

Revisiting the ‘Best’ Covariates of Infant and Child Mortality: the Philippines Case¹

Josefina V. Cabigon
Population Institute
College of Social Sciences and Philosophy
University of the Philippines
Diliman, Quezon City

John 12:36 *‘While ye have light, believe
In the light, that ye may be the
children of light...’*

Introduction

In the formulation of consistent and feasible health policies and projects, planners need some insights into trends in both development and population as well as into the relationship between development and population variables. Development variables may include child immunization, water supply, medical technology, education and housing. In fact, infant mortality has been taken to indicate socioeconomic development of a given areal aggregation. Population variables may include mortality, fertility and migration. In the provision of health services, health planners face problems of determining priorities: which subgroups of the population require top-priority attention. They also encounter the closely related problems of resource allocation and cost, which are particularly serious in the developing world where available resources are most limited and allocation problems are most binding; thus there is a continual process of competition between health and other development options. It is imperative that health planners understand the socioeconomic and health relationships, for example, the ‘best’ covariates of infant and child mortality, if they are to design effective policies.

The development of conceptual frameworks and appropriate methodological tools for analyzing child survival has greatly contributed towards the advancement of knowledge in understanding the underlying causes of infant and child mortality. Nonetheless, the linkages between the socioeconomic, environmental, demographic, cultural, biological and behavioral factors and infant and child mortality are highly complex. Moreover, in actual empirical work, one cannot usually include all the factors that influence child survival because of the lack of relevant data, and if there are relevant data, most of the factors are highly correlated with each other. Hence, the attainment of the best description of these interrelationships has remained a major and special goal of researchers from various disciplines. Results of efforts along this line have been gratifying but at the same time have called for further elaborations and clarifications. Moreover, because of differing underlying theoretical concepts and differing availability of reliable and valid data, which necessarily demand use of proper statistical techniques, and disciplinary or factor focus, the emerging analytical frameworks and statistical methods used are of varying types. While some studies have concentrated on general issues, others have focused on one or two issues, but properly using control variables in explaining relationships between explanatory variables and infant and child mortality.

It is important to revisit these findings, put them together and further examine them carefully and objectively in the context of the nature and theme of this conference and of the Department of Health (DOH)’s national goals and objectives for health through the prevention and control of

¹ Paper presented during the Bangkok Regional Population Conference “Southeast Asia’s Population in a Changing Asian Context” held June 10-13, 2002 in Bangkok, Thailand.

diseases and the promotion and protection of health. Moreover, it is helpful to reach an honest understanding of these findings and develop meaningful theories for more general understanding. It is along these lines that this paper is developed. To set the proper perspective for this main portion of the paper, two things are done first. First is to examine how the Philippines fares with selected Asian countries in the most recent infant and child mortality, some health-related, fertility, population and economic indicators and how infant and child mortality relates with these other variables except population size. Second is to review trends in Philippine infant and child mortality rate, economic performance, population size and total fertility rate.

Comparing the Most Recent Child Mortality, Health-Related, Fertility, Population Size and Economic Indicators and Their Relationships in Selected Asian Countries

Table 1 reveals that in the late and early 1990s, respectively, the Philippine infant mortality rate (IMR) of 31 infant deaths per 1000 live births and under-five mortality rate of 54 child deaths per 1000 live births are low by Asian standards (Population Reference Bureau, 2001). Within the Southeast Asian Region, the Philippine IMR and under-five mortality rate are lower, respectively, than those of Laos (104 and 161), Cambodia (95 and 150), Myanmar (92 and 105), Indonesia (46 and 72) and Vietnam (37 and 64) but higher than those of Thailand (22 and 39) and Singapore (2.5 and 7). Compared with those of South Asian countries, they are much lower, in that order, than those of Pakistan (91 and 115), Nepal (79 and 129), India (70 and 100) and Bangladesh (66 and 106) but much higher, respectively, than those of Sri Lanka (17 and 21). Compared with East Asian countries, the Philippine IMR is on par with China IMR (31) but the under-five mortality rate is much higher than that of China (47). Both the Philippine IMR and under-five mortality rate are much higher, respectively, than those of Japan (3.4 and 5) and South Korea (8 and 15).

Interestingly, the differences in the level of malnutrition of the under 5 population among these countries under consideration are not as marked as those observed with the infant and child mortality rates. The same observation holds true with the percent of population with access to health services and safe water supply. These three health related indicators do not reveal a clear association with IMR and under-five mortality rate.

In terms of TFR, the Philippines exhibits the same level (3.5 per woman) as Bangladesh, India, Malaysia, Myanmar, but lower than that of Nepal, Pakistan, Cambodia and Laos. It shows however a much higher level than that of Sri Lanka, Indonesia, Singapore, Thailand, Vietnam, China, Japan and South Korea. As observed with the health related indicators, there is no clear association between infant and child mortality and fertility.

