Forum: Adult mortality

The World Bank's recent publication, *The Health of Adults in the Developing World*, edited by Feachem, Kjellstrom, Murray, Over and Phillips, is both a response to concerns that adult mortality has been receiving insufficient attention and a challenge to governments, public-health workers and researchers. We present some different perspectives.

The health of adults in the developing world: the view from Bangladesh*

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Introduction

It is rare for a book to simultaneously point out a neglected research area, convincingly demonstrate the importance of the area through research and analysis, and set out an agenda for both action and research. *The Health of Adults in the Developing World*, by Richard Feachem and others in the World Bank group, does just this. One of their findings, which influenced much of their own research, is that very little good information exists on adult ill health and its consequences in the developing world. Rather than debating the significance of adult health I would like to add some data from Bangladesh, a poorer developing country than those considered by the World Bank group, to the discussion.

Data from Matlab, Bangladesh

Since the early 1960s the ICDDR,B, formerly known as the Cholera Research Laboratory, has been conducting research in a rural area known as Matlab, which is about 55 kilometres from Dhaka. In order to follow the effects of cholera vaccine trials, and later other health interventions, a vital registration system was established there in 1966. Since then field workers have regularly visited every household in the area, initially every other day and now fortnightly. At each visit all vital events: births, deaths, marriages and divorces, and migrations, which have occurred since the last visit, are identified. At each monthly visit the area supervisor, in consultation with the field worker, fills out the registration form for each event, which is then computerized and checked. The population now under surveillance numbers just over 200,000, and is the largest population under intense observation for this long in the developing world.

Several pieces of information which are routinely collected in Matlab make these data useful for examining adult mortality and its effects. Age is well recorded, although probably better for children,

*The Demographic Surveillance System of the ICDDR,B has been supported by a number of donors since 1966, and is currently funded by the government of the Netherlands and by the UNDP. The ICDDR,B is funded by countries and agencies which share its concerns about health and population in the developing world. I am grateful to Prof. Richard Feachem for calling my attention to this topic in 1988, and to the World Bank for the seed money to start this work. I wish to thank Karen Allen and Demissie Habte for comments on an earlier draft of this paper.

whose births are registered or who in-migrate at an early age making gross errors unlikely. Since surveillance began in 1966, and was based in part on earlier preliminary work, many young to middle-aged adults today will have entered the system at an early age, reducing the possibility of severe age misreporting. The Matlab field workers live in the area in which they work and most have been working there for 15 years or more. During this time they have developed a close rapport with the people in their areas which enables them to obtain better answers to questions like age than would be otherwise possible.

Whenever a death takes place in the surveillance area the supervisor tries to determine a cause of death. The methods used, as well as the classification schemes, have changed over time, as described by Zimicki et al. (1985) and Fauveau et al. (1991). Changes have generally reflected both the current research interests of the institution and the skill level of the field workers. Initially the registration forms had several boxes, one for each cause of death, which the interviewers simply ticked off. Gradually space was provided for additional comments by the field workers. These comments were taken into account by the cause-of-death coders. Since 1987 a verbal autopsy procedure has been in place. Field supervisors visit each household where a death has taken place, interview surviving family members, and write down in a somewhat structured narrative all of the events and symptoms which preceded the death. One medically trained coder then determines the cause of death and codes it using a modified WHO ICD-9 classification scheme. Analysing trends in individual causes of death (anything from tetanus to murder) over the period since 1966 is virtually impossible since the system has gone through so many changes. Following aggregate groups of causes, such as those proposed in the World Bank volume, does appear to be practicable, as seen below.

The final pieces of information which are entered whenever a vital event occurs and which make the surveillance system a very powerful tool for research, are the identification numbers of the individuals involved. This enables us to follow people longitudinally over time, as we do below to determine the subsequent survivorship of children in households where an adult death has taken place. The ability to link high-quality information on a large population over time makes the Matlab data unique.

Levels and trends in adult mortality

The expectation of life at birth for the population in the Matlab vital registration area has increased from 50-52 years in 1966 to about 62-63 years in 1990. This modest increase occurred despite several setbacks, as shown in Figure 1.

Dramatic but temporary declines in the expectation of life correspond to the dislocations caused by the War of Liberation in 1971 and the 1974-75 famine.[1] The more gradual decline in the early 1980s is probably due to the appearance of *Shigella* in Matlab.[2] Although the estimates for 1989 and 1990 are still provisional, it appears that female life expectancy at birth is now higher than that for males in Matlab.

