# Social Aspects of Mortality in Young and Middle Adulthood in Thailand

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## Introduction

There is a substantial body of data from countries at all stages of development, suggesting that mortality risks are closely associated with certain social characteristics. The more complete analyses are for the more developed countries. For instance, lower risk of morbidity and mortality has been associated with marriage, with employment and with parenthood in the United States of America (Verbrugge, 1983; Mergenhagen et al., 1985). There are two explanations for such findings. The more traditional explanation is that a bad state of health restricts entry into the states of marriage, employment and parenthood (see, for example, Bouvier-Colle, 1983, using data from France). The less traditional explanation (Verbrugge, loc. cit.) is that valued social roles are associated with lower morbidity and mortality because participation in the social process reduces the likelihood that adults will expose themselves to risk.

Throughout the 1980s and 1990s, debate about the protection and selection effects in the developed countries has intensified. In an assessment of the evidence from various countries, Hu and Goldman (1990) found that divorced people had the highest death rates, and that the excess mortality of unmarried persons relative to the married had generally been increasing over the past two to three decades. They observed that the smaller the proportion of persons who never married, or who were divorced, the higher

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was the resulting death rates. This would be consistent with the existence of selection processes. Goldman (1993) subsequently used simulation methods to demonstrate that the types of evidence that had been available for much of the previous analysis could not resolve whether selection or protection was involved, and that prospective studies were needed.

Evidence from prospective studies has subsequently appeared, and gives some support to the argument that protection effects exist. The most comprehensive evidence for a specific protection effect comes from the 'Whitehall study' which followed the mortality experience of 18,403 male civil servants in Great Britain in the period since 1967 (Ben-Shlomo et al., 1993). The researchers drew on an early finding that civil servants low in the hierarchical grade structure had higher mortality than high-grade civil servants (Marmot et al., 1984), to develop progressively an explanation that low control over work activities was associated with significantly higher incidence of ischaemic heart disease (Marmot et al., 1997). In very recent findings, the study has found evidence of another independent factor competing to cause the observed mortality differentials (Bosma et al., 1998). This was imbalance between the amount of personal effort put into work, through attributes such as competitiveness, and the rewards obtained, such as poor promotion prospects. With lack of job control, the two factors contributed approximately equally and independently to development of heart disease. It is noteworthy that some other factors, such as 'job strain', had no independent effect.

In a more general context, outside the workplace, Orth-Gomer et al. (1993) used evidence from a prospective study in Sweden to find that lack of social support was strongly associated with the development of heart disease. The authors found independent effects from lack of close relationships with other people (low 'attachment') and lack of social support at a wider level (low 'integration').

A number of recent studies have used prospective data to examine differentials associated with marital status, also in the developed countries. One of the earliest of

these studies, by Wyke and Ford (1992) examined four explanatory mechanisms for a protective effect, using data from a longitudinal study in Scotland.  They found that risk-taking behaviour, as measured by smoking and drinking, did not account for differences between married and unmarried people, and nor did social support measured objectively.  They observed that levels of material resources, levels of stress, and perceived levels of social support could play a role, but Wyke and Ford (ibid.) felt that it was not yet possible to disentangle possible selection effects from protection effects. Hibbard and Pope (1993) were less cautious, in reporting the results of a fifteen-year follow-up. They noted protective effects against death conferred by marriage and work roles of women.  Women had lower death rates if they had equality of decision-making and companionship in their marriages. Work support, they found, decreased risk of mortality from some types of diseases among women.  Unlike most other studies, this study found no protective role for men from marriage, and it also found that stress increased mortality among working men.

Waldron et al. (1996) used the National Longitudinal Surveys of Young Women in the United States to record that while there were protective effects against female mortality from marriage, they applied only to women who were not working. The authors argued that protection and selection effects reinforced one another in differentiating mortality levels for different categories of marital status.  Lillard and Panis (1996) have pointed out that selection for marriage includes a component of adverse selection, in that among people who marry early there are some with worse-than-average health.  Cheung (1998) and Cheung and Sloggett (1998) find evidence for adverse selection as well as positive selection associated with marriage, using data for the 1958 birth cohort in Great Britain as represented in the National Child Development Study.

It should be clear from this summary of studies in developed countries that there has been little progress towards a general resolution of the relationships between social roles and mortality, despite increasing availability of prospective data from

longitudinal studies and discovery of some specific effects. Among the few studies from less-developed countries, Rahman (1991) examined the competing protection and selection explanations using data from Bangladesh. While marriage and remarriage after divorce were found to be selective on the basis of health status, non-marriage also results in changes in lifestyle such as social isolation, poor diet and increased poverty, resulting in higher mortality, according to Rahman. These findings provide support to both camps.