With respect to population size, its 77.2 million population is close to Vietnam. However, it shows a much higher number than Singapore (4.1 million), Laos (5.4 million), Cambodia (13.1 million), Sri Lanka (19.5 million), Malaysia (22.7 million), Nepal, (23.5 million), Myanmar (47.8 million), South Korea (48.8 million) and Thailand (62.4 million). It is nonetheless that small compared to the most populous countries in Asia and even the world (China, 1,273.3 million and India, 1,033 million), and to the countries with very large population such as Indonesia (206.1 million), Pakistan (145 million), Bangladesh (133.5 million) and Japan (127.1 million).

As to the gross national income (GNI) in purchasing power parity (PPP) in US dollars, the Philippines with a GNI-PPP of US\$3,990 is more or less in the same economic level as Sri Lanka (\$3,230), and China (\$3,550). It is not however as desperate as Nepal (\$1,280), Cambodia (\$1,350), Laos (\$1,430), Bangladesh (\$1,530), Pakistan and Vietnam (\$1,860), India (\$2,230) and

Indonesia (\$2,660). It is nonetheless much lower compared to Thailand (\$5,950), Malaysia (\$7,640) and to the most economically advanced countries in the region (Japan, \$25,170, Singapore, \$22,640 and South Korea, \$15,530). It is apparent that the countries with very high infant and child mortality are having low GNI-PPP and the countries with very low infant and child mortality are having high HNI-PPP. However, the relationship is not that very clear as will be explained in the next section.

Trend in Philippine Infant and Child Mortality, Economic Performance, Population Size and Total Fertility Rate

Turning to the trend in infant mortality based on indirect estimation techniques (**Table 2**), the Philippines reveals a slight improvement (17 percent) of infant survival with both sexes IMR dropping from 108 infant deaths per 1000 live births in 1960 to 90 in 1970, markedly falling (30 percent) to 63 in 1980 but then a decelerating decline (8 and 10 percent, respectively) to 1990 (58) and 1995 (52). In fact, going to earlier and the same periods, but with different figures (not shown) derived using different but comparable methods, the decline was very rapid, particularly between 1953 and 1957, slowed down during the 1960 to 1976 and quickened from 1978 until 1982 (Cabigon, 1990; Zablan, 1988). Official estimates based on national surveys even indicate a fluctuating pattern from 1976 to 1990 and then a declining trend from 1990 to 1995 (National Statistical Coordination Board, 1993; Cabigon and Flieger, 1999). Direct measures of infant and child mortality based on surveys indicate a fairly rapid decline around 1950 to 1960 but the decline faltered thereafter (Cabigon, 1990), according to the 1978 Republic of the Philippines Fertility Survey and 1983 National Demographic Survey (NDS) and stagnation in IMR at about 35 deaths per 1000 births and a slight fall in under five mortality from 54 deaths per 1000 births in 1988-1992 to 48 deaths in 1993-1997 according the 1993 and 1998 NDSs (National Statistics Office, Department of Health and Macro International, 1999).

This sluggish or not monotonic improvement over time in infant mortality appears to coincide with a rise and fall in GNP per capita around the same periods under consideration (**Table 2**). It has also been demonstrated that in terms of economic performance, the Philippines has been lagging behind her Southeast Asian neighbors such as Thailand, Indonesia and even Vietnam (e.g. Jha, Deolalikar and Pernia, 1993; Orbeta and Pernia, 1999). What further complicates this situation is that poverty incidence or the proportion of families with income below the poverty threshold reversed its gradual decline from 35.5 percent in 1994 to 31.8 percent in 1997 to a gradual increase to 34.2 percent in 2000 (National Statistical Coordination Board, 2000; 2001). It seems likely that national economic trends might be crudely associated with infant and child mortality trends, although the processes through which such trends are related are highly complex. As the World Health Organization (WHO, 1981:21) clearly states, the GNP

... is far from being an ideal economic indicator, particularly in relation to health for all, since it does not reflect the degree of equity in the distribution of resources, and factors tending to increase the GNP might actually be detrimental to health, nevertheless, it is still the economic indicator in most common use.

However, that the GNP-PPP is almost half of that of Malaysia and five times lower than the advanced countries as shown earlier is a clear indication that the Philippines has been grappling with its economic problems, influencing and placing additional burdens in physical and social infrastructures, increasing the danger of unemployment and underemployment, affecting production and distribution of food and having qualitative and quantitative implications for water, education, housing sanitation and health care as well as changes in disease patterns. In fact,

pneumonia, other respiratory-related diseases, congenital anomalies, diarrhea, septicemia, avitaminosis and other nutritional disorders, birth injury and difficult labor, measles, other diseases of the respiratory system and meningitis are the 10 leading causes of infant mortality (Department of Health, 1999)..