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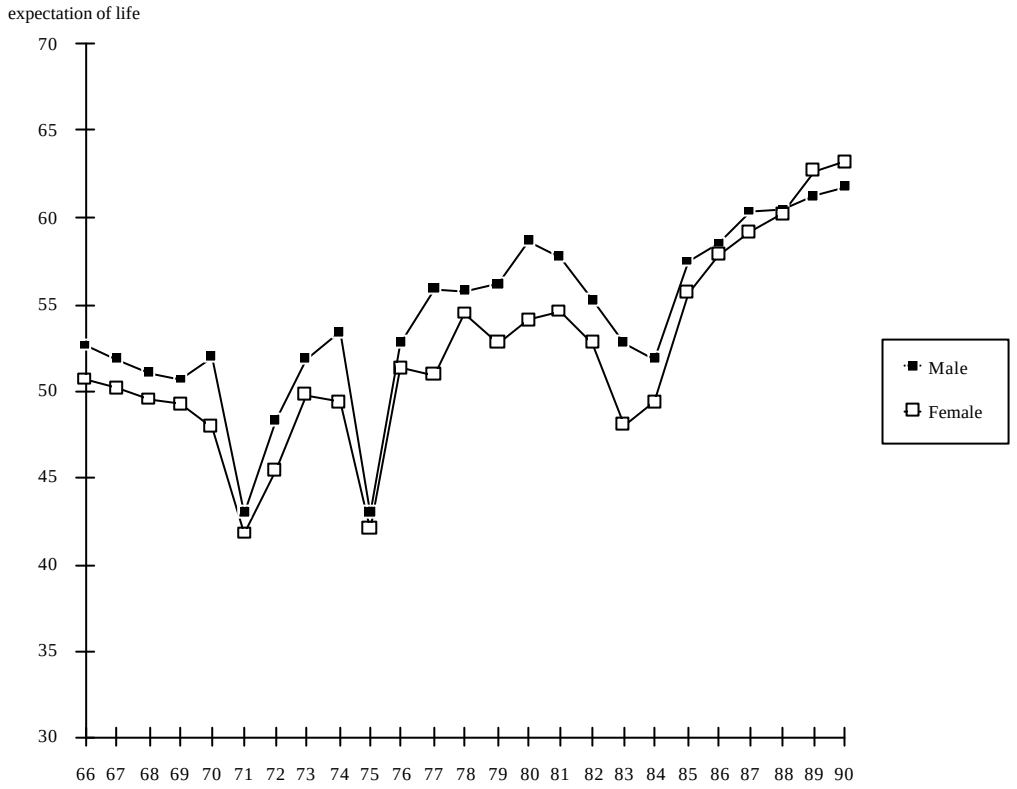
[1] For a discussion of the demographic impact of the war see Curlin et al. (1976). The effects of the famine are examined in Dyson's articles (1991 a and b); by Chen and Chowdhury (1977); and by Razzaque (1989).

[2] The annual reports of the Demographic Surveillance System show a steady increase in death rates due to acute and chronic dysentery from 1981 to 1984. Unpublished data from the ICDDR,B's hospital and laboratory in Matlab show an increase in clinically diagnosed dysentery between 1982 and 1985, and a corresponding increase in the proportion of *Shigella* found in cultured samples. Many of these cases were resistant to existing antibiotics; the subsequent decline may reflect the introduction of newer drugs.

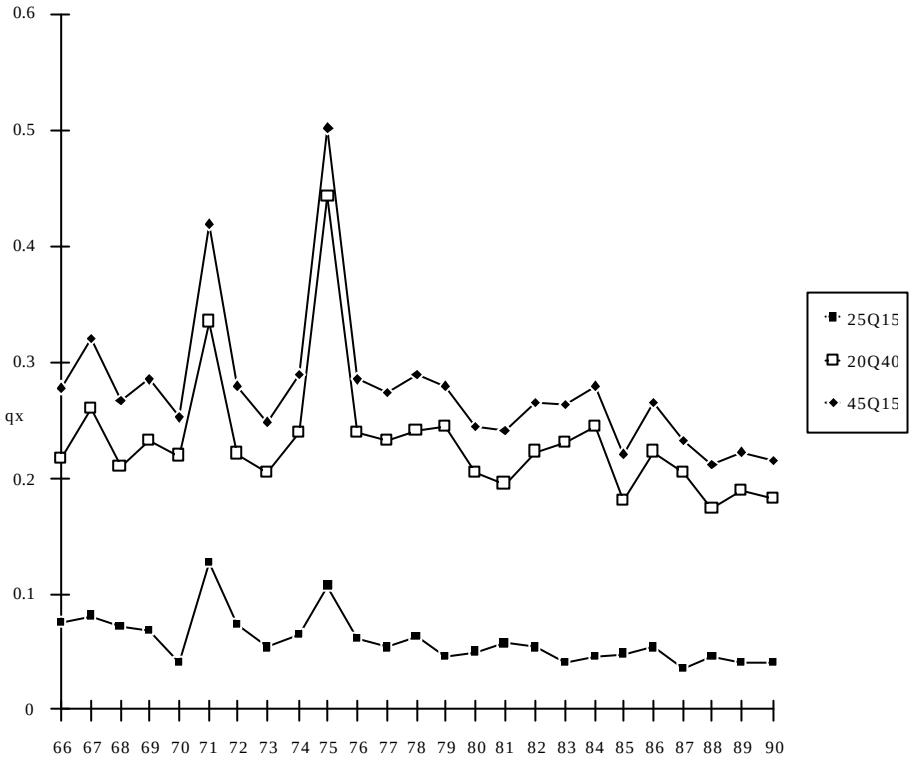
Figure 1
Expectation of life at birth, Matlab, 1966–90



Most of the 20 per cent increase in life expectancy is a recent phenomenon, and most of it is due to declines in infant and child mortality since about 1984. In part these mortality declines are a result of the Maternal and Child Health - Family Planning project which operates in half of the Matlab area. Since 1977 this project has recruited female health workers from each village, trained and supervised them, and has had them visit each household fortnightly. These workers now immunize women and children, treat mild to moderately severe respiratory and diarrhoeal diseases, and refer more severe cases to nearby clinics. The majority of these health interventions began after 1981. In the half of the surveillance area not covered by this project, infant and child mortality has also been falling, although not as rapidly. The decline there is probably due in part to government health programs and immunization, and to the availability of a wide range of inexpensive antibiotics from village pharmacies and health practitioners. Between 1978 and 1990 the death rate of children one to four years old fell by 76 per cent in the MCH-FP area and by 58 per cent in the comparison area.

