# SOCIODEMOGRAPHIC FACTORS AND MORTALITY AMONG FINNISH WOMEN 1981-5

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ABSTRACT

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The study examines women's mortality according to age and a wide range of socioeconomic indicators, economic activity, marital status, motherhood and children's characteristics. The purpose of this study has been to find better empirical understanding of women's socioeconomic mortality differentials and to show how female mortality varies in the face of conflicting demands of employment, marriage and motherhood. All deaths among 35-64-year-old Finnish women in the period 1981-5 were analysed on the basis of data in which census records were combined with death registration. The empirical data analysis was carried out by means of Poisson regression models.

Socioeconomic mortality differentials among 35-64-year-old Finnish women exist for all groups of causes of death analysed in this study. For most diseases the relationship between mortality and socioeconomic status was positive: mortality was higher among women from lower socioeconomic statuses. Mortality differentials were relatively small for other cancers than breast cancer, but large for causes related to circulatory diseases and 'other diseases'. Women from lower socioeconomic statuses had lower breast cancer mortality than other women.

For married women mortality differentials according to husband's educational and occupational characteristics were, for most causes of death, comparable to those based on women's own characteristics. Similar results were obtained for men.

Socioeconomic mortality differentials were similar in all sub-groups defined by parental status, economic activity and marital status with the exception of single women who had very large differentials for circulatory diseases and 'other diseases'. Socioeconomic mortality differentials were also similar in categories defined by other socioeconomic variables.

The study has also shown that marital status, motherhood and economic activity are strongly related to mortality from all causes of death. These relationships can to a large extent be understood in terms of main effects. Only lone mothers with more than one child have higher mortality than expected on the basis of the main effects model; high mortality is mainly attributable to circulatory diseases and accidents and violence.

A detailed discussion of the theoretical relevance of these results is included in the thesis.

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## *1. BACKGROUND OF THE STUDY*

One of the most intensely discussed topics in mortality research deals with sex mortality differentials. Sex differentials in mortality have proved to be persistent manifestations of sex inequalities in Western countries. Explanations abound, but interestingly enough, these manifestations have seldom been touched upon within the feminist literature, even though major sources of sex differences surely lie in sex related behavioral and environmental factors as well as in sex roles in work and family life. The observed large variation of sex mortality differentials over time, across countries and according to age, marital status and socioeconomic status question the possibility of solely biological explanations (see e.g. Waldron 1976; Lopez 1984; Nathanson 1984; Verbrugge and Wingard 1987). However, most writers are hesitant to discount them altogether because after controlling for several behaviourial risk factors and social variables clear sex differentials still exist (e.g. Verbrugge 1989; Waldron 1983). Changes in sex differentials are most likely caused 'by the interacting effects of multiple sex differences in physiology and anatomy, changing sociocultural environments and behaviour, and improvements in prevention and medical care' (Waldron 1992).

The level and evolution of sex mortality differentials are, however, a result of changes in the mortality of men and women. These changes are different between sexes and are probably borne out in very different processes. For example, it has been suggested that rising participation of women in employment may increase women's mortality (e.g. Verbrugge 1983, 1986). Among men, however, no such process is taking place as men's participation in employment is actually decreasing (for Finland see Tilastokeskus SVT VI C:107 1985, Vol. I; for the United States see Losh-Hesselbart 1987). According to some authors (Nathanson and Lopez 1987), on the contrary, the most important process among men that is of relevance from the point of view of sex mortality differentials, is the very slow mortality decline among blue-collar workers. Thus, it does not seem to be fruitful to study and explain the sex mortality ratio (the ratio between male and female mortality), the difference between male and female expectation of life or any other measure of sex mortality differentials (see also Keyfitz and Golini 1975 and Pollard 1983 on the methodological difficulties in comparing sexes), but rather to try to understand the different factors affecting male mortality and female mortality separately. The results can, of course, be assessed from the point of view of sex differentials.

The analyses of male and female mortality have not evolved equally. A topic that has been quite thoroughly studied for middle-aged men but that has so far attracted relatively little interest with respect to women is socioeconomic differentials in mortality. Mortality differentials by occupational status and changes in these differentials, in particular, have been a topic of intensive research and debate (see e.g. Illsley 1986, Stern 1983; Townsend, Davidson and Whitehead 1988a; Koskinen 1985; Pamuk 1985; Fox et al. 1985; and more generally Valkonen 1987). Two important reasons are believed to account for the neglect of research on socioeconomic status differentials in health and mortality among women (Pugh and Moser 1990). Firstly, 'a well documented lack of attention to women, and issues specifically relating to women' and secondly, 'the particular difficulties associated with satisfactorily analysing women's mortality data by occupation' (Pugh and Moser 1990, p. 94). A somewhat more justifiable argument is that from the point of view of health policy, middle-aged men, with high mortality and large socioeconomic mortality differentials, form a group that must have a preferential place among the research targets of demographic or epidemiologic mortality research.

The 'particular difficulties' of occupational status as a measure of women's socioeconomic status must, however, be acknowledged and carefully evaluated. Additional measures, not only at the individual level, but also spouse's socioeconomic status and other household and asset based measures of socioeconomic status must be incorporated into the analysis. Some of the few previous studies demonstrate (e.g. Moser, Pugh and Goldblatt 1990a; Goldblatt 1990b) that, neither for women nor for men, can occupational status be routinely taken as the socioeconomic indicator with the strongest discriminatory power.

The assumed relationship between women's rising participation in employment and health and mortality (e.g. Verbrugge 1983a, 1983b; Arber, Gilbert and Dale 1985; Kotler and Wingard 1989; Passannate and Nathanson 1985, 1987) is, as well, intriguing and not at all well understood. This is an area of research that has not been neglected for women but that has originated from the changes women have experienced in the labour market. Besides women's traditional roles as a wife and a mother, an additional role as a salaried employee is becoming more and more common in almost all western countries. This development is assumed to affect women's health and mortality. It is, however, still not quite clear whether this effect is detrimental or beneficial. Empirical

studies give partly contradicting results. The modifying effects of the number and age of children and full-time and part-time work suggest that the relationship between rising labour force participation and health and mortality is very complicated (e.g. Arber, Gilbert and Dale 1985).

Although the multiple role framework is quite specific, it emphasises the fact that women's health and mortality are not just matters of social stratification, but also respond to women's marital and parental roles. There is, thus, a need to combine the 'social stratification' and 'role' frameworks in order to achieve a more holistic representation of the factors related to female (and also male) mortality (e.g. Arber 1991; Arber and Lahelma 1993). The interrelationships between these two 'spheres' can be significant, but are not very well known. It has been unfortunate, perhaps more due to defective data rather than deliberate considerations, to keep the analysis of these two 'spheres' separate. Recent analyses by Moser, Pugh and Goldblatt (1990a) and Koskinen and Martelin (1993) show that interesting new results can be reached by combining, for example, the analysis of socioeconomic status mortality differentials with the analysis of marital status.

Although research is making advances in the field of socioeconomic mortality differentials and better data are available than before, the direction of causation still remains a puzzle. It is not clear whether women have low mortality because of the protective and health promoting effects of a high socioeconomic status or because healthy persons or persons with good health potential are more likely to move into better socioeconomic statuses. In the latter case, the relationship between occupational status and mortality, for example, does not reflect the causal effects of occupational status. These selection processes will be dealt with more thoroughly in the following chapters.

The purpose of this study is to find better empirical understanding of women's socioeconomic mortality differentials and to show how female mortality varies in the face of conflicting demands of employment, marriage and motherhood. The study uses data on 35-64-year-old Finnish women in the period 1981-5. The main emphasis is given to the analysis of the relationship between various socioeconomic indicators and mortality. A fuller description of the research design and research questions follows the review of the relevant research literature.

# 2. FRAMEWORK OF THE STUDY

## 2.1. Socioeconomic status and mortality

### 2.1.1. The significance of socioeconomic mortality differentials

Research on socioeconomic mortality differentials can be justified from three standpoints (see e.g. Valkonen et al. 1990 Finnish version; Marmot et al. 1991). Firstly, socioeconomic mortality differentials can be viewed as general indicators of social and economic conditions. Secondly, they can be used to probe into new cause specific risk factors or to explain observed socioeconomic differentials with known risk factors. Thirdly, they have important implications for equal opportunity and health policy. A few comments on each three perspectives follow.

**Social indicator perspective.** Although social differentials have already been measured, for example, in terms of consumption possibilities and in access to material welfare and services, it is also important to quantify these social differentials in mortality (and health) simply because health is most likely a better indicator of people's quality of life. Many of the other 'economic indicators are largely blind to qualitative changes in the material and social environment, which are so crucial to human welfare. Health, on the other hand, is not only sensitive to qualitative changes in material life but the accumulating research evidence on stress, boredom, inactivity, depression, and lack of close social contact show that it is also sensitive to many psychosocial aspects of the quality of life' (Wilkinson 1986a, p. 2). This perspective forms a part of a more general sociological stratification research (Valkonen et al. 1990).

**Epidemiological risk factor perspective.** The Whitehall study (e.g. Rose and Marmot 1981; Marmot 1986) is an excellent example of an epidemiological risk factor study on socioeconomic status. Marmot was able to show that after controlling for specific risk factors (smoking) for lung cancer and (smoking, systolic blood pressure and plasma cholesterol) for CHD clear 'employment grade' differentials in mortality could still be observed. This can be interpreted to mean that more general risk factors (e.g. poverty) also influence socioeconomic mortality differentials or that other more specific risk factors are still not known. Analysis by socioeconomic status may, thus, provide clues to the etiology of disease (e.g. Liberatos 1988).

Another very common approach is to study more specific occupational hazards related to a particular type of work (see e.g. Alderson 1983, Karvonen and Mikheev 1986). This usually requires a detailed analysis of individual occupations.

**Health policy perspective.** Studies on socioeconomic mortality differentials provide the basic information that is needed to plan and target public health interventions. Kitagawa and Hauser (1973) have stated that one of the objectives of their classic study on socioeconomic mortality differentials in the United States is 'to stimulate such programs in public health agencies, in private and social medicine, and through various types of social and economic activities to reduce high death rates. That is, the goal of equal opportunity for all, so deeply ingrained in American ideology, tradition, and law, is still to be implemented in the realm of life itself - the achievement of equal opportunity for survival' (Kitagawa and Hauser 1973, p. 2; see also p. 180). Similar emphasis on policy has also been stated in the introduction to the Inequalities in Health: The Black Report and Health Divide (Townsend, Davidson and Whitehead, 1988a).

The interventions, as the risk factors mentioned above, may be either general or specific. The more general interventions are not explicitly implemented to reduce mortality differentials, but to advance other goals. These include policies such as income support for poor families and unemployment benefits. The more specific interventions include, for example, anti-smoking campaigns or dietary information targeted especially at the disadvantaged (see e.g. WHO 1986, p. 26).

### *2.1.2. Women's socioeconomic status and mortality*

Before engaging in the review of literature on socioeconomic mortality differentials among women it is necessary to briefly discuss some terminological questions. In this study socioeconomic status refers to the individual's or family's general position in the system of social stratification manifested in all modern western societies. Other related terms, e.g. social class which is a term commonly used in Britain, are avoided because of interpretative difficulties or because they are operationalizations of the more all-embracing concept. Different measures of socioeconomic status, each with a special emphasis, provide a rough indication of social and hierarchical standing, prestige,

standard of living, access to resources and also way of life and behaviourial and attitudinal factors (e.g. Liberatos 1991)

'Social class', as often used in the British morbidity and mortality differentials research, is actually one operationalization of the more all-embracing concept of socioeconomic status. In this study 'social class' will be referred to as occupational status as it is mainly based on grouping detailed occupations into larger categories (see e.g. Leete and Fox 1977). It is perhaps worth pointing out that Kitagawa and Hauser (1973) had adopted a similar terminology, i.e. referring to socioeconomic status as a catch-all entity and measuring it in terms of education, income and occupation, 'the three basic aspects of socioeconomic status' (Kitagawa and Hauser 1973, p. 7).

*International comparisons*

Several studies in many countries show an inverse relationship between mortality and occupational status for women, i.e. the lower the occupational status the higher mortality (see e.g. Kitagawa and Hauser 1973; OPCS 1978, 1986; Fox and Goldblatt 1982b; Desplanques 1984, Andersen 1985, 1986; Borgan and Kristofersen 1986; Klinger 1986; Marin 1986; Valkonen 1987; Townsend and Davidson and Whitehead 1988a; Occupational Mortality in the Nordic Countries 1971-80 1988; Lynge et al. 1989; Pagnanelli 1989; Powell-Griner and Rosenberg 1989; Moser et al. 1990a; Valkonen et al. 1990, 1991, 1992; Vågerö and Lundberg 1992).

According to the OPCS Decennial Supplement (OPCS 1978, 1986) on occupational mortality in England and Wales, occupational status total mortality differentials were larger among 15-64-year-old men than women. Married women were classified according to their husband's status and not currently married women according to their own status. Occupational differentials among women were small for cancers but very large for circulatory diseases. A range of SMRs from about 60 (professionals) to about 150 (Unskilled) was clearly larger than among men. Differentials for accidents, poisonings and violence were U-shaped with highest mortality among unskilled and the second highest among professionals (OPCS 1978). The OPCS Decennial Supplement as well as The Black Report (Townsend et al. 1988a), however, provide a poor basis for studying mortality differentials according to women's individual occupational characteristics.

Studies in Scandinavian countries (e.g. Andersen 1985 1986; Borgan and Kristofersen 1986; Marin 1986; Vågerö and Lundberg 1992; Occupational Mortality in the Nordic Countries 1971-80 1988; Lynge et al. 1989), the United States (e.g. Kitagawa and Hauser 1973; Powell-Griner and Rosenberg 1989), France (e.g. Desplanques 1984), Hungary (Klinger 1986) and Italy (e.g. Pagnanelli 1989) show similar differentials. Detailed international comparisons on women's occupational status mortality differentials are, however, hard to come by and their usefulness is somewhat questionable as women are classified into occupational statuses according to a different reference person (e.g. husband's status or own status), as studies have different coverage (e.g. in some studies only economically active are studied) and as occupational classifications are very diverse. It is thus more useful to refer to an educational comparison (Valkonen 1989) than try to make sense of occupational data.

Valkonen (1989) uses census based data for 35-54-year-old men and women from the 1970's from six countries, Denmark, England and Wales, Finland, Hungary, Norway and Sweden, to study levels and changes in educational mortality. The results demonstrate that large total mortality differentials between educational groups exist among women as well as men (for men see also Leclerc et al. 1992): mortality decreases with increasing duration of education. Differentials in total mortality for women are, however, smaller and the observed pattern is more diverse between countries than that among men.

Female mortality differentials in accidents and violence and neoplasms were small, or, in some cases, reversed: mortality was higher among better educated women. Relative differentials for circulatory diseases were, however, considerable and in all countries larger for women than for men. The overall small differentials between educational groups for women, thus, to a large extent reflect the relative importance of neoplasms as a female cause of death. On the basis of the Finnish record linkage data (Valkonen et al. 1992) and the OPCS data (1978) a similar conclusion can be made for occupational status differentials.

The above discussed studies have demonstrated that socioeconomic mortality differentials exist for women in all countries that have been studied. Many of these studies, however, treat women one-sidedly as a homogenous group, some have no information on cause of death and many give only simple descriptive results with cross-sectional data. More careful and detailed research carried out on three societies, the

United States, Finland and England and Wales, will be described shortly in the following. The three countries were chosen for the following reasons: the research has been instrumental in fuelling debate on socioeconomic mortality differentials, it is of high quality, and moreover, it has been valuable in providing insights into formulating research questions for the empirical part of the study.

*Women's socioeconomic status and mortality in the United States*

Kitagawa and Hauser (1973), linking death certificates to census forms in the United States in 1960 have also demonstrated that wide educational differentials in total mortality exist for both men and women. White women aged 25-64-years with the lowest level of education (less than seven years) have about 50 per cent higher total mortality than corresponding women with the highest level of educational attainment (college). The corresponding differential is only 40 per cent among men. These differentials persist although at a somewhat lower level when family income (in addition with age) is controlled for. Among women the 50 per cent excess mortality of those with the lowest level of education narrows to about 35 per cent after family income is controlled for (see Kitagawa and Hauser 1973, Table 2.6, p. 24)

If the age-group from 25 to 64 years is divided into 10-year age-groups, women's educational mortality differentials are larger than those among men only in the oldest age-group. Among men differentials are very large in the young age-groups, but tend to decrease with increasing age. Among women differentials are roughly equally large in all age-groups.

Analysis by broad cause of death groups reveal that women's educational mortality differentials are larger for cardiovascular diseases than they are for all cancers. Small cancer differentials only partly reflect the inverse relationship between education and breast cancer. Among women with any college experience breast cancer mortality is about 30 per cent higher than among women with less than eight years of education. For circulatory diseases, and accidents and violence the same differentials are about 100 and 25 per cent respectively and in favour of the better educated.

Socioeconomic mortality differentials by family income were also large: 41 per cent excess total mortality among 25-64-year-old women with the lowest level of income as compared to women with the highest level of income. This differential is reduced to 19

per cent when education is controlled for. Because poor health may possibly lead to low family income, Kitagawa and Hauser (1973) consider education to be a more reliable measure of mortality differentials.

Later research (Rogot et al. 1988; Feldman et al. 1989; Powell-Griner and Rosenberg 1989) based on several different data sets also indicate that large educational mortality differentials exist among women in the United States. According to Feldman et al. (1989) the differentials among women have remained more or less the same from 1960 till the 1970's and mid-1980's.

*Women's socioeconomic status and mortality in England and Wales*

The OPCS Longitudinal Study, a one per cent sample of the population of England and Wales, has proved useful for the study of women's socioeconomic status. A good summary of this work, published originally as working papers by the Social Statistics Research Unit at the City University, is by Moser, Pugh and Goldblatt (1990a, see also Moser, Pugh and Goldblatt 1988 and 1990b). Mortality differentials by women's own occupational status identify three groups with somewhat different mortality: the non-manual group had an SMR of 78, the manual group had an SMR of 104 and the 'unoccupied' group (a group that includes housewives) had an SMR of 113. The differentials were, however, larger among the unmarried population. This was partly due to compositional differentials in the 'unoccupied' class by marital status: married women in this group were mainly housewives but single women were probably more often permanently sick or disabled.

Married women's mortality differentials by husband's occupational status were somewhat larger than those according to own status mainly because women with husband's in higher statuses had low mortality. Furthermore, at each life-cycle stage, demarcated by the age of the youngest child, large occupational differentials in mortality were observed.

In addition to occupational status, housing tenure and car access, both household based characteristics, were studied. Both measures are strongly related to mortality. Both owner occupiers and those with access to a car had low mortality. Again differentials

for single women were largest. By cross-classifying women by both household characteristics and occupational status large mortality differentials were found.

Cause of death analysis revealed that there was a significant excess of circulatory disease deaths among single women. This was particularly true for single women in manual statuses (SMRs of over 200). Breast cancer mortality seem to be high in this same group (SMR 188, based on 10 deaths) and other cancers low (SMR 85, based on 11 deaths).

Among married women low mortality from other cancers (all cancers except breast cancer) and circulatory diseases was observed among non-manual women living in owner occupied housing and having an access to car. High mortality from the same causes was associated with being in manual statuses and not living in owner occupied housing.

By means of statistical modelling Goldblatt (1990b) was able to assess the relative importance of each socioeconomic variable. He analysed a subset of all 15-59-year-old women that included married women with husband in manual or non-manual occupational statuses and single women. These three groups also constituted the three categories of the variable known in the analysis as 'marital situation'.

Car access (access, no access) and marital situation, in this order, proved to be the two most significant variables in the model irrespective of the two criteria used (maximising the mean of the reduction in deviance and minimising the mean of the residual deviance). Own occupational status (non-manual, manual, unclassified) and housing tenure (owner occupied, rented) were also important explanatory variables. Furthermore, interactions between own occupational status and car access and marital situation were responsible for a large amount of the remaining variation. These interactions reflect the larger mortality differentials among single women. If the data were, thus, analysed separately for singe women, married women classified to an occupational status and married 'unoccupied' women, somewhat different and simpler results were obtained: for single women an adequate model was achieved by incorporating car access and own occupational status in the model, married occupied women needed only husband's status and married 'unoccupied' car access and husband's occupational status.

Arber's (1989, 1991, 1993) analyses, although primarily concerned with health differentials[1], are worth a brief mention here. Her analysis (1989) on limiting long standing illness shows that among 20-59-year-olds in Britain both men's and women's health is positively affected by spouse's occupational status. Furthermore, such household based measures of socioeconomic status as housing tenure and car ownership are as strongly associated with health in men as they are in women.

In addition to material circumstances women's health is also related to marital status and number of dependent children. Furthermore, there are interactions between women's employment status and other variables (Arber 1991). The complexity of women's morbidity determinants bears resemblance to women's mortality determinants as analysed on the basis of OPCS Longitudinal Study.

*Women's socioeconomic status and mortality in Finland*

Occupational and educational mortality differentials in Finland have been analysed by Valkonen and colleagues (1990, 1991, 1992) on the basis of record linkage data. Only the results for the middle-aged (35-64-year-old) population will be discussed here. It is worth pointing out at the outset that all housewives (about 12 per cent of all 35-64-year-old women in 1980) are allocated according to their husband's occupational status. Relative occupational total mortality differentials are smaller for women than they are for men (this has also been demonstrated for other Nordic countries (e.g. Lynge et al. 1989, Andersen et al. 1986). This is true regardless of whether education is or is not controlled for. Similarly, relative educational mortality differentials are smaller for women than men irrespective of occupational status. Among women education appeared to be more important factor than occupational status. The interaction between education and occupational status was not statistically significant for all causes of death combined.

Among women occupational mortality differentials by cause of death resemble educational differentials. Small differentials from all neoplasms were to some extent due to an inverse relationship between occupational status and breast cancer mortality. Differentials from circulatory diseases were large.

[1] Mortality and morbidity, although related, are not the same phenomena. One should, thus, be very careful when supporting results from mortality studies by referring to evidence from morbidity studies. These studies can give somewhat different results. The best known example is, perhaps, the observation that women have higher morbidity than men, but lower mortality (e.g. Verbrugge and Wingard 1987).

Koskinen and Martelin (1993) analysed the Finnish record linkage data for 35-64-year-old persons in order to disentangle why socioeconomic mortality differentials are smaller for women than for men. The authors show that the smaller differentials for women do not depend on the measure of socioeconomic status. All four indicators (education, occupational status, housing density and standard of equipment of dwelling) show a larger total mortality differential for men. Using the level of education, Koskinen and Martelin demonstrate that women's differentials are small in comparison with men only among the married population, and that educational mortality differentials in most causes of death are as steep for women as they are for men. In summary, socioeconomic total mortality differentials (measured in terms of education) are smaller among women than men partly because of the effects of marital status and partly because of cause of death structure.