The reason that prospective studies are needed to assess the protection and selection hypotheses is that information about the social characteristics of individuals in the period immediately before they died is not readily available from standard sources about the process of mortality, such as death registration data. Death registrations essentially describe people's characteristics at their time of death, but their social attributes may have changed considerably in the time leading up to death. For example, unless death was sudden, most people who were formerly employed will have ceased work during the stages of illness preceding death.

In this paper, we examine the characteristics of adults who died at the ages of young to middle adulthood (15-64 years), in the twelve-month period of follow-up of the Survey of Population Change 1995-96 (National Statistical Office, no date; National Statistical Office, 1997). The objective is to detect differences that may be associated with social roles.

## Data source

The sixth Survey of Population Change undertaken by the National Statistical Office was started in 1995 and completed in 1996, with four objectives. The first was to obtain estimates of birth and death rates, the rate of population growth and fertility rate. The second objective was to provide current and accurate data on demographic characteristics such as size of population by age and sex, marital status, education and

occupation. The third objective was connected with national development planning, namely to obtain an estimate of the rate of population growth at the end of the Seventh National Economic and Social Development Plan (1992-1996) and to provide reliable data essential for population projection. Lastly, the survey was to provide data on changes in demographic characteristics in the mid-decade period.

The 1995-1996 Survey of Population Change covered 600 sample enumeration districts/villages in all provinces of the country and approximately 87,600 sample private households and collective households or institutions. There were five rounds over a twelve-month period, with an interval of three months between each round. In the first round of the survey, all members of sample households in sample enumeration districts/villages were enumerated, recording their demographic characteristics, such as month and year of birth, age, sex, residence status, marital status, number of children ever born, living children, education and employment. In the four subsequent rounds, the households were enumerated only for events, that is, births, deaths and changes in some other characteristics which occurred during the previous three months. Differences in reporting events during the rounds of the survey permitted use of the dual record procedure to estimate the total number of births and deaths.

Details of survey definitions, sample design and method of estimation are given in Chapters 2 and 3 of the Report on Population Characteristics, the 1995-1996 Survey of Population Change (National Statistical Office, no date), and in slightly less detail in Chapters 2 and 3 of the Report on the 1995-1996 Survey of Population Change (National Statistical Office, 1997).

The survey had a very large sample. There were over 268,000 individuals in sample households in the first round of the survey. While this large sample size permits analysis of some aspects of population change which are difficult to analyse using other data sources, only a small amount of information was collected about each person in the sample, accordingly restricting the scope of possible analyses.

One advantage of the large sample size was that it was possible to produce detailed life tables for males and females (National Statistical Office, 1997). The life tables show expected patterns of difference between survival of males and females at all ages. There are also differences favouring residence in urban areas over residence in rural areas, reflecting not only differences in the social and physical environment but also differences in access to health care and quality of health services.

As a result of these expected differences, the twelve-month survival chances of a man aged almost 65 in a rural area will be considerably less, on average, than those of a 15-year-old female in an urban area of Thailand. In the results that are discussed in this paper, all differences which are expected on the basis of age, sex and rural or urban location are controlled.

## Method

Each individual in each sample household either survived to the end of the five rounds of the survey, in the vast majority of cases, or lived only part of the survey period before dying. The method employed for this analysis assumes that the relative mortality risks for those who died within twelve months were not dependent on the proportion of the twelve-month period that they survived. This is known as the assumption of proportional hazards, and it is an eminently reasonable assumption to make about the low rates of mortality which apply to people in young and middle adulthood.

The results which will be discussed in this report are from Cox regression models of the following form:

$$\log_e (h/h_0 + \varepsilon = [f_1(age) + f_2(sex) + f_3(urban/rural)] + f_4(X)$$

where

- $h/h_0$ is the estimated hazard of mortality relative to an urban female aged 15-24 in the reference category of the variable X, at any length of interval less than twelve months;

- $\varepsilon$ is a residual, with average value zero, expressing the difference between the model and each personís actual experience;

- $f_1$, $f_2$ and $f_3$ are estimated functions of age, sex and urban/rural residence, set to zero for an urban female aged 15-24;

- X is a social characteristic (such as marital status);

- $f_4$ is a function of the social characteristic X, set to zero for the reference category (in the case of marital status, the reference category is 'currently married').