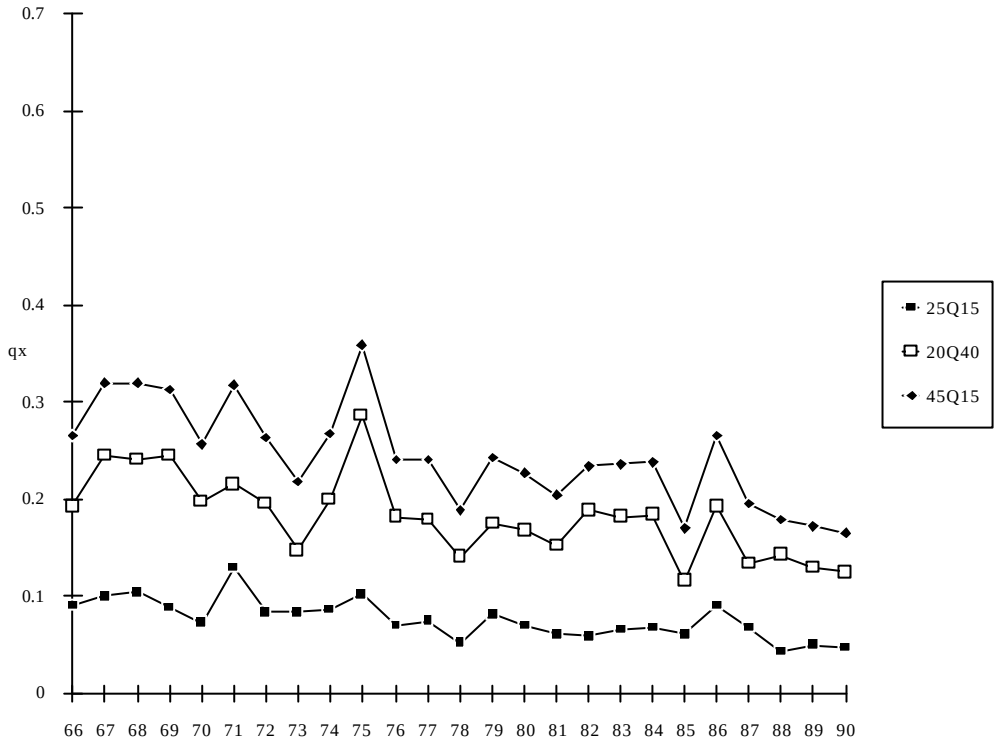
As shown in Figures 2 and 3, the declines in adult mortality in Matlab have been much more gradual.

Figure 2
Adult male mortality in Matlab, 1966–90



Adult male mortality declined from a $_{45}q_{15}$ (the probability of a person age 15 surviving 45 years to age 60) of about 0.30 in 1966-67 to 0.22 in 1992, roughly the same as the decline in adult mortality in Chile during the same period and higher than, but parallel to, the decline in Singapore (Feachem et al. 1992:41). Declines in adult female mortality in Matlab have been somewhat more pronounced, with female $_{45}q_{15}$ in 1966-67 of 0.30 falling to 0.17 in 1990. These probabilities are much higher than the $_{45}q_{15}$ values for women in Chile, Singapore, Sri Lanka, Costa Rica, or China for the same period, but the Matlab decline parallels theirs. Despite the extremely high levels of maternal mortality suffered by women in Matlab, their adult mortality experience is generally better than that of men in the area. Young adult mortality, the probability of dying between age 15 and 40 ($_{25}q_{15}$), has been slightly higher for women than men since 1966. Older adult mortality, the probability of dying between age 40 and 60 ($_{20}q_{40}$), as well as overall adult mortality, has been lower for women every year since 1970.