### *2.1.3. Women's occupational status: a measurement problem*

The most commonly used measure of men's socioeconomic status in mortality research is occupational status. The frequent use of this measure arises, to a large extent, from the reasonably good availability of occupational data, e.g. from death registration and censuses. Comparisons over time and across countries are also possible, although by no means uncomplicated.

Some authors (e.g. Illsley 1986; Stern 1983) have questioned the validity of the use of occupational status in studies on mortality differentials by arguing that selective social mobility and changes in occupational structure distort the results, especially those related to changes in differentials over time (for other contributions to this debate see e.g. Townsend, Davidson and Whitehead 1988a; Koskinen 1985; Pamuk 1985; Hart 1987; West 1991; Blane et al. 1993; and more generally Valkonen 1987).

Analysis of women's mortality differentials using occupational status is confronted with several additional measurement problems specific to women (see e.g. Pugh and Moser 1990). Three main problems will be taken up here, some of which were already shortly mentioned in the previous section. Firstly, in some registers and data sets all married women are recorded according to their husband's occupational status. This basis of combining statistics obviously does not reflect women's own occupational experience. To some extent, this is not a problem of the occupational classification in itself, but a

problem of deficient data. Housewives are, however, usually classified according to their husbands occupational status unless previous status is available in a longitudinal framework.

Secondly, women's occupational careers are very closely related to their marital status and childcareing responsibilities. Married women with other than occupational duties, e.g. household work and childcare, move in and out of labour force more often than men and may be forced at re-entry to employment to take jobs that do not correspond to their qualifications or previous work experience. For example, with possibly poor availability of daycare facilities for children well educated women searching work after child birth may be compelled to take up part-time jobs at a level that is lower than the one they occupied before. This may damage women's occupational careers permanently. Evidence for such occupational downgrading exists for Britain (e.g. Martin and Roberts 1984; Dex 1987), but it may be a less serious problem in other countries (for France see Walters and Dex 1992). Married women's 'individual' occupation may thus not be the most appropriate measure of socioeconomic status. Women's disrupted occupational careers are sometimes used as an argument to classify women according to their husband's occupation. The second problem is thus related to the first one.

Thirdly, some occupational classifications in certain national circumstances are not able to discriminate between women's occupations, i.e. most women fall into two or three categories (lower white collar and manual occupations).

These measurement problems, of course, do not apply to the same extent in all societies and data sets. Although no data set is immune to all of these criticisms, many seem to be embodied in the OPCS Decennial Supplement for England and Wales (e.g. McDowall 1983; Pugh and Moser 1990). This is probably why the criticism of occupational status as a measure of women's socioeconomic standing has been fiercest in Britain.

### *2.1.4. Own and husband's occupational status*

Several possibilities to avoid the limitations of the 'classical' occupational classification as used in the OPCS Decennial Supplement (1978, 1986) have been proposed and used

in empirical studies. Three solutions based on occupational data are first shortly presented and evaluated and then several other non-occupational measures are discussed.

All three alternative occupational measures start from the premise that information on women's own occupational characteristics must be available. The first alternative approach is to construct a new occupational scale using detailed occupational data and information on several other women's characteristics. The new classification may give special emphasis to housewives, be able to better discriminate women's occupations and give some emphasis to women's careers in part-time and full-time work (Barker and Roberts 1986; Roberts and Barker 1986; Abbott and Sapsford 1987). Again one should emphasise that these considerations are most urgent in countries where part-time work is common, where a large part of the female population stay at home, and where the traditional occupational scales fail to discriminate women's jobs. Although such composite scales have been proposed, none that fill the above three criteria yet exist or have been widely used in mortality studies. It is also a matter of debate, whether to combine the available occupational and other data into a single index of occupational status or to use separate 'one-dimensional' variables in the analyses. Several American authors (e.g. Kitagawa and Hauser 1973, Liberatos et al. 1988) have taken the view that composite variables should not be used when the relationship between individual components and mortality has not been firmly established.

The second approach, the dominance approach, is a household based measure. It has been argued that individualistic approach to occupational status is not adequate (especially among women) and that household based measures should ideally be used. These methods take into account the fact that socioeconomic status is not necessarily solely determined by his/her own characteristics. Individuals should, thus, be allocated into socioeconomic statuses according to information on the characteristics of more than one member of the household (or family) or use information common to all household members, e.g. number of cars in the household or housing tenure. Household based measures are believed to give a more holistic view of the women's and men's socioeconomic status than the individual occupational status.

The dominance approach compares both spouses' occupational classes (other social characteristics can alternatively be used) and attaches the higher status to both spouses

regardless of sex. This method has the obvious advantage of not attributing women to their husband's occupational status without considering their own position.

The dominance approach has, however, its own weaknesses. Firstly, in practice husband's occupational position determines almost all women's positions (Abbott and Sapsford 1987). Secondly, one must be willing to arrange the occupational categories. How, for example, should entrepreneurs and farmers be situated on this hierarchical scale of occupational groups? Thirdly, the approach is only applicable to married couples. Unmarried people still have to be classified solely on the basis of their own status (Arber 1989). Fourthly, a more thorough use of the information available is to analyse the effects of husband's status separately or to cross-classify it with women's own status.

The last point brings us to another household based measure, i.e. the cross-classification of own and spouse's occupational status (see e.g. Britten and Heath 1983) or any other social characteristics. The relevance and applicability of the cross-classification of both spouse's occupational statuses in mortality research is of course an empirical question. If no further discriminatory power is obtained the cross-classification should not be used as it complicates the analysis somewhat.

This approach, however, also has its own weaknesses. In addition to the problem of having to classify unmarried people solely according to their own socioeconomic characteristics, the cross-classification of both spouses' characteristics creates a problem of combinations with only a very small number of observations (Arber 1989). The problem of small numbers is mainly, of course, a problem of small samples, but even in large scale census studies small 'cells' do occur (marriages between members at opposite ends of the occupational scale). The fact that these combinations are rare, however, make them less important.

The simplest way around the problems posed by occupational status is to discard it altogether and use other measures of socioeconomic status or use it in combination with other measures. Different approaches to and measures of socioeconomic status are not, of course, completely interchangeable. Each measure emphasises different aspects of socioeconomic status.

*2.1.5. Other measures of socioeconomic status*

Education, an additional individual level measure of socioeconomic status, avoids some of the disadvantages inherent in occupational status (e.g. Kitagawa and Hauser 1973; Valkonen 1989; Carr-Hill and Pritchard 1992) and has an additional advantage of being practically constant for people above the age of 25 or 30 years. It is, of course, possible to use individual education as part of a household based measure of socioeconomic status by cross-classifying it with, for example, spouse's occupational status or educational attainment.

Possibly the most important advantage of using education instead of occupational status is that housewives can be allocated to an educational group without any difficulties. This makes comparisons between housewives and employed women easy. Educational attainment is not, furthermore, as seriously affected by occupational considerations after childbearing (e.g. low status part-time jobs or jobs suitable for women with young children) as occupational status.

The most severe disadvantage is, however, that the distribution of women's (and men's) educational attainment is quite skewed in most societies, especially in the older age-groups. Most middle-aged women still have only basic education (e.g. 65 per cent of 35-64-year-old Finnish women in 1980).

Non-occupational household based measures are also becoming widely available. Quite commonly used measures (especially in the OPCS longitudinal study e.g. Goldblatt 1990a) are access to cars and housing tenure. These have the same advantages over occupational status as education, i.e. the analysis of housewives is straight forward and women's uneven educational careers do not pose a difficulty. Several other variables, e.g. family disposable income and level of housing have also been used.

In addition to avoiding difficulties, use of these measures (education and household based measures) in combination with occupational status brings about advantages by enabling a more comprehensive analysis of the determinants of mortality. Occupational status and other measures of socioeconomic status are not just interchangeable variables in an analysis but they can each make independent contributions. Among women lower white collar groups and manual groups are large and to some extent heterogenous

groups and further distinction into, for example, tenure groups can give important new insights.

### *2.2. Multiple roles and mortality*

The second starting point for this study has been the discussion on the health effects of role accumulation, especially through women taking up a further role in employment. Both beneficial and harmful outcomes of multiple roles have been proposed. This section is divided in three parts. First, some general comments on multiple roles are made. Second, the competing hypotheses are presented in the context of health and mortality. Third, empirical evidence on the effects of multiple roles on health and mortality are shortly reviewed.

#### *2.2.1. Some general remarks on multiple roles*

The assumption that multiple roles can cause role strain, defined by Goode (1960, p. 483) as 'the felt difficulty in fulfilling role obligations', can be found in the writings of Merton (1957). According to Merton 'each social status involves, not a single associated role, but an array of associated roles'. Merton uses an example of a medical student: the single status of student involves the roles of a student in relation to teachers, but also in relation to students and other medical personnel. An occupant of a particular social status may thus be confronted by conflicting expectations from his role-partners and suffer strain from having to come to terms with all these expectations (Merton, 1957 p. 369).

Multiple roles, or a complex status-set to use the Mertonian concept, may well lead to role strain. As different statuses and the corresponding role-sets coincide in the same individual it is likely that one has to cope with an array of expectations and obligations possibly even more numerous and diverse than could ever be encountered in any single status.

The concept of role strain, however, in addition to role conflict comprises another element, namely role overload (Sieber 1974). Role overload refers to the constraints imposed by time and energy. As more statuses are acquired the status-occupant will

have to cope with an increasing number of role expectations and demands. At some point one will feel difficulty in fulfilling the obligations attached to these roles. Although Goode (1960) does not directly refer to time constraints some of his remarks (e.g. 'conflicts of time, place or resources' and 'finite sum of role resources') closely relate to the notion of overload (Sieber 1974).

According to Sieber, however, researchers and theorist have neglected the possible benefits of multiple roles and that these benefits might exceed the burden of role strain. Sieber distinguishes four positive outcomes of 'role accumulation'. They are role privileges, overall status security, resources for status enhancement, and personality enrichment and gratification.

**Role privileges.** Sieber reminds us that as well as obligations all roles carry with them certain rights. There is some reason to believe that these rights can outstrip the obligations. According to rules of reciprocity rights tend to be balanced by obligations. In addition to these 'reciprocal rights' there are liberties, i.e. rights that do not demand any specific behaviour of role partners (e.g. right to interact with friends on the job). These liberties can be considered compensatory for any strain and offer a prospect for net gratification. Furthermore, reference to role obligations in one sphere of life may provide an acceptable excuse to fail to meet obligations on an other sphere.

**Overall status security.** Multiplicity of role partners may, especially if in separate social spheres (Thoits 1983), offers compensation in case of failure in any one field. 'These alternative relationships afford compensatory affection, moral support, emergency resources, and perhaps even assistance for a renewal of effort in the original role' (Sieber 1974, p. 573).

**Resources for status enhancement.** Role partners may also provide benefits which do not demand any special effort or cost. Some of these 'by-products of social relationships', e.g. recommendations, connections, free meals, a good credit worthiness, sexual favours, use of company property for personal needs and bribes, can be reinvested to meet demands in other spheres of life and thus accumulate benefits that exceed role expectations and obligations.

**Personality enrichment and gratification.** Role accumulation increases the susceptibility to new and different ideas and diverse forms of behaviour and may thus

enhance one's personality and fill the need of new experiences. It is similarly conceivable that role overload enhances one's feeling of importance. The numerous demands and expectations placed on occupants of multiple statuses may in some instances promote a sense of irreplaceability.

Marks (1977) has, furthermore, criticised the scarcity approach to human energy which stresses the 'overdemanding nature of multiple roles'. He argues that social roles can also produce energy because of the sympathy and satisfaction that the roles provide.

### *2.2.2. Role accumulation and multiple role hypothesis of mortality*

In the context of health and mortality analysis great interest has focused on three central roles: marital status, parenthood and employment status. The relationship between these roles has been a subject of intense investigation in societies where women's labour force participation is increasing rapidly (mainly in the United States and Great Britain). Two hypotheses have been put forward to predict the consequences of women taking a further role in paid employment. The arguments these hypotheses are based on can be derived from the previous chapter on the more general multiple role framework.

The role accumulation hypothesis asserts that in addition to providing income and financial independence from men, employment can also be seen as an avenue for creating social ties outside of home and marriage. People who are economically active probably have better opportunities than those not economically active to create supportive social ties because they have more contacts with people outside the family. Besides more extensive network of social ties, economically active women may also gain self-esteem, be able to compensate a failure in any one sphere of life and be freed, at least partially, from possibly tedious and little respected household work. Thus, according to role accumulation hypothesis, women will gain better health and lower mortality by taking an additional role as an employee. The possible causal mechanisms are poorly understood, but they may include improved coping resources or host resistance and a healthier lifestyle.

According to the multiple role hypothesis, on the contrary, multiple roles of a wife, a mother and a paid employee at the same time are detrimental to women's health (see e.g. Verbrugge 1983b). The division of household work in industrialised countries imposes primary responsibility for child-care and household work to women (e.g. Fox and Nickols 1983; Pleck 1983; Robinson 1980) This responsibility seems to be left intact despite increasing labour force participation among women. Many employed women, thus, have to fulfil role obligations of an employee and a housekeeper. This may lead to role conflict and role overload, which in turn may result in tiredness, exhaustion and finally disease and mortality. (see e.g. Arber, Gilbert and Dale 1985; Sorensen and Verbrugge 1987)[2].

Although the hypotheses on multiple roles are to a large extent concerned with the rising labour force participation of women, the reasoning can be extended to other phenomena, e.g. comparisons of lone mothers and other non-married women. In such instances other mediating factors than those mentioned above are sometimes suggested. In the case of lone mothers, for example, these may include the notion of deviancy (Kotler and Wingard 1989).

### *2.2.3. Convergence hypothesis of mortality*

The controversy over employment, women's roles and health and mortality bear a great deal of resemblance to the debate on the convergence hypothesis. The convergence hypothesis is explicitly constructed to explain and predict changes in sex mortality differentials. These changes are, however, assumed to materialise because of relative changes in women's mortality. The convergence hypothesis (see e.g. Lopez 1988; Fox and Carr-Hill 1989; Hart 1989) assumes that sex mortality differentials will gradually disappear as women gain equality with men, particularly in employment. The proponents of the convergence hypothesis stress the supposedly negative side effects of economic activity on health and mortality. It is argued that as women engage more in paid work, it follows that work related stress increases, and likelihood to adopt

[2]Multiple roles and multiple role hypothesis should not be confused with each other. Multiple roles refer to a life situation where a person has several of the following roles: wife/husband, mother/father and an employee. The multiple role hypothesis is, on the other hand, a 'theory' that tries to explain what effects multiple roles have on morbidity and mortality.

hazardous, typically male, life styles (e.g. such as smoking and alcohol consumption) becomes greater (Hart 1989, p. 140).

The convergence hypothesis like the multiple role hypothesis are concerned with the same phenomena, the supposed negative effects of employment on women's health and mortality. The hypotheses seem to stress different aspects of life. The convergence hypothesis assumes that harmful effects of employment are primarily related to work and adoption of male patterns of behaviour. The multiple role hypothesis emphasises the effects of conflict between family and work roles, and role overload. These interpretations are clearly not mutually exclusive.

### *2.2.4. The empirical evidence*

#### *Multiple role and role accumulation hypotheses*

The empirical evidence on the effects of multiple roles on mortality is, unfortunately, scarce. A rare example, Kotler and Wingard's (1989) study, based on data from Alameda County, California, analyses mortality of 35-64-year-old men and women. According to the authors the relationship between motherhood and mortality among married working women was negligible. 'Married working women with children had the lowest mortality risks of any role status group in this study' (Kotler and Wingard 1989). Furthermore, no special effect of combining parental and work roles seems to have existed. Housewives with four or more children or a child present at home had high mortality. Similarly, working lone mothers had 2.2 times higher mortality than corresponding women without a child. The high mortality of lone mothers could, however, be caused by random variation. Controlling for variety of other factors (e.g. education, alcohol consumption, smoking) did not change the foregoing relationships.

Similarly, Hibbard and Pope (1991, 1992, 1993), examining 'serious' morbidity and mortality of a sample of about 2500 men and women subscribers to a health plan in the Northwestern United States, were not able to detect interactions between the two 'domestic roles', (marital status, and parental status) either among employed nor among non-employed women. Controlling for the quality of social roles, i.e. work support and marital or parental satisfaction did not seem to affect the results (Hibbard and Pope 1993).

Analyses on morbidity, which Hibbard and Pope's (1991, 1992, 1993) studies already partly are, do not give consistent results. As morbidity differentials are of secondary interest for the purposes of this study only few works are mentioned here. Haynes and Feinleib (1980) find evidence for a possible harmful effect of multiple roles. They reported a very high IHD incidence among clerical workers who had ever married and had several children. Also, Cleary and Mechanic (1983) who analysed psychological distress concluded 'that the strain of working and doing the majority of the work associated with raising children increases distress among married women' (Cleary and Mechanic 1983, p. 111). According to Haavio-Mannila (1986), combining family and work roles is related to symptoms of anxiety, but not to more serious morbidity.

Data from the 1975 and 1976 OPCS General Household Surveys (Arber, Gilbert and Dale 1985), suggest that part-time work may have slight beneficial effects on limiting longstanding illness of women, 'but full-time work for women under 40 with children appears to have detrimental effects on health'(Arber, Gilbert and Dale 1985, p. 396). For those women who are over 40 years of age, full-time work is not related to excess morbidity, 'probably because the older average age of their children causes less role strain for these working mothers'(p. 396). Employed lone mothers were also observed as having very poor health.

Verbrugge (1983b) has tested the multiple role versus role accumulation hypothesis on the basis of the U.S National Health Interview Survey. Women with multiple roles, i.e. people who have more than one role at the same time enjoy the best health. Among married employed women (with or without children), a group that has the best health of all women, the possible health promoting effects of job and family roles are additive. Housewives with children, however, have better health than housewives without children. Furthermore, non-married women with children have worse health than non-married women without children.

Waldron and Jacobs (1988, 1989) analyse national longitudinal survey data for the United States for a period between 1977 and 1982. They control for age, education, race and health at the 1977 interview and follow the changes in health between the two points of time. The authors report better health trends for both white and black women with multiple roles. For example, labour force participation has a possible beneficial effect on health among white unmarried women and marriage has a possible beneficial effect on health among white women not in the labour force.

Men may also benefit or suffer from multiple roles, although probably less than women (Verbrugge 1983b). The three roles (a husband, a father and an employee) also have different relative importance and meaning for men than for women. According to some authors (e.g. Verbrugge 1983b), for example, the role of a husband and a father place little demand for participating in household work. On the other hand, more pressure may be put on men to make a living for the whole family.

*Convergence hypothesis*

The importance of convergence hypothesis, a hypothesis that has been put forward to predict sex mortality differentials has been explicitly assessed by Passannante and Nathanson (1987). Their data consist of the white civilian labour force for the period 1974 to 1978 in Wisconsin, United States. Deaths were gathered from death certificate files and denominators for death rates were generated from The Survey of Income and Education. According to the results female mortality does not seem to be negatively affected by labour force participation as sex mortality ratios are usually higher in labour force than in total population in almost all age and marital status groups. A different result is to be expected if convergence of mortality is really taking place: sex mortality differentials should have been smaller in the labour force than in the total population, because working women are exposed to the same occupational hazards, work related stress and behaviourial factors as men. Housewives, on the other hand, are not exposed to these factors. Only among some white-collar and service worker groups are mortality rates among working men and women similar.

According to the convergence hypothesis sex mortality differentials among labour force participants should be smaller for causes of death related to occupational hazards than for other causes of death. This is to be expected, because women in employment should in principle be exposed to the same occupational risks as men are. No cause specific differentials could, however, be observed (Passannante and Nathanson 1987).

The cross sectional data are, however, the major weakness of Passannante and Nathanson study as well as the fact that men and women do not work in similar occupations and are thus not exposed to similar occupational hazards. Health related selection into and out of the labour force can seriously distort the results (e.g. Waldron 1980; Waldron and Jacobs 1988; Adelmann et al. 1990). Koskinen and colleagues (1989) study is, thus, not based on economic activity but the authors presume that

certain population groups are forerunners in the assumed increase in equality between sexes in various areas of life. According to the authors the male/female ratio decreased only moderately in the age group 35-49 during the period 1971-85. The decrease, however, was not observed in the population groups which were considered to be 'avantgardist' in adopting new behaviour patterns, i.e. highly educated people and those who live in the capital region. Furthermore, large part of the observed decrease in the male/female mortality ratio could be explained by changes in the cause of death structure, not by changes in the cause-specific male/female mortality ratio.

## *3. EMPIRICAL RESEARCH QUESTIONS*

The 1980 Finnish census data with a 5-year mortality follow-up offer a possibility to clarify some of the problems encountered in studies presented in the previous chapters. The strength of the Finnish data lies mainly in two fields. Firstly, the multiplicity of background variables recorded at the time of the census make it possible to study the relationship between socioeconomic status and mortality in great detail and to use various different measures. Also the analysis of multiple roles and mortality is enhanced by the availability of conditioning variables (e.g. characteristics of children). Secondly, the study population is large enough to give statistically significant results, even when analysing mortality by cause of death or studying relatively marginal population groups. The data set is presented in more detail in Chapter 4.

Empirical research questions were formulated on the basis of the literature review . These questions guide the data analysis and can also be seen as a crude disposition for the chapters to come after an introduction to data and methods.

Eight main questions are analysed:

1. How are different measures of socioeconomic status related to female mortality?

2. How do these relationships differ according to women's age?

3. Is the relationship between mortality and any one measure of socioeconomic status different in categories of another measure of socioeconomic status?

4. Is the relationship between mortality and any one measure of socioeconomic status different in categories of employment status, marital status or motherhood?

5. Are spouse's socioeconomic characteristics related to mortality differently among women than men?

6. How are motherhood, marital status and economic activity related to mortality? How are multiple roles related to mortality?

7. Is the relationship between multiple roles and mortality different in age and socioeconomic groups or in groups defined by age and number of children?

8. Are the relationships observed for total mortality similar for specific causes of death?

# *4. DATA AND METHODS*

## *4.1. General description of the data*

The study is based on the 1980 census records in Finland linked with all deaths during the period 1981-5 and certain variables from the 1975 and 1970 censuses. Furthermore, income variables have been linked from the data files of the National Board of Taxation. The linkage of data sets has been carried out by the Central Statistical Office of Finland by means of personal identification codes[3]. Personal identification codes were deleted before the data set was delivered to a research project headed by prof. Tapani Valkonen at the University of Helsinki. The data are cross-tabulated according to the variables included in the study. These tables are analysed by means of Poisson regression models (see below).