What is even more puzzling is that mortality has slackened even though female educational attainment and women's status are among the highest in Asia (e.g. on par with Singapore, Hong Kong and Sri Lanka in terms of literacy, secondary education as of 2002 according to the Population Reference Bureau, 2002). Caldwell (1986, 1989) demonstrated that China, Costa Rica, Kerala and Sri Lanka experienced drastic decline in mortality, even without economic advancement, through political will in China and both through political and social will in the other three countries, in which a large proportion of the already tight national budget has been earmarked for education and health. These areal units also exemplify his theory (1979) on the role of education as a major factor affecting child mortality, operating through three channels: educated mothers becoming less fatalistic about illness, more capable of drawing advantages from the modern world and more influential in family decision-making. Caldwell (1976) stresses that the eventual outcome of the third channel is a change in the net flow of wealth (money, goods, services, guarantees) from the pre-transitional children-to-parents flow to the reverse flow from parents to children, thus increasing the chances of improving the health of children.

The Philippines has also fallen far behind its neighboring East and Southeast Asian countries in population growth reduction which may be attributed mainly to sluggish fertility decline and economic performance. The Philippine population is still growing above two percent per year resulting into a population size of 37 million in 1970, 48 million in 1980, 62 million in 1990 and 76 million in 2000. Its TFR has declined the slowest in the past 25 years by 38%, from 6.0 to 3.7 children per woman when compared with other Southeast Asian fertility. Thailand fertility registered the fastest decline during the same period by 69%, from 6.4 to 2.0, followed by Indonesia by 50%, from 5.6 to 2.8, then by Singapore by 45%, from 3.1 to 1.7. Malaysian fertility decline of 40%, from 5.3 to 3.2 during the same 1970-1995 period is slightly faster than Philippine fertility. Strikingly, Vietnam fertility has remarkably went down in 10 years by 50%, from 4.6 to 2.3.

The faltering change in infant and child mortality coinciding with a saw-tooth pattern of economic performance and a modest but monotonically declining fertility calls for further discussion. Identifying which factors persist and which ones disappear or emerge to be greatly affecting infant and child mortality in covariate analyses so far performed with Philippine data in various years since the 1980s and the use of different techniques sheds further light on this slackening infant and child mortality change. Revisiting through a more comprehensive discussion of the 'best' covariates of Philippine infant and child mortality is therefore a worthy endeavor.

Analyses of the Determinants of Philippine Infant and Child Mortality

The Mosley-Chen (1984) framework for analysis of child survival has so far been generally regarded as the most comprehensive and systematic conceptual framework (Ruzicka, 1989) because it incorporates both socioeconomic and proximate determinants such as risk factors, disease processes, prevention and treatment. However, the biggest problem faced by researchers in operationalizing the whole framework in developing countries is unavailability of data, particularly the proximate determinants. In fact, Gray (1989) considered issues within this

framework that relate to epidemiologic approaches to the study of risk factors to be integrated in demographic studies to expand understanding of health problems in developing countries.

It is encouraging, however, that since then, several studies using Philippine data have drawn heavily on this framework, each having a unique methodology in estimating the effects of the 'underlying' and 'proximate' factors on infant and child mortality (Hobcraft et al., 1984; Cabigon, 1990; Park et al., 1993; Popkin et al., 1993; Cabigon, 1997; Guilkey and Riphahn, 1998; Alcantara, Rodriguez and Cabigon, 2000). These are the sources of the main part of this paper which is a holistic discussion of the 'best' covariates of infant and child mortality in relation to the conference theme and the DOH's national goals and objectives for health through the prevention and control of diseases and the promotion and protection of health.

'Best' Socioeconomic and Health-related Covariates of Infant and Child Mortality

Maternal and paternal education and occupation. Hobcraft et al., (1984) investigated the role of socioeconomic factors in infant and child mortality for 28 countries including the Philippines using data from the World Fertility Survey (WFS). Their bivariate and multivariate analyses indicated that mother's education, husband's occupation and husband's education were strongly associated with post-neonatal and child mortality in the Philippines according to the explanatory framework used in the study. Their comparative analysis revealed the role of mother's education on post-neonatal and child mortality in the Philippines as comparable with that in Kenya, Indonesia, Korea and Malaysia; the role of husband's education with Senegal, Kenya, Mexico, Costa Rica, Bangladesh, Indonesia, and Sri Lanka, and the role of occupation of the husband with Senegal and Peru. The analyses of Cabigon (1990, 1997), Park et al. (1993) and Alcantara, Rodriguez and Cabigon (2000) are consistent in revealing maternal educational attainment as the strong determinant during early and late childhood mortality.