This form of linear model has been chosen for three reasons. The first reason is that it is largely unaffected by any inaccuracy in the level of enumeration of deaths in the survey. As noted above, dual record methods were used by the National Statistical Office to perform minor but proportionately significant adjustments to enumerated numbers of deaths. Inaccurate levels of enumeration could affect results obtained with other forms of linear model, such as logistic regression, even if differentials are otherwise identified correctly in the survey results.

The second reason for choice of this method is that it facilitates comparable estimation of hazards from a particular set of causes. In this report, relative mortality risks are presented in two categories: first, for all causes combined; and second, for 'external' causes only, involving accidents and violence. This is both because external causes of death are very prominent causes of death at the ages of young and middle adulthood, and also because cause of death is an important factor in testing the ësocial roles' and 'selection' hypotheses about dying too young.

The third reason for use of Cox regression is that it is sensible and indeed preferable to use unweighted numbers of cases for the analysis. An individual person's mortality hazard should be assessable in terms of his or her individual age, location and exposure to risk. A valid model of risk should therefore be valid for individuals in the sample, and a model derived from unweighted individual data is consequently more likely to yield a valid model.

## Results

*(a) Expected differences - age, sex and urban/rural location*

The differentials in mortality that are associated with age, sex and urban or rural location are shown in Table 1. In all subsequent tables, these three characteristics are controlled in calculating differentials. Note that the differences are shown as relative risks, compared with a base category, which is age group '15-24', 'females' in the case of sex, and 'municipal' areas in the case of urban/rural location.

The relative risk for each base category is shown as 1.00. It can be seen that people aged 55 to 64 are 6.99 times more likely to die in a twelve-month period, from any cause, as people aged 15 to 24. This is after controlling for differences in sex and urban or rural location. Similarly, males are 2.17 times as likely to die in a twelve-month period as females, in these age groups taken as a whole. Lastly people in non-municipal areas are 2.09 times as likely to die as people in urban (municipal) areas.

In the case of deaths from external causes, there is a very different age pattern. In this case, all relative risks are assessed as lower than the reference category, age group 15 to 24, although the difference is statistically significant only in the case of age group 25-34. The finding emphasizes the relatively high risk of accidental or violent death faced by adolescents.

Table 1   Relative risk of death within twelve months, by age, sex and rural or urban location, adults aged 15 to 64, survey of population change 1995-1996.

| | Sample individuals | Number of deaths within twelve months | | Relative risk of death within twelve months (controlling for the other two variables) | |
|---|---|---|---|---|---|
| | | All causes | External causes(b) | All causes | External causes(b) |
| **Age:** | | | | | |
| 15-24(a) | 52,437 | 37 | 26 | 1.00 | 1.00 |
| 25-34 | 50,219 | 49 | 10 | 1.33* | 0.38 |
| 35-44 | 40,290 | 60 | 16 | 1.99 | 0.72* |
| 45-54 | 24,452 | 74 | 11 | 3.96 | 0.79* |
| 55-64 | 18,034 | 99 | 10 | 6.99 | 0.92* |
| Sex: | | | | | |
| Male | 89,400 | 213 | 57 | 2.17 | 3.78 |
| Female(a) | 96,017 | 106 | 16 | 1.00 | 1.00 |
| Area: | | | | | |
| Municipal(a) | 97,911 | 100 | 15 | 1.00 | 1.00 |
| Non-municipal | 87,506 | 219 | 58 | 2.09 | 4.29 |

(a)   Reference category
(b)   Predominantly accidents and violence, including suicide
*    Not significantly different from reference category

*(b) Marital status*

For any explanatory variable X, the risk of death for a particular category of person is determined relative to the risk for a person in the reference category, specifically as $\exp(f_4(X))$ according to the model. This means that the risk is determined controlling for the expected effects associated with age, sex and urban or rural location. For example, in the case of relativities associated with marital status, the following table of results is obtained:

**Table 2    Relative risk of death within twelve months, controlling for age, sex and rural or urban location, adults aged 15 to 64, survey of population change 1995-1996-marital status**

| Marital status | Sample individuals | Number of deaths within twelve months | | Relative risk of death within twelve months (controlling for age, sex, location) | |
|---|---|---|---|---|---|
| | | All causes | External causes(b) | All causes | External causes(b) |
| Never married | 58,486 | 78 | 30 | 2.41 | 2.12 |
| Currently married(a) | 114,503 | 198 | 36 | 1.00 | 1.00 |
| Widowed | 6,409 | 33 | 5 | 2.12 | 3.24 |
| Other | 5,984 | 10 | 2 | 1.12* | 1.14* |
| Not Known | 50 | - | - | | |

(a)  Reference category
(b)  Predominantly accidents and violence, including suicide
*    Not significantly different from reference category

The relative risk figures indicate that people who were never married were 2.41 times more likely to die from any cause during the twelve month period than people who were currently married (the reference category), after allowing for any effects associated with age sex and location. They were 2.12 times more likely to die from external causes, which are predominantly accidents and violence. Similarly, widowed people were 2.12 times more likely to die from any cause, and 3.24 times more likely to die from external causes, than currently married people.   However, those who had any other marital status (mainly divorced and separated) did not have any significantly elevated risk, under the same conditions.