The analysis includes women and men in Finland between 35-64- years of age during the period 1981-5. Main emphasis is given to women. By restricting the study to the middle-aged population several advantages are obtained or, to put it in another way, a few difficulties and caveats can be avoided. Firstly, educational attainment does not change during the follow-up period for the great majority of people in the 35-64-age-group. Among those younger than 30 years a non negligible part was still engaged in further education in 1981-5 and their educational attainment may thus change during the study period. Secondly, occupational status may be misleading both in the younger (born after 1950) and older (born before 1916) age-groups. Young students, for example, who do not have an earlier occupation are classified according to the head of the household. Similarly, in the elderly population socioeconomic status is problematic, because it may be based on an occupation held several decades ago. Furthermore, as the study is, to some extent, aimed at disentangling the relationships between economic activity, parenthood and marital status, on the one hand, and mortality, on the other, it is not relevant to analyse age-groups where most people are pensioned, studying or do not have children living in the household.

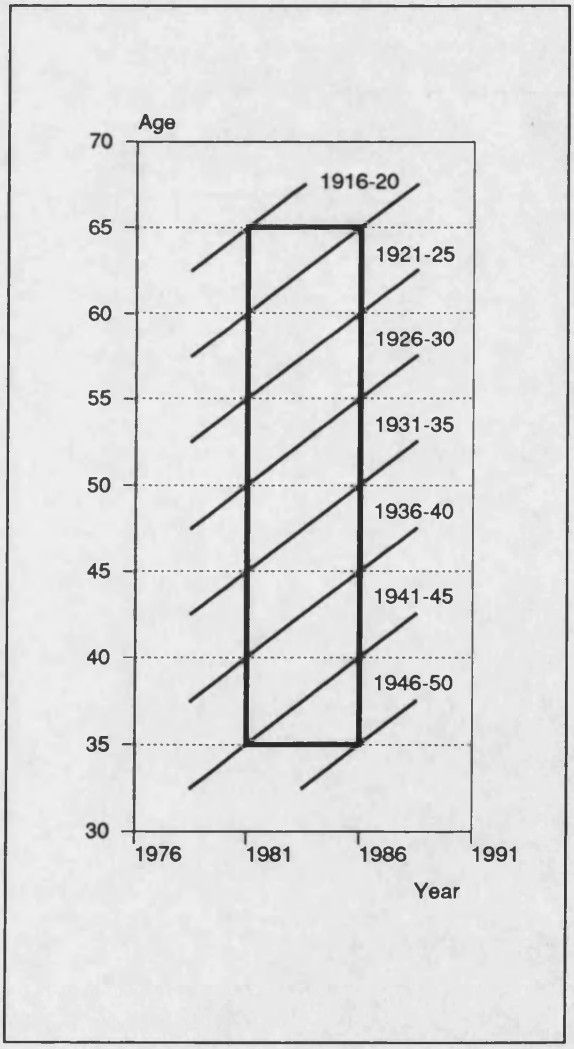
The explanatory variables in this study are all measured at the time of the 1980 census or linked from previous censuses (1970 or 1975). Thus, for each individual all

[3]I am grateful to the Central Statistical Office of Finland for the permission (TK-53-69-87) to use the data.

characteristics are fixed for the whole study period 1981-5. This is not a problem for attributes like sex and age and, to lesser extent, also education (educational qualifications are usually obtained well before age 35). But for some characteristics, e.g. occupation or marital status, changes may occur during the follow-up period that remain unobserved. The data, at present, provide limited possibilities to trace these changes.

The number of person years lived by the female study population in the period totals to about 4.45 million and the number of deaths is about 15300. Person-years are calculated on a daily basis. Less than 0.2 per cent of deaths could not be matched to a census record. The structure of the data is presented in Figure 4.1.

FIGURE 4.1. Structure of the data by year, age and birth cohorts.



### *4.2. Measures of socioeconomic status*

As has been pointed out several times, it is not satisfactory to study socioeconomic status mortality differentials among women or men using only one measure. Thus, several indicators of socioeconomic status were included in the analyses. Six measures were chosen altogether. All of these indicators depict somewhat different aspects of socioeconomic status. Two separate variables were chosen to represent each of the three 'levels' of measurement: education and occupational status to represent the individual level, family disposable income and housing tenure to represent the household level and spouse's education and occupational status (spouse's characteristics are in fact also household based measures). Of the two household based measures housing tenure may be considered to emphasise wealth and family disposable income consumption possibilities.

#### *4.2.1. Own and spouse's occupational status*

Constructing a socioeconomic classification for women from the about 5000 specific occupations recorded in the Finnish census was not attempted in this study. The decision to not attempt to reclassify all individual occupations was taken because several other measures of socioeconomic status were available and the standard occupational status classification (see Valkonen et al. 1990) does not suffer from some of the problems discussed earlier. Firstly, women are not classified according to their husband's occupation; rather all employed women can be classified according to their own current occupation. As current occupation is not available for pensioned women, they are classified according to their own most recent previous occupation (from the 1975 or 1970 censuses). Married housewives, who constitute 12 per cent of person-years of the study population (1981-5) as compared with 44 per cent of 15-59-year-old 'unoccupied' women in England and Wales (1971), can also be classified according to their own previous occupation, but spouse's occupation is also available for married housewives as well as all for other married women.

Secondly, although the distribution of occupations among women is more concentrated in the lower white collar category than men's distribution, no single category dominates women's occupations. Among economically active women 9 per cent of person-years

were in the upper white collar group as compared with 14 per cent among men. Similarly, among women 39 per cent were in lower white collar and 35 per cent in manual groups. The corresponding figures were 17 and 47 per cent among men (for England and Wales, see McDowall 1983).

Thirdly, the additional problem that women after childbirth drift down into occupations, usually part-time, for which they are overskilled is less serious in Finland. Part-time work is very rare (about 6 per cent of all 35-64-year-old women in 1985) and women with young children usually take up employment fairly soon. Eighty-seven per cent of the combined group of housewives and economically active women with 0-6-year-old children were housewives (see also Jallinoja 1985).

In this study, occupations, whether own current, own previous or spouse's occupation, are classified into four categories. The classification slightly resembles the measure used for the OPCS longitudinal study and the Registrar Generals's Decennial Supplement for Great Britain (Leete and Fox 1977). In addition to upper white collar, lower white collar and manual groups, a residual group containing mainly entrepreneurs, farmers and those whose occupation is unknown has been included. Distribution of person-years and deaths according to socioeconomic status variables are presented in Tables 5.1, 5.6, 5.11, 5.14 and 5.18 for certain sub-populations (see also Appendix 8).

### *4.2.2. Own and spouse's education*

Three educational categories are separated. The division is similar for both own and spouse's education and, it is based on years of education. Basic education includes those with primary education or first five forms of secondary school, lasting for less than 10 years. Intermediate education has lasted between 10 and 12 years, and it includes those with vocational training and high school graduates. Higher education has lasted for more than 12 years, and it includes those with an institute or a university degree or certificate. The bulk of the female study population aged 35-64-years has only basic education. Only about 8 per cent have higher education (see Tables 5.1 and 5.6 and Appendix 8).

*4.2.3. Family disposable income per consumption unit*

Family disposable income comprises all income earned by the family members, including wages, pensions, maternity allowances, child benefits, etc. Taxes are, of course, deducted. The information on different sources of income come from the tax return forms held in the registers of the National Board of Taxation and the registers of the Social Insurance Institution. The family is considered to be either a married couple with or without children, a cohabiting couple with children, or a single parent with children. Different weights are used for adults and children when relating family disposable income to the number of consumption unit. The first adult in the family corresponds to one consumption unit and all others over 18 years of age 0.7 units. Children under 18 years of age equal 0.5 consumption units.

The measure of family disposable income per consumption unit is divided into quartiles. The cut-points were calculated from a 10 per cent systematic sample drawn from a total male and female population arranged according to age. Those who had no information on family disposable income were put into the lowest income category (see Table 5.18 and Appendix 8).

*4.2.4. Housing tenure*

Housing tenure is divided into two categories: (1) living in owner occupied housing and (2) living in rented housing or information on housing tenure not available. Rented accommodation also includes accommodation provided by the employer. About two-thirds of the study population live in owner occupied housing (see Table 5.18 and Appendix 8).

*4.3. Marital status*

Four marital status groups are distinguished: married, single, divorced or separated and widowed. Those who cohabited without being formally married could not be separated from the unmarried population. On the basis of estimations by the Central Statistical Office (Tilastokeskus 1982) the prevalence of cohabitation among women in the age-groups between 35-64-years was only 3.3 per cent in 1981 (6.6 per cent in the age-

group 35-39 and 0.9 per cent in the age-group 59-64). Divorced and separated were treated as a single group, because the characteristics of the groups are very similar and there are too few separated for detailed mortality analysis. See Table 6.1 for the distribution of person-years and deaths.

### *4.4. Motherhood*

Motherhood or parenthood refers in this study to the absence or presence of children living in the household. In the older age-groups those without children may either never have had children or their children have already moved away from home. In the younger age groups those without children have most likely never had children, unless their only child has died or does not live with the mother. Death of a child is quite rare in Finland. Infant mortality is very low (6-7 per mil) and the probability of dying before 18 years of age is about one per cent.

#### *4.4.1. Number of children living in the household*

The measure of number of children living in the household is classified into five categories. The categories run from 0 to 4 or more children. It must be emphasised again that this variable is only a very poor indicator of fertility especially in the older age-groups. Among the 35-64-year-old population having 0-2 children living at home is most common. Having four or more children is very rare (5 per cent of the person-years). This is because fertility in Finland has been quite low for some time (total fertility rate was below two already in 1970) and the eldest children may have already moved away from home.

#### *4.4.2. Age of the youngest child*

Age of the youngest child has also been divided into five categories. Those who have no children living at home compose the first category. Pre-school children (children under 7 years of age) are divided into two categories: 0-2-year-olds and 3-6-year-olds. The fourth category, includes children between 7-15-years of age. This is the age group of compulsory education. Children over 15 years of age have either chosen to continue

their studies in high school, changed into vocational training, or decided to seek employment. This group comprises the fifth category (see Table 6.5).

### *4.5. Economic activity*

All persons in the study population are classified according to their main economic activity one week prior to the 1980 census. Also spouse's economic activity is used when analyses for household based measures are carried out. Both variables have the same four-category classification. All labour force participants, employed or unemployed, are classified into one category. Those not in the labour force are either housewives ('performing household work') or pensioners, who are mostly on disability pension. Those whose economic activity is not known comprise the fourth group. Pensioned and those whose economic activity is not known are combined for the statistical analysis.

About 72 per cent of women in the study population belong to the labour force. Women's labour force participation is and has for long been very high in Finland as compared with many other Western European countries. This may have consequences for the interpretation of some of the results. A more detailed discussion on female labour force participation is carried out elsewhere in the study.

### *4.6. Mortality by cause of death*

The analysis focuses on mortality by cause of death at the outset. Cause of death analyses are interesting per se, but they can also give insight into the mechanisms that lead from particular social characteristics to high mortality. Total mortality is a sum of diverse patterns of mortality differentials and may be highly misleading if used carelessly.

All deaths during the 1981-5 follow-up period have been classified according to the eight revision of the international classification of diseases. For the purposes of this study, a more crude classification was compiled. Besides total mortality this classification includes four 'main causes of death', i.e. malignant neoplasms (ICD 140-239), circulatory diseases (ICD 390-458), other diseases, and accidents and

violence (ICD E800-999). Breast cancer (ICD 174) was, however, separated from all neoplasms. Also lung cancer (ICD 162) is briefly analysed separately from other cancers.

It was necessary to separate breast cancer from all other cancers because it makes up about 23 per cent of all cancer deaths and, as previous studies have shown (e.g. Valkonen et al. 1991), socioeconomic mortality differentials from breast cancer are reverse to those observed for other prominent cancers, i.e. clearly higher mortality in the higher socioeconomic groups. Furthermore, as breast cancer is the most prominent sex specific disease, it is sensible to carry out comparisons between women and men only for cancers that exclude breast cancer. Excluding other sex specific cancers, e.g. cancer of cervix uteri or prostate, is not absolutely necessary as they are relatively small causes of death among 35-64-year-olds or they depict socioeconomic mortality differentials similar to those observed from most other cancers.

All circulatory diseases were analysed as one group of causes of death. This was considered appropriate because all the major circulatory diseases exhibit roughly similar socioeconomic mortality differentials. IHD is the largest cause (about 50 per cent of all deaths from circulatory diseases) and also shows the largest differentials. All other diseases (i.e. all diseases except cancers and circulatory diseases) were also grouped together. This group is very heterogenous, but all separate causes show high mortality in low socioeconomic groups (e.g. Valkonen et al. 1991).

### *4.7. Methods*

Because dependent variables in the analysis are intensities of death, for which the normality assumption of the traditional linear regression model does not hold, and because most of the explanatory variables are qualitative, it is preferable to use the generalized linear model and particularly its special case the Poisson model as the method of analysis (e.g. Aitkin et al. 1989).

The deaths and exposures are cross-tabulated according to the variables included in the analysis. The cross-table is analysed by means of Poisson regression analysis. Each cell in the table includes information on the number of deaths and the number of person-years lived during the period 1981-5. The cell is taken to be the unit of analysis. The

model describing the relationship between mortality and the explanatory variables can be described by the following model:

$$\log(E(d_i))=\log(V_i)+a+b_1x_{i1}+b_2x_{i2}+...+b_px_{ip},$$

where $E(d_i)$ is the expected number of deaths in the ith cell, $V_i$ is the number of person years lived in the ith cell, $x_i,...,\ x_p$ are the explanatory variables and $a,b_i,...,b_p$ are the parameters to be estimated. (Aitkin and Clayton 1980; Haapakoski 1983). By rearranging the terms the expected logarithmic intensity of death is obtained on the left side of the equation:

$$\log(E(d_i)/V_i)=a+b_1x_{i1}+b_2x_{i2}+...+b_px_{ip},$$

The GLIM statistical package is used in fitting the models. In this program the dependent variable is the number of deaths during the period 1981-5. The population at risk, i.e. the number of person-years lived is effectively 'moved' to the left side of the equation by defining it as an OFFSET-term. The error is assumed to be Poisson-distributed and the link-function is taken to be logarithmic (Payne 1985; Aitkin et al. 1989).

In the GLIM statistical package the goodness of fit and the statistical importance of an added term is measured by means of scaled deviance (S(c,f)):

$$S(c,f)=-2\log(lc/lf),$$

where lc is the likelihood function of the tested model and lf is the likelihood function of the full model. S(c,f) is asymptotically $\chi^2$-distributed. Scaled deviance is analogous to the residual sum of squares from the traditional linear model (Healy 1988; Payne 1985; McCullagh and Nelder 1983).

The results of the Poisson models are presented as relative mortality rates. The first category of each explanatory variable is taken as a reference group, with a relative rate of one (see e.g. Valkonen and Martelin 1988). The relative rates for other categories are obtained by taking anti-logarithms of the parameter estimates.

In this study the manner of indicating the terms included in the model or added to the model is similar to that used in the GLIM statistical package. When referring to a model with several explanatory variables the names of the variables are separated by the plus-sign. For example, a model which includes the main effects of age and sex is denoted shortly as age+sex. An interaction term is denoted by separating the variables with a period. For example, an interaction between age and sex is notated as age.sex. Furthermore, when a term is added to a model it is preceded by a plus-sign. Consider a model which, in the first phase, includes the main effects of age and sex. Then, in the second phase, the researcher adds an interaction term age.sex to the initial model. The two phases can be denoted in the following way:

1. sex+age
2. +sex.age

In addition to the relative mortality rates indices of dissimilarity (e.g. Koskinen 1985) are also used to compare the extent of socioeconomic mortality differentials between groups or to compare various indicators of socioeconomic status within the same group. The index of dissimilarity is a summary measure that takes into account not only the age specific death rates within categories but also the relative sizes of categories defined by the classificatory variable. A 20 per cent mortality differential between two large groups is more 'important', because the differential applies to more people, than a similar differential between two small groups and is reflected in a larger absolute value of the dissimilarity index. The index has a percentage interpretation: e.g. a value of 5.0 means that 5 per cent of all deaths must be transferred from the high mortality groups into the low mortality groups in order to achieve an equal level of age-standardised mortality for all. The value of the index is calculated from the following formula:

$$ID=100 \times \frac{\Sigma|o_i-e_i|/2}{\Sigma o_i}$$

where $O_i$ is the observed number of deaths in socioeconomic group i and $E_i$ is the expected number of deaths in the same group presuming that the age specific death rates were the same as in the whole study population. The index is not free of difficulties (e.g. Wagstaff et al. 1991) and in this study it is never used without reference to relative mortality rates.

# *5. SOCIOECONOMIC STATUS DIFFERENCES IN MORTALITY*

## *5.1. Educational mortality differentials*

### *5.1.1. Mortality according to own education*

The analysis on women's socioeconomic mortality differentials begins with an analysis of educational attainment. This was decided upon for two reasons. Firstly, all women can be classified into an educational category using the same criteria, i.e. highest formal educational level ever attained. Secondly, education is usually determined for life for almost all in their late teens or, at the latest, in mid twenties. Education is thus fixed for 35-64-year-olds well before the beginning of the study period and chronologically precedes all other socioeconomic variables in the data. The first section (5.1.1) presents mainly results that have perviously been obtained elsewhere (see Valkonen et al. 1991; Koskinen and Martelin 1993).

Person-years and deaths by education are shown in Table 5.1. It can be seen that the distribution of person-years by education is bottom heavy. Sixty-five per cent of all person-years are lived in the lowest educational category (less than 10 years of education). This will, at some stage, complicate analysis as the numbers of deaths in other educational groups, especially among women with higher education (12 or more years of education), will become too small to obtain meaningful results (see Section A of Appendix 8 for the numbers of deaths).

TABLE 5.1. Person-years and all deaths by education. 35-64-year-old Finnish women in the period 1981-5.

| Education | Person-years % | All deaths |
|---|---|---|
| Higher | 8 | 697 |
| Intermediate | 27 | 2565 |
| Basic | 65 | 12002 |
| All (in 1000's) | 100(4447) | 15264 |

Table 5.2 shows the relative age-standardised mortality rates for education by cause of death. The first educational category, i.e. those with higher education is chosen to be the reference group with a relative mortality rate 1.00. The results are based on Poisson regression models. From the last column of Table 5.2 one can see that total mortality is high among women who have low educational attainment. Women with basic education have 42 per cent higher mortality than women with higher education.

Similarly, women with an intermediate level education have 12 per cent higher mortality than women with higher education.

TABLE 5.2. Age-standardised relative cause specific mortality rates according to education, indices of dissimilarity (ID) and distribution of deaths by cause. 35-64-year-old Finnish women in the period 1981-5.

| Education | Breast cancer | Other cancers | Circul. diseases | Other diseases | Accid. & violence | All causes |
|---|---|---|---|---|---|---|
| Higher | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Intermediate | 0.76* | 1.04 | 1.64* | 1.62* | 0.77* | 1.12* |
| Basic | 0.69* | 1.21* | 2.37* | 2.16* | 1.08 | 1.42* |
| ID | 3.3 | 2.9 | 7.1 | 6.4 | 5.3 | 4.6 |
| % of all deaths | 9 | 30 | 34 | 15 | 11 | 100 |

* = 95 % confidence interval does not include 1.00
[ = between 30 and 50 deaths
[ ] = less than 30 deaths

However, no single cause of death, as classified in this study shows mortality differentials similar to those observed for all causes of death combined. Circulatory diseases, about 34 per cent of all deaths, shows very large educational mortality differentials, with a 137 per cent excess mortality among women with basic education as compared to women with higher education. The corresponding excess mortality among women with intermediate education is 64 per cent. Even the mortality difference between the two lowest educational levels (about 45 per cent) is larger than the difference between the two extreme groups for mortality from all causes of death combined.

Also the cause of death group 'other diseases', i.e. all diseases except cancers and circulatory diseases indicates large mortality differentials. These differentials are almost as large as those observed for circulatory diseases.

All cancers except breast cancer, the second largest group of deaths (30 per cent), on the other hand, indicate small differentials in death: excess mortality of only 21 per cent among women with basic education and a negligible 4 per cent excess among women with intermediate education. Furthermore, breast cancer mortality differentials are the reverse of those observed for other causes of death discussed so far: lower educational groups experience lower levels of mortality. The excess mortality of those with higher education is about 45 per cent as compared to women with only basic education.

Deaths attributable to accidents and violence exhibit again a further new pattern of differentials in mortality. The relationship is U-shaped with the lowest mortality for women with intermediate education. The mortality differential between women with higher education and women with basic education is not statistically significant. The U-shaped mortality curve seems to be brought about by a relatively high mortality among women with higher education. More detailed cause specific analysis shows that the U-shaped curve is mainly attributable to suicides (Koskinen and Martelin 1993).

Table 5.2 also shows the values of the index of dissimilarity (see Chapter 4 on methods). The index of dissimilarity indicates large mortality differentials for circulatory diseases and 'other diseases' and small differentials for all cancers thus validating the observations made previously in this chapter. The index is of better use later on when different sub-populations or different indicators of socioeconomic status are compared.

### *5.1.2. Own educational mortality differentials by age*

The person-year distribution for educational attainment by age shows a clear process of 'modernisation' (Table 5.3). The proportion of those with higher education in the youngest age-group is more than three-fold as compared to the oldest age-group: a difference of nine percentage points (4 vs. 13 per cent). A similar increase in the proportion of women with intermediate level of education is also observed, while the proportion of women with only basic education has contracted from about 80 per cent among 55-64-year-old women to about 50 per cent among 35-44-year-old women.

TABLE 5.3. Person-years and deaths from breast cancer by education and age. 35-64-year-old Finnish women in the period 1981-5.