Nevertheless, according to my 1990 study, maternal education is negatively associated with child mortality, at any age, although non-monotonically, indicating its importance in its own right in the Philippine setting. However, while its inverse effects on post-neonatal mortality are direct, its effects on neonatal mortality depend on the size of preceding birth interval and maternal age at childbirth; its effects on overall infant mortality depend on the source of drinking water and toilet facility and its effects on child mortality depend on the household income and toilet facility.

Stating differently, although births to highly educated mothers tend to show the lowest risk of neonatal mortality, variations by mother's education at longer preceding birth intervals and older maternal ages at delivery are small and non-uniform. These patterns imply that mother's education may be significant in its own right, or may be a reflection of differentials owing to education of the mother in nutrition, care of the mother during pregnancy or in conditions of maternal delivery, or in length of preceding birth interval.

Moreover, among those with unsafe sources of drinking water at any given level of toilet facility and among those with safe sources of drinking water, but with at least some toilet facilities, the higher the education of the mother, the lower the infant mortality; but among those with safe sources of drinking water but no toilets, those whose mothers have the educational attainment, are likely to experience the highest infant mortality. Similarly, while the expected net negative effects of education at any given level of income and at levels with at least some toilets were evident, among those with no toilets and very low household income, those with college educated mothers have the highest child mortality. These patterns suggest that formal schooling alone will not lead to reductions in overall infant and child mortality. Among the disadvantaged group,

what matters appears to be income and public health. If the mother is highly educated but has a meager income and an unsanitary environment, the child she bears is likely to be exposed to higher risks of infant and child mortality.

In short, while education persists to be shown by independent analyses as the strongest covariate of infant and child mortality, there seem to be other important countervailing factors causing the sluggish mortality change. Nonetheless, policy efforts to upgrade the formal education to at least finishing high school can significantly reduce infant and child mortality. Directing short-term educational programs toward women (especially out-of-school youth) and domestic helpers or child takers can also be incorporated within health programs in areas or communities where these programs are underway.

Income. According to my 1990 study, the direct effect of average household income is greater than that of mother's education on post-neonatal mortality. Average household income is the only socioeconomic determinant which maintains its direct effect on overall infant mortality. This implies that formal schooling, which has been shown in previous Philippine studies as the strongest socioeconomic determinant, may have reflected income characteristics and that maternal education may not be an adequate proxy of Philippine socioeconomic status. This in turn implies the need for equal attention to increasing the purchasing power of the populace and improving their educational levels. Moreover, this may indicate why infant and child mortality has not drastically declined in the recent years because of poverty.

With respect to the covariates of **child mortality** with the 1983 National Demographic Survey, the sharpest covariate among the three interacting variables is household income, followed by toilet facility and education. The effects of income depend on the levels of birth order, maternal education and toilet facility. For the first and fourth and higher order births, the higher the child mortality, the lower the household income. The reverse holds with second or third order births. For any given level of education and toilet facility, the general pattern persists of lower child mortality risks with higher income. These illustrate the important role of household income, mother's education and other health-related factors in the causal chain leading to child mortality. Having a college education may not be enough, unless the attained education is a means of generating income to augment the husband's income. The issue of producing college-educated mothers but not providing corresponding job opportunities arises.

The 1998 National Demographic and Health Survey (Alcantara, Rodriguez and Cabigon, 2000) reveals that household wealth status is a significant predictor of infant and child mortality. Compared to the richest 20% of the population, the poorest 20% and 40-60% of households experience higher risks of infant and child mortality. For example, the poorest 20% of households are 154% and 161% more likely to experience an infant and child mortality in the first five years of life compared to the richest 20% of households.

Source of drinking water and toilet facility. In the early 1980s using the 1983 National Demographic Survey, (Cabigon, 1990), I found that the presence of toilet is the least prominent with post-neonatal mortality but its effect is direct and its net effects on overall infant mortality are in the expected direction of negative association with infant mortality at any given level of education and source of drinking water. Its effects on child mortality more or less reflect the general pattern that having at least a toilet is associated with lower child mortality, regardless of income and education levels. In fact, among the three interacting variables (mother's education, toilet facility and source of drinking water with infant mortality as the dependent variable and household income, mother's education and toilet facility), toilet facility shows the sharpest

association with infant mortality and ranks second with child mortality within the explanatory frameworks used.