In other words, the figure of 1.12 for the relative risk of dying from any cause for the category of ëotherí marital status is not significantly different from 1.00, at a 95 per cent level of significance. The figure of 1.00 for the reference category is arbitrary, and the mortality hazard for individuals in this category depends on their age, sex and rural or urban location.

*(c) Relationship to head of household*

There is a very close relationship between marital status and relationship to the head of the household. Most young adults in Thailand who have never married will be related as descendants to the heads of the households in which they live. It is therefore to be expected that if never-married people have elevated mortality hazards, then so will people classified as descendants of household heads. However, the scale of the difference, shown in Table 3, may be unexpected. After controlling for the effects of age, sex and rural or urban location, children and grandchildren of household heads have over three times the risk of death from any cause compared with other adults, and more than twice the risk of death from external causes.

**Table 3    Relative risk of death within twelve months, controlling for age, sex and rural or urban location, adults aged 15 to 64, survey of population change 1995-1996-relationship to head of household**

| Relationship to head of household | Sample individuals | Number of deaths within twelve months | | Relative risk of death within twelve months (controlling for age, sex, location) | |
|---|---|---|---|---|---|
| | | All causes | External causes(b) | All causes | External causes(b) |
| Head or spouse(a) | 105,369 | 205 | 35 | 1.00 | 1.00 |
| Descendant | 47,470 | 85 | 32 | 3.14 | 2.48 |
| Other relation | 21,861 | 25 | 5 | 1.21* | 0.95* |
| Non-relation | 10,732 | 4 | 1 | 0.69* | 0.48* |

(a)  Reference category
(b)  Predominantly accidents and violence, including suicide
*    Not significantly different from reference category

The table does not show spouses separately from household heads, because this difference is mainly the sex difference which has already been controlled in the analysis. Note also that people in any relationship other than descendant to the head of the household have no statistically significant different risk of mortality.

The results in these tables show elevated risk of death for descendants in general. A finer analysis, in Table 4, shows that substantially elevated risk exists for both unmarried children and married children. The relatively small number of grandchildren in the sample meant that the relative risk estimate, although comparable

to the estimates for married or unmarried children, was not significantly higher than 1.00.

**Table 4     Relative risk of death within twelve months, controlling for age, sex and rural or urban location, adults aged 15 to 64, survey of population change 1995-1996-type of descendant of household head**

| Relationship to head of household | Sample individuals | Number of deaths within twelve months | Relative risk of death within twelve months (controlling for age sex, location) |
|---|---|---|---|
| Unmarried child | 32,543 | 59 | 3.82 |
| Married child | 12,200 | 23 | 2.34 |
| Grandchild | 2,727 | 3 | 2.93* |
| Any other(a) | 137,962 | 234 | 1.00 |

(a)   Reference category

\*    Not significantly different from reference category

*(d) Employment status*

Table 5 shows relative risk of death from all causes and external causes according to whether people were employed or not at the time of the first round of the survey. This prospective analysis of mortality risks according to employment status is impossible to carry out from other types of data source, such as registration of deaths.

The main results of the analysis is that adults who did not have a job were subject to approximately twice the risk of death of those who were employed, after controlling for age, sex and rural or urban location. However, there was no significant

difference in the case of deaths from external causes. A possible explanation is that employed people are exposed to risk of occupational death and are also exposed to risk when they are travelling to and from work.

Table 5　Relative risk of death within twelve months, controlling for age, sex and rural or urban location, adults aged 15 to 64, survey of population change 1995-1996-employment status

| Employment status | Sample individuals | Number of deaths within twelve months | | Relative risk of death within twelve months (controlling for age, sex, location) | |
|---|---|---|---|---|---|
| | | All causes | External causes(b) | All causes | External causes(b) |
| Working (a) | 142,868 | 232 | 63 | 1.00 | 1.00 |
| Not working | 42,564 | 87 | 10 | 1.97 | 0.64* |

(a)　Reference category
(b)　Predominantly accidents and violence, including suicide
*　　Not significantly different from reference category

*(e) Multivariate analysis*

Three apparently distinct characteristics of people in young and middle adulthood have been shown here to have strong relationships with survival chances, in startling multiplications of risk. Compared with other studies on this topic, we have adduced an additional condition, namely that being a descendant of the head of the household appears is associated with apparently increased mortality risk, at least in Thailand. Since the status of descendant of head of household is closely connected with

being unmarried, it appears to be desirable to try to disentangle the relative importance of these factors.