A. Person-years (%)

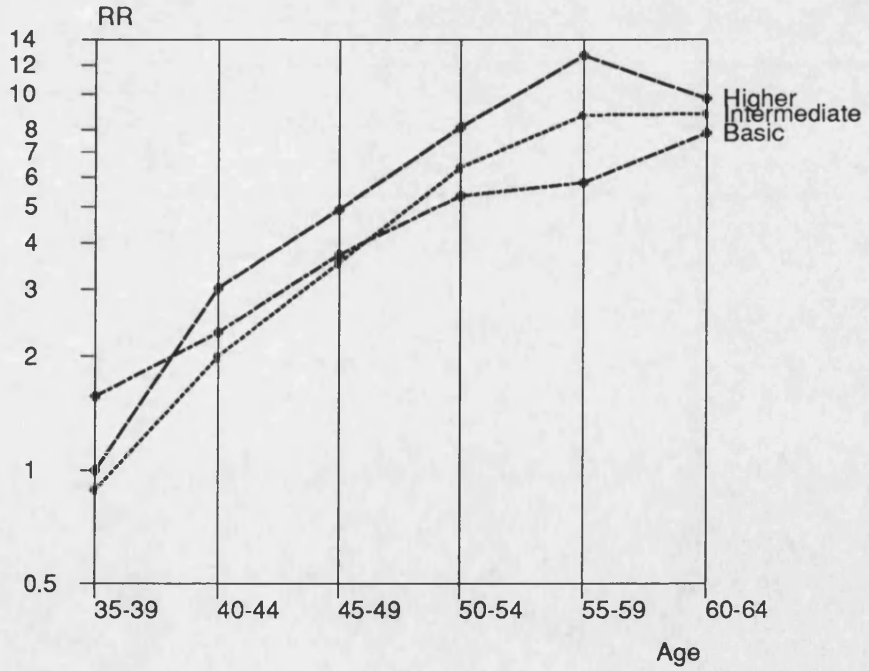
| | Age-group | | | | | | |
|---|---|---|---|---|---|---|---|
| Education | 35-39 | 40-44 | 45-49 | 50-54 | 55-59 | 60-64 | All |
| Higher | 13 | 11 | 8 | 7 | 5 | 4 | 8 |
| Intermediate | 41 | 34 | 27 | 20 | 17 | 15 | 27 |
| Basic | 46 | 54 | 65 | 73 | 78 | 81 | 65 |
| All | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Person-years in 1000's | 963 | 739 | 684 | 694 | 706 | 660 | 4447 |

B. Deaths from breast cancer

| Education | Age-group 35-39 | 40-44 | 45-49 | 50-54 | 55-59 | 60-64 | All |
|---|---|---|---|---|---|---|---|
| Higher | 9 | 18 | 20 | 27 | 32 | 18 | 124 |
| Intermediate | 25 | 36 | 46 | 64 | 73 | 61 | 305 |
| Basic | 49 | 66 | 117 | 192 | 228 | 299 | 951 |
| All | 83 | 120 | 183 | 283 | 333 | 378 | 1380 |

Despite differences in the educational structure of these age-groups, the patterns of differentials in mortality by age are similar for all causes of death except breast cancer (see Appendix 1, test A1). The reverse mortality gradient, i.e. lower educational attainment groups having lowest mortality, for breast cancer arises only in the older age groups. Figure 5.1 shows that breast cancer mortality is lowest in the intermediate educational attainment category for the age groups below 50 years. Only in the three oldest age groups, where the majority of deaths occur, mortality of women with basic education stays below that of all other groups.

FIGURE 5.1. Age-standardised relative breast cancer mortality rates by education and age. 35-64-year-old Finnish women in the period 1981-5.




*5.1.3. Own educational mortality differentials by motherhood*

Women's socioeconomic mortality differentials may vary in groups defined by motherhood, marital status and economic activity. This may arise because women's socioeconomic circumstances and characteristics intersect with their family roles and

participation in paid employment (see e.g. Arber 1991). The aim of this section is to explore whether educational mortality differentials vary by motherhood. In the next section a corresponding analysis is carried out by marital status. Analysis by economic activity is put off till Section 5.2 when the analysis of education is combined with the analysis of occupational status.

Table 5.4 shows relative mortality rates by education, motherhood and cause of death. The pattern of educational differentials are very similar both among women with children and women without children. There seems to be, however, some indication that women with intermediate education who have children have relatively low mortality. The differentials between motherhood groups are sufficiently large to be statistically significant (Appendix 1, test A2) only for accidents and violence. Women who have children and are in the intermediate educational category have about 40 per cent lower accidental and violent mortality than similar women with either higher or basic education. This U-shaped mortality differential could not be observed among women without children.

TABLE 5.4. Person-years and age-standardised relative mortality rates from selected causes of death by education and motherhood. 35-64-year-old Finnish women in the period 1981-5.

| Own education | Person-years % | Breast cancer | Other cancers | Circul. diseases | Other diseases | Accid. & violence | All causes |
|---|---|---|---|---|---|---|---|
| Children | | | | | | | |
| Higher | 9 | 1.00 | 1.00 | 1.00 | [1.00 | 1.00 | 1.00 |
| Intermediate | 29 | 0.76 | 0.97 | 1.68* | 1.65* | 0.61* | 1.02 |
| Basic | 62 | 0.67* | 1.11 | 2.51* | 1.72* | 0.96 | 1.26* |
| All (in 1000's) | 100(2900) | - | - | - | - | - | - |
| No children | | | | | | | |
| Higher | 8 | 1.00 | 1.00 | 1.00 | [1.00 | 1.00 | 1.00 |
| Intermediate | 22 | 0.77 | 1.13 | 1.66* | 1.78* | 1.10 | 1.28* |
| Basic | 70 | 0.73* | 1.35* | 2.35* | 2.77* | 1.39* | 1.68* |
| All (in 1000's) | 100(1546) | - | - | - | - | - | - |

* = 95 % confidence interval does not include 1.00
[ = between 30 and 50 deaths
[ ] = less than 30 deaths

The interactions between education and parenthood may be disguised by the marital status structure of the population. A great majority (almost 90 per cent, see Statistical Yearbook of Finland 1989, Table 47, p. 88) of children were still born into marriages in the late 1970's and early 1980's. It may thus be more appropriate to test the interaction between education and motherhood among married women only. When this is done a statistically significant interaction can only be observed for all causes of death

combined. This interaction also shows relatively low mortality among women of intermediate education with children. A more detailed analysis of role combinations as well as the main effect of motherhood is carried out in Chapter 6.

### *5.1.4. Own educational mortality differentials by marital status*

This section examines educational mortality differentials separately in marital status groups. The analysis is important because similar analysis is very difficult to replicate for the other socioeconomic variables. This is due, as is observed later in Chapters 5.2 and 5.3, to the fact that occupational status or household based indicators of socioeconomic status are difficult to obtain for all marital status groups or are by definition strongly influenced by marital status. The analysis of marital status is relevant in this context because it embodies elements that affect women's labour force participation. Furthermore, concentrating only on married women is inappropriate. Although nearly 72 per cent of all person-years are lived in the married population, only 45 per cent of deaths occur among the married in this study population.

TABLE 5.5. Person-years and age-standardised relative mortality rates from selected causes of death by education and marital status. 35-64-year-old Finnish women in the period 1981-5.

| Own education | Person-years % | Breast cancer | Other cancers | Circul. diseases | Other diseases | Accid. & violence | All causes |
|---|---|---|---|---|---|---|---|
| Married | | | | | | | |
| Higher & interm. | 36 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Basic | 64 | 0.84* | 1.17* | 1.47* | 1.23* | 1.28* | 1.22* |
| All (in 1000's) | 100(3196) | - | - | - | - | - | - |
| Single | | | | | | | |
| Higher & interm. | 46 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Basic | 54 | 1.02 | 1.50* | 2.22* | 2.50* | 1.48* | 1.82* |
| All (in 1000's) | 100(505) | - | - | - | - | - | - |
| Divorced | | | | | | | |
| Higher & interm. | 32 | [1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Basic | 68 | 1.05 | 1.04 | 1.61* | 1.53* | 1.42* | 1.35* |
| All (in 1000's) | 100(409) | - | - | - | - | - | - |
| Widowed | | | | | | | |
| Higher & interm. | 19 | [1.00 | 1.00 | 1.00 | [1.00 | [1.00 | 1.00 |
| Basic | 81 | 0.65* | 1.09 | 1.52* | 1.51* | 1.13 | 1.25* |
| All (in 1000's) | 100(336) | - | - | - | - | - | - |
| All | | | | | | | |
| Higher & interm. | 35 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Basic | 65 | 0.85* | 1.18* | 1.58* | 1.46* | 1.31* | 1.31* |
| All (in 1000's) | 100(4447) | | | | | | |

* = 95 % confidence interval does not include 1.00
[ = between 30 and 50 deaths
[ ] = less than 30 deaths

The educational pattern of mortality for all causes of death combined is roughly similar in all marital status groups except among single women. Single women with only basic education have very high relative mortality. This is especially evident when women with basic education in each marital status group are compared to corresponding women with intermediate or higher education (Table 5.5). This comparison is more reliable because of larger number of deaths. The total mortality difference between these two educational attainment groups is about 80 per cent among single women but only about 20-30 per cent in other marital status groups. This high mortality among single women with basic education is mainly due to cancers (except breast cancer), circulatory diseases and to 'other diseases'. For these causes of death educational differentials in mortality varied between 50 and 150 per cent among single women. For other marital status groups the variation stayed in the range of 10 to 60 per cent. There is some evidence to argue that also divorced and widowed women have larger educational mortality differentials for circulatory diseases and 'other diseases' than married women. This cannot, however, be validated at acceptable levels of statistical significance (p=0.05).

### *5.1.5. Mortality differentials among married women: own and spouse's education*

For married women, spouse's socioeconomic, especially occupational characteristics have often been assumed to better describe women's living circumstances and their attachment to social structure and thus indicate larger mortality differentials than their own socioeconomic properties. The weakness of women's own occupational status as an explanatory variable has been justified by the assumed transitory nature of women's employment due to responsibilities at home and towards children. Because of these responsibilities women may, in some cases, feel compelled to take up employment that does not fully utilise their skills and potential. Men's occupational careers are largely not disrupted by family responsibilities and their status is thus seen as dominant in determining family's social standing.

This section compares married women's own and spouse's educational attainment. The aim here is to evaluate whether spouse's educational characteristics are better discriminators of women's mortality than women's own educational characteristics and to examine whether the cross-classification of both spouses' characteristics enhances the

analysis of educational mortality differentials. The analysis of spouse's educational attainment can be carried out only for the subset of currently married women.

Married women classified according to their husband's educational attainment have a slightly more even educational distribution than the same women classified according to their own education (Table 5.6). Eleven per cent of women are married to men who have higher educational attainment, but only 8 per cent of married women have higher education themselves. The size of the intermediate group is roughly similar regardless of whether women are classified according to their own or spouse's education. Numbers of deaths according to both own and spouse's education are presented in Section B of Appendix 8.

TABLE 5.6. Person-years and all deaths according to own education and spouse's education. 35-64-year-old married Finnish women in the period 1981-5.

| | Person-years % | All deaths |
|---|---|---|
| Own education | | |
| Higher | 8 | 413 |
| Intermediate | 27 | 1533 |
| Basic | 64 | 6847 |
| Spouse's education | | |
| Higher | 11 | 611 |
| Intermediate | 27 | 1625 |
| Basic | 62 | 6557 |
| All (in 1000's) | 100(3196) | 8793 |

Mortality differentials in the married sub-population by women's own educational attainment are, of course, very similar to those observed in the total population (72 per cent of the population is married). Spouse's educational attainment also shows large differentials in mortality (Table 5.7). The range and pattern of these differentials are almost as large as and similar to those observed by women's own education. Thus, there is no reason to believe that husband's educational characteristics display larger mortality differentials than women's own education. The dissimilarity indices, however, show larger mortality differentials for three causes of death: breast cancer, 'other diseases' and, more narrowly, circulatory diseases. For these three causes of death the large dissimilarity indices for spouse's education in comparison to women's own education arise from two sources.

TABLE 5.7. Relative cause specific mortality rates according to two models by own and spouse's education, indices of dissimilarity (ID) and distribution of deaths by cause. 35-64-year-old married Finnish women in the period 1981-5.#

| | Breast cancer | | Other cancers | | Circul. diseases | | Other diseases | | Accid. & violence | | All causes | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Own education | Age+ edu | +sed | Age+ edu | +sed | Age+ edu | +sed | Age+ edu | +sed | Age+ edu | +sed | Age+ edu | +sed |
| Higher | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Intermediate | 0.71* | 0.76* | 1.04 | 1.02 | 1.63* | 1.44* | 1.83* | 1.74* | 0.68* | 0.65* | 1.08 | 1.03 |
| Basic | 0.65* | 0.73* | 1.20* | 1.17 | 2.20* | 1.80* | 2.03* | 1.81* | 0.96 | 0.89 | 1.30* | 1.20* |
| ID | 3.5 | | 2.6 | | 5.9 | | 3.5 | | 5.7 | | 3.4 | |
| Spouse's education | Age+ sed | +edu | Age+ sed | +edu | Age+ sed | +edu | Age+ sed | +edu | Age+ sed | +edu | Age+ sed | +edu |
| Higher | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | [1.00 | [1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Intermediate | 0.88 | 0.99 | 1.06 | 1.00 | 1.36* | 1.14 | 1.06 | 0.90 | 0.95 | 1.01 | 1.08 | 1.02 |
| Basic | 0.72* | 0.82 | 1.14 | 1.05 | 1.81* | 1.43* | 1.46* | 1.19 | 1.14 | 1.16 | 1.26* | 1.14* |
| ID | 5.2 | | 1.7 | | 6.3 | | 6.0 | | 3.4 | | 3.3 | |
| % of all deaths | 10 | | 33 | | 33 | | 13 | | 10 | | 100 | |

AGE = Age
EDU = Education
SED = Spouse's education

* = 95 % confidence interval does not include 1.00
[ = between 30 and 50 deaths
[ ] = less than 30 deaths
# = see end of section 4.7. for the manner of indicating the terms included in the model or added to the model.

Firstly, although the range of differentials is larger by own education, the differentials between the two lowest educational categories are larger according to spouse's education. This is true to a large extent for both breast cancer and 'other diseases'. For 'other diseases', the mortality differential between the two lowest categories is about 10 per cent by own education, but almost 40 per cent according to spouse's education. For breast cancer mortality differentials are reversed, women with intermediate level education have about 10 per cent higher mortality than women with basic education. However, women married to men with intermediate education have more than 20 per cent higher mortality than women whose husband's have basic education.

Secondly, although relative mortality differentials according to spouse's education are smaller or as large as those according to own education, the distribution of person-years and deaths is such that smaller differentials apply to larger parts of the population. A differential involving large parts of the population 'matters' more in terms of dissimilarity indices, because more deaths have to be hypothetically transferred from one category to another in order to achieve equal level of mortality for all. The slightly larger dissimilarity index by spouse's education for circulatory diseases exemplifies this. Although mortality differentials in terms of relative mortality rates are larger

between all categories according to women's own education, the differential between both women married to men with higher education and other married women carries with it inequality applying to more women. The two sources of explanation are of course not mutually exclusive, although due to quite similar person-year distributions for both own and spouse's education the former has more potential.

For other cancers than breast cancer and accidents and violence, indices of dissimilarity are larger according to own than spouse's education. Similarly, relative mortality differentials between all three educational groups are larger according to own than spouse's educational attainment. In sum, table 5.7 does not provide evidence to argue that mortality differentials are larger according to spouse's education than according to women's own education.

Own and spouse's education are highly interdependent. This is confirmed in Table 5.8. About 60 per cent of married women with higher education have a spouse with higher education. Similarly, 75 per cent of married women with only basic education are married to men with basic education. If there was no relationship between women's education and their husband's education the figures should be 11 and 62 per cent. The relative mortality rates according to both variables are thus likely to change discernibly when they are estimated simultaneously from a model where age and both spouse's educational characteristics are included. This may have importance for the relative significance of own education and spouse's education as discriminators of women's mortality. Furthermore, when the usefulness of the cross-classification of spouse's educational characteristics is assessed it is contrasted to this particular model.

The second column under each cause of death in Table 5.7 shows the age-standardised relative mortality rates for the models where both own and spouse's variables are included. For most causes of death relative mortality rates for both educational variables decline notably when the other educational variable is added to the model. The decline is, however, more marked for spouse's education. Inclusion of both own and spouse's education into the same model thus somewhat emphasises the importance of own education.

The change in relative mortality rates is not uniform across all causes of death. For all causes of death combined, the excess mortality of those married to men with basic

education is almost halved, but the corresponding reduction for own education is about 30 per cent. For circulatory diseases the decline in relative mortality rates is about 30 per cent for women's own education as compared to up to about 50-60 per cent for spouse's education. For spouse's education the differentials decline most markedly in relation to the highest educational group. For 'other diseases' the decline in relative mortality rates is also large between the two extreme spouse's educational groups, but rather small between women's own educational groups.

For accidents and violence the differential between the two lowest educational groups does not change very noticeably, either according to own or spouse's education. For other cancers than breast cancer the already small spouse's educational mortality differentials disappear when own education is controlled for. Small differentials, however, remain according to own education. For breast cancer spouse's education is a stronger predictor of mortality according to both models.

TABLE 5.8. Person-years (%) by a cross-classification of own and spouse's education. 35-64-year-old married Finnish women in the period 1981-5.

| | Spouse's education | | | | |
|---|---|---|---|---|---|
| Own education | Higher | Intermediate | Basic | All | Person-years in 1000's |
| Higher | 5 | 2 | 1 | 8 | 265 |
| Intermediate | 4 | 11 | 12 | 27 | 871 |
| Basic | 2 | 14 | 48 | 64 | 2060 |
| All | 11 | 27 | 62 | 100 | 3196 |
| Person-years in 1000's | 350 | 855 | 1991 | 3196 | - |

The importance of own education is further emphasised in a series of statistical tests where each of the two educational variables is added separately to a baseline model that already includes the age-standardised effect of the other educational variable (see Appendix 1, tests B2 and B3). For breast cancer and 'other diseases' adding own or spouse's education to the baseline model improves (in terms of scaled deviance) the fit of the model equally. For all 'other cancers' and circulatory diseases, however, adding own education improves the baseline model more than when adding spouse's education. And even more clearly, adding spouse's education to the explanatory model does not enhance (even at the 0.25 significance level) the model at all for causes related to accidents and violence and all cancers except breast cancer. All in all, the analysis

shows that own education is as strong as or possibly somewhat stronger determinant of female mortality than spouse's education.

The relative mortality rates according to a cross-classification or interaction between own and husband's educational attainment were also analysed. This interaction was statistically significant only for all causes of death and 'other cancers'. As the relative mortality rates of this interaction for all causes of death reflect the corresponding interaction for 'other cancers' Table 5.9 presents rates only for the latter cause of death.

TABLE 5.9. Age-standardised relative mortality rates for other cancers (all cancers except breast cancer) by a cross-classification of own and spouse's education. Figures in parentheses are based on main effects. 35-64-year-old married Finnish women in the period 1981-5.#

| | Spouse's education | | | All women | |
|---|---|---|---|---|---|
| Own education | Higher | Intermediate | Basic | Age+edu | Age+edu+sed |
| Higher | 1.00 (1.00) | 1.56* (1.00) | 1.44* (1.05) | 1.00 | 1.00 |
| Intermediate | 1.20 (1.02) | 1.29 (1.02) | 1.26 (1.07) | 1.04 | 1.02 |
| Basic | 1.75 (1.17) | 1.34 (1.17) | 1.48 (1.23) | 1.20 | 1.17 |
| All women | | | | | |
| Age+sed | 1.00 | 1.06 | 1.14 | - | - |
| Age+edu+sed | 1.00 | 1.00 | 1.05 | - | - |

AGE = Age
EDU = Education
SED = Spouse's education

* = between 30 and 50 deaths
& = less than 30 deaths
# = see footnote in table 5.7

The reference category in Table 5.9 is the group of highly educated women married to highly educated men. Figures in parentheses are calculated according to the main effects model. Mortality is lower than expected according to the main effects model among women in the reference category. This can be seen as in every other category relative mortality rates according to the interaction model are higher than rates based on the main effects model (figures in parentheses). Another way of presenting the result, is to recode the variables and fix the reference group as women with basic education married to men with basic education. In this way it can be shown that the mortality advantage among highly educated women with highly educated men as compared to the main effects model is about 20 per cent.

Furthermore, highly educated women married to men with intermediate or basic education and women with basic education married to men with higher education, the so-called status incongruence groups, seem to have about 15 to 25 per cent higher mortality for 'other cancers' than is expected according to the main effects model. These groups are, however, small and the relative mortality rates are based on few deaths. All in all, it can, thus, be concluded that for most causes of death mortality differentials by own education varied very little according to spouse's education.

A final note: spouse's education among married women also indicate a changing pattern of breast cancer mortality differentials by age. A clear structure could not, however, be observed. Interactions between age and spouse's educational attainment variables were not observed for any other cause of death (see Appendix 1, test B5).

## *5.2. Occupational status mortality differentials*

### *5.2.1. Mortality differentials among economically active and pensioned women: own current and previous occupational status*

As compared to education, determining occupational status is a difficult task for men, but especially for women. It is almost impossible to devise one single criterion to allocate all women into an occupational status. Thus, three groups of women are here treated separately. These three groups are economically active women, housewives (of whom all are married) and finally pensioners and persons whose economic activity is unknown, here usually briefly termed as pensioners. The age-structure of these groups are very different: pensioners and to a lesser extent housewives are older than economically active women. For example, 61 cent of all pensioners are 55-64-years-olds. The corresponding figures for housewives and economically active women are 37 and 23 per cent respectively. Table 5.10 shows person-years, deaths and relative total mortality rates for these three groups.

Economically active women account for 72 per cent of all person-years but only about 42 per cent of deaths. The corresponding figures for pensioners (and those whose main economic activity is not known) are 16 and 48 per cent and for housewives 12 and 10 per cent. Thus more than half of all deaths take place in the latter two groups for whom

current own occupational status does not exist. Pensioned women have more than three-fold mortality and housewives roughly 20 per cent higher mortality than economically active women. A more detailed account of mortality differentials by economic activity is carried out in Chapter 6.

TABLE 5.10. Person-years, all deaths and age-standardised relative total mortality rates (RMR) by economic activity. 35-64-year-old Finnish women in the period 1981-5.

| | Person-years % | All deaths | RMR |
|---|---|---|---|
| Labour force | 72 | 6445 | 1.00 |
| Housewives | 12 | 1499 | 1.17 |
| Pensioners | 16 | 7320 | 3.33 |
| All (in 1000's) | 100(4447) | 15264 | - |

In the following, economically active women are compared with pensioners and women whose economic activity is not known. Finally, in section 5.2.2 housewives are contrasted against economically active married women. Two issues are discussed in both parts. Firstly, how do the economically active women compare with pensioned women (or housewives) in terms of mortality differentials both by education and occupational status? Secondly, how do education and occupational status work simultaneously in creating socioeconomic mortality differentials and do cross-classifications between socioeconomic variables increase our understanding of mortality differentials?

All economically active women can be classified into occupational groups according to their own current occupation (Table 5.11). If classification is to be done on the basis of women's own status, pensioners have to be classified according to an occupation held previously. For the purposes of this study we take the occupation held at the time of the 1975 census or, if the person was not occupationally active in 1975, that at the 1970 census. Table 5.11 shows the person-years and deaths (deaths by cause are presented in Section C of Appendix 8) by occupational status and educational attainment. The two largest occupational groups among economically active women are lower white collar workers and manual workers constituting 39 and 35 per cent of person-years respectively. Both upper white collar workers and farmers include 9 per cent of person-years. Among pensioned women 40 per cent either had inadequately described occupation or had not been employed at the time of the 1975 and 1970 censuses. Pensioned lower white collar workers, manual workers and farmers are the

three largest occupational categories for those that could be classified to an occupation, with pensioned manual workers clearly being the largest single group with 25 per cent of all person-years. Only 2 per cent of person-years are pensioned upper white collar. The bottom heavy distribution of occupation and similarly education for pensioned women is a result of age-structure and a greater likelihood of early retirement from the lower occupational and educational categories. For a more detailed mortality analysis farmers and entrepreneurs, groups of less interest, are combined with women whose occupation is unknown. This residual group will be called 'others'.

