Revisiting the 'Best' Covariates of Infant and Child Mortality: The Philippine Case

Josefina V. Cabigon

Introduction

The development of conceptual frameworks and appropriate methodological tools for analyzing child survival have greatly contributed towards the advancement of knowledge in understanding the underlying causes of infant and child mortality. Admittedly, the linkages between the socioeconomic, environmental, demographic, cultural, biological and behavioral factors, on the one hand, and infant and child mortality, on the other, are highly complex. In addition, one cannot realistically include all the factors that influence child survival due to inadequate 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. While results of efforts along this line have been gratifying, the need for further elaboration and clarifications still remain. Moreover, because of differences in underlying theoretical concepts, availability of reliable and valid data, and factor focus, the emerging analytical frameworks and statistical methods used also differ.

It is thus important to revisit these findings, put them together and further examine them carefully and objectively, so as to develop meaningful theories that will allow for a better understanding of the covariates of infant and child mortality. It is along these lines that this paper is developed. To set the proper perspective for its main portion, this paper first examines how the Philippines compares with selected Asian countries in terms of infant and child mortality, and some health-related, fertility, population and economic indicators. Then, the paper reviews trends in Philippine infant and child

mortality rate, economic performance, population size and total fertility rate.

Child Mortality, Fertility, Population Size, Health-related and Economic Indicators in Selected Asian Countries

Table 1 shows 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). However, these rates are 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, than those of Pakistan (91 and 115), Nepal (79 and 129), India (70 and 100), and Bangladesh (66 and 106) but much higher, than those of Sri Lanka (17 and 21). Compared with East Asian countries, the Philippine IMR is on par with China's 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, 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-five population among the abovementioned countries 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, and 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, on the one hand, and TFR, on the other.

With respect to population size, the Philippines' 77.2 million population is close to Vietnam. However, this number is much higher than that of 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 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 such countries as Indonesia (206.1 million), Pakistan (145 million), Bangladesh (133.5 million), and Japan (127.1 million).

As for the gross national income (GNI) in purchasing power parity (PPP) in US dollars, the Philippines' 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 however, better than that of Nepal ($1,280), Cambodia ($1,350), Laos ($1,430), Bangladesh ($1,530), Pakistan ($1,860) Vietnam ($1,860), India ($2,230), and Indonesia ($2,660). It is 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 GNI-PPP. However, the relationship is not that very clear as will be explained in the next section.

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

Trends in infant mortality in the Philippines based on indirect estimation techniques (Table 2), indicate a slight improvement (17 percent) in infant survival, with the IMR for both sexes dropping from 108 infant deaths per 1000 live births in 1960 to 90 in 1970, 63 in 1980 (30% decline), 58 in 1990 (8% decline) and 52 in 1998 (10% decline). Previous studies using different but comparable methods of estimating IMR found a very rapid decline in IMR between 1953 and 1957, which slowed down during 1960 to 1976, and quickened from 1978 until 1982 (Cabigon, 1990; Zablan, 1988). Official estimates based on national surveys even indicate a fluctuating pattern in IMR 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). The 1978 Republic of the Philippines Fertility Survey and the National Demographic Surveys in 1983, 1988, 1993 and 1998 (NDS) noted a 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 (NSO, DOH & MI, 1999).

This sluggish or non-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 (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 appears that national economic trends are 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) 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, given that the Philippines' GNP-PPP is almost half of that of Malaysia and five times lower than the advanced countries, there are clear indications that the country has been grappling with its economic problems, which consequently have affected the production and distribution of food, and the availability and quality of services related to water, education, housing, sanitation, and health care. 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 (DOH, 1999).

What is even more puzzling is that improvements in infant mortality in the Philippines have slackened despite the fact that female educational attainment and women's status in the country are among the highest in Asia (e.g., on par with Singapore, Hongkong, and Sri Lanka in terms of literacy, and secondary education as of 2002, according to the Population Reference Bureau, 2002). This runs counter to the findings of studies (e.g., Caldwell, 1976 and 1979) that have shown that education is a major factor affecting child mortality. Specifically, it has been argued that because better educated mothers become less fatalistic about illness and become more influential in family decision-making, higher maternal education brings about improvements

in the health status of the children. Why this relationship between maternal education and child survival has not strongly manifested in the Philippines can perhaps be partly explained in terms of Caldwell's findings (1986, 1989) on infant mortality declines in China, Costa Rica, Kerala, and Sri Lanka. Caldwell noted that these countries experienced drastic declines in infant mortality mainly through the political will of their governments, which earmarked a large proportion of the national budget for education and health. As earlier pointed out, economic problems have made it difficult for the Philippine government to provide adequate health services for the population.

