child care (care by a pre-teen or care at the work place) had lower height for age. As the authors argue, the data are consistent with the hypothesis that women's economic contribution, particularly when the economy is in crisis and there is little paternal support, can make a critical difference in their children's growth. Similar results were obtained by Vial, Muchnik and Mardones (1989) in a study in Santiago, Chile. They found better weight gain in the infants of working than non-working mothers and concluded that the negative effects of early termination of breastfeeding were outweighed by the higher incomes earned which allowed increased expenditures on food and better access to health care. Engle (1993) found roughly the same results in Guatemala and Johnson and Rogers (1993) in the Dominican Republic. Hobcraft (2000), in his review of the consequences of female empowerment for child wellbeing, also concluded that the often presumed negative consequences of female employment for child development do not hold. He did find, however, that there do seem to be some negative consequences for children from partnership breakdown and from extra-partnership childbearing.

Johnson and Rogers (1993) analyse data from a Dominican Republic national representative household survey of food consumption, income, and expenditure in 1986. Out of 1440 families surveyed, 706 had children less than 6 years of age. Anthropometric indicators of height and weight were collected for all 1251 children in the sample in a follow-up study conducted from December 1986 to January 1987. It was concluded that at low income levels, where there is a high risk of dietary inadequacy, children in female-headed households achieve superior nutritional status to those in male-headed households, in spite of lower per adult equivalent calorie availability and higher incidence of some illnesses. Multivariate analysis indicated that one possible explanation lies in the relative amount of household earnings for women. At low income levels, the percentage of income earned by women was a significant predictor of children's nutritional status (height and weight by age) even when the mother's education and total household income were controlled for. This suggests that when women control household resources, pre-school children in the household benefit.

4.4.3. Violence against women

In a study in Leon, Nicaragua, by Åsling-Monemi et al. (2003), it was found that children of women who experience physical or sexual violence – whether before, during or after pregnancy – are significantly more likely to die before age 5. The odds of losing a child, among women who had ever been physically or sexually abused, were 2-4 times as high as they were among women who had not been abused.⁴ The type and severity of the violence was probably more relevant to the risk than the timing, and violence may cause impact on child health through maternal stress or care-giving behaviours, rather than through direct trauma itself.

The study also suggests that mothers exposed to physical or emotional stress are more likely than others to have low birth-weight infants, who, in turn, have an increased risk of dying during childhood. Also, the capacity of women to raise a child may be diminished because of emotional issues associated with abuse, like depression, anxiety and post-traumatic stress, and they may even be physically prevented from obtaining care for their children. A greater propensity towards low birth weight in children of abused mothers was also found in a Mexican study by Valdez-Santiago and Sanin-Aguirre (1996).

Another study, conducted by Kishor and Johnson (2004), analyses DHS data to examine the prevalence and correlates of domestic violence and the health consequences of domestic violence for the health of their children, particularly the relation between the incidence of violence and routine child immunisation. Data from nine countries – Cambodia (2000), Colombia (2000), the Dominican Republic (2002), Egypt (1995), Haiti (2000), India (1998-1999), Nicaragua (1998), Peru (2000), and Zambia (2001-2002) – were investigated and evidence shows that, in most countries, children of mothers who have experienced violence are disadvantaged in their access to life-saving routine immunisations. If the likelihood of receiving all of the required vaccinations is examined, in six of the nine countries, children of mothers who have experienced violence are less likely to be fully immunised. The proportion of fully vaccinated children age 12-35 months among mothers who have not experienced violence, compared with children of mothers who have experienced violence, is higher by at least 5-10% in Colombia, Egypt, Nicaragua, and Peru, and 49% in the Dominican Republic.

4.5. Migration and child mortality

Rural-urban and international migration may have either beneficial or harmful effects on infant and child health. Recent literature on Mexican immigrant families points to a diversity of outcomes, as the following studies illustrate.

According to Donato et al. (2003) the role played by migration on child mortality is mostly conditioned by the social and economic situation of the emigrant's household.

⁴ Butchart and Villaveces (2003), however, note that the study questionnaire did not include items regarding whether a child's birth was intended and whether the child was abused. They comment that, in the absence of such controls, the findings may overestimate the true association between violence against women and the risk of death for their children.

In their recent study on the impact of migration on the health of Mexicans, where the households of migrants and non-migrants were evaluated, the authors demonstrate that child mortality in Mexico suffers the influence of migration, and that the regions with the greatest reductions of child mortality influenced by migration were the more economically vulnerable ones. Moreover, the study demonstrates that the reduction depends on which spouses migrates. When the mother migrates, the risk of child mortality rises, whereas when both parents migrate, the risk tends to be reduced. Lastly, the impacts of migration on health are more related to better income levels than to any other explanatory factor.