Source of drinking water is influential only with overall infant mortality both provinces and births as units of analysis in my 1990 study, a finding consistent with the finding of Martin et al (1983) of its insignificance on child mortality. Its effect displays expected and unexpected patterns at different levels of mother's education and toilet facility. The unexpected pattern is higher infant mortality among those with safe source of drinking water than those with an unsafe source of drinking water for elementary or college educated women with no or outside toilet facility and high school educated women with outside and inside toilets. The unexpected pattern persists even with the most detailed categorization of source of drinking water.

Several explanations of this unexpected pattern are advanced. First is misreporting of the type of drinking water source. It may be possible that unsafe sources were reported as safe by some respondents in the survey. However, the detailed categorization of drinking water supply by infant mortality level does not show a systematic bias towards reporting sources of drinking water as safe even if they were not. Nonetheless, further investigation of this aspect is important before reaching definitive conclusions.

Second is the role played by behavioral practices enhanced by non-formal or formal education as clearly indicated by the marked educational differentials by unsafe source of drinking water. Perhaps, knowing their sources of drinking water are unsafe, most mothers with at least an elementary education may have been boiling the water before consuming it, so it may be the behavioral practices rather than the source of drinking water *per se* that are measured. This may be a more reasonable explanation than misreporting.

Third is the manner of transport from the source to the house and the means of storing the water. While piped water and artesian wells were reported as sources of drinking water, these sources are likely to be public sources for the majority of the population in question. Therefore, the container, the mode of transport from the public source to the house, and the way of storing the water are important factors to be considered for this segment of the population. In fact, this study shows that as expected, the higher educated mothers, who are more likely to afford tap water inside their houses, experience fewer infant deaths than those with other sources of drinking water, irrespective of current residence.

Strikingly though during the late 1990s with the 1998 National Demographic and Health Survey (Alcantara, Rodriguez and Cabigon, 2000), type of toilet facility and source of drinking water are no longer important determinants of infant and child mortality once other health related and nutrition, demographic and socioeconomic variables are simultaneously considered.

Quality of housing. My 1990 study also shows that the better the quality of housing, the lower the post-neonatal and child mortality. Using the Cebu Longitudinal Health and Nutrition Survey, Popkin et al. (1993) found out that poor sanitation, measured by the level of bacterial contaminants significantly elevates mortality, particularly among infants born with a traditional birth attendant.

Health-risk Covariates (preceding birth interval, birth order and maternal age at childbirth)

With the 1990 study of the 1983 National Demographic Survey (Cabigon, 1990), all these three demographic or health-risk factors --- preceding birth interval, crudely measure, birth order and

maternal age at childbirth --- are 'best' covariates of neonatal mortality. The prominence of all three health-risk factors reinforces findings of several studies that biological or medical rather than environmental factors are associated with neonatal mortality. Birth order and maternal age at childbirth emerge as important predictors of post-neonatal, overall infant and child mortality. The effects of birth order were negative on neonatal, positive on rich-child, J-shaped on post-neonatal and poor child, inverted J-shaped on overall infant mortality. Effects of maternal age at child birth were inverted J-shaped on neonatal, post-neonatal and infant mortality but inverse on child mortality, suggesting that older women are more experienced than younger women in caring for an older child to prevent child loss through death.

Stating differently, first births or any birth to mothers at their younger ages of reproduction experience the highest risk, followed by fourth or higher order births or any birth to mothers at their oldest ages of reproduction. Differences by maternal age at childbirth are great with preceding birth intervals of less than 18 months, regardless of mother's education and with preceding birth intervals of less than 31 months and no or primary education of mothers. Also, educational differentials are marked at the youngest maternal ages at childbirth and shortest preceding birth interval. These patterns identify the groups most likely to experience higher than average neonatal mortality. They are first births, and any birth at very young ages of mothers with no or primary education and with very short preceding birth intervals. They define targets requiring top priority in the implementation of health programs.

I re-examined the 1983 NDS to address the complicated mechanisms through which birthspacing and breastfeeding affect the mortality of a child, usually the termed the index child (Cabigon, 1997). Mortality as the dependent variable was looked at in specific age segments in months, 0, 1-2, 3-5, 6-11, 12-23 and 24-59. The independent variables of interest were length of preceding interval, pace of following conception and breastfeeding with controls (previous sibling mortality, birth order, maternal age at birth of index child, maternal education, average household income, housing quality, family composition and toilet facility). The analyses reveal preceding birth interval to have remained highly significant at any given age segment even with the introduction of pace of following conception. The net influence of preceding birth interval was stronger at ages 3-11 months than at the other age segments. The effects of pace of following conception were also in the expected direction but they were highly significant only at age segment 5-11 months among births between 5 and 16 years before the survey and at segments 3-5 and 5-11 months among births between 1 and 6 years before the survey. Crudely defined, preceding birth interval did not come out important with the 1998 data (Alcantara, Rodriguez and Cabigon, 2000). This may be due to the more important roles of health related and nutrition variables simultaneously examined in this study.

