NOTES ON MORTALITY RESEARCH

Discussion of related papers presented at the International Population Conference of the International Union for the Scientific Study of Population (IUSSP), held in Manila, Philippines, December 9-16, 1981[1]

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Under natural conditions, the levels of mortality of a population constitute valid proxies of the levels of its underlying morbidity. Under the same circumstances, the extremely complex interrelationships responsible for the morbidity status of the population also determine mortality rates. In fact, results of different analytic approaches indicate that there are associations between the socioeconomic, cultural and educational characteristics of the family and the infant and child mortality rates (1).

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The same factors are determinants of the health and nutritional status of a population (2).

The associations of morbidity and mortality rates of a population with its social and economic characteristics have made the former valid indicators of socioeconomic development. Moreover, it is assumed that improvement of the socioeconomic and educational levels of the population will trigger the sequence of events postulated in the theory of epidemiological transition. According to this theory, high death rates begin declining in response to economic development and advances in sanitation and preventive medicine, while the response of birth rates lags behind. This differential response between birth and death rates leads to higher rates of natural population increase and produces what is sometimes referred to as a "population explosion". Finally, with rising living standards, birth rates also respond to development and begin declining. This brings birth and death rates into balance, and a decline in population growth (3, 4).

The propositions contained in the theory of epidemiological transition, however, have been modified by other factors such as health, nutritional, and family planning services. These programs are presently reducing the mortality rates in most countries, even though they are not affecting the underlying causes of death. Furthermore, the effects of most programs are not evenly distributed at community level; those better able or better prepared to receive their services benefit most (5). Consequently, these programs may be widening the gap between extreme socioeconomic groups within the community. Moreover, by focusing on the mother and child dyad as the more vulnerable population group, health and nutritional programs neglect the functional unit of society, which is the family. Once the differential impacts of social programs within a community or a family begin to occur, the interrelationships initially found between socioeconomic characteristics of the family and mortality rates may disappear (6).

Key pieces of this complex puzzle were addressed by the papers presented at the session on determinants of late fetal, infant and child mortality changes.

Caldwell and McDonald presented data on the role of maternal education on infant and child mortality (7). Caldwell had previously reported a negative association between mortality and education found in Nigerian data (8). Preston (6) has argued that advances in female education may represent a cost-effective means

for reducing child mortality. In a previous meeting held in Mexico, Behm (9) presented abundant information suggesting that maternal education powerfully differentiates among child mortality levels in Latin America, and Cochrane (10) compiled confirmatory evidence for other regions. In Caldwell and McDonald's paper (7), the authors further explored the interrelationship between education and mortality utilizing world fertility survey data from ten developing countries. The general results point to a strong negative association of maternal and paternal education level (number of years completed in school), especially that of the mother, with infant and child mortality. These findings also give partial support to the hypothesis of a reduction of mortality due to community development. In fact, one important component of community development efforts in developing countries has been the upgrading of the population through education.

The question of whether the above association is a spurious or a causal one however, still remains unsolved. Since education is also significantly associated with socioeconomic and cultural variables, the observed association may well be spurious. The authors (7) partially explore this possibility by taking into consideration gross measures of other variables for which data are available in these surveys, such as occupation and rurality. They conclude that these variables do not explain the observed association between education and mortality. Based on these results, the authors therefore suggested that improved utilization of services and resources available to the family could be one of the mechanisms by which education affects mortality. Other papers presented in this session analyzing data from Bangladesh (11), India (12), Brazil (13), Togo (14), and Argentine (15) also found a negative association between education and infant and child mortality.

Some findings in rural Guatemalan populations may contribute to the interpretation of these results. First, it has been found that mortality rates are higher for children of shorter mothers than for children of taller mothers, after adjusting for maternal age and parity (16). This association holds for rural Indian population without formal education, as well as for rural *ladino* (of Spanish descent) populations with access to formal education. It is well known that 75% of maternal stature is achieved at around seven years of age; therefore, high or low maternal statures reflect good or poor past nutritional status of the mothers. A second related finding is the existence of a positive association

between school performance and the height of children of school ages (17). This relationship between past nutritional status of children and school performance remains significant after controlling for indicators of home stimulation and socioeconomic status. Therefore, it could be suggested that attained educational levels are proxies of better prepared (more able) individuals or better prepared families. Incidentally, it has been shown that taller women in poor communities frequently marry taller men (18). The same seems to be true for educational level and socioeconomic conditions.

Based on the afore-mentioned findings, it is clear that poor socioeconomic conditions entail economic, cultural and biological deprivation which are transmitted from generation to generation. Therefore, in any developing country, the lower socioeconomic group woman is shorter, has almost no formal education, works more during pregnancy, and generally has poorer health. She is also more likely to have a smaller pelvis and a poorer diet during pregnancy; consequently, she has a higher probability of having a low birthweight baby and an inadequate lactation period. In addition, women of low socioeconomic groups are more likely to delay seeking prenatal care. Since each of the above factors has been shown to be associated with a high risk of infant mortality (19), they could therefore partially explain the association found between infant mortality and education.

The Allman and Rohde (20) and Chen *et al.* (21), presentations were related to the impact of specific interventions on infant and child mortality. Allman and Rohde focused theirs on the ways in which family planning may reduce mortality rates in both developing and developed countries, providing very clear examples. On the other hand, Chen *et al.* presented data supporting the hypothetical estimates of Allman and Rohde, and showed that the introduction of family planning services in rural Bangladesh affected the crude mortality rate through age structure changes. Other specific health interventions analyzed by Chen *et al.* were the tetanus immunizations to mothers during pregnancy and the utilization of oral rehydration therapy in cases of diarrheal diseases, which proved to lower mortality rates. It should be pointed out, however, that the tetanus immunization program had a low overall impact because of the poor acceptance of the vaccine. This is an unfortunately common experience. Technology that proved to be successful in pilot studies, fails when implemented in larger population groups. These examples

and others from Guatemala, demonstrating that less than 50% of children suffering from severe diarrhea actually attend the available free health services (22), indicate the need to integrate educational activities and improve supervision with the provision of services in health care programs.

Allman and Rohde's findings regarding the apparent negative effect of an otherwise successful health intervention on the nutritional status of the population deserve further comment. In Haiti, the authors found that a health program produced a substantial reduction in infant mortality rates, but deteriorated the nutritional status of children below five years of age. A decline in infant nutritional status has also been found in a simplified health care program in rural Guatemala (20). This is due in part to the survival of infants, mostly malnourished, who would have died had there been no intervention.

Various other papers focused on specific actions aimed to decrease infant mortality rates. These actions should be adapted to the needs of each population group, and planners should take into account the sociopolitical constraints that influence maternal and child health status. As immediate actions, integrated primary health care programs with a strong educational component, and utilization of paramedical personnel as well as of appropriate technology, may be most effective. Health and nutritional education should be aimed at achieving changes in behavior. This could be done by the implementation of educational programs that follow the principles of social learning theory. This theory implies that modification of behavior will be obtained through stimulation, participant modelling and reinforcement. Programs based on this model are increasing in the health education field. Educational programs should focus on environmental sanitation and hygiene, infectious diseases, and food and nutrition, including food production, selection, acquisition, conservation, preparation, distribution, and consumption. In the long term, however, the most effective actions in developing countries will be those oriented to tackle not only common health and nutritional problems, but also the social and economic context in which they occur.

As a final comment, it is important to stress the need for performing analyses on mortality rates by categories of functional groups. For example, analyses of infant and child mortality rates by occupation of the father could constitute useful information for socioeconomic planning.

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