The Philippines has also fallen far behind its neighboring East and Southeast Asian countries in population growth reduction. The Philippine population is still growing above two percent per year resulting in a population size of 76 million in 2000. Historically, it rose from 37 million in 1970, 48 million in 1980, and 62 million in 1990. Its TFR has declined the slowest in Southeast Asia in the past 25 years, from 6.0 to 3.7 children per woman, or a 38% decline. Thailand registered the fastest fertility decline during the same period, from 6.4 to 2.0 (69%); followed by Indonesia, from 5.6 to 2.8 (50%); then by Singapore, from 3.1 to 1.7 (45%). Malaysia's fertility rate declined by 40%, from 5.3 to 3.2, during the same period. Strikingly, Vietnam's TFR has remarkably gone down in ten years by 50%, from 4.6 to 2.3.

The erratic trends in infant and child mortality in the Philippines need further examination. In particular, it is important to identify which factors persist and which ones disappear or emerge to be greatly affecting infant and child mortality in the country, i.e., the 'best' covariates of Philippine infant and child mortality.

The Socioeconomic and Health-related Covariates 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) for analyzing infant and child mortality 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 developing countries in operationalizing the whole framework is the unavailability of data, particularly those pertaining to the proximate determinants. It is encouraging, however, that several studies using Philippine data have drawn heavily on this framework. Each study used 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, presented in the sections that follow.

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 education were strongly associated with post-neonatal and child mortality in the Philippines. In particular, they found that mother's education as a factor on post-neonatal and child mortality in the Philippines is comparable with that of Kenya, Indonesia, Korea and Malaysia. Husband's education likewise influences post-neonatal and child mortality in the Philippines and in countries such as Senegal, Kenya, Mexico, Costa Rica, Bangladesh, Indonesia, and Sri Lanka. The analyses of Cabigon (1990, 1997), Park et al. (1993) and Alcantara, Rodriguez and Cabigon (2000) found the same patterns as Hobcraft, et. al., with maternal educational attainment emerging as a strong determinant of early and late childhood mortality.

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

Stated differently, although births to highly educated mothers tend to show the lowest risk of neonatal mortality, variations in neonatal mortality risks 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. It could be a reflection of differentials on mother's level of knowledge on nutrition, care of the mother during pregnancy, conditions of maternal delivery, or length of preceding birth interval.

Moreover, among those with unsafe sources of drinking water at any given type 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. However, those with safe sources of drinking water but no toilets, and with college educated mothers, are likely to experience the highest infant mortality. Similarly, college educated mothers may experience high infant mortality in a situation of low household income and absence of toilet facility. 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 good hygiene practices. 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 analyses have consistently established education as the strongest covariate of infant and child mortality, there seem to be other important countervailing factors causing the sluggish mortality improvement in the Philippines. Nonetheless, policy efforts to upgrade the formal education system should be sustained because studies have shown that a minimum high school education can significantly reduce infant and child mortality. Directing short-term educational programs toward women (especially out-of-school youth) and domestic helpers or care givers for children can also be incorporated in community-based health programs.

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 that 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 of infant mortality, 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 to improving their educational levels. Moreover, this suggests that infant and child mortality has not significantly declined in the Philippine in recent years because of poverty.

With respect to the covariates of child mortality, analysis of the 1983 National Demographic Survey data revealed that the strongest 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. Meanwhile, for any given level of education and type of toilet facility, the general pattern of lower child mortality risks with higher income persists. 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

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not be enough, unless the attained education translates to income that augments the husband's income. In connection with this, 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 times more likely to experience an infant and child mortality in the first five years of life, respectively, compared to the richest 20% of households.

Source of drinking water and toilet facility. In my analysis of the 1983 National Demographic Survey, (Cabigon, 1990), I found the presence of toilet affects post-neonatal mortality the least. However, its effect is direct while its net effects on overall infant mortality are in the expected direction of negative association, 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), toilet facility had the sharpest association with infant mortality and was the second most important covariate of child mortality.

The insignificance of source of drinking water on neonatal, post-neonatal and child mortality is consistent with the finding of Martin et al (1983) of its insignificance on child mortality. Source of drinking water has an independent effect only with overall infant mortality with both provinces and births as units of analysis in my 1990 study. However, while its effect is in the expected direction with provinces as units of analyis, its effect is in the unexpected direction with births as units of analysis; i.e. those with unsafe sources of water supply are more likely to experience lower infant mortality than those with safe sources of drinking water supply in most levels of education and toilet facility. Specifically, infant mortality is higher among those with safe source of drinking water but with at least elementary or college educated women, or with either no toilet facility or with toilet facility outside the dwelling unit than their counterparts with unsafe source of drinking water. The same pattern of high infant mortality is observed among high school educated women with toilet facility either inside or outside the dwelling

unit. 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 the misreporting of the type of drinking water source. It is possible that some respondents in the survey reported unsafe sources as safe. 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. 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. Knowing their sources of drinking water as unsafe, most mothers with at least an elementary education may have been boiling the water before consuming it. Thus, it may be the behavioral practices rather than the source of drinking water *per se* that was measured in the survey. This explanation is deemed more plausible than attributing the findings to misreporting.