All other things being equal, the largest reduction (50-67 percent) of mortality resulting from long preceding and succeeding birth intervals occurred at ages 3-11 months; the reduction of mortality at the other ages due to long preceding birth interval was smaller but still considerable (about 40 percent). These findings are consistent with findings of other studies (e.g. Hobcraft et al., 1983; Cleland and Sathar, 1984; Palloni and Tienda, 1986; Palloni, 1989; Park et al., 1993). The persistent impact of preceding birth interval does not seem to support the argument that replacing a dead child prevails in the Philippines. In fact, Cabigon et al. (1994) found that it is only within a desired family size norm that if a child died, parents tended to replace the lost child. If the existing family size exceeded their norm, parents would not be in the position to desire to replace the lost child.

What then are the mechanisms through which preceding birth interval affects Philippine child mortality? It is difficult to identify the exact mechanisms owing to lack of medical information,

but an inference can be made. The two possible mechanisms are maternal depletion syndrome and competition between siblings for care and resources. However, previous sibling mortality was significant only during the first half of infancy but minimally reduced the magnitude of the effects of preceding birth interval when it was introduced into the models. This indicates that the presence of an older sibling to compete with the index child for food and care is not the main mechanism. Maternal depletion syndrome causing low birthweight or prematurity, through which short preceding birth intervals tend to heighten mortality risks, appears to be the more likely mechanism than competition between siblings. These findings define targets requiring top priority in the implementation of family planning and reproductive health programs.

Proximate Covariates

A separate log-linear rate analysis of the 1983 National Demographic Survey (Cabigon, 1997) has established the marked importance of breastfeeding in preventing Philippine infant and child mortality. Breastfeeding reduced mortality risks the most (80-90 percent) at the first two months of life and at a declining but nevertheless significant level at the older ages. The same finding emerges with the Cebu Longitudinal Health and Nutrition Survey (Guilkey and Riphahn, 1998) and with the 1998 National Demographic and Health Survey (Alcantara, Rodriguez and Cabigon, 2000). According to my 1990 study, the mortality risk faced by non-breastfed index children with previous short birth intervals was 19 and 7 times that encountered by breastfed index children with long preceding birth intervals ages 0 and 1-2 months, respectively. Mortality rates for non-breastfed index children preceded by birth intervals of less than 18 months and followed by another conception shortly after their births were, at ages 3-11 months 16 times, and beyond infancy 2-3 times, the mortality rates for breastfed and widely spaced index children. These findings obviously point to the importance of breastfeeding in the delivery of maternal and child health and family planning services to the Philippine populace.

My 1990 study using births in the last five years before the 1983 NDS reveal no significant independent effects of prenatal care, place of maternal delivery and birth attendance. However, those without any immunization at any given level of housing quality, are more likely to have higher risk of dying at ages 7 to 60 months than those with immunization.

With the most recent survey (Alcantara, Rodriguez and Cabigon, 2000), mothers who have sought prenatal care during pregnancy have a 34 percent reduced likelihood of having a child die in the first five years of life. Likewise, those who deliver at home have significantly higher risks of under-five mortality (by 137 percent) compared to women who deliver in a private facility. Not visiting a health facility in the past six months raises the risk of having a child die in the first 12 months of life by 49 percent. Mothers who received tetanus toxoid injections during pregnancy experience reduced risks of infant mortality by 35 percent and under-five mortality by 30 percent. Infants in provinces where the Local Performance Program (LPP) exists are 54 percent less likely to experience infant mortality compared to their counterparts in non-LPP provinces.

The above findings emphasize the importance of medical and preventive care during pregnancy, delivery and utilization of health facilities for infant, child or under-five survival. These are the top priorities of the DOH present administration in improving the health and life of Filipino infants and children.

Nutrition Covariates

As expected, all other things being equal based on the 1983 NDS (Cabigon, 1990) and the 1998 National Demographic and Health Survey (Alcantara, Rodriguez and Cabigon, 2000), those never given food supplement are more likely to die during the childhood ages 7 to 60 months than those ever given food supplement. Based on the Cebu Longitudinal Health and Nutrition Survey, low or high (>4 kg) birth weight babies have higher risks of dying compared to their normal weight counterparts (Popkin et al, 1993; Guilkey and Riphahn, 1998). These findings indicate the need to improve the advocacy campaign on food supplementation and proper nutrition and care of pregnant women.