Kanaiaupuni and Donato (1999) applied multi-level methods to data from 25 Mexican communities located in central Mexico and examined how village migration patterns affect infant survival outcomes in original communities. The study analyses data from the Mexican Migration Project, which surveyed the communities in the winters of 1987-1988 through 1992-1993. As the findings indicate, in its initial stages migration may be disruptive to communities and families; with time, however, it eases household survival as it becomes part of local institutions and community life. Two factors diminish the disruptive effects of migration: migradollars (US remittances to communities), and the institutionalisation of migration over time. Mortality risks fall when remittances are high, and the change may be related to technological and structural advancements made gradually to facilitate incoming migradollars and their use and investment in local infrastructure. Infants in communities with 20 years of exposure to at least median migration intensity rates were nearly half as likely to die. Annual remittances of at least US\$ 10,000 improved infant survival.

Hildebrandt and McKenzie (2005) also investigate the impact of international migration on child health outcomes in rural Mexico using data from the 1997 Encuesta Nacional de Dinámica Demográfica (ENADID). Children in migrant households are found to have lower rates of infant mortality and higher birth weights. Children born in households with a migrant member are estimated to be 3-4.5% less likely to die in their first year than children born in households without a migrant member. Controlling for state-level health infrastructure, state historic infant mortality rates, and state GDP per capita reduces the estimated effect slightly to 3.7%. Being in a household with at least one migrant is estimated to raise birth weight by 364 grams, and 335 grams once state level controls are included. In addition, children in migrant households are significantly more likely to be delivered by a doctor.⁵ The study suggests that migration raises health knowledge in addition to the direct effect on wealth. Nevertheless, preventive health care, such as breastfeeding and vaccinations, is less likely for children in migrant households.

Internal migration effects are investigated by Brockerhoff (1994), who analysed the improved survival chances for children under 2 years of age who migrated with their mothers from rural to urban areas during the late 1970s and 1980s. The data, which was pooled by region, was obtained from DHS surveys conducted in 17 countries, between 1986 and

⁵ Hanson and Woodruff (2003) as well as Duryea et al. (2005) found that children from migrant-sending families in Mexico completed between 0.7 and 1.6 more years of schooling than children from families without any migrants abroad.

1990, in Sub-Saharan Africa, North Africa, Latin America (Bolivia, Ecuador, Guatemala, Mexico, and Peru), and Southeast Asia. Migrating children younger than 2 years experienced a decline in mortality from 110 deaths per 1,000 live births before migration to 82 deaths per 1,000 live births after migration. Survival improvement was found to be related to conditions in urban areas and also to the relative timing of births and migration. Children born during the two-year period surrounding their mother's migration had considerably higher mortality rates, but after this period the advantages of migration for child survival became gradually more evident.

Not all research has found positive effects though. Bender, Rivera and Madona (1993) found that children of urban women of rural origin in Bolivia were more likely to suffer from malnutrition than those of native urban women, a difference only partially explained by the lower educational level of the former. A UNICEF study on Ecuador, Mexico, and the Philippines (Cortés, 2006) suggests that children whose parents migrated can suffer adverse psychological effects. In another study by UNICEF (2005 b), on children and adolescents in the triple border region - Argentina, Brazil, and Paraguay - involving 62 municipalities of the three countries, the vulnerability of children in this transit area becomes evident. In transit area municipalities of Paraguay and Argentina, child mortality rates are higher than their national averages, whereas in Brazil, because of intense work by NGOs (especially Pastoral da Criança), child mortality was actually below the national average. Differences among the three countries also appear when other causes of death rates are analysed, including AIDS. These are indications that the potential advantages of the integration process and the Mercosul Treaty are not yet comprehensive for all the population, and there is a need for common policy implementation.

The migration of qualified health personnel from underserved areas to developed countries is a significant problem in several sectors of the health system. In the Caribbean sub-region, which is particularly affected, it is known as the "nursing crisis" (see also section 2.4. of this document). Child mortality is arguably the goal most sensitive to the lack of qualified health personnel. Basic orientation and counselling regarding lactation, child nutrition, and disease management are factors closely linked to the availability of health professionals.

MAIN IDEAS ON MDG 4:

General conclusions

- In recent years, infant health in the LAC region has improved considerably, and the region as a whole is on track to meet this Target – except for Haiti and Paraguay. Even though it is still far behind the industrialised countries' average of 6 child deaths per 1,000 live births, it has the lowest under 5 mortality rate of any of the world's developing regions. With an average annual reduction of 4% during the 1990s, the region's under 5 mortality rate fell from about 56 to 33 deaths per 1,000 live births between 1990 and 2003.