Figure 3
Adult female mortality in Matlab, 1966–90



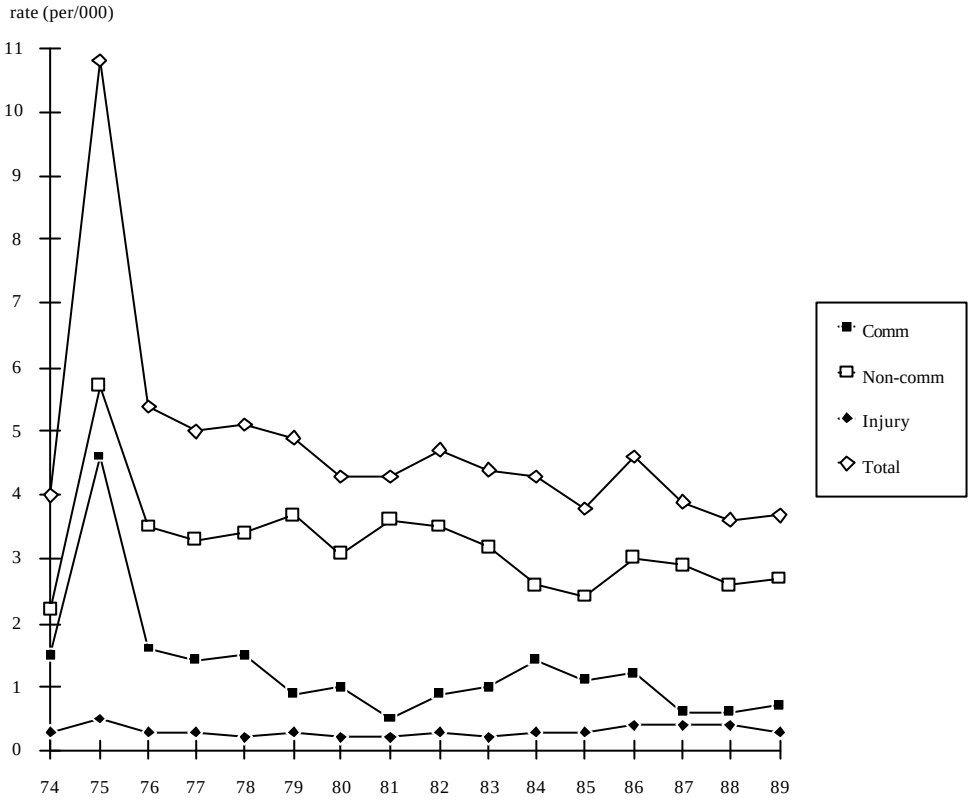
Causes of adult deaths in Matlab

In order to compare the Matlab results with those presented in the World Bank volume, deaths each year were divided into the three groups which Feachem et al. (1992) used. These are communicable, including diarrhoea, tuberculosis, respiratory infections, and neonatal deaths, and reproductive; non-communicable, including neoplasms, diabetes, cardiovascular, chronic respiratory diseases, and senility; and injuries, including accidents, suicide, and homicide. Despite the potential problems with reporting systems and classification schemes mentioned above, the series for young and old adults are remarkably smooth, with spikes due to known events and with no major discontinuities when field or office systems changed.[3]

Figures 4 and 5, showing death rates for the three broad groups of mortality causes from 1974 to 1989, indicate that it is perhaps too soon to talk about a cause-of-death transition in Bangladesh.

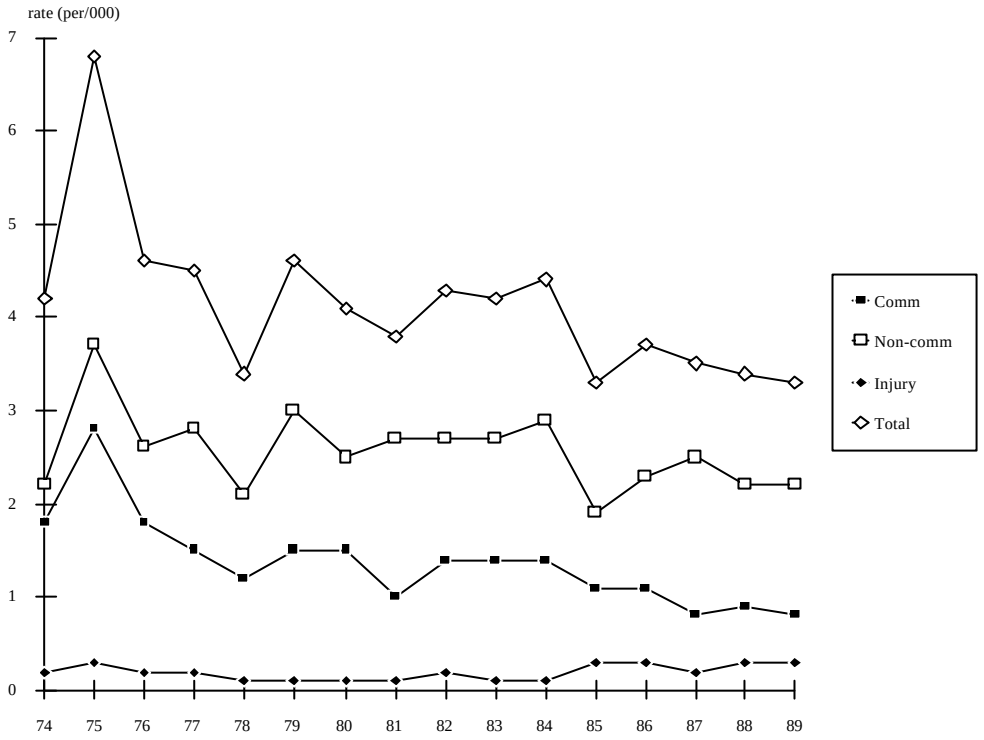
Figure 4
Adult male mortality by group of mortality causes, Matlab, 1974–89

[3]The anomalous one-year decline in the noncommunicable death rate for older adults in 1985 is under investigation.



As was found by the World Bank study (Feachem et al. 1992:60), for men aged 15 to 59 noncommunicable diseases account for most deaths, but there has been only a slight decrease in this cause in the past 15 years. Unlike the countries the World Bank group examined, communicable diseases are the second leading cause of death in Matlab, followed by injuries. There has been a slight downward trend in the former and an upward trend in the latter. The rates for communicable diseases and injuries have been roughly the same among men 15 to 39, primarily because deaths due to communicable diseases are fairly rare in this age group.

Figure 5
Adult female mortality by group of mortality causes, Matlab, 1974–89



For women aged 15 to 59 the death rates due to injuries and to communicable diseases, including maternal causes, are roughly the same as men's. It is women's lower rates of death from noncommunicable causes which have kept their overall rates below men's. Women aged 15 to 39 have about the same mortality rates due to injuries and noncommunicable causes as do men in that age group; their rates of death due to communicable diseases pushes their overall rate above men's. Women aged 40 to 59 have lower mortality rates for all three cause groups, especially noncommunicable and injuries, so that their survival in this age group has always been better than men's. Unlike the developing countries examined by the World Bank group, in Bangladesh the difference between the sexes is not due to lower injury rates or high communicable disease rates among women but rather to their lower rates of noncommunicable diseases.