TABLE 5.11. Person-years, all deaths and age-standardised relative total mortality rates (RMR) according to education and occupational status. 35-64-year-old Finnish economically active and pensioned women in the period 1981-5

| | Economically active[1] | | | Pensioned[2] | | |
|---|---|---|---|---|---|---|
| Occupational status | Person-years % | All deaths | RMR | Person-years % | All deaths | RMR |
| Upper white collar | 9 | 462 | 1.00 | 2 | 115 | 1.00 |
| Lower white collar | 39 | 2137 | 1.05 | 16 | 926 | 1.05 |
| Manual | 35 | 2457 | 1.10 | 25 | 1645 | 1.06 |
| Farmers | 9 | 698 | 1.07 | 14 | 862 | 0.90 |
| Entrepreneurs | 4 | 272 | 1.11 | 3 | 243 | 1.35 |
| Unknown | 3 | 419 | 1.66 | 40 | 3529 | 1.45 |
| Education | | | | | | |
| Higher | 10 | 473 | 1.00 | 4 | 169 | 1.00 |
| Intermediate | 29 | 1401 | 1.01 | 16 | 918 | 1.20 |
| Basic | 61 | 4571 | 1.15 | 80 | 6233 | 1.36 |
| All | 100 | 6445 | - | 100 | 7320 | - |
| Person-years (1000's) | 3211 | - | - | 692 | - | - |

1 = Own occupational status from the 1980 census
2 = Own previous occupational status from the 1975 or 1970 census

Pensioned women and women whose economic activity is unknown have more than three-fold mortality as compared to economically active women. However, the pattern of mortality by education in these two groups is similar. Statistical significance tests in Appendix 2 (test A1) validate this rough similarity in mortality differentials between employed and pensioned women for all categories of cause of death as well as all causes combined. There is slight evidence ($p \leq 0.05$), however, that the mortality differentials among pensioned women for 'other cancers' are slightly smaller than those for occupationally active women. Conversely, although not quite reaching the 5 per cent confidence level, breast cancer differentials seem to be somewhat larger among pensioned women. Due to small numbers of deaths in the highest educational category, comparisons between the two lower educational levels are more reliable. The indices of dissimilarity are also fairly volatile and do not give a consistent result.

Comparing the pattern of differentials in mortality of economically active and pensioned women by occupational status (economically active classified according to current occupation and pensioned according to previous occupation) gives somewhat different results. Dissimilarity indices show very large differentials in death for pensioned women from causes related to accidents and violence and to lesser extent circulatory diseases. This comparison is, however, useless as the occupational category 'others' has usually a very dissimilar mortality in comparison to other groups. This relatively high mortality arises mainly from the very high mortality of women whose occupation is unknown, a group that constitutes about 40 per cent of all person-years among pensioned women. For circulatory diseases and 'other diseases' this unknown group has about 50 to 100 per cent higher mortality than most other categories.

TABLE 5.12. Relative cause specific mortality rates according to two models by education and occupational status, indices of dissimilarity (ID) and distribution of deaths by cause. 35-64-year-old Finnish women in the period 1981-5.#

| | Breast cancer | | Other cancers | | Circul. diseases | | Other diseases | | Accidents & violence | | All causes | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Economically active | | | | | | | | | | | | |
| Occupational status (1980) | Age+ occ | +edu | Age+ occ | +edu | Age+ occ | +edu | Age+ occ | +edu | Age+ occ | +edu | Age+ occ | +edu |
| Upper white collar | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | [1.00 | [1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Lower white collar | 0.67* | 0.74 | 1.03 | 1.00 | 1.59* | 1.13 | 1.38 | 1.17 | 0.88 | 1.09 | 1.05 | 1.00 |
| Manual workers | 0.49* | 0.55* | 1.09 | 1.03 | 1.74* | 1.17 | 1.36 | 1.16 | 1.09 | 1.31 | 1.10 | 1.02 |
| Others | 0.56* | 0.64* | 1.13 | 1.07 | 1.97* | 1.35 | 1.68* | 1.43 | 1.18 | 1.42 | 1.21* | 1.12 |
| ID | 8.5 | | 1.7 | | 4.8 | | 3.8 | | 5.1 | | 2.0 | |
| Education | Age+ edu | +occ | Age+ edu | +occ | Age+ edu | +occ | Age+ edu | +occ | Age+ edu | +occ | Age+ edu | +occ |
| Higher | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | [1.00 | [1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Intermediate | 0.67* | 0.89 | 0.96 | 0.95 | 1.66* | 1.49* | 1.46* | 1.29 | 0.76* | 0.67* | 1.01 | 0.99 |
| Basic | 0.58* | 0.84 | 1.11 | 1.09 | 2.02* | 1.77* | 1.44* | 1.25 | 0.96 | 0.80 | 1.15* | 1.12 |
| ID | 5.7 | | 2.7 | | 5.8 | | 2.4 | | 4.5 | | 2.6 | |
| % of all deaths | 12 | | 37 | | 28 | | 9 | | 14 | | 100 | |
| Pensioned | | | | | | | | | | | | |
| Previous occupational status (1975 or 1970) | Age+ poc | +edu | Age+ poc | +edu | Age+ poc | +edu | Age+ poc | +edu | Age+ poc | +edu | Age+ poc | +edu |
| Upper white collar | [1.00 | [1.00 | 1.00 | 1.00 | [1.00] | [1.00] | [1.00] | [1.00] | [1.00 | [1.00 | 1.00 | 1.00 |
| Lower white collar | 0.92 | 0.78 | 0.82 | 0.68 | 1.18 | 0.93 | 2.30* | 2.01* | 0.61 | 0.54* | 1.05 | 0.88 |
| Manual workers | 0.64 | 0.57 | 0.78 | 0.64* | 1.48* | 1.09 | 1.81* | 1.54 | 0.71 | 0.61 | 1.06 | 0.86 |
| Others | 0.65 | 0.57 | 0.76 | 0.62* | 1.84* | 1.37 | 3.17* | 2.71* | 0.78 | 0.67 | 1.30* | 1.05 |
| ID | 5.6 | | 1.5 | | 7.2 | | 11.3 | | 3.8 | | 5.0 | |
| Education | Age+ edu | +poc | Age+ edu | +poc | Age+ edu | +poc | Age+ edu | +poc | Age+ edu | +poc | Age+ edu | +poc |
| Higher | [1.00] | [1.00] | [1.00 | [1.00 | [1.00 | [1.00 | [1.00 | [1.00 | [1.00] | [1.00] | 1.00 | 1.00 |
| Intermediate | 1.21 | 1.50 | 1.05 | 1.31 | 1.33 | 1.23 | 1.43 | 1.15 | 0.89 | 1.09 | 1.20* | 1.23* |
| Basic | 0.90 | 1.23 | 1.05 | 1.35 | 1.77* | 1.52* | 1.62* | 1.25 | 1.04 | 1.24 | 1.36* | 1.36* |
| ID | 4.0 | | 0.1 | | 3.8 | | 2.4 | | 2.0 | | 2.0 | |
| % of all deaths | 6 | | 23 | | 40 | | 22 | | 8 | | 100 | |

AGE = Age
EDU = Education
OCC = Occupational status
POC = Previous occupational status (1975 or 1970 census)
* = 95 % confidence interval does not include 1.00
[ = between 30 and 50 deaths
[ ] = less than 30 deaths
# = see fotenote in table 5.7

If pensioned and economically active women are compared in terms of the actual relative mortality rates, especially the rates for the lower white collar and manual workers, groups where rates are based on adequate numbers of deaths, no indication of dissimilarity in the pattern of mortality differentials between economically active and pensioned women can be observed. This is substantiated by statistical tests (Appendix 2, test A2) where the last occupational category is eliminated. The similarity in the pattern of mortality differentials is confirmed even if one uses previous occupational or spouse's occupational status for both economically active and pensioned women (tests A3 and A4 in Appendix 2). To summarise so far, both educational and occupational mortality differentials between employed and pensioned women are very similar for most causes of death.

Generally, the pattern of mortality differentials by occupational status is similar to those observed by education, i.e. large differentials for circulatory diseases and 'other diseases', small differentials for other cancers, reverse differentials for breast cancer and U-shaped differentials for accidents and violent causes of death. This is perhaps not very surprising as the variables are strongly correlated. Among economically active women about 80 per cent of upper white collar and manual workers have higher or basic education respectively. If no correlation existed the corresponding figures would be 10 and 60 per cent.

The second main topic in this chapter is to analyse education and occupational status simultaneously. The relative mortality differentials decline for education and occupational status when they are calculated on the basis of a model where age and both of these socioeconomic variables are included. For economically active women education is a stronger predictor of female mortality than occupational status for circulatory diseases and to lesser extent other cancers than breast cancer. This could already be seen from the large indices of dissimilarity and relative mortality rates for education for these two causes of death, but it is also validated by a series of two stage statistical significance tests similar to those carried out for women's own and spouse's education in Section 5.1.5 (Appendix 2, tests B1 and B2).

In a model where age, education and occupational status are included, the range of relative circulatory disease mortality rates for the first three occupational categories is

from 1.00 to 1.17. For education the rates vary from 1.00 to 1.77. For other cancers than breast cancer the relative excess mortality of manual women as compared to lower white collar women is almost non-existent. The excess mortality of women with basic education as compared to women with intermediate education is, however, 16 per cent. For other groups of diseases occupational status is a stronger predictor of mortality than education. This is especially evident for breast cancer.

For pensioned women occupational status indicates larger differentials in mortality for all causes of death than educational attainment. This result is trivial because of the occupational group 'others' again contaminate the comparison.

The interactions between education and occupational status were also analysed. The statistical test did not indicate strong interactions between own education and own occupational status among economically active women or between own education and own previous occupational status among pensioned women.

Table 5.13a and 5.13b show the person-years, all deaths, deaths from circulatory diseases and relative mortality rates from circulatory diseases according to own education and own current occupational status among economically active women. As before in the case of own and spouse's education, person-years and death are concentrated into the 'congruent' educational-occupational categories, i.e. categories where both variables indicate high position or categories where both variables indicate low position.

TABLE 5.13. Person-years (%) and relative circulatory diseases mortality rates by a cross-classification of education and occupational status. Figures in parentheses are based on main effects. 35-64-year-old Finnish economically active women in the period 1981-5.

A. Person-years

| | Upper white collar | Lower white collar | Manual | Other | All | Person-years in 1000's |
|---|---|---|---|---|---|---|
| Higher | 7 | 2 | . | . | 10 | 318 |
| Intermediate | 1 | 17 | 7 | 4 | 29 | 942 |
| Basic | 1 | 20 | 28 | 12 | 61 | 1951 |
| All | 9 | 39 | 35 | 16 | 100 | 3211 |
| Person-years in 1000's | 291 | 1268 | 1133 | 519 | 3211 | - |

B. Age-standardised relative circulatory disease mortality rates.#

| | Upper white collar | Lower white collar | Manual | Other | All women Age+ edu | All women Age+edu occ |
|---|---|---|---|---|---|---|
| Higher | 1.00 | 1.22* | . | . | 1.00 | 1.00 |
| | (1.00) | (1.13) | . | . | | |
| Intermediate | 1.37* | 1.68 | 1.77 | 1.99 | 1.66 | 1.49 |
| | (1.49) | (1.68) | (1.74) | (2.01) | | |
| Basic | 1.95* | 1.99 | 2.07 | 2.41 | 2.02 | 1.77 |
| | (1.77) | (2.00) | (2.07) | (2.39) | | |
| All women | | | | | | |
| Age+occ | 1.00 | 1.59 | 1.74 | 1.97 | - | - |
| Age+edu+occ | 1.00 | 1.13 | 1.17 | 1.35 | - | - |

AGE = Age
EDU = Education
OCC = Occupational status

* = less than 30 deaths
& = between 30 and 50 deaths
. = less than 0.5 per cent of person-years
# = see footnote in table 5.7

The lower part of Table 5.13 shows relative mortality rates for circulatory diseases as an example. The relative mortality rates from the interaction model correspond to those obtained from the main effects model surprisingly well. There is thus, to restate, no indication of an interaction between occupational status and education. Furthermore, interactions between current occupational status and motherhood or marital status were not statistically significant either (Appendix 2, tests B5 and B6).

### *5.2.2. Mortality differentials among married women: own and spouse's occupational status*

The analysis of occupational and educational status among housewives was detached from the analysis in the previous chapter for the following reasons: firstly, all housewives are married and thus correct comparisons are to be made to other married women. Secondly, occupational status from the previous 1975 and 1970 censuses only enables one to classify about 40 per cent of all housewives into occupational groups (30 per cent into white collar and manual occupations), too few to allow for a meaningful statistical analysis for different causes of death and too few to draw conclusions concerning all housewives.

As housewives' own previous occupational status is not a viable occupational measure, at least in the framework of this study, one is left with the traditional approach of

classifying housewives according to husband's occupational status. This discriminates housewives well with about 20 per cent of person-years in both upper and lower white collar groups and about 40 per cent in the manual group.

Also housewives' own education is analysed. Unfortunately housewives with higher education comprise slightly less than 6 per cent of all person-years among housewives and only 55 deaths from all causes. The distribution of person-years by education and own current occupational status is, for obvious reasons, very similar among married economically active women as it is among all economically active women.

TABLE 5.14. Person-years and all deaths according to own current and previous occupational status, spouse's occupational status and education. 35-64-year-old married housewives and economically active Finnish women in the period 1981-5.

| | Economically active | | Housewives | |
|---|---|---|---|---|
| Occupational status (1980) | Person-years % | All deaths | Person-years % | All deaths |
| Upper white collar | 9 | 270 | - | - |
| Lower white collar | 38 | 1273 | - | - |
| Manual | 35 | 1499 | - | - |
| Other | 18 | 952 | - | - |
| Previous occupational status (1975 or 1970) | | | | |
| Upper white collar | 7 | 221 | 2 | 14 |
| Lower white collar | 38 | 1255 | 16 | 112 |
| Manual | 29 | 1221 | 12 | 163 |
| Other | 27 | 1299 | 70 | 1210 |
| Spouse's occupational status (1980) | | | | |
| Upper white collar | 14 | 432 | 20 | 233 |
| Lower white collar | 18 | 600 | 17 | 237 |
| Manual | 42 | 1623 | 40 | 655 |
| Other | 26 | 1339 | 23 | 374 |
| Education (1980) | | | | |
| Higher | 9 | 285 | 6 | 55 |
| Intermediate | 29 | 856 | 25 | 246 |
| Basic | 61 | 2853 | 69 | 1198 |
| ALL | 100 | 3994 | 100 | 1499 |
| Person-years (1000's) | 2320 | - | 542 | - |

For the two lowest educational categories and for the two largest causes of death, where comparisons in terms of statistical power are most feasible, patterns in mortality differentials between housewives and economically active married women are very similar: the mortality of women with basic education being about 15 per cent higher than the mortality of women with intermediate education for all cancers except breast cancer and for circulatory diseases (Table 5.15). This similarity in the differentials by education seems to hold roughly for other causes of death as well. For no cause of

death is there a statistically significant differential in the pattern of mortality differentials between housewives and occupationally active married women even at the 10 per cent confidence level (Appendix 3, test A1).

A similar conclusion is reached when comparing the pattern of mortality differentials of the same two groups by occupational status. Occupied married women, however, classified as upper white collar, seem to have very low mortality form circulatory diseases. This seems to inflate the excess mortality of other occupational groups. Among housewives both white collar groups have equally low mortality from circulatory diseases. Due to small numbers of death, indices of dissimilarity are quite unstable, especially among the housewives, and are thus poor measures to use for comparisons.

It is worth pointing out that although socioeconomic differentials in mortality are roughly similar in the two economic activity groups studied in this section, and also among pensioners, these differentials are clearly smaller than the same differentials in the total population for most causes of death. This apparent paradox is simply an outcome of the distribution of these three groups in the total population: mortality in the lower socioeconomic categories is more heavily influenced by economic activity groups with high mortality, mainly pensioners. For example, nearly 20 per cent of women with basic education are pensioned, whereas only about 9 per cent of women who have higher or intermediate education fall into this group.

For both housewives and economically active married women either education or occupational status adequately describes socioeconomic mortality differentials, i.e. including both variables into the model does not improve the fit of the model markedly. This applies to all causes of death. No indication of the larger circulatory disease differentials according to education as opposed to occupational status, observed among all employed women, exist among employed married women.

Among both economically active women and housewives the interactions between education and occupational status are of little relevance (Appendix 3, tests B4 and C2).

TABLE 5.15. Relative cause specific mortality rates according to two models by own and spouse's occupational status and education, indices of dissimilarity (ID) and distribution of deaths by selected cause. 35-64-year-old married housewives or economically active Finnish women in the period 1981-5.#

| Married economically active | Other cancers | | Circul. diseases | | All causes | |
|---|---|---|---|---|---|---|
| Occupational status (1980) | age+ occ | +edu | age+ occ | +edu | age+ occ | +edu |
| Upper white collar | 1.00 | 1.00 | [1.00 | [1.00 | 1.00 | 1.00 |
| Lower white collar | 0.99 | 0.94 | 1.75* | 1.51 | 1.06 | 1.07 |
| Manual | 1.09 | 1.00 | 1.94* | 1.62* | 1.11 | 1.10 |
| Other | 1.14 | 1.06 | 2.10* | 1.77* | 1.17* | 1.17* |
| ID | 2.6 | | 4.8 | | 1.8 | |
| Education | age+ edu | +occ | age+ edu | +occ | age+ edu | +occ |
| Higher | 1.00 | 1.00 | [1.00 | [1.00 | 1.00 | 1.00 |
| Intermediate | 0.96 | 0.98 | 1.55* | 1.15 | 0.98 | 0.92 |
| Basic | 1.13 | 1.12 | 1.80* | 1.29 | 1.09 | 1.02 |
| ID | 2.9 | | 4.5 | | 2.1 | |
| % of all deaths | 39 | | 27 | | 100 | |
| Housewives | | | | | | |
| Spouse's occupational status (1980) | age+ soc | +edu | age+ soc | +edu | age+ soc | +edu |
| Upper white collar | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Lower white collar | 1.01 | 0.97 | 1.02 | 0.98 | 1.01 | 0.99 |
| Manual | 1.23 | 1.17 | 1.41* | 1.34 | 1.20* | 1.18 |
| Other | 1.09 | 1.04 | 1.13 | 1.08 | 1.00 | 0.98 |
| ID | 4.0 | | 6.7 | | 4.5 | |
| Own education | age+ edu | +soc | age+ edu | +soc | age+ edu | +soc |
| Higher | [1.00] | [1.00 | [1.00] | [1.00] | 1.00 | 1.00 |
| Intermediate | 1.19 | 1.15 | 1.24 | 1.15 | 0.89 | 0.86 |
| Basic | 1.35 | 1.25 | 1.44 | 1.25 | 1.03 | 0.96 |
| ID | 2.3 | | 2.7 | | 2.0 | |
| % of all deaths | 34 | | 33 | | 100 | |

AGE = Age
EDU = Education
OCC = Own occupational status
SOC = Spouse's occupational status

* = 95 % confidence interval does not include 1.00
[ = between 30 and 50 deaths
[ ] = less than 30 deaths
# = see footnote in table 5.7

This section also presents relative mortality rates for economically active married women according to their spouse's occupation. As can be judged from the relative mortality rates and indices of dissimilarity (Table 5.16), both own and spouse's occupational status indicate roughly equally large differentials in mortality. Mortality differentials for breast cancer according to own occupation are, however, larger than those according to spouse's occupation. The relative importance of own occupation for breast cancer is further exacerbated when relative mortality rates are calculated from a model where parameters for both occupational variables are estimated simultaneously

(second column under the heading breast cancer). On the whole, relative mortality rates obtained from a model that includes own and spouse's occupational characteristics tend to narrow mortality differentials in a similar manner for both socioeconomic indicators.

TABLE 5.16. Relative cause specific mortality rates according to two models by own and spouse's occupational status, indices of dissimilarity (ID) and distribution of deaths by cause. 35-64-year-old economically active Finnish women in the period 1981-5.#

| | Breast cancer | | Other cancers | | Circul. diseases | | Other diseases | | Accidents & violence | | All causes | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Occupational status (1980) | age+ occ | +soc | age+ occ | +soc | age+ occ | +soc | age+ occ | +soc | age+ occ | +soc | age+ occ | +soc |
| Upper white collar | 1.00 | 1.00 | 1.00 | 1.00 | [1.00 | [1.00 | [1.00] | [1.00] | [1.00 | [1.00 | 1.00 | 1.00 |
| Lower white collar | 0.69* | 0.71* | 0.99 | 0.97 | 1.75* | 1.54* | 1.34 | 1.33 | 0.94 | 1.03 | 1.06 | 1.04 |
| Manual | 0.47* | 0.50* | 1.09 | 1.04 | 1.94* | 1.59* | 1.36 | 1.35 | 1.11 | 1.23 | 1.11 | 1.06 |
| Other | 0.59* | 0.71 | 1.14 | 1.05 | 2.10* | 1.71* | 1.51 | 1.41 | 1.00 | 0.99 | 1.17* | 1.10 |
| ID | 8.9 | | 2.6 | | 4.8 | | 2.3 | | 3.3 | | 1.8 | |
| Spouse's occupational status (1980) | age+ soc | +occ | age+ soc | +occ | age+ soc | +occ | age+ soc | +occ | age+ soc | +occ | age+ soc | +occ |
| Upper white collar | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | [1.00 | [1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Lower white collar | 0.84 | 0.99 | 1.02 | 1.01 | 1.47* | 1.32 | 1.13 | 1.05 | 0.72* | 0.69 | 1.02 | 1.01 |
| Manual | 0.67* | 0.89 | 1.12 | 1.09 | 1.72* | 1.49* | 1.12 | 1.02 | 0.90 | 0.82 | 1.10 | 1.07 |
| Other | 0.63* | 0.73 | 1.20 | 1.15 | 1.76* | 1.49* | 1.26 | 1.13 | 0.99 | 0.98 | 1.16* | 1.11 |
| ID | 7.2 | | 2.5 | | 5.5 | | 2.9 | | 3.8 | | 2.1 | |
| % of all deaths | 12 | | 39 | | 27 | | 9 | | 13 | | 100 | |

AGE = Age
OCC = Own occupational status
SOC = Spouse's occupational status

* = 95 % confidence interval does not include 1.00
[ = between 30 and 50 deaths
[ ] = less than 30 deaths
# = see footnote in table 5.7

The interaction between own and spouse's occupational status is presented in Table 5.17. Concentrating on the 3*3 matrix in the upper left hand corner, the groups of most substantive interest, one can observe that no interaction between the two variables exists. Relative total mortality rates based on the interaction model do not differ radically from the rates obtained from the main effects model. This is confirmed by statistical tests in Appendix 3 for all causes of death (test B3). Outside the 3*3 matrix women employed in 'other' occupations, i.e. entrepreneurs, farmers and occupations not known, have high mortality over and above the main effects in the first three spouse's occupational groups. Again only relatively few persons exhibit an incongruent combination of own and spouse's occupational characteristics.