- Some analytical frameworks incorporate both social and biomedical variables and adopt a multi-disciplinary approach. The well-known analytical framework by Mosley and Chen (1984) integrates research methods employed by social and medical scientists to clarify the understanding of the many factors involved in infant and child survival. It offers a scheme that treats socioeconomic factors (individual productivity of fathers and mothers; income/wealth; ecological setting; political economy; health system) as the independent variables that must act through five proximate variables to have their effects (maternal factors, such as age, parity, and birth interval; environmental contamination; nutrient deficiency; injury; and personal illness) controlled.
- Similarly, UNICEF's triple-A approach – Assessment, Analysis, and Action – offers conceptual guidance in studying the immediate, underlying, and basic causes of malnutrition in infants. The immediate causes include inadequate dietary intake and disease. The underlying causes are adequate access to food; adequate care of children and women; and adequate access to preventive and basic health services, together with a healthy environment. Finally, the basic causes are considered the historical processes in society related to the availability and control of human, economic, and organisational resources: ecological/technical conditions of production; social conditions of production; political and ideological factors, including habits, beliefs, cultural preferences, and all ideas that legitimise social actions.

1. Health care versus economic determinants of infant and child mortality

- There is some divergence in the literature on the determinants of infant and child health, with some authors arguing in favour of general socioeconomic determinants while others give much more weight to specific health system factors.
- The thesis that social and economic transformations, rather than interventions in the health area, are responsible for current reductions of infant and child mortality had much acceptance in the 1970's. It has resurfaced in the late 90's, when some authors argued that virtually all inter-country variation in child mortality was explained by a set of development indicators (including GNP per capita) and that adding a health expenditure variable to the model added little explanatory power.
- This position has been contested by a number of studies which argue that, while income per capita is a robust determinant of infant and child mortality, so are indicators of health, education, and gender inequality.

2. Reproductive patterns and child mortality

- That reproductive patterns are closely linked to the health of children is extensively documented by the literature.
- Infant and child mortality levels are related to births spaced too close to one another, to large families, and to high birth orders. Better timing and spacing of pregnancies improves child health outcomes.

- More recent research has yielded dramatic results with respect to the under 5 mortality rate. A multi-country study indicates that children born after birth intervals of 24-29 months still face under 5 mortality risks that are 70-90% higher than children born after intervals of 36-41 months.
- The use of family planning can reduce infant mortality, by reducing the incidence of short birth intervals.
- Several studies from a variety of countries, relating maternal age to various aspects of pregnancy and child development, suggest that maternal age is a central variable influencing pregnancy outcome. Child mortality increases, to an important extent, with births to very young or to very old mothers.
- Children born to very young mothers are more likely to be premature, to be low-birth-weight, and to suffer from complications at the time of delivery – particularly if the woman is younger than 15 years. These relationships are robust with respect to controls for several confounding factors such as income and education.
- In the LAC region, there are high adolescent fertility rates, as well as unmet need for contraception among adolescents. There is no reason to expect adolescent fertility rates to fall at the same rate as fertility in other age groups.
- According to estimates by the UN Population Division, postponing all first births until the woman is at least 20 years old would, by itself, reduce under 5 mortality by up to 21.3% in Mexico and 17.2% in the Dominican Republic.
- A priority for governments must be to improve SRH information and services for adolescents. In addition to that, it is also important to design and provide sensitive and confidential RH services that respond to young peoples' particular needs.
- Babies born to women older than 35 and especially 40 are also at risk. Very early fertility, however, has received the most public attention, and little information is usually available about the problems of very late fertility. Nevertheless, older women face biological risks of poor birth outcomes, such as an increased likelihood of health conditions like hypertension and diabetes, as well as shorter duration of pregnancy. The problem is compounded by the fact that in general they have already had several children. They are also more likely to have stillbirths or to bear children with congenital abnormalities. Down's syndrome, for instance, is well known to be correlated with age.
- The wantedness of births makes a difference in the children's health status: undesired children are more likely to be in poorer health compared with children born as a result of other pregnancies. Some studies indicate that the intendedness appears to affect the odds of obtaining adequate prenatal care. Other analyses also suggest that wantedness affects the likelihood of receiving treatment, of contracting acute respiratory infections of diarrhea, and of receiving vaccinations.

3. Other life-saving effects of SRH

- Broader access to SRH, independent of whether it alters reproductive patterns, holds other kinds of relationships with the reduction of child mortality.