Conclusion

Overall, the revisit of the trends and 'best' covariates of infant and child mortality provided confidence in reaching conclusions with respect to Philippine infant and child mortality in changing times. While other Asian countries have undergone dramatic rises in survival and economy, the Philippines has faltered in survival and economic performance and has followed a path of an ensuing plateau in infant and child mortality levels. Groups at higher risks of mortality, be it neonatal, post-neonatal, overall infant and child have clearly been identified. Programs to reduce the gap in mortality between such higher risk groups and lower risk groups are indicated to effect further infant and child mortality reductions.

References

- Alcantara, Astrid A. Ma. Victoria C. Rodriguez and Josefina V. Cabigon (2000). 'Determinants of Child Mortality and Morbidity' in J. V. Cabigon (ed) **Papers on the 1998 National Demographic Survey: Special Issue of the University of the Philippines Population Institute. PSSC Social Science Information** 28(2): 1-32.
- Cabigon, Josefina V. (1990). "Philippine Mortality in Changing Times". Unpublished Ph. D. thesis, Australian National University, Canberra.
- Cabigon, Josefina V. (1997). 'The Effects of Birthspacing and Breastfeeding on Childhood Mortality in the Philippines'. *Journal of Population* 3(1):1-18.
- Cabigon, Josefina V. (2001). 'Complete Life Tables for the Philippines as a Whole and Metro Manila for the Years 1960, 1970, 1980, 1990 and 1995'. *Philippine Quarterly of Culture & Society* 29(1/2):161-209.
- Cabigon, Josefina V. and Wilhelm Flieger (1999). **1995 Gender-Specific Life Tables for the Philippines, Its Regions and Provinces. Monograph No 17.** Manila: National Statistics Office.
- Cabigon, Josefina V. Chai Bin Park and Andrew Kantner (1994). 'Measuring the Effects of Child Death and Lactation on Subsequent Fertility in the Philippines: An Application of the Hazard Model'. *Philippine Population Journal* 10(1-4):56-80.
- Caldwell, John C. (1976). 'Toward a Restatement of Demographic Transition Theory'. *Population and Development Review* 2(3 and 4): 321-366.

- Caldwell, John C. (1979). 'Education as a Factor in Mortality Decline: An Examination of Nigerian Data.' *Population Studies* 33(3): 395-413.
- Caldwell, John C. (1986). 'Routes to Low Mortality in Poor Countries'. *Population and Development Review* 12(2):171-220. Also in 1989 in J.c. Caldwell and G. Santow (eds.). **Selected Reading in the Cultural, social and Behavioural Determinants of Health. Health Transition Series No. 1**, Canberra: Health Transition Centre, The Australian National University, pp. 1-46.
- Department of Health (1999). *National Objectives for Health Philippines 1999-2004*. Manila: Department of Health.
- Guilkey, D. and R. T. Riphahn.(1998) 'The Determinants of Child Mortality in the Philippines: Estimation of a Structural Model'. *Journal of Development Economics* 56:281-305.
- Gray, Ronald H. (1989). 'The Integration of Demographic and Epidemiologic Approaches to Studies of health in developing countries'. In L. Ruzicka, G. Wunsch and P. Kane (eds.) *Differential Mortality: Methodological Issues and Biosocial Factors*. Oxford: Clarendon Press, pp. 36-63.
- Hobcraft, John N., John W. McDonald and Shea O. Rutstein (1984). 'Child-spacing Effects on Infant and Early Child Mortality: A cross-National Comparison' *Population Studies* 38(2):193-223.
- Jha, S. A. Deolalikar and E. Pernia (1993) 'Population Growth and Economic Development Revisited with Reference to Asia' *Asian Development Review* 11(2)"1-46.
- Mosley, W. Henry and Lincoln C. Chen (1984). 'An Analytical Framework for the Study of child Survival in Developing Countries'. In W.H. Mosley and L.C. Chen (eds.) *Child survival Strategies for Research, Population and Development Review*. Supplement to Vol 10:25-45.
- National Statistics Office (NSO), Department of Health (DOH) [Philippines] and Macro International Inc. (MI). (199). *National Demographic and Health Survey 1998*. Manila: NSO and MI.
- National Statistical Coordination Board (NSCB) Task Force on Infant and Child Mortality Rate (1993) *Final Report of the Task Force on Infant Mortality Rate*. NSCB Technical Report Series No. 13-93. Makati City:: NSCB.
- National Statistical Coordination Board (2000). *Philippine Poverty Statistics*. Makati City: NSCB.
- National Statistical Coordination Board (2001). '2000 Poverty Incidence' Makati City: nscb.gov.ph.
- Orbeta, Aniceto C. and Ernesto M. Pernia (1999). 'Population Growth and Economic Development in the Philippines: what has been the Experience and what Must Be Done?' Discussion Paper Series No. 99-22. Makati City: Philippine Institute for Development Studies.