Consequences of adult mortality

Chapter 4 of the World Bank book states that 'adult ill-health can harm the health of, and even kill, other household members' (Feachem et al. 1992:164). The authors then go on to review one study from nineteenth century Sweden and two from Matlab documenting the dramatic impact which the death of a mother has on the survival chances of a newborn child. They also present some preliminary results which I provided, which look at the mortality experience of children in Matlab following the death of an adult in their household. These data indicate that children, and especially girls, are much more likely to die if their mother died during the preceding two years. These results were based on only one year of adult deaths and two years of subsequent child experience (1983-85). This analysis has recently been

extended to 1983-89 (Strong 1992), confirming the previous results, although the effect shown is perhaps a little less dramatic.

In my study all households in Matlab experiencing an adult death in each calendar year between 1983 and 1987 were first located in the computerized data base. Then all children under ten years old in these households were identified, as well as their relationship to the deceased adult. These children were then traced for the 24 months following the adult death. Children in households without an adult death were also followed for 24 months, starting from 1 July of each calendar year. The survivorship of each child was then determined. The number of children in each category is shown in Table 1. These observations were then separated into different groups depending on the age of the child at the start of the interval, under the assumption that different types of mortality risks are present at different ages.

Table 1
Number of adult deaths and subsequent child deaths, Matlab, 1983–89

	Child dies		Child survives		Percentage dying	
	Son	Daugher	Son	Daugher	Son	Daugher
Father died	9	16	617	526	1.5	3.0
Mother died	32	37	407	337	7.9	11.0
Neither died	2,094	3,067	157,206	143,128	1.3	2.1
Ratio (%)						
with adult death	1.1	1.4				
no adult death	1.4	5.1				

Several control variables were included in the multivariate analysis of these data. Roughly half of the children were in the MCH-FP treatment area, where they receive good immunization coverage and some treatment and referral for diarrhoeal and respiratory diseases and malnutrition. A dummy variable was used to indicate whether or not a child was in this area. Dimension of the house, measured during the 1982 census of Matlab, has been successfully used as a measure of socioeconomic status in other studies and was therefore included here. Finally a dummy for the year in which observation began was included to examine trends in survivorship.

Expected probabilities of dying within 24 months of the start of observation for each age group of children are shown in Table 2. For children who are under one month old when they enter observation only the death of their mother significantly affects their survival chances, and that effect is dramatic: 70 per cent of them will die during the next 24 months. This probability is unaffected by socioeconomic status or residence in the MCH-FP area, and is virtually the same for boys and girls. (Note that this group is not the same as a birth cohort; these children have survived until the death of an adult or July 1 of the initial year.)

Table 2
Expected probabilities of dying within 24 months of start of observation, Matlab, 1983–89

Age of children	Father died	Mother died	Neither died
Less than 1 month			
son	–	0.697	0.061
daughter	–	0.737	0.073

1 month to 11 months			
son	–	0.263	0.034
daughter	–	0.368	0.055
12 months to 59 months			
son	–	0.044	0.015
daughter	–	0.078	0.027
60 months to 119 months			
son	0.008	0.016	0.003
daughter	0.011	0.020	0.004

Note: SES (dimension of dwelling), year, and MCH area held at mean values

For children one to eleven months old at the start of observation, the impact of a mother's death is half what it was for neonates, and the sex differential has increased dramatically, with girls about 40 per cent more likely to die than boys. Living in the MCH-FP area, or living in a better-off household, reduces the risk of death, but the death of a father still had no significant effect on survivorship. For children aged 12 to 59 months and 60 to 119 months the same pattern emerges, with death of father only becoming significant in the oldest age group. Probabilities of dying are lower in these age groups, but the sex differential reaches a maximum for children 15 to 59 months, where daughters, compared to sons, are almost twice as likely to die following their mother's death.

This study raised several important questions which are currently being investigated. The first of these is related to the causes of the adult and child deaths, and the interval between them: how many of the child deaths are medically related to the adult death, either through complications of delivery, or through the same infection or accident? A more fundamental question deals with care and feeding of children following the death of a mother: how does the household composition, including the possible remarriage of the father, affect child survival? And finally, why is the death of a father only important for children five to ten years old? Are economic safety nets at work which protect most younger children from this loss or is mortality too crude a measure of the long-term impact of a father's death?

Conclusions

These results from Matlab largely support those of the World Bank group. Although the age structure of the population in Bangladesh is quite young, so that about half of all deaths are deaths of children, 20 per cent are deaths to adults aged 15 to 59. As was found elsewhere, noncommunicable diseases are the leading causes of adult death, although deaths due to injuries are not as important as in the World Bank study. Age-specific death rates, and adult mortality overall, are falling, but in Matlab these trends are very modest and susceptible to occasional reversals. Men aged 15 to 59 years have higher mortality rates than women in Matlab, as they do elsewhere, but during the childbearing years male mortality has been a little lower than that of women. Ill-health of adults has significant consequences for children; the death of an adult increases the risk of death to children as old as ten years old for at least two years following the adult death. And finally, better information on adult ill-health and mortality is needed. Even in Matlab, where data are quite good for a country at this level of development, improvements, especially in the areas of morbidity and the determination of cause of death, are needed.