TABLE 5.17. Age-standardised relative total mortality rates by a cross-classification of own and spouse's occupational status. Figures in parentheses are based on main effects. 35-64-year-old married economically active Finnish women in the period 1981-5.#

| | Spouse's occupational status | | | | | |
|---|---|---|---|---|---|---|
| Occupational status | Upper white collar | Lower white collar | Manual | Others | All women Age+ occ | Age+occ+ soc |
| Upper white collar | 1.00 (1.00) | 1.16 (1.01) | 1.18* (1.07) | 1.06* (1.11) | 1.00 | 1.00 |
| Lower white collar | 1.09 (1.04) | 1.01 (1.05) | 1.13 (1.11) | 1.26 (1.15) | 1.06 | 1.04 |
| Manual | 0.93* (1.06) | 1.15 (1.07) | 1.15 (1.13) | 1.27 (1.18) | 1.11 | 1.06 |
| Others | 1.30& (1.10) | 1.25 (1.11) | 1.40 (1.18) | 1.21 (1.22) | 1.17 | 1.10 |
| All women Age+soc | 1.00 | 1.02 | 1.10 | 1.16 | - | - |
| Age+soc+occ | 1.00 | 1.01 | 1.07 | 1.11 | - | - |

AGE = Age
OCC = Own occupational status
SOC = Spouse's occupational status

* = between 30 and 50 deaths
& = less than 30 deaths
# = see footnote in table 5.7

### *5.3. Mortality differentials by family disposable income and housing tenure*

Family disposable income is a property that not only describes the individual but also characterises the whole household as it is by definition determined by income earned by all family members, most commonly by the individual income of both spouses. Similarly, the characteristics of both spouses are of importance when the family 'decides' on its housing arrangements. The study population has thus been limited to those who have a spouse, i.e. who are married. Furthermore, all economically inactive women are discarded from the analysis, because possible selection out of the labour force and a related fall in income may inflate income differentials in mortality. Although this restriction excludes a large part of the total population (about 48 per cent) it is believed that the relationship of both income and housing tenure with mortality should be observed at its purest in this more homogenous population.

Family disposable income is classified into 'quartiles' and housing tenure into two categories: owner occupied and rented (see Chapter 4 on data). For both of these variables women whose income and housing characteristics are unknown are included in the lowest

category, i.e. living in rented housing and the fourth income 'quartile'. The groups for whom information is not available are very small (less than 1 per cent). The income 'quartiles' do not each contain 25 per cent of the study population. This is due to married economically active women having larger income than all men and women, according to whose family income the quartile cut points have been calculated. Enough person-years and deaths fall into each category to enable meaningful cause of death analysis (Table 5.18 and Section E of Appendix 8). All parameters are based on more than 70 deaths.

TABLE 5.18. Person-years (%) and all deaths by family disposable income and housing tenure. 35-64-year-old married economically active Finnish women in the period 1981-5.

| Family disposable income | Person-years % | All deaths |
|---|---|---|
| Family income | | |
| 1. quartile | 28 | 1230 |
| 2. quartile | 29 | 1032 |
| 3. quartile | 24 | 885 |
| 4. quartile | 19 | 847 |
| Housing tenure | | |
| Owner occupied | 80 | 3132 |
| Other | 20 | 862 |
| All (in 1000's) | 100(2320) | 3994 |

Mortality differentials by family disposable income (Table 5.19) are quite consistent with those observed for education and occupational status. The magnitude of the differentials are, however, smaller and become even smaller when own and spouse's education are controlled for. There is no mortality gradient for cancers other than breast cancer. Breast cancer exhibits the usual reversed mortality differentials with more than 30 per cent lower mortality in the two lowest income 'quartiles', but that narrows down to about 13 per cent after statistical controls are introduced.

For circulatory diseases and 'other diseases' some excess mortality can be observed in the lowest or the two lowest income 'quartiles'. The excess mortality for both causes is in the range of 20-40 per cent but again narrows down to about 20 per cent when both educational variables are controlled for. As for other socioeconomic indicators accidents and violence evidence a U-shaped mortality pattern by income.

Husband's economic activity was also controlled for in order to evaluate whether having a pensioned husband, a husband who would more likely be on low income, would contribute to the observed mortality differentials among women. Controlling for spouse's

economic activity, however, had only a marginal effect on the mortality differentials by family disposable income.

If farmers, a low income sub-population with relatively low mortality, are dropped from the analysis the excess mortality of the lowest income category is elevated. On the other hand the classificatory scheme, by attributing all women whose income is not known to the lowest income group, may overestimate the income differentials.

Mortality differentials by housing tenure are large for most causes of death with high mortality among women living in rented accommodation. These differentials are unaffected by controls for both educational variables and spouse's economic activity. Circulatory diseases and 'other diseases' again show largest differentials in mortality, with differentials for other cancers than breast cancer being about half of that. Surprisingly, the one feature replicated by all socioeconomic indicators this far, the reversed mortality gradient for breast cancer, does not hold true for housing tenure. No differentials in mortality can be observed for breast cancer. Furthermore, mortality differentials for accidents and violence cannot, due to the housing tenure classification, be U-shaped (Table 5.19). Excluding farmers, who mainly live in owner occupied housing, from the analysis does not markedly change the relative excess mortality rates for the population living in rented accommodation.

The fact that housing tenure differentials are unaffected by controls of both own and spouse's educational attainment indicate that housing tenure and other socioeconomic variables are not interrelated. Indeed, at all levels of educational attainment 80-81 per cent of Finnish women live in owner occupied accommodation and at both categories of housing tenure about 10, 30 and 60 per cent have high, intermediate and basic education respectively. Although the educational structure changes with age, educational differentials between housing tenure groups within each age-group are still small. Furthermore, there is no clear evidence to show that women living in rented accommodation are also more likely to be on low income. In fact, the income distribution of renters is somewhat more concentrated in the two middle income categories than that of owner occupiers.

Differentials in mortality by income and housing tenure did not vary greatly by age or education (Appendix 4). For accidental and violent causes of death, however, differentials

in mortality by family disposable income varied by age. No coherent pattern, nevertheless, emerged.

TABLE 5.19. Relative cause specific mortality rates according to two models by family disposable income and housing tenure. 35-64-year-old married economically active Finnish women in the period 1981-5.

| | Breast cancer | | Other cancers | | Circul. diseases | | Other diseases | | Accid. & violence | | All causes | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Family income | M1 | M2 | M1 | M2 | M1 | M2 | M1 | M2 | M1 | M2 | M1 | M2 |
| 1. quartile | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 2. quartile | 0.82 | 0.91 | 0.89 | 0.86* | 1.10 | 1.02 | 0.90 | 0.89 | 0.97 | 0.93 | 0.95 | 0.92 |
| 3. quartile | 0.75* | 0.88 | 1.01 | 0.95 | 1.12 | 1.00 | 1.19 | 1.17 | 0.78 | 0.73* | 0.98 | 0.94 |
| 4. quartile | 0.72* | 0.86 | 1.01 | 0.95 | 1.38* | 1.23* | 1.07 | 1.05 | 1.00 | 0.89 | 1.06 | 1.02 |
| Housing tenure | M1 | M2 | M1 | M2 | M1 | M2 | M1 | M2 | M1 | M2 | M1 | M2 |
| Owner occupied | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Rented | 0.98 | 0.99 | 1.23* | 1.22* | 1.48* | 1.46* | 1.59* | 1.58* | 1.37* | 1.30* | 1.31* | 1.29* |

* = 95 % confidence interval does not include 1.00
M1 = Age-standardised relative mortality rates
M2 = Age, own education and spouse's education and economic activity standardised relative mortality rates

[ = between 30 and 50 deaths
[ ] = less than 30 deaths

### *5.4. Mortality differentials among men: own and spouse's socioeconomic status*

Socioeconomic mortality differentials have often been shown to be larger for men than for women (e.g. Valkonen 1987). If one compares educational total mortality differentials for married men in Table 5.20 with the corresponding mortality differentials for married women in Table 5.7 this is true. If the comparison is carried out by cause of death (see Appendix 5, test A1 and C1) women actually have roughly as large or, for some causes, slightly larger educational and occupational mortality differentials as men for all diseases except cancer (not including breast cancer). Closer scrutiny (Koskinen and Martelin 1993 and Appendix 5, test A1) shows that the large differentials for cancer among men are mainly due to very large mortality differentials for lung cancer, a prevalent cause of cancer death among men but not among women. Furthermore, educational mortality differentials for circulatory diseases are slightly larger among women than men. For accidents and violence men have, however, larger differentials than women, for whom differentials are slightly U-shaped. A roughly similar conclusion is reached if men and women are compared according to spouse's education and occupational status (Appendix 5, tests B1 and D1). Lung cancer differentials in mortality according to spouse's education are, however, very small among women.

Conversely, it has sometimes also been implicitly assumed, by analysing women alone, that spouse's socioeconomic characteristics are an important discriminator only for women (see however an American discussion on IHD incidence e.g. Haynes, Eaker and Feinleib 1983; Eaker, Haynes and Feinleib 1983; Carmelli, Swan and Roseman 1985; Suarez and Barrett-Connor 1984). Because of women's child bearing and rearing responsibilities and the resulting uneven occupational careers women's socioeconomic position is sometimes assumed to be more accurately characterised by husband's socioeconomic status. The analysis in previous chapters has already shown this not to be the case in Finland. Women's own and husband's characteristics both indicate roughly equally large mortality differentials.

Table 5.20 furthermore shows that spouse's (wife's) education is also a very strong predictor of male mortality; about as strong or even slightly stronger for some broad causes of death as men's own education (see Appendix 6, tests C1 and C2). The differentials between these two measures are, nevertheless, with the exception of causes of death attributable to accidents and violence, too small to elaborate on. For accidents and violence own education indicates larger differentials than wife's education. Highly educated men seem to have very low mortality. This result is also replicated for occupational status: upper white collar men (classified according to men's own occupation) having very low mortality for accidents and violence.

TABLE 5.20. Age-standardised relative cause specific mortality rates according to own and spouse's education by cause of death. 35-64-year-old married Finnish men in the period 1981-5.

| Own education | Cancers | Circul. diseases | Other diseases | Accid. & violence | All causes |
|---|---|---|---|---|---|
| Higher | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Intermediate | 1.27* | 1.42* | 1.21* | 1.28* | 1.34* |
| Basic | 1.59* | 1.81* | 1.41* | 1.64* | 1.68* |
| Index of dissimilarity | 5.3 | 6.1 | 4.0 | 6.6 | 5.8 |
| Spouse's education | | | | | |
| Higher | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Intermediate | 1.35* | 1.47* | 1.13 | 1.08 | 1.32* |
| Basic | 1.59* | 1.94* | 1.49* | 1.48* | 1.70* |
| Index of dissimilarity | 3.8 | 5.8 | 5.3 | 6.6 | 5.3 |
| % of all deaths | 24 | 52 | 10 | 13 | 100 |

* = 95 % confidence interval does not include 1.00
# = less than 100 deaths

The above results for all cause of death groups are more or less replicated by the analysis of own and wife's occupational status for economically active married men, i.e. wife's occupation is as strong an indicator of male mortality as men's own occupation. These results are, therefore, not presented here.

The simultaneous analysis of own education and occupational status among economically active men (Table 5.21) shows very clearly what was less evident among corresponding women: education is a stronger predictor of cancer and circulatory disease mortality than occupational status and that the reverse is true for 'other diseases' and accidents and violence. Statistical tests in Appendix 6 (tests B2 and B3) confirm this. For circulatory diseases, for example, the mortality difference between the two extreme educational groups is 45 per cent, when the largest mortality difference by occupational status is only 19 per cent. The corresponding figures for cancers are 50 and 15 per cent.

As for women, also for men the cross-classification of both spouse's educational attainment, occupational characteristics or education and occupational characteristics did not greatly add to the understanding of socioeconomic mortality differentials (Appendix 6, tests B1, C3 and D1). Only for all causes of death combined was the interaction between own and spouse's occupational status statistically significant ($p \leq 0.05$). This interaction was a reflection of variable mortality in the residual occupational groups 'others'. Furthermore, the interaction between marital status and own education was statistically significant only for circulatory diseases. This interaction was largely a reflection of very small educational mortality differentials among widowed women.

TABLE 5.21. Relative cause specific mortality rates according to two models by own education and occupational status by cause of death. 35-64-year-old economically active Finnish men in the period 1981-5.#

| | Cancers | | Circul. diseases | | Other diseases | | Accid. & violence | | All causes | |
|---|---|---|---|---|---|---|---|---|---|---|
| Own education | Age+ edu | +occ | Age+ edu | +occ | Age+ edu | +occ | Age+ edu | +occ | Age+ edu | +occ |
| Higher | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Intermediate | 1.31* | 1.32* | 1.34* | 1.23* | 1.38* | 1.16 | 1.41* | 0.93 | 1.35* | 1.18* |
| Basic | 1.53* | 1.50* | 1.63* | 1.45* | 1.47* | 1.11 | 2.00* | 1.13 | 1.67* | 1.36* |
| Own occupational status | Age+ occ | +edu | Age+ occ | +edu | Age+ occ | +edu | Age+ occ | +edu | Age+ occ | +edu |
| Upper white c. | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Lower white c. | 1.10 | 0.92 | 1.29* | 1.10 | 1.11 | 1.04 | 1.30* | 1.28* | 1.22* | 1.08* |
| Manual | 1.35* | 1.06 | 1.44* | 1.15* | 1.39* | 1.31* | 2.22* | 2.06* | 1.55* | 1.29* |
| Other | 1.21 | 0.96 | 1.48* | 1.19* | 1.82* | 1.71* | 2.19* | 2.04* | 1.56* | 1.30* |

AGE = Age
EDU = Education
OCC = Occupational status

* = 95 % confidence interval does not include 1.00
# = see footnote in table 5.7

# *6. MORTALITY ACCORDING TO MARITAL STATUS, ECONOMIC ACTIVITY AND MOTHERHOOD*

The purpose of Chapter 6 is to assess the relevance of the multiple role and role accumulation hypotheses. The combinations of three variables are analysed: marital status, economic activity and motherhood. The chapter is divided into two sections. In the first section, the statistical main effects of each of the three variables are examined. The second section is the actual test for the two competing hypotheses, i.e. does combining work and family roles have harmful or beneficial effects on mortality. Besides analysing the level of mortality in the different role combinations, a specificatory analysis is also carried out, in which it is evaluated whether the observed mortality differentials are similar in groups defined by characteristics of children, women's age and education.

## *6.1. Mortality differentials by marital status, economic activity and motherhood*

Person-years, numbers of deaths and relative total mortality rates by motherhood, marital status and economic activity are presented in Table 6.1. Pensioners and women whose economic activity is unknown are not included in the analysis, as they are of secondary importance from the point of view of the multiple role hypothesis.

The first column of relative total mortality rates in Table 6.1 are only standardised for age. Women who do not have children living in the household have 28 per cent higher total mortality than women who do have children. Married women have lower mortality than women who are not currently married. Divorced women have about 40 per cent higher mortality than married women, while the position of single and widowed is intermediate (27 and 16 per cent higher mortality). Furthermore, housewives have higher mortality than economically active women.

Table 6.1 also presents the relative mortality rates for each of the variables when the other two variables and own education are added to the initial model in which only age was controlled for. The variables are added one by one and the relative death rates are shown in each step to make it possible to evaluate which added variables change the initially observed relationship markedly. The model that comprises marital status, motherhood and economic activity will be the model that the latter interaction model will be compared

against. In the last column of Table 6.1 education and occupational status are also controlled for. Housewives are classified according to their husband's occupation.

TABLE 6.1. Person-years (%), deaths and relative total mortality rates according four different models by marital status, economic activity and motherhood. 35-64-year-old Finnish women (excluding pensioners) in the period 1981-5.#

| Marital status | Person-years % | Deaths | age+ mar | +mot | +eco | +edu +occ |
|---|---|---|---|---|---|---|
| Married | 76 | 5493 | 1.00 | 1.00 | 1.00 | 1.00 |
| Single | 10 | 912 | 1.27* | 1.12* | 1.19* | 1.23* |
| Divorced | 9 | 843 | 1.42* | 1.37* | 1.45* | 1.46* |
| Widowed | 5 | 696 | 1.16* | 1.14* | 1.22* | 1.21* |
| **Economic activity** | **Person-years %** | **Deaths** | **age+ eco** | **+mar** | **+mot** | **+edu +occ** |
| Economically active | 86 | 6445 | 1.00 | 1.00 | 1.00 | 1.00 |
| Housewives | 14 | 1499 | 1.12* | 1.25* | 1.25* | 1.25* |
| **Motherhood** | **Person-years %** | **Deaths** | **age+ mot** | **+mar** | **+eco** | **+edu +occ** |
| Children | 70 | 4200 | 1.00 | 1.00 | 1.00 | 1.00 |
| No children | 30 | 3744 | 1.28* | 1.24* | 1.24* | 1.23* |
| All (in 1000's) | 100(3753) | 7944 | - | - | - | - |

AGE = Age
MAR = Marital status
MOT = Motherhood
ECO = Economic activity
EDU = Education
OCC = Occupational status

*=95 % confidence interval does not include 1.00
# = see footnote in table 5.7

The 27 per cent excess mortality of single women is reduced to 12 per cent when the dummy variable motherhood is controlled for. The excess mortality of divorced and widowed is also slightly reduced. Controlling for economic activity again increases the differentials between married and other women. This statistical control is very hypothetical as by definition only married women can be housewives. But it indicates that marital status mortality differentials are slightly larger among economically active women than in the total study population. Controlling for education and occupational status does not affect marital status mortality differentials.

Mortality differentials by motherhood remain largely uninfluenced by statistical controls of other explanatory variables in Table 6.1. The excess mortality of women without children living in the household narrows 4 percentage points to 24 per cent. After controlling for marital status, controlling for economic activity, education and occupational status has no impact on mortality differentials by motherhood.

The relative excess mortality of housewives increases as statistical controls are introduced. The initial 12 per cent excess mortality increases to 25 per cent when marital status is added to the model. The excess mortality among housewives as compared to other **married** women is thus 25 per cent. Further controls for motherhood, education and occupational status do not affect the relative mortality of housewives.

The pattern of mortality differentials according to marital status, motherhood and economic activity by cause of death are similar to those observed for all causes combined (Table 6.2). The magnitude of the differentials, however, tends to be larger for other causes than for cancers. The excess mortality of housewives is again clearly underestimated for all causes of death if they are compared to all economically active women. Housewives enjoy a mortality advantage due to them all being married.

Marital status differentials in mortality are slightly out of the ordinary for breast cancer: single women have the highest mortality of all groups. Single women's high breast cancer mortality might be partly understood in terms of parity associated risks of breast cancer. Controlling for motherhood (not shown separately in Table 6.2), however, only slightly reduced single women's excess mortality for breast cancer. This reduction in relative excess mortality is, nevertheless, large enough to make it statistically indistinguishable from 1.00.

Similarly, the excess mortality of single women from causes of death related to accidents and violence declines from 53 per cent to 19 per cent. At the 95 per cent confidence level this does not differ from the mortality of married women. Closer analysis shows (not presented here) that this is related to single women not having children in the household. The opposite takes place for circulatory diseases: relative mortality among single women, as well as among other not married women, increases when statistical controls are introduced. Among single women, this arises from the advantageous economic activity and educational structure.

TABLE 6.2. Relative cause specific mortality rates according to two models by marital status, economic activity and motherhood. 35-64-year-old Finnish women (excluding pensioners) in the period 1981-5.

| | Breast cancer | | Other cancers | | Circulat. diseases | | Other diseases | | Accidents & violence | |
|---|---|---|---|---|---|---|---|---|---|---|
| Marital status | M1 | M2 | M1 | M2 | M1 | M2 | M1 | M2 | M1 | M2 |
| Married | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Single | 1.28* | 1.23 | 1.13 | 1.07 | 1.24* | 1.37* | 1.58* | 1.41* | 1.53* | 1.19 |
| Divorced | 1.17 | 1.23 | 1.16* | 1.15* | 1.41* | 1.52* | 1.86* | 1.92* | 2.10* | 2.07* |
| Widowed | 1.10 | 1.20 | 1.09 | 1.09 | 1.14 | 1.24* | 1.28 | 1.39* | 1.42* | 1.47* |
| Economic activity | | | | | | | | | | |
| Econom. active | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Housewives | 1.21* | 1.30* | 1.00 | 1.05 | 1.23* | 1.39* | 1.15 | 1.42* | 1.13 | 1.40* |
| Motherhood | | | | | | | | | | |
| Children | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| No children | 1.11 | 1.04 | 1.18* | 1.17* | 1.19* | 1.14* | 1.65* | 1.52* | 1.80* | 1.71* |

* = 95 % confidence interval does not include 1.00
M1 = Age-standardised relative mortality rates
M2 = Age, motherhood, marital status, economic activity, education and occupational status standardised relative mortality rates
[ = Between 30 and 50 deaths
[] = Less than 30 deaths

### *6.2. The relationship between multiple roles and mortality*

Table 6.3 shows the person-years and all deaths by a cross-classification of marital status, motherhood and economic activity. Marital status is truncated into two classes: currently married and not married. A terminological point should again be emphasised. Although being a single woman or a housewife must imply a corresponding role, a role in this chapter, in accordance with the literature on multiple roles and mortality, refers only to the roles of an employee, a spouse and a mother. Housewives, for example, are thus not regarded as having a role of a housewife, but only as not having the role of an employee.

Forty-nine per cent of all person-years are spent in a state defined by three roles: those of an employee, a spouse and a mother. Another 33 per cent of person-years is spent in states defined by two roles: married housewives with children, economically active married women (without children) and economically active non-married women with children. Having two or three roles (out of a maximum of three) is thus a state of affairs that is not only common but represents the great majority. When analysing mortality of women with several roles in comparison to women with only one role one has very little material for comparison. Women with one role are quite hard to come by (18 per cent of all person-years). The only considerable group of women with only one role are the not

married economically active women with no children who constitute 14 per cent of all person-years. Women with zero roles do not exist in this analysis, as pensioners and not married housewives, irrelevant groups for multiple role analysis, are not included.