Park, Chai Bin, Josefina. V. Cabifgon, Josefa Zafra, Andrew Kantner, . and Marina Jose (1993) ‘The Determinants of Infant and Child survival in the Philippines’. Unpublished manuscript. Honolulu: Program on Population, East West Center.

Popkin, B.M., D.K. Guilkey, J.B. Schwartz and W. Flieger (1993). ‘Survival in the Perinatal Period: A Prospective Analysis’ *Journal of Biosocial Science* 25:359-370.

Population Reference Bureau (2001). *2001 World Population Data Sheet*.

Ruzicka, Lado T. (1989) ‘Problems and Issues in the Study of Mortality Differentials’ in L. Ruzicka, G. Wunsch and P. Kane (eds.) *Differential Mortality: Methodological Issues and Biosocial Factors*. Oxford: Clarendon Press, pp. 3-18.

United Nations ACC Task force on Basic Social Services for All (1997). *Basic Social Services for All 1997*. Wall Chart.

World Health Organization (1981) *Global Strategy for health for All by the year 2000, Health for All series, No. 3*. Geneva: World Health Organization.

Zablan, Zelda, C. (1988) *The Morbidity and Mortality Differentials: Philippines*. Final Country Report (Vol 1). ASEAN Population Program Phase III. Demographic Research and Development foundation. Quezon city: Population Institute, University of the Philippines.

Table 1. Selected Demographic and Economic Indicators for Selected Asian Countries

| Countries | Infant Mortality Rate (late 1990s) | Under-five Mortality Rate (early 1990s) | Underweight Prevalence Under 5 (early 1990s) | Population with access to health services (%) (early 1990s) | Population With access to Safe Water (%) (early 1990s) | Total Fertility Rate (1990s) | Population Mid-2001 (millions) | GNI PPP Per Capita, 1999 (US\$) |
|-------------|------------------------------------|---|--|---|--|------------------------------|--------------------------------|---------------------------------|
| Bangladesh | 66 | 106 | 67 | 45 | 97 | 3.3 | 133.5 | 1530 |
| India | 70 | 100 | 53 | 85 | 81 | 3.2 | 1,033.0 | 2230 |
| Nepal | 79 | 129 | 49 | - | 44 | 4.8 | 23.5 | 1280 |
| Pakistan | 91 | 115 | 38 | 55 | 60 | 5.6 | 145.0 | 1860 |
| Sri Lanka | 17 | 21 | 38 | 93 | 46 | 2.1 | 19.5 | 3230 |
| Cambodia | 95 | 150 | 40 | 53 | - | 4.0 | 13.1 | 1350 |
| Indonesia | 46 | 72 | 35 | 80 | 62 | 2.7 | 206.1 | 2660 |
| Laos | 104 | 161 | 40 | 67 | 39 | 5.4 | 5.4 | 1430 |
| Malaysia | 8 | 25 | 20 | - | - | 3.2 | 22.7 | 7640 |
| Myanmar | 92 | 105 | 43 | 60 | 38 | 3.3 | 47.8 | - |
| Philippines | 31 | 54 | 30 | 76 | 85 | 3.5 | 77.2 | 3990 |

| | | | | | | | | |
|-------------|-----|----|----|-----|----|-----|---------|-------|
| Singapore | 2.5 | 7 | - | 100 | - | 1.6 | 4.1 | 22640 |
| Thailand | 22 | 39 | 25 | 90 | - | 1.8 | 62.4 | 5950 |
| Vietnam | 37 | 64 | 45 | 90 | 36 | 2.3 | 78.7 | 1860 |
| China | 31 | 47 | 16 | 92 | 90 | 1.8 | 1,273.3 | 3550 |
| Japan | 3.4 | 6 | - | - | - | 1.3 | 127.1 | 25170 |
| South Korea | 8 | 15 | - | 100 | - | 1.5 | 48.8 | 15530 |

Sources: Population Reference Bureau 2001 World Population Data Sheet
United Nations ACC Task Force 1997 Basic Social Services for All.

Table 2. Indirectly Estimated Infant Mortality Rates per 1000 Births by Sex and GNP per capita in constant 1987 US\$, Philippines, 1960-1995

| Indicator/Sex | 1960 | 1970 | 1980 | 1990 | 1995 |
|-------------------|------------|-----------|-----------|-----------|-----------|
| Male | 120 | 95 | 66 | 61 | 54 |
| Female | 96 | 85 | 60 | 54 | 49 |
| Both Sexes | 108 | 90 | 63 | 58 | 52 |
| GNP | 827* | 644 | 952 | 653 | 736* |

*refers to 1962 and 1994.

Sources: For infant mortality rates, Cabigon, 2001
For GNP per capita, World Bank, 1998 as cited by Orbeta and Pernia, 1999.