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The Colleges of Medicine and the health of the South

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Physicians in the North, which by Brandt's definition includes Australia and New Zealand (Brandt 1980), often try 'to do something' for their fellow human beings in the South. Selzer (1986) the great surgeon-writer described this driving impulse well: 'Tomorrow we leave Peru carrying with us the pathetic belief that the way to heal the world is to take it in for repairs' (p.239). The medical missionary movement has long been a powerful force, with professionally trained personnel working in remote areas throughout the world. The iconic figure in that endeavour was, and still is, Albert Schweitzer of Lambarene. Medical associations of all types have lectured, consulted, and practised throughout the developing world. Tropical medical experts from the North not only invented the field but have served the several roles of research, teaching and practising their specialty, largely in the developed world. Clearly, the southerners hardest hit have been the infants and children under five, largely by infectious diseases and malnutrition, but those who survived the early years have had a reasonable life expectancy.

Over the past several decades infant and child mortality has declined dramatically, and in most areas, outside of war zones, continues to do so. I well remember the back room at the Villa Serbelloni in Bellagio, Italy, in 1988 when Jack Caldwell first enunciated the concept of the Health Transition. It was, in the parlance of James Joyce, an epiphany; a sea-change had quietly crept up on us.

We are faced with an enormous and exponentially growing problem of health care and preventive medicine among the elderly for which the South is poorly prepared. Without, in any way, neglecting the problems of infants and children which remain enormous, how best can the medical expertise of the North be applied to this 'new' problem of the South? It must be said from the outset that the skills and experience of those individuals and organizations that wish to become involved must be appropriate to the needs addressed.

Let me describe two different approaches that have recently involved two of the great associations of specialists in internal medicine, the Royal College of Physicians and its American counterpart.

Action in International Medicine (AIM) was initiated in 1988 by Sir Gordon Wolstenholm, O.B.E., M.D., L.L.D., F.R.C.P., F.A.C.P., the illustrious past director of The Ciba Foundation. He began by obtaining the backing of the two Colleges, but AIM is now an international consortium of medical and health professionals engaged 'in programmes to strengthen health management systems in developing countries' with the specific goal 'to improve the structure and function of "District Health Systems"' (Action in International Medicine brochure 1992:1). While many of its member organizations specialize in adult medicine, the focal point of AIM's program is the development of district health systems, providing for populations of several hundred thousand people through primary and secondary care. The 'bare statistics' quoted to support this approach relate to women dying in childbirth, and infectious diseases of infants and children. A purpose is to train generalists who can deal with a broad spectrum of problems such as 'chronic osteomyelitis, cataracts, obstructed labor, contractures from burns, poliomyelitis and leprosy,' and who 'enjoy the challenge of public health' (*Action in International Medicine Bulletin* 1992:1).

The International Medical Activities Subcommittee of the American College of Physicians deals with a variety of programs, largely in the developing world. These include fellowships for Latin American physicians, opportunities to work at missionary hospitals in the rural South, and support for AIM. Recently the committee began to explore new initiatives. Dean Gerald H. Escovitz of the Medical College of Pennsylvania took a year off to prepare a report subsequently published in the *Annals of Internal Medicine* (1992). Escovitz described transition countries as having an infant mortality rate of 20 to 80 per thousand live births, a life expectancy of 60 to 70 years, a medium birth rate, good sanitation, and a growing literacy rate. This includes most countries in Central and South America, many of those on the Pacific Rim and some Eastern European and Middle East countries. He notes that

> The health care needs of adults in developing countries experiencing the health transition provide, for internal medicine in developed countries, a timely and appropriate focus of interest and potential support (Escovitz 1992: 501).

He suggests that the Alma Ata Declaration needs to be specially applied 'to the adult chronic diseases' including

> not only selective primary care with a reemphasis on preventive medicine but selective secondary and tertiary care as well, with selectivity based on both efficacy and affordability (Escovitz 1992: 504).

One of the 'buzzwords' of the recent past was appropriate technology for the developing world. It seems that in this time of transition the appropriate use of the medical manpower of the North to aid the people in the South is a matter of great importance. Given the training and experience of the great majority of the members and fellows of the Colleges of Medicine, it seems inappropriate for them to be engaged in management of district medical systems, public health matters, and surgical, obstetrical and paediatric problems. On the other hand, the coming of the health transition appears to afford the altruistic members of the Colleges of Medicine of the North a unique opportunity to collaborate with their counterparts in the South. Working effectively under the financial constraints of that region could be a salutary experience, and one that can well be exported home.

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The effects of socioeconomic factors on adult morbidity in Thailand

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Introduction

Nowadays, many developing countries are facing problems of adult health as these countries experience rapid social and economic development and transitions in their demographic profiles (Mosley, Jamison and Henderson 1990; Murray and Feachem 1990; Pan American Health Organization 1990; Jamison and Mosley 1991; Phillips 1991). However, little is known about the cause of adult health problems because data on adult health are relatively difficult to obtain (Timaeus 1991). *The Health of Adults in the Developing World*, a book supported by the World Bank, therefore, calls attention to the importance of considering adult health experience in developing countries (Feachem et al. 1992). This book analyses existing data and presents overall levels and specific causes of adult mortality, measures of morbidity, consequences of adult health, important factors affecting adult health and guidance for future research and health policy. To contribute to knowledge of adult health in developing countries, my article is derived from dissertation research (Sethapongkul 1992), undertaken to address questions similar to those posed by the authors of that book; but my research deals with a single country and thus involves more detail. The emphasis in this research is on adults of working age (15–60 years) in Thailand, with the particular goal of improved understanding of the impact of socioeconomic factors and health interventions on morbidity. The theory of epidemiologic transition proposed by Omran (1971) is applied to explain adult health experiences in Thailand. The main concept of this theory is that disease patterns are associated with demographic, social and economic changes and that as a country moves from a developing to an industrial society, health problems will also shift from communicable and infectious diseases to man-made and degenerative diseases.