TABLE 6.3. Person-years (%) and number of deaths according to a cross-classification of motherhood, marital status (married - not married) and economic activity. 35-64-year-old Finnish women (excluding pensioners) in the period 1981-5.

| | Married | | Not married | All |
|---|---|---|---|---|
| | Econom. active | House-wives | Econom. active | |
| Children | | | | |
| Person-years (%) | 49 | 11 | 10 | 70 |
| Deaths | 2557 | 854 | 789 | 4200 |
| No children | | | | |
| Person-years (%) | 13 | 4 | 14 | 30 |
| Deaths | 1437 | 645 | 1662 | 3744 |
| All | | | | |
| Person-years (%) | 62 | 14 | 24 | 100 |
| Deaths | 3994 | 1499 | 2451 | 7944 |

Table 6.4 presents the relative total mortality rates for the different role combinations. These rates are based on the interaction model. Rates in parentheses are based on the main effects models discussed in the previous section. It is clear on the basis of Table 6.4 that women with all three roles have low all-cause mortality as compared to any other group of women. Women with any two roles have about 30 per cent higher mortality and women with only one role about 50 per cent higher mortality than this most advantageous group. The low mortality of women with all three roles does not, nevertheless, have to imply an interaction. Comparing relative rates obtained from a main effects model (figures in parentheses) to those obtained from the interaction model indicate little discrepancy. This suggests that the more simple main effects model is almost as good as the more complex interaction model.

TABLE 6.4. Age-standardised relative mortality rates according to a cross-classification of motherhood, marital status and economic activity. Figures in parentheses are based on main effects. 35-64-year-old Finnish women (excluding pensioners) in the period 1981-5.

| | Married | | Not married |
|---|---|---|---|
| | Econom. active | House-wives | Econom. active |
| Children | 1.00 (1.00) | 1.29 (1.25) | 1.35 (1.28) |
| No children | 1.27 (1.22) | 1.52 (1.52) | 1.56 (1.56) |

Two tests for interactions were carried out for all causes of death combined (Appendix 7, tests A1, A2, A3, B1 and B2). Firstly, the interaction between motherhood and economic activity was tested in the sub-population of married women. Secondly, the interaction between motherhood and marital status was tested among economically active women. The tests were carried out in sub-populations in order to compare like with like. Tests for third order interactions were not feasible due to the selection of the study population.

Regardless of the very close similarity between the main effects model and the interaction model in Table 6.4, the statistical test A1 in Appendix 7 suggest ($p \leq 0.05$) that motherhood is differently related to total mortality among non-married than among married women: mortality differentials according to motherhood are smaller among not married women. This seems to arise mainly from the relatively high mortality among not married women with children. On a cause specific level, the same interaction can only be observed for circulatory diseases ($p \leq 0.01$). These lone mothers actually have similar or slightly higher circulatory disease mortality than not married women without children. The corresponding married women who have children have about 20 per cent lower circulatory disease mortality than married women without children.

It was impossible to pinpoint the high mortality among non-married women with children as occurring only among single, divorced or widowed women (see test A3 in Appendix 7). The excess mortality thus seems to be similar among all non-married women.

### *6.3. Characteristics of children and multiple role differentials in mortality*

The results presented in Table 6.4 in the previous passage do not include more specific information on women who have children living in the household. The conditioning effects of characteristics of children are believed to contribute to the understanding of multiple roles (e.g. Verbrugge, 1983b; Arber, 1985). Table 6.5 presents the person-years and relative mortality rates according to age of the youngest child and number of children living in the household. The younger children are the lower their mothers' mortality: women with children under six years have a level of age-standardized total mortality that is about 65 per cent of the mortality of women with children over 15 years of age. For all other causes of death than cancers this differential is even larger, but for other cancers than breast cancer quite small. Breast cancer differs from the general pattern. Women with

very young children have the highest mortality. Not much attention should, however, be paid to this finding as the rate is based on very few deaths.

The fewer children living in the household one has, the higher women's mortality (lower part of Table 6.5). The crucial difference seems to run between women with one child and women with more than one child: the latter women have about 15 per cent lower total mortality than women with one child. Differentials are again small for all cancers and particularly large for accidents and violence and 'other diseases'.

TABLE 6.5. Person-years, deaths from all causes and age-standardised relative cause specific mortality rates by age of the youngest child and number of children living in the household. 35-64-year-old Finnish women (excluding pensioners) in the period 1981-5.

| Age of the youngest child | Person-years (%) | Deaths | Breast cancer | Other cancer | Circul. diseas. | Other diseas. | Accid. viol. | All causes |
|---|---|---|---|---|---|---|---|---|
| 16+ years | 24 | 2388 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 7-15 years | 31 | 1465 | 1.05 | 0.87* | 0.83* | 0.66* | 0.91 | 0.85* |
| 3-6 years | 9 | 227 | [1.08 | 0.81 | [0.56* | [0.44]* | [0.55* | 0.65* |
| ≤2 years | 6 | 120 | [1.28] | [0.85 | [0.49]* | . | [0.64* | 0.64* |
| No children | 30 | 3744 | 1.14 | 1.13* | 1.11* | 1.36* | 1.62* | 1.20* |
| Number of children | | | | | | | | |
| 1 child | 26 | 2018 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 2 children | 28 | 1389 | 0.94 | 0.98 | 0.87 | 0.73* | 0.75* | 0.88* |
| 3 children | 11 | 550 | 0.97 | 0.94 | 0.87 | [0.63* | 0.79 | 0.87* |
| 4+ children | 5 | 243 | [0.76] | 1.02 | 0.81 | [0.58]* | [0.71 | 0.83* |
| No children | 30 | 3744 | 1.07 | 1.17* | 1.12* | 1.39* | 1.54* | 1.20* |
| All (in 1000's) | 100(3753) | | | | | | | |

*=95 % confidence interval does not include 1.00
[ = Between 30 and 50 deaths
[] = Between 10 and 29 deaths
.=less than 10 deaths

For all causes of death combined statistical significance tests shown in Appendix 7 (test A4) indicate an interaction between marital status and number of children, an interaction that goes beyond the more simple interaction of marital status and motherhood (children - no children) discussed above. Closer scrutiny reveals that this is essentially a difference between women who have one child and women who have two or more children (Table 6.6). Non-married economically active women with two or more children have very high mortality: about 10 per cent higher than non-married women with one child, who have a lower mortality than could be expected on the basis of the main effects model. The corresponding mortality difference among married women is 22 per cent and in favour of those with two or more children. The more children married women have the lower their mortality.

TABLE 6.6. Age-standardised relative mortality rates according to a cross-classification of number of children living in the household, marital status and economic activity by selected causes of death. Figures in parentheses are based on main effects. 35-64-year-old Finnish women (excluding pensioners) in the period 1981-5.

| | All causes | | | Circulatory diseases | | | Accidents & violence | | |
|---|---|---|---|---|---|---|---|---|---|
| | Married | | Not married | Married | | Not married | Married | | Not married |
| | Econ. active | House-wives | Econ. active | Econ. active | House-wives | Econ. active | Econ. active | House-wives | Econ. active |
| 1 child | 1.00 (1.00) | 1.23 (1.26) | 1.17 (1.27) | 1.00 (1.00) | 1.26 (1.40) | 1.22 (1.33) | 1.00 (1.00) | 1.55* (1.43) | 1.32 (1.54) |
| 2+ children | 0.82 (0.88) | 1.11 (1.11) | 1.28 (1.12) | 0.74 (0.88) | 1.29 (1.23) | 1.48 (1.16) | 0.74 (0.78) | 0.88 (1.12) | 1.64 (1.20) |
| No children | 1.15 (1.15) | 1.38 (1.44) | 1.41 (1.46) | 1.10 (1.07) | 1.41 (1.50) | 1.30 (1.42) | 1.38 (1.38) | 2.24 (1.98) | 2.00 (2.14) |

* = between 30 and 50 deaths
\# = less than 30 deaths

The relatively high total mortality of lone mothers with two or more children is a reflection of excess mortality of this group of women for circulatory diseases and accidents and violence. For these two causes of death non-married women with two or more children have about 20-25 per cent higher mortality than corresponding women with a child. For circulatory diseases the mortality of these women is even higher (15 per cent) than among women with no children.

Another way to approach the problem is to compare married women and not married women at each level of number of children. Not married women with two or more children, for example, have 2.2 times higher mortality from accidents and violence than corresponding married women. Not married women without children or with a child have only about 30 per cent excess mortality as compared to similar married women.

The age of the youngest child living in the household does not modify the multiple role effects at all (see significance tests A6 and B4 in Appendix 7).

*6.4. Age, education and multiple role differentials in mortality*

An attempt was made to study the modifying effects of person's own age and education on multiple roles. Age and education are surely important factors that affect the way people perceive their lives. Multiple roles among employed women with basic education, for example, who are probably working in less satisfying and financially less rewarding jobs should feel the strain of their domestic roles more acutely than women with intermediate or higher level of education. The research task is, thus, to discover whether the interplay of multiple roles is different between subsets of the study population, defined by age and education, and to analyse whether controlling for education affects the multiple role effects discussed in the previous passages.

For the analysis of age and multiple roles another abridged age variable was compiled. This was done in order to retain sufficient deaths in each age group. The original five 5-year age groups were reclassified into three age groups as before: 35-44-year-olds, 45-54-year-olds and 55-64-year-olds. Education was left as it was, although women with higher education comprise a group with precariously few deaths.

The pattern of mortality differentials according to marital status and motherhood vary by age (see rates based on main effects model age+mar+mot+eco in Table 6.7 for each age group). Excess mortality among not currently married economically active women as compared to married women is about 50-70 per cent larger among 35-44-year-olds than among older women. There is a 37 per cent excess mortality among 35-44-year-olds as compared to the about 25 per cent excess mortality in the oldest 10-year age-group.

Mortality differentials between those who have children living in the household and those who do not are also larger among younger women. The excess mortality among women without children varies between 40 per cent among 35-44-year-olds and 10 per cent among 55-64-year-olds. One should keep in mind that the reference group of people who do not have children living at home probably changes markedly when moving into the older age groups. Among 35-44-year-olds those not having children living at home are mostly people who have never had children. On the contrary, people not having children in the older age groups are to a growing extent people whose children have moved out of home. Differentials in the age pattern of relative mortality among housewives are quite small.

TABLE 6.7. Age-standardised relative total mortality rates according to a cross-classification of number of children living in the household, marital status and economic activity in three separate age-groups. Figures in parentheses are based on main effects. 35-64-year-old Finnish women (excluding pensioners) in the period 1981-5.

| | 35-44-year-olds | | | 45-54-year-olds | | | 55-64-year-olds | | |
|---|---|---|---|---|---|---|---|---|---|
| | Married | | Not married | Married | | Not married | Married | | Not married |
| | Econ. active | House-wives | Econ. active | Econ. active | House-wives | Econ. active | Econ. active | House-wives | Econ. active |
| 1 child | 1.00 (1.00) | 1.40* (1.29) | 1.22 (1.37) | 1.00 (1.00) | 1.18 (1.32) | 1.10 (1.25) | 1.00 (1.00) | 1.23 (1.22) | 1.19 (1.22) |
| 2+ children | 0.71 (0.75) | 0.90 (0.97) | 1.26 (1.03) | 0.82 (0.88) | 1.12 (1.16) | 1.17 (1.10) | 0.97 (1.03) | 1.28 (1.26) | 1.42 (1.26) |
| No children | 1.31 (1.22) | 1.88# (1.57) | 1.56 (1.67) | 1.17 (1.23) | 1.65 (1.62) | 1.47 (1.54) | 1.14 (1.13) | 1.35 (1.38) | 1.36 (1.38) |

* = between 30 and 50 deaths
\# = less than 30 deaths

The real interest here is, however, to see whether the multiple role effects vary by age. Statistical significance tests in Appendix 7 (tests A7 and B5) show this is not the case for the interaction between marital status and number of children (or for the interaction between economic activity and motherhood). The relative mortality rates for the different role constellations are, however, presented in Table 6.7 for all causes of death combined. Although there is an indication of the 'number of children and marital status' -interaction being strongest in the youngest 10-year age-group, mortality at younger ages is so low that statistical tests do not confirm this.

Analyses were also carried out to determine whether the relationship between multiple roles and mortality varied by educational attainment. The statistical tests indicate (Appendix 7, tests A8 and B6) that the interplay of marital status, motherhood and economic activity is similar in all educational categories. Not only were multiple roles related to mortality similarly in all educational groups but also the 'main effects' of marital status (married - not married), motherhood and economic activity showed very little variation by education (see however Section 5.1.2 of this study). The high mortality among not married women with children could not, however, be observed among highly educated women. There were, however, very few deaths in this group.

It still remains to be seen whether controlling for education changes the multiple role relationships observed so far. All the previous models concerning multiple roles did not

include education as an explanatory variable. Controlling for education before testing the multiple role effects did not, however, change the results (Appendix 7, tests A2, A5 and B2). Examining the relative mortality rates further validated this finding. The lack of influence when adjusting for education is not surprising: it was earlier observed that controlling for education did not have a substantial effect on the relative mortality rates of the main effects of marital status, motherhood and economic activity (Table 6.1).

## *7. SUMMARY OF THE MAIN RESULTS*

In this study, women's mortality was examined using a wide range of socioeconomic indicators, marital status, motherhood, children's characteristics, economic activity and, of course, age. The purpose of the study has been to find better empirical understanding of women's socioeconomic mortality differentials and to show how female mortality varies in the face of conflicting demands of employment, marriage and motherhood. All deaths among 35-64-year-old Finnish women in the period 1981-5 were analysed on the basis of a census based record linkage data. Eight broad questions, presented in Chapter 3, have been analysed. Although this summary is not structured according to the order in which the eight questions were introduced, all of the issues brought about in these questions will be touched upon.

### *7.1. Socioeconomic status and mortality*

The study has demonstrated that **educational** mortality differentials for 35-64-year-old Finnish women exist for all groups of causes of death, namely breast cancer, other cancers, circulatory diseases, other diseases, and accidents and violence analysed in this study. Differentials were largest for causes of death related to circulatory diseases and 'other diseases' (all other diseases except cancers and circulatory diseases). For these two broad groups of causes of death women with basic education (less than 10 years of education) had more than twice the mortality of higher educated women (12 or more years of education). Women with intermediate level of education (10-12 years) had also an intermediate mortality at a level of about 60 per cent higher than that of higher educated women.

Educational mortality differentials were relatively small for other cancers than breast cancer. The difference between the two extreme educational groups was only about 20 per cent. For the total female population breast cancer mortality differentials were large but reversed: higher educated women having roughly 45 per cent higher mortality than women in the lowest educational group. This reverse mortality gradient was, however, a product of mortality at older ages. Only among 50-64-year-old women was the mortality of those with basic education lower than mortality among women with intermediate education. For

other causes of death relative differentials in mortality were roughly similar in all age-groups.

For deaths related to accidents and violence women in the intermediate educational group had about 30-40 per cent lower mortality than women with either higher or basic education, creating a U-shaped mortality curve. Other studies have shown that this is mainly attributable to mortality from suicides (Koskinen and Martelin 1993). Differentials in total mortality, although large, may be misleading as they are a sum of at least four different patterns of mortality differentials on the cause specific level.

For most causes of death educational mortality differentials were similar among women with children and women without children irrespective of whether the comparisons were carried out among all women or among married women only. Educational mortality differentials were also similar in all marital status categories with the exception of single women who had larger differentials for other cancer than breast cancer, circulatory disease and 'other disease' mortality than other marital status groups. For these causes of death educational differentials in mortality varied between 50 and 150 per cent among single women. For other marital status groups the variation stayed in the range of 10 to 60 per cent.

The second principle of arranging women into socioeconomic status was **occupational status**. As there is no one criteria for classifying all women, three different criteria were used: own current occupation, own previous occupation (from the 1975 or 1970 censuses) and spouse's occupation. As these indicators were not available equally for all women the analysis had to be stratified. In the first section, comparisons of all economically active women classified according to their current occupation and pensioned women classified according to their previous occupation showed that, although the basis for classification was somewhat different, differentials in cause specific mortality were very similar. Statistical tests did not indicate dissimilarities in the pattern of mortality differentials between these two economic activity groups by occupational status or for that matter education.

The magnitude and pattern of differentials by occupational status were quite similar to those by education. For all causes of death other than breast cancer and accidents and violence upper white collar employees had lower mortality than lower white collar

employees, who in turn had lower mortality than manual workers. Breast cancer and accidents and violence showed their particular reverse and U-shaped mortality differentials.

When relative mortality rates were calculated according to a model in which age, occupational status and education were included, differentials by both variables declined markedly. The reduction of differentials was, however, stronger for occupational status than that observed for education. Education was a stronger predictor of cancer (except breast cancer) and especially circulatory disease mortality than occupational status. For breast cancer the opposite was true and for all other cause of death groups both variables were roughly equally strong.

In the second section housewives, of whom all were married and who were classified according to their husband's occupation, were compared to married economically active women. This was done in order to compare like with like. Classification of housewives according to a previously held (1975 or 1970) occupation was not feasible as only about 40 per cent of all housewives could be classified into an occupational group. Again differentials in mortality by occupational status and education were quite similar in both of these groups.

For married women **spouse's educational** attainment indicated very similar mortality differentials for most causes of death as women's own education. Calculating relative mortality rates simultaneously for both own and spouse's education, i.e. from a model that incorporated the main effects of both variables, emphasised the importance of women's own education somewhat. A similar conclusion was reached in a series of statistical test where each of the two variables was subtracted separately from a baseline model containing the age-standardised effect of both variables. A model including women's own education gave a better or an equally good fit than a model with spouse's education for all causes of death.

A comparison of own and spouse's occupational characteristics was also carried out among economically active married women. Both own and spouse's occupational status also indicate roughly equally large differentials in mortality for all cause of death groups except breast cancer. For breast cancer own occupational status showed larger differentials than spouse's occupational status.

Two further measures of socioeconomic status, i.e. **family disposable income** and **housing tenure** were also examined. Both these measures were household based and their relationship to mortality was analysed among married economically active women. Mortality differentials by family disposable income were quite consistent with those observed for education and occupational status. The magnitude of the differentials were, however, narrower and narrowed further when own and spouse's education and economic activity were controlled for.

Mortality differentials by housing tenure were large for most causes of death and unaffected by controls for both educational variables and spouse's economic activity. The one feature replicated by all socioeconomic indicators this far, the reversed mortality gradient for breast cancer, did not hold true for housing tenure. No differentials in mortality by housing tenure could be observed for breast cancer. An indication of a varying age pattern was observed: relatively higher breast cancer mortality among young women in rented accommodation counterbalanced by a reverse gradient among older women. This was not, however, consistent across all age-groups. Otherwise differentials in mortality by housing tenure and income did not vary strongly and consistently by age or education.

The relationship between any socioeconomic variable and cause specific mortality varied little in groups defined by other socioeconomic variables. Such interaction effects, both between two own socioeconomic characteristics and own and spouse's characteristics, were rarely statistically significant. Among economically active women, housewives and pensioned women the interaction between education and occupational status, current, spouse's or previous respectively, was statistically significant only among housewives for 'other diseases'. Among married women the interaction between own and spouse's education proved to be significant only for other cancers than breast cancer. Both interactions indicated slightly lower mortality than expected on the basis of main effects for women classified into higher socioeconomic categories according to both variables. Similarly, among married economically active women differentials in mortality by own occupational status proved to be similar at all levels of spouse's occupational status for all broad causes of death.

Several **comparisons between men and women** were carried out. These analyses showed that women's own educational and occupational status mortality differentials were roughly

as large as those obtained for men. This agreement of mortality differentials could be observed for all cause of death groups except accidents and violence, and all causes combined. The dissimilarity of mortality differentials for total mortality mainly arises from cause of death structure, i.e. breast cancer, a cause of death that is negatively related to socioeconomic status, is common only among women and causes with a strong positive relationship with socioeconomic status (e.g. lung cancer) are more common among men than among women (see also Koskinen and Martelin 1993).

Furthermore, spouse's education is a very strong predictor of male mortality; about as strong or even slightly stronger for most broad causes of death as men's own education. For accidents and violence own education, however, indicates larger differentials than wife's education. Highly educated men seem to have very low mortality. More or less similar results are obtained if the analysis is carried out according to own and wife's occupational status for economically active married men, i.e. wife's occupation is as strong an indicator of male mortality as men's own occupation.

The simultaneous analysis of own education and occupational status among economically active men showed very clearly what was less evident among corresponding women: education is a stronger predictor of cancer and circulatory disease mortality than occupational status and that the reverse is true for 'other diseases' and accidents and violence. Furthermore, as for women also for men the interactions between own and spouse's educational and occupational characteristics were not significant.

### *7.2. Multiple roles and mortality*

This study has demonstrated that Finnish women who have children living in the household have lower total mortality than women who do not have children. Married women have lower total mortality than women who are not married. Divorced women have the highest relative mortality, while the position of single and widowed is intermediate. Furthermore, economically active women have lower total mortality than housewives. The pattern of mortality differentials according to marital status, motherhood and economic activity by cause of death are similar to those observed for all causes combined. The magnitude of the differentials, however, tend to be larger for other causes than cancers.

The main emphasis of this study was, however, to analyse how the so called multiple roles, i.e. combinations of marital, parental and work roles, are related to mortality. Women with all three roles of a wife, a mother and an employee had low mortality. This low mortality was, however, a reflection of the main effects of these three variables. Only one constellation of characteristics defined by cross-classifying marital status, motherhood and economic activity was characterised as having somewhat deviant mortality from that to be expected according to the main effects. These were the currently non-married economically active women with children in the household. The excess mortality of these lone mothers as compared to corresponding married women was 35 per cent. The same differential among women without children was less 25 per cent. High mortality among lone mothers with children could not be pinpointed to any particular one of the three non-married groups, i.e. single, divorced or widowed.

Analysis by characteristics of children revealed that not all lone mothers en bloc had high mortality; only those with two or more children. These women had almost 60 per cent excess mortality as compared to married women with equal number of children. High mortality was mainly due to causes of death related to accidents and violence and circulatory diseases. For these two causes of death the excess mortality of lone mothers with two or more children was 100 per cent or more. The corresponding excess mortality among women with no children or one child was about 20-45 per cent.

Further examination showed that the excess mortality among lone mothers with two or more children and the lack of interactions for any other role constellation was similar in all age and educational groups.

# *8. DISCUSSION*

## *8.1. Women's socioeconomic mortality differentials*

### *8.1.1. Mortality differentials by education and occupational class*

Socioeconomic mortality differentials among women exist in all countries that have been studied (see e.g. Kitagawa and Hauser 1973; Desplanques 1984, Andersen 1985, 1986; Borgan and Kristofersen 1986; Klinger 1986; Marin 1986; Townsend and Davidson and Whitehead 1988a; Occupational Mortality in the Nordic Countries 1971-80 1988; Feldman et al. 1989; Lynge et al. 1989; Moser et al. 1990a; Pagnanelli 1989; Powell-Griner and Rosenberg 1989; Valkonen et al. 1991, 1992). All of these studies show relatively high total mortality for those in lower socioeconomic categories. Not surprisingly, this study has also demonstrated that large mortality differentials among 35-64-year-old Finnish women exist for a wide range of socioeconomic variables.