Third is the manner of transporting water 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 manner it is stored are important factors to be considered for this segment of the population. A cross-tabulation of infant mortality by maternal education and the most detailed categories of source of drinking water supply (while controlling for urban and rural residence) shows that infants of more highly educated mothers, who are more likely to afford tap water inside their houses, are likely to experience lower infant mortality than those with other sources of drinking water, irrespective of whether they are in urban or rural areas. In effect, as expected, piped water inside the house compared to piped water from public source would be much better.

Strikingly though, the 1998 National Demographic and Health Survey found that 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 in the analysis. Again behavioral practices such as boiling water for drinking or improved drinking water systems implemented in and toilet facilities through sealed toilets being distributed to most barangays by the government are plausible explanations.

Quality of housing. My 1990 study on infant and child mortality 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 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 of Infant and Child Mortality

Analysis of the 1983 National Demographic Survey (Cabigon, 1990) showed that three health-risk factors, viz. preceding birth interval, birth order, and maternal age at child birth, are the 'best' covariates of neonatal mortality. The prominence of all three factors corroborates the findings of several studies that biological or medical, rather than environmental factors are associated with neonatal mortality. Birth order and maternal age at childbirth emerged as important predictors of post-neonatal, overall infant, and child mortality. The effects of birth order were negative on neonatal, but, 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. This differential suggests that older women are more experienced than younger women in caring for an older child to prevent child loss through death.

Stated differently, first births or any birth to mothers at relatively younger ages of reproduction experience the highest risk. 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. These groups should be primary targets and be given 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 termed the index child (Cabigon, 1997). Mortality as the dependent variable was examined at 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. The control variables included 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 revealed preceding birth interval to be highly significant at any given age segment even with the introduction of the pace of following conception. The net influence of preceding birth interval was stronger at ages 3-11 months than at other age segments. The effects of the pace of following conception were also in the expected direction and were highly significant at age segment 5-11 months among births between five and 16 years before the survey, and at segments 3-5 and 5-11 months among births between one and six years before the survey.

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 parents tended to replace the lost child. If the existing family size exceeded their norm, parents have little 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 for care and resources between siblings. As stated earlier, to measure the effects of these variables, one needs to carefully specify estimating models that would identify their effects on child mortality in specific age segments in months of the index child. My 1997 study on birthspacing and breastfeeding effects on child mortality revealed that 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, such that short preceding birth intervals heighten mortality risks, appears to be the more likely mechanism through which preceding birth interval affects child mortality. These findings define targets requiring top priority in the implementation of family planning and reproductive health programs.

Proximate Covariates of Infant and Child Mortality

A separate log-linear rate analysis of the 1983 National Demographic Survey (Cabigon, 1997) has established the marked importance of breastfeeding in preventing infant and child mortality in the Philippines. 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). Results of my 1990 study showed that the mortality risk faced by non-breastfed index children with previous short birth intervals was 19 and seven times greater than that encountered by the 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 revealed no significant independent effects of prenatal care, place of maternal delivery, and birth attendance on infant and child mortality. However, those without any immunization at any given level of housing quality are more likely to have higher risk of dying at ages seven to 60 months than those with immunization.

Findings of the most recent survey (Alcantara, Rodriguez and Cabigon, 2000), indicate that 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 provinces were LPP is no implemented. It must be stated here that improving the quality of life of children and women are LPP main thrusts.

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

Nutrition Covariates

As expected, all other things being equal, those never given food supplement are more likely to die during the childhood ages seven to 60 months than those ever given food supplement (Cabigon, 1990; Alcantara, Rodriguez, and Cabigon, 2000). Based on the Cebu Longitudinal Health and Nutrition Survey, babies that are either underweight or overweight. 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 further analyses 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 yield further infant and child mortality reductions.

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Table 1. Selected demographic and economic indicators for selected Asian countries

Countries	Infant Mortality Rate (late90s)	Under -5 Mortality Rate (early 90s)	Underweight Prevalence Under -5 (early 90s)	% of Pop'n with access to health services (early 90s)	% of Pop'n with access to safe water (early 90s)	Total Fertility Rate (1990s)	Pop'n Mid-2001 (mil)	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	56	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	15	92	90	1.8	1,273.3	3550
Japan	3.4	6	-	-	-	1.3	127.1	25170
So. 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. Indirect estimates of 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 sex	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.