A multivariate analysis was undertaken with all of the explanatory variables which have been described in the preceding section, namely marital status, relationship to household head, type of descendant and work status, along with the control variables of age group, sex and rural or urban location. The results were simpler than those obtained with bivariate analysis, as shown in Table 6.

Table 5     Relative risk of death within twelve months, controlling for age, sex and rural or urban location, adults aged 15 to 64, survey of population change 1995-1996-employment status

| Explanatory variable and category | Relative risk of death within twelve months (controlling for age, sex, location) - [BIVARIATE] | Relative risk of death within twelve months (controlling for age, sex location and other explanatory variables) - [MULTIVARIATE] |
|---|---|---|
| **Marital  status:** | | |
| Never married | 2.41 | 1.39* |
| Currently married (a) | 1.00 | 1.00 |
| Widowed | 2.12 | 1.85 |
| Other | 1.12* | 0.83* |
| **Type  of  descendant:** | | |
| Unmarried child | 3.82 | 2.80 |
| Married child | 2.34 | 2.48 |
| Grandchild | 2.93* | 2.16* |
| Any other (a) | 1.00 | 1.00 |
| **Work  status:** | | |
| Working (a) | 1.00 | 1.00 |
| Not working | 1.97 | 1.80 |

(a)   Reference category
*     Not significantly different from reference category

It was found firstly that relationships other than being descendant of the household head had no statistically significant relationship with increased mortality risk, and this variable has consequently been omitted from the table. After taking descendant status into account, marital status differentials are also reduced, and the only statistically significant one is relatively high risk for widowed people. This finding could be explained by the likelihood that the factors which have contributed to the death of one partner in a marriage (whether in the physical or the social environment) are also likely to have increased risk for the other partner.

Higher mortality risk for never-married people disappears at a statistically significant level in the multivariate analysis. The implication is clear that the apparent differential found in the bivariate analysis was due to the fact that never-married people are often in the relationship of descendant of the household head. Higher risk associated with being a descendant is unrelated to marital status, according to the multivariate analysis, being approximately the same for unmarried and married descendants.

The mortality differential associated with work status is similar in the multivariate analysis to the bivariate analysis, with the implication that this differential is independent of marital status and relationships.

## Discussion

The results presented in this paper resolve some of the issues surrounding the 'social roles' and 'selection' hypotheses about mortality differentials. The most important contribution is the finding that marital status differentials, except those associated with widowhood, really represent higher mortality risks for both unmarried and married adults who are in the subordinate position of being descendants of the heads of the households in which they live. Whether or not marriage is good for a person, it does not appear to have any particular beneficial effect on survival chances in Thailand, by this analysis.

The fact that the children of household heads have higher mortality risks has explanations within both the 'social roles' framework and the 'selection' framework. While the most immediately apparent explanation is that people who live with their parents contain a subgroup of people with low health status who are being cared for, an alternative explanation is that people who live with their parents have less independence and control of their own lives. This would be a distinctly less positive interpretation of the social roles hypothesis than the supposed protective benefits of assumption of a valued social role as in marriage or parenthood, but it bears resemblance to the findings about job control from the Whitehall study (Marmot et al., 1997; Bosma et al., 1998).

After controlling for expected differentials, people who are not working have considerably higher mortality risk in young and middle adulthood for the ensuing twelve months than people who are working. This difference does not apply to external causes of death. The most evident explanation is that people who have poor health status are found disproportionately among those who are not working, but it is not possible to dismiss the alternative hypothesis that work provides a valued social role and protective benefits. Essentially, a twelve-month follow-up period is too short to make any judgment about the matter.

As noted in the introduction to this paper, prospective analysis of mortality risks is difficult to carry out using standard data sources. The Survey of Population Change is a valuable source for this type of analysis. Whether the results concerning relatively high mortality risks for those who have the status of descendant of household head would apply in the social context of other countries is uncertain. It is nevertheless clear that the results obtained provide little support to theory promoting the beneficial effects, for health, of valued social roles. The findings do provide support to a more specific theory, that people's control over aspects of their everyday life has a protective effect against ill-health leading to mortality.

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