Of education and occupational status, the two more closely analysed socioeconomic variables in this study, only education provides a uniform basis for classifying all women and, as has been mentioned before, education has been determined early in life and thus enjoys at least temporal, if not necessarily causal, priority to occupational status and other socioeconomic variables. Furthermore, as education is a determinant of occupational attainment, at least part of the possible causal effects of education on mortality could work through occupation.

The pattern of educational mortality differentials among Finnish women are roughly as large as those observed in other Nordic countries (Valkonen 1989) and, although educational variables are not strictly comparable, also in the United States (e.g. Kitagawa and Hauser 1973; Feldman et al. 1989). When comparisons are possible by cause of death, each country (Finland, Norway, Denmark and United States) shows larger differentials for circulatory diseases than cancers. This study and the analysis of the United States data (Kitagawa and Hauser 1973), furthermore, demonstrate a negative relationship between education and breast cancer. As in Finland, also in the United States the educational pattern of mortality from accidents and violence is U-shaped. In the United States the U-shaped pattern is, however, very slight.

Comparison to the OPCS Longitudinal Study (England and Wales) according to education are, although possible, unreliable (Valkonen 1989), and occupational status comparisons are notoriously difficult. Furthermore, different age-groups and methods of analysis have been used. Nevertheless, as far as can be judged, the pattern of mortality differentials according to women's own occupational status are very roughly similar in both Finland, and England and Wales, i.e. higher mortality in the manual occupational groups for most causes of death. The Finnish data, however, seem to show narrower total mortality differentials by occupation than the OPCS data (Moser et al. 1990a). This seems to arise from the very small occupational mortality differentials from all other cancers than breast cancer and very strong reverse differentials from breast cancer.

It should be emphasised again (see Section 4.2.1 of this work on data) that the Finnish occupational data for women is superior to that used in e.g. OPCS Decennial Supplement (1978, 1986) on two counts. Firstly, all economically active and pensioned women can be meaningfully classified according to their own occupation. Secondly, as part-time work is very rare and child care facilities reasonably advanced, re-entry into the labour market after childbirth is probably not as strongly associated with occupational down drift into less valued part-time work as it is in England and Wales (e.g. Martin and Roberts 1984; Dex 1987; Walters and Dex 1992). For a more detailed discussion on national differences in the female labour market see Section 8.1.2 of this study.

The relationship between socioeconomic status and mortality is sometimes argued to result from health related mobility: poor health could be a barrier to upward mobility or it may cause downward mobility (inter-generational or intra-generational). According to this model illness determines socioeconomic status. Although such selection effects cannot be ruled out in this study, only relatively limited evidence from other empirical studies so far support this argument (see Illsley 1955; Meadows 1961; Goldberg and Morrison 1963; for discussion see e.g. Fox et al. 1982a, 1985; Blane et al. 1993).

More recently, Patrick West (1991) has drawn attention to indirect selection by which is meant social mobility not attributable to health but to factors such as childhood deprivation or life-style, factors that may affect both social mobility and health. Indirect selection is, thus, different from direct selection in the sense that it does not posit a causal relationship between health and socioeconomic status but assumes that the relationship is brought about by some third variable influencing both health and socioeconomic status

simultaneously (see e.g. Blane et al. 1993). According to West this form of selection is most likely to occur in early adulthood and be inter-generational. The Finnish data set in itself, as used here, provides very little direct evidence for or against health selection explanations.

Nevertheless, education and occupational status may be said to emphasise different aspects of social stratification. Education reflects the experiences of early life, say between ages from 7 to about 25. This is the time when educational qualifications are usually obtained and it is also the time of life when seeds are laid for many of the behaviours and attitudes that may last till later life. These can include specific aspects of behaviour such as patterns of alcohol and tobacco use and exercise, but also more general factors like ability to cope and sense of coherence (Antonovsky 1987, 1989), a feeling of confidence that one's environment is comprehensible, manageable and meaningful. Different educational experiences also provide people with different linguistic abilities and perceptions of the society; those with better qualifications are likely to be better able to operate in the social environment to their advantage.

Behaviour should not be interpreted to mean that educational and socioeconomic mortality differentials more generally can be explained in purely individualistic terms. Individual behaviour and achievement is surely conditioned by social pressures and constraints (e.g. Blane 1985). Educational attainment is not purely a matter of individual ability but is influenced by e.g. resources of the family of origin. Furthermore, education is here not to be seen as a very good proxy for behaviour or e.g. the ability to cope, but only representing the component of socioeconomic status that is most closely related to these factors.

Occupational status, on the other hand, mirrors experiences during later life and a part of occupational mortality differentials could well be related to the sphere of work itself. The contribution of industrial accidents and exposure to poisonous substances on mortality differentials by occupational status are most likely relatively small for most causes of death. However, more general difficult physical working conditions (e.g. Lundberg 1990a, 1990b) and/or degree of control over the pace and content of work (e.g. Karasek et al. 1981; Markowe et al. 1985; Marmot and Theorell 1988; Marmot 1989; Karasek and Theorell 1990) and social support at work (e.g. Hibbard and Pope 1992, 1993 and more generally Berkman and Syme 1979; Berkman 1984) may be more important.

This distinction cannot, of course, be rigid and should only be taken as a rough guide. It would be only foolish to propose that e.g. tobacco smoking is fixed for life before age 25 and does not respond to latter life experiences or that the two quite loose aspects of socioeconomic status are clearly independent.

If the rudimentary schema on the early as opposed to late components of socioeconomic status is, however, accepted, the results of the multivariate analysis by cause of death can be given some further meaning. It may be argued that mortality differentials by education that are controlled for by occupational status reflect the extent that 'early experiences' create socioeconomic mortality differentials and that the remaining occupational status mortality differentials reflect the importance of more recent experiences on socioeconomic mortality differentials. The simultaneous analysis of education and occupational status was only carried out among economically active women, women for whom current occupational status is available.

The larger educational than occupational mortality differentials among economically active women for all cancers except breast cancer and, especially, circulatory diseases may, thus, be said to reflect the importance of early experiences and possibly the abilities and behaviours (e.g. smoking and exercise) related to these experiences in creating socioeconomic mortality differentials. The importance of education may be further underestimated because its effects may be intermediated through occupation. The effects of early experiences are in accordance with the chronic character of these two disease groups.

For the cause of death group 'other diseases' and accidents and violence both education and occupational status showed roughly equally large mortality differentials. The stronger explanatory power of occupational status for these causes of death than causes related to circulatory diseases and other cancers than breast cancer may be understood by the possibly more recent nature of some of the 'other diseases', which include e.g. all infectious and respiratory diseases, and especially accidents. Many of the proximate determinants of these causes of death may be very closely linked to occupation.

For breast cancer occupational status is a more potent explanatory variable than education. This is evident even if the simple age-standardised effects are compared. Crude analysis of this data (not presented here) has shown that in the youngest age-group (35-39-years)

presence of children, age of the youngest child and number of children living in the household are roughly as closely related to occupational status as they are to education. In the youngest age-group, among whom most children still live in the maternal home, these variables may be taken as rough indicators of fertility and indirectly especially age at first birth, one of the most important risk factors for breast cancer (La Veccia et al. 1989; Kelsey and Gammon 1990; Kogevinas 1990; Kvåle 1992). Tables from the recent Finnish fertility survey (Nikander 1992) and the earlier 1970 survey (Tilastokeskus 1975) on the average number of live births at different ages seem to give similar results for all 35-64-year-old women. It seems, thus, that the more important contribution of occupational status to breast cancer differentials cannot be understood in terms of a well known breast cancer risk factor, i.e. age at first birth. Other factors, possibly linked to later experiences at the labour market, must play an important role.

A similar pattern of stronger differentials by education for cancers and circulatory diseases was observed also for men. Among men the pattern was even more evident. For 'other diseases' and accidents and violence mortality differentials by occupational status were, furthermore, larger than those according to education.

The more evident contribution of education for the mortality differentials from the more chronic circulatory diseases and cancers (except breast cancer) among men than women seems to partly arise from two sources. Firstly, among married women the circulatory disease mortality gradient by education is narrower than among women of other marital status groups, especially single women. No large differentials between married and unmarried men were observed in this study. Among married economically active women (women for whom current occupational data exist) both education and occupational status are roughly equally powerful determinants of circulatory disease and cancer (except breast cancer) mortality. The variation in educational mortality differentials by marital status will be discussed in more detail later on.

Secondly, women seem to be unable to reap the benefits of education in terms of occupational status as effectively as men. Eighty-three per cent of highly educated men have obtained an upper white collar occupation as well as 13 per cent of men with intermediate education. Among women education and occupational attainment, although strongly interrelated, are nevertheless more independent than among men. 'Only' about 70 per cent of women with higher education are employed in upper white collar occupations.

Among women, as compared to men, occupational status carries with it a larger proportion of differential mortality that is unrelated to education. In a multivariate framework occupation is, thus, able to display a stronger independent contribution.

Occupational status is, however, more strongly related to mortality from 'other diseases' and accidents and violence than education among men, but not among women. This may be partly explained by the specific occupational exposures of some manual male occupations for these causes of death e.g. accidents among construction workers and exposure to poisonous substances among industrial workers. For accidents some evidence for this clearly exists; about 90 per cent of all work related accidents are among men and a large proportion of these are concentrated in manual classes (Työsuojeluhallitus 1985, 1991).

### *8.1.2. Mortality differentials by spouse's socioeconomic characteristics*

Large age-standardised mortality differentials for married women by husband's occupational characteristics have been observed in this study on Finnish women as well as for English and Welsh women (Moser, Pugh and Goldblatt 1990; Goldblatt 1990). Similar results have been found from studies on women's health in both Britain (Arber 1989, 1992) and Sweden (Lundberg 1990b). Corresponding results have also been reported from eight industrialised countries concerning class identification or voting behaviour (Erikson and Goldthorpe 1992). The great importance of men's socioeconomic characteristics for their spouse's health and mortality has often been interpreted as demonstrating that men's status accurately describes the socioeconomic standing of the whole household. Women's own characteristics, especially occupational class, are argued to be poorer indicators of women's social status because their occupational careers are disrupted by their responsibilities as mothers and wives and are thus more loosely attached to the labour market than men.

This study, as well as studies by Moser el al. (1990) and Arber (1989), however, show that for women for whom occupational information exists, women's own and husband's occupational characteristics are roughly equally strong indicators of female mortality and morbidity. For Finnish women the equality of mortality differentials according to own and husband's occupational characteristics hold for all causes of death except breast cancer.

Among **all women** or **all married women** larger morbidity and mortality differentials according to the British 'conventional' approach, i.e. classifying married women according to their husband's occupational status, as compared to the 'individual' approach reflects mainly distributional differentials in the occupational structure by sex and marital status or large mortality differentials among the sub-populations of non-married and 'unoccupied' women.

Analysing the British General Household Survey, Arber (1989) notices that among **all women** the strength of the class gradient in 'limiting long-standing illness' based on the British 'conventional' approach is largely due to the very poor health of single and previously married women in manual (especially semi-skilled or unskilled) occupations. Among **married** women the occupational status 'gradient is nearly as strong using the 'individualistic' approach (last occupation among housewives) as by using the 'conventional' approach' (Arber 1989, p. 265). She does not, however, make the observation that the power of the 'individual' approach among **all women** is somewhat blurred because not married semi-skilled or unskilled women with high morbidity are in the 'individual' approach subsumed in a mass of similar, but relatively healthy married women. The distribution of married women according to their own occupation is biased towards the lower ranges of the occupational classification. This may partly arise from the low status part-time jobs married women do. If married women are, however, classified according to their husband's occupation the distribution is upward biased as men and married men in particular tend to be better placed on the occupational scale than women. Thus, in the British 'conventional' approach not married semi-skilled and un-skilled women's poor health contributes significantly to the overall gradient at the lower end of the occupational scale.

Moser et al. (1990) on the basis of the OPCS Longitudinal Study show relatively small total mortality differentials according to own occupation based social class among **economically active married women** (women for whom occupational data exist). Among same women the differentials are slightly larger according to husband's class, 'principally because it distinguishes those with a husband in Social Classes I or II as a substantial group with low mortality' (Moser et al. 1990, p. 148). The strong discriminatory power of husband's class among **all married women** is, however, in this study largely attributable to the very high mortality among 'unoccupied' women married to men in manual classes. Also Arber (1989) found poor health among semi-skilled and unskilled

housewives classified according to their own previous occupation. The 'healthy worker' effect is likely to account for some of this excess mortality and morbidity.

The close similarities between Finland and England and Wales in the relationships between own and spouse's occupational status and mortality are interesting considering the differentials in the female labour market in these countries. In contrast to England and Wales, Finland like Sweden is a country of very high female labour force participation: about 67 per cent of Finnish 35-64-year-old women worked for wages in 1980, while only about 56 per cent in Britain did so (ILO 1990; see also OECD 1992). Thus, working outside home is nowadays the norm for most Finnish women. It is common to stay at home and take care of children and the household only when children are very young. This period coincides with the statutory maternity leave of about 9 months. Seventy per cent of women with children under three years are employed. This is in stark contrast to England and Wales, where only 32 per cent of women with children under five years participate in paid work (Arber and Gilbert 1992).

Although women's labour force participation rates have increased rapidly in both societies the initial level in the early 1960s has varied greatly (ILO 1990). In Finland the increase in the female labour force participation has taken place in a labour market where part-time work has not been available. Only about 10 per cent of all employed women were in part-time work. This is in clear contrast to the British and also Swedish experience (Jallinoja 1985; Arber and Gilbert 1992; Julkunen 1992; see also Arber and Lahelma 1993). In both of these countries around 45 per cent of employed women work part-time. Furthermore, in Britain, as opposed to Finland, part-time work is closely linked to childrearing: almost three-fourths of British employed women with children under five years work part-time.

This study has, furthermore, shown that mortality differentials according to spouse's occupational status were very large also among men. The range of the occupational status mortality differentials according to own and spouse's characteristics are roughly equally large. Arber (1989) has also shown that differentials between occupational categories among married men in self-reported 'limiting long-standing illness' are actually slightly larger according to wife's occupational characteristics than according to men's own characteristics.

Similar results are obtained for Finnish men and women if the analysis is carried out according to own and spouse's education: for both married men and women spouse's education is roughly as strong a explanatory variable as one's own education. The analysis by education is in some respects more reliable because all women can be classified according to the same criterion and, furthermore, occupational downgrading after childbirth does not affect the results.

To summarise so far, for the analysis of mortality and morbidity differentials there is quite little evidence to argue, on the basis of this study and studies by Arber (1989) and Moser et al. (1990), that among women the British 'conventional' approach to class assignment will better discriminate between occupational groups than the 'individual' method. Mortality and morbidity differentials among men and women for whom occupational data exist are roughly as large according to own and spouse's occupational characteristics in both Finland and Britain (Arber 1989, Moser et al 1990). Furthermore, own and spouse's education indicate similar results for the Finns. The results seem to be consistent across different labour market conditions for women.

One implication of these findings is that studying married women's mortality and morbidity differentials according to their husband's socioeconomic characteristics is not necessarily more appropriate than studying married men's mortality or morbidity differentials according to wife's characteristics. The explanations for the strong relationship between spouse's socioeconomic characteristics and mortality should not be sought form arguments claiming that one or the other spouse is somehow more dominant and thus determines the whole household's socioeconomic standing.

The relevance of these results in relation to the more general sociological issue (see e.g. Allen 1982; Goldthorpe 1983, 1984; Erikson 1984; Heath and Britten 1984; Stanworth 1984; Abbott and Sapsford 1986; Leiulfsrud and Woodward 1987, 1988; Erikson and Goldthorpe 1988, 1992) of women's and men's class assignment are not straightforward. Erikson and Goldthorpe (1992) have shown using data from several studies on eight industrialised countries that husband's class is a stronger predictor of women's and men's class identification and class related voting than wife's class. All men and women in their study were married and both spouse's were economically active. They also argued, referring to studies in Britain and Sweden (Fox and Goldblatt 1982b on the OPCS LS; Arber 1991 and Lundberg 1990), that among women similar results have been obtained

for morbidity and mortality. These differentials in mortality and morbidity have, however, already been argued to mainly arise from distributional complexities. If economically active married women and men are compared the studies into class identification and health seem to give clearly different results.

If we take the results by Erikson and Goldthorpe (1992) at face value, i.e. we believe that husband's class is the dominant determinant of both spouse's class identification, how can the diverging results of studies in mortality and morbidity be explained? Should one actually expect a similar pattern of results? It may be that the aspects of occupation based 'social class' that affect class identification and voting behaviour are somewhat different from those that affect mortality and morbidity, and that own and spouse's occupational characteristics hold a somewhat different meaning among men than women.

One possibility to understand the results of both Erikson and Goldthorpe (1992) and those concerning mortality and morbidity differentials is to argue that in a multivariate framework husband's occupational characteristics are more important in determining the family position in the hierarchical structure of the society than wife's occupational characteristics and that wife's occupation controlled for by husband's occupation more accurately reflects another component of the family's socioeconomic status e.g. that related to dietary habits and life-style in general. The structural position would be important in determining both spouses' 'class consciousness' and voting behaviour as well as have an effect on mortality. Besides this broad structural effect, wife's occupational status, which is of no lesser importance, would have an additional effect on mortality but not on 'class consciousness'.

It is worth pointing out that if own and spouse's educational and occupational attainment are all added to the model simultaneously, own and spouse's education are clearly the two most important socioeconomic variables among men for both circulatory diseases and cancers. Among women such clear cut conclusions cannot be made, but for circulatory diseases spouse's (husband's) occupational status is the single most important variable. Also this may indicate that husband's structural position in the society has important consequences for women's mortality, but that among men wife's education, and thus again possibly factors related to diet, use of leisure time and life-style in general, may be more important; in a model where only own and wife's occupational status were included the effect of wife's education is possibly intermitted through wife's occupational status.

The simultaneous analysis of own and spouse's educational and occupational characteristics is rather speculative and more work is badly needed from this Finnish as well as other data sets. More specific cause of death groups should be utilised.

### *8.1.3. Mortality differentials by family disposable income and housing tenure*

Family disposable income and housing tenure, both household based measures, were also related to mortality, family disposable income, however, less than other variables (education, occupational status and housing tenure). The patter of mortality differentials were as expected, i.e. reverse differentials for breast cancer, somewhat larger differentials for circulatory diseases and U-shaped differentials for accidents and violence, but parameters often failed to reach statistical significance levels. The relatively small income differentials may be interpreted to mean that socioeconomic mortality differentials among women have little to do with factors related to abject poverty, physical circumstances and consumption possibilities e.g. inability for financial reasons to purchase adequate and nutritious food or having to live in so poor conditions as to cause high mortality. Sketchy evidence from elsewhere (Koskinen and Martelin 1993) showing relatively small total mortality differentials according to housing density and equipment level support this interpretation.

The small mortality differentials by family income in this study are in some contrast to the differentials obtained in the United States by Kitagawa and Hauser (1973). They observe a 41 per cent total mortality differential between the two extreme family income groups among 25-64-year-old white female family members. These differentials are partly due to the larger number of income categories and also possibly to the use of a different income measure and, most importantly, inclusion of all economic activity groups into the study population. Analysing income and mortality in an under 64-year-old population that includes pensioners creates a relationship between the two almost by definition: pensioners have retired because of poor health and enjoy pensions that are less than income earned from occupations held previously. National differentials in the value attached to high income may also explain some of the larger income differentials in the United States. Education is a stronger predictor of total mortality than income also in the United States. The 41 per cent income differential declines to 19 per cent when education is controlled

for while the mortality differential between the two extreme educational groups remains at about 35 per cent.

The relatively small mortality differentials by income may, however, also partly reflect the complexities of the income variable as used in this study. The income variable includes income earned by all family members as well as social security benefits. Taxes are deducted and the final figure is divided by the number of consumption units in the family (for details see Section 4.2.3.). This multi-faceted nature of the income variable may dilute the 'real' relationship between mortality and income. Some other more simple measures of income e.g. individual income may indicate larger mortality differentials. Different measures of income, however, partly depict different aspects of socioeconomic status. The income variable used in this study may be an accurate measure of consumption possibilities, but individual income, on the other hand, may more reliably reflect the educational qualifications needed for the job one is working in or the respect the job carries with it.

Several British authors (e.g. Townsend et al. 1988b; Davey Smith 1990) have used car access as a proxy of current income. Large differentials in mortality and morbidity among women have been observed by car access (e.g. Moser et al. 1990a; Arber 1989). Both car access and income may, however, be strongly influenced by reverse causality: poor health conceivably leading to both. The possibility of reverse causality is especially problematic for income when the analysis is carried out simultaneously for economically active and inactive populations. For this reason education may be a more reliable measure of mortality differentials than income (e.g. Kitagawa and Hauser 1973; Holme et al. 1980) and car access.

Further analysis on different components of family disposable income (e.g. wage income, rents or benefits) and different classifications is needed. Blaxter (1990) for example has shown that the relationship between income and health is highly non-linear: little improvement in health is observed with increasing income above the middle ranges of the income distribution. Information on individual level income is, however, rarely available, especially for populations that are feasible for mortality analysis. On the aggregate level Wilkinson (1986b, 1992) has, however, drawn attention to the possible effects of income distribution on health and mortality.

The importance of housing tenure as a discriminator of female mortality is unquestionable. It is, however, more difficult to understand how living in rented accommodation might influence mortality. Although housing tenure has often been taken as an indicator of wealth, it is somewhat unclear how those in owner occupied housing differ from those in rented accommodation. Arber (1989) has proposed that part of the mortality differentials between housing tenure groups may be understood in terms of local authority tenants being more likely to be unemployed or retired, both groups with high mortality. Such compositional differentials could affect mortality differentials by housing tenure, but they are of lesser relevance here because the analysis was restricted to married economically active women and local authority tenants were not separated form other tenants. Excluding farmers, who mainly live in owner occupied housing, from the analysis does not markedly change the relative excess mortality rates for the population living in rented accommodation.

This study has, furthermore, shown that relative excess mortality of those in rented accommodation is unaffected by controls of own and husband's education and husband's economic activity, i.e. indicating the fact that these three variables are not strongly related to housing tenure. Family disposable income was not strongly related to housing tenure either. In addition, housing tenure is not related to breast cancer mortality, although reverse differentials were observed for all other socioeconomic variables. There is thus some evidence to argue that housing tenure, at least among married economically active women, may be measuring an aspect of social stratification, an aspect very poorly understood, not captured by any other measure or that using housing tenure as a socioeconomic indicator is inappropriate altogether. Unsystematic results on the relationship between housing tenure (and also car access) and morbidity have also been reported by Lahelma and Arber (1993) from a comparative study of three