Source of data

The source of the data for this research is the 'Morbidity Survey'. This project was conducted during April and May of 1985 by the Institute for Population and Social Research, Mahidol University, Thailand. The sample totals 22,151 persons, comprising 5,663 in urban areas and 16,488 in rural areas. The main statistical method is logistic regression analysis.

Causes of illness

In this study, illness refers to any condition that interrupts a person's daily routine or prevents food intake for at least 24 hours, or that is diagnosed as a physical or mental disorder by a medical doctor. Ordinary headaches or chronic colds are explicitly excluded. Causes of illness differ somewhat from

causes of death. Accidents, poisonings, and violence are main causes of death among young adults while heart diseases, malignant neoplasms, tuberculosis, and accidents, poisonings and violence are leading causes of death among middle-aged adults (Porapakkham 1986; Sethapongkul 1992). On the other hand, causes of illness indicate that the overall level of acute sickness observed is half of the level reported for chronic sickness. Diarrhoea and acute respiratory infections are common acute illnesses among adults. Peptic ulcer has become the first leading cause of chronic diseases for both young and middle-aged adults: it appears that the prevalence rate of peptic ulcer in Thailand is much higher than the rate in Western countries such as the United States. Among young adults, other major health problems are chronic infectious and parasitic diseases (i.e., malaria) for men, while diseases of the circulatory system, urinary tract and sex organs are common disorders for women. In addition to peptic ulcer, middle-aged adults suffer from many other chronic conditions such as cardiovascular diseases, chronic respiratory diseases, diabetes, and tuberculosis. Injury is a cause of morbidity, as well as mortality, among young adult men. Around half the injuries to young adults are caused by motor-vehicle accidents.

The effects of socioeconomic factors on unhealthy behaviours and sanitation

Most physicians and medical epidemiologists agree that unhealthy behaviours are major causes of many modern diseases (for example, Wynder 1981). Unhealthy behaviours in this study include smoking habits, drinking behaviour, and misuse of anti-pain medication. Around 31 per cent of adults of working age report being smokers. Cigarette smoking is most common among men, who are 32 times more likely to smoke than women. Higher socioeconomic status (education, family wealth and occupation) decreases significantly the likelihood of cigarette smoking; but among smokers, the number of cigarettes smoked per day does not vary substantially by socioeconomic status. Blue-collar workers have the highest probability of cigarette smoking and are the heaviest smokers. Professional and white-collar workers have a low proportion of smoking but those who do smoke are heavy smokers. Urbanization has a negative effect on the proportion smoking but has a positive effect on the number of cigarettes among smokers.

Drinking behaviour is measured by the frequency of drinking alcohol: every day/almost every day, 1-2 times per week, occasionally, and never. Most Thai adults do not drink alcoholic beverages, and of those who do, most drink occasionally. Alcoholic beverages are much more popular among males than females: drinking among females is less socially acceptable in Thailand. The probability of being a non-drinker tends to be positively associated with family wealth and occupation. Blue-collar workers are most likely to drink alcohol frequently, and professional and white-collar workers drink more often than farmers. The variation between drinking and socioeconomic status may be related to the involvement in social circumstance and functions. Drinking is largely a social and recreational activity, common in social settings such as parties, clubs, bars, meetings, and restaurants (Clark 1991). Since it is likely that individuals with higher socioeconomic status participate more often in these social settings (Hilton 1991), their drinking may be related to social norms and values or to their work duties, that is, entertaining clients. On the other hand, blue-collar workers may drink alcohol as a way of coping with social deprivation (Dutton 1986).

Another unhealthy behaviour is the use of anti-pain medication. Labourers and farmers often use this medication to relieve back and other pain from their heavy work, and they tend to use it more often. The misuse and side effect of such medications may lead to peptic ulcer (Soll 1989); thus this issue is especially relevant to this study, because peptic ulcer is one of the most common diseases among the sample. Blue-collar workers are more likely to take anti-pain medication than other occupational groups. As the survey period was during the off-season of agriculture, farmers were less likely to use

this medication than blue-collar workers, but tended to use it more than professional and white-collar workers and those who were not working.

Sanitation is a salient intervention relating to infectious diseases in rural areas: having a latrine is an important indicator of hygiene. Compared to urban areas, households in rural areas are far less likely to have a latrine; this reflects the inequality of development and distribution of facilities within the country. The household head with a lower level of education or family wealth, or who is a farmer, is less likely to have a latrine. The finding suggests that lower socioeconomic status of the household head makes it difficult for the family to have a latrine.