- Adequate antenatal care strongly impacts on infant and child health. A Bolivian study indicates that antenatal care received from a physician or other health care professional reduces the odds of death, including the neonatal period, by a factor 1.2, as compared with women who received no care at all. Brazilian data suggest that if the percentages of mothers with fewer than five antenatal care visits could be reduced by half, one would theoretically prevent 16.2% of all perinatal-caused deaths in the country. Research from Jamaica shows a 50% greater infant mortality for children whose mother had not received any iron supplementation during pregnancy.
- Breastfeeding and oral re-hydration therapy alone can prevent an estimated 13% and 15% of all under 5 deaths, respectively. Also, 6 other interventions could each further prevent a significant percentage of under 5 deaths: insecticide-treated materials (7%); complementary feeding (providing food in addition to breast milk) (6%); antibiotics for sepsis (6%); antibiotics for pneumonia (6%); anti-malarials (5%); and zinc to reduce diarrhea and pneumonia deaths (5%).
- Recent nationally representative surveys for 16 of 36 countries in the region were analysed, and the results indicate that about 55% of infant deaths from diarrhea disease and acute respiratory infections could be prevented by exclusive breastfeeding among infants aged 0-3 months and partial breastfeeding throughout the remainder of infancy. Among infants aged 4-11 months, 32% of such deaths could be prevented by partial breastfeeding.

4. Women's roles and child health

- The idea that maternal (but not paternal) orphanhood greatly increases the risk of death of children has great intuitive appeal, but there are relatively few data to support it. The few existing studies are mostly from Europe, Asia and Africa, especially from areas with high AIDS mortality. In the LAC region, one study, based on Mexican PROGRESA data, concludes, after controlling for family consumption levels, that the loss of either parent significantly raises the risk of child mortality. During the first semester, the effect of a maternal death is stronger (a factor 3.49) than that of a paternal death (1.54). The latter becomes more important over time and reaches 2.68 in the third semester. But because paternal deaths are much more common than maternal deaths, the number of child deaths attributable to the loss of a father is probably greater.
- Mother's education impacts on child survival and on the management of childhood diseases. There is a positive correlation between the formal education of the mother and the use of prenatal care and delivery assistance. This relationship has been shown to hold up even after controlling a range of indicators of income, social status, and access to health services. There are at least five potential pathways linking maternal education and child health: 1. Improved socioeconomic status; 2. Health knowledge; 3. Modern attitudes towards health care; 4. Female autonomy; and 5. Reproductive

behaviour. Investments in women's education are important for lowering infant and child mortality.

- Even though there is some controversy regarding the way in which the health of children is affected by the employment of their mothers, research from Nicaragua, Chile, and the Dominican Republic indicates that children of employed mothers are more likely to have better weight/height than those whose mothers are not employed.
- Children of women who experience physical or sexual violence are more likely to have poor health outcomes. Violence impacts on child health through maternal stress, anxiety, depression, or care-giving behaviour. A greater propensity towards low birth weight has been found in children of abused mothers, as well as a decrease in their access to life-saving routine immunisations.

5. Migration and child mortality

- Migration plays a role in infant and child health. The impact of migration on child mortality is mostly conditioned by the social and economic situation of the emigrants' household. A study from Mexico demonstrates that the reduction also depends on which spouse migrates. When the mother migrates, the risk of child mortality rises, whereas when both parents migrate, the risk tends to be reduced.
- A study in rural Mexico indicates that children in migrant households have lower rates of infant mortality and higher birth weights. They are also more likely to be delivered by a doctor. In its initial stages migration may be disruptive to communities and families; with time, however, it eases household survival as it becomes part of local institutions and community life. Remittances to communities and the institutionalisation of migration over time diminish the its effects. Mortality risks fall when remittances are high, and the change may be related to technological and structural advancements made gradually to facilitate incoming migradollars and their use and investment in local infrastructure.
- In general, internal migration also impacts positively on child health, as is confirmed by a study with DHS data on 17 countries, pooled into regions, on the survival chances of children who migrated with their mothers from rural to urban areas during the late 1970s and 1980s. Migrating children younger than 2 years experienced a decline in mortality from 110 deaths per 1,000 live births before to 82 deaths per 1,000 live births after migration.
- There are exceptions though. In transit area municipalities, for example, vulnerability of children may increase – as seems to be the case of the triple border region of Brazil, Argentina, and Paraguay.
- The migration of qualified health personnel to developed countries is a significant problem in several sectors of the health system which arguably impacts more on infant and child health than on other population groups. In the Caribbean sub-region, which is particularly affected, it is known as the “nursing crisis”.