The impact of socioeconomic factors and health interventions on morbidity

The theory of the epidemiologic transition suggests that people in more developed locations and in higher socioeconomic status are more likely to be sick with chronic diseases and less likely to become sick with acute diseases. However, the results of this study are only partly consistent with this theory: they indicate that a disparity in development between urban and rural areas reflects inequalities in health and differences in types of sickness conditions or diseases. People living in urban areas are generally healthier than those in rural areas. In urban areas, those with better living conditions, food, and medical care are less likely to be sick from the acute and chronic diseases that are usually associated with poverty: infectious diseases, cataract, and nutritional deficiencies. However, the processes of urbanization and industrialization also increase environmental pollution, stress, and adverse behaviours: smoking, drinking, eating richer food, less physical exercise. Consistent with this observation, the analysis shows a greater prevalence of chronic degenerative diseases such as peptic ulcer, cardiovascular diseases and chronic respiratory diseases in urban areas. Peptic ulcer is also a common disease among rural villagers, indicating that it is not always related to the processes of modernization.

The role of development in influencing health is further analysed by evaluating the effects of socioeconomic factors. As expected, the distribution of the risk of being ill varies substantially by differences in conditions or types of disease. In the case of acute diseases and diarrhoea, those with less education are more likely to report an acute illness. However, this gradient does not hold as strongly in urban areas. Similarly, diarrhoea is generally found in farmers living in villages. People with higher levels of socioeconomic status are more able to improve living conditions and to gain access to preventive care (Roa and Richard 1984; Lemkow 1986; Grosse and Auffrey 1989). According to this view, having a latrine is a good example of health interventions that decrease the incidence of acute diseases for rural villagers with higher socioeconomic status.

Whereas education is an important factor for understanding acute diseases, among chronic diseases, occupation is the strongest predictor of whether one is ill: professional and white-collar workers are less likely to have a chronic condition. When specific diseases are examined, farmers are less likely than those in other occupations to be sick from chronic affluence diseases such as cardiovascular and chronic respiratory diseases. The risk of having one of these diseases is not higher for professional and white-collar workers than for blue-collar workers. As for peptic ulcer, farmers and blue-collar workers are more likely to have this disease than are professional and white-collar workers.

The association between occupational status and chronic degenerative diseases and peptic ulcer can be accounted for by differences in working conditions, unhealthy behaviours, and financial and psychological resources (Bunker, Gomby and Kehrer 1989). Blue-collar workers are exposed to more hazardous agents on the job, and their jobs are often stressful because of the work pace, scheduling, and long hours. Furthermore, blue-collar workers may cope with psychological and physical stress by drinking, smoking, and engaging in other risk behaviours. As discussed earlier, the frequency of drinking alcoholic beverages tends to rank highest among blue-collar workers, especially men, as does

cigarette smoking. These factors may put blue-collar workers at high risk of chronic degenerative diseases. Likewise, use of anti-pain medication, by farmers and blue-collar workers to relieve physical pain from heavy jobs contributes to peptic ulcer. In contrast, professional and white-collar workers are more likely to have a richer diet, to work a sedentary job, and to drink alcohol frequently. This research finds that among men, professional and white-collar workers tend to drink alcoholic beverages more often than farmers. Professional and white-collar workers are less likely to smoke cigarettes, but those who do, smoke more heavily than farmers. These factors may increase their risk of degenerative diseases compared to farmers.

When the effects of high-risk behaviours on chronic sickness are investigated, it is found that smoking and drinking have little impact on any chronic sickness. The only disease found to be related to smoking is peptic ulcer, with smokers more likely to have peptic ulcer than non-smokers. In addition, users of anti-pain medication are more likely to develop peptic ulcer than non-users. These results suggest that occupational status affects the chance of getting peptic ulcer directly and indirectly through smoking and using anti-pain medication. On the other hand, a direct effect of occupation on other chronic degenerative diseases is more important than indirect effects through smoking and drinking. There are two reasons why the effects of smoking and drinking on chronic degenerative diseases do not appear in this analysis. First, available data provide only current status of smoking and drinking which may not reflect the risk factors intended in this study because some smokers and drinkers may quit these habits when they become ill. Secondly, the effects of smoking and drinking on chronic diseases (i.e., lung cancer and cardiovascular diseases) are either cumulative or lagged. For example, Murray, Yang and Qiao (1992) suggest that smoking-attributable mortality mostly involves the elderly. Thus we would not expect to find many long-term health effects of cigarette smoking or drinking among economically active people.

Policy implications

As adult health problems in Thailand vary substantially between urban and rural areas and socioeconomic strata, improving adult health is one of the greatest challenges for health-policy makers. Such an epidemiological diversity of adult health problems demands an appropriate health policy formation. Traditionally, physicians have been concerned with providing curative medical care; now their role has expanded to include a range of activities intended to prolong life, prevent diseases and disability, and promote health. Three strategies for improving adult health are preventive health services, health protection, and health promotion (Breslow 1987). This study suggests that the poor in rural areas continue to need health education, sanitary facilities and preventive services. Additionally, rural villagers tend to misuse medication such as anti-pain drugs. Information on how to use anti-pain medication, and its side-effects, as well as other methods for pain relief (e.g., massage) needs to be distributed to farmers and blue -collar workers.

Finally, this study suggests that health protection and health promotion in Thailand are not well established. Not only the government but also the private sector should provide information and knowledge to the population in order to change unhealthy behaviours. Although this study indicates that smoking and drinking have little impact on diseases, these risk behaviours are accepted as important causes of many chronic diseases. The success of changing smoking and drinking habits requires not only more efficient health-education programs but heavier regulation and taxation of cigarettes and alcoholic beverages as well.

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Mortality rate, adult, female (per 1,000 female adults).Â Mortality rate, infant, male (per 1,000 live births). Birth rate, crude (per 1,000 people). Life expectancy at birth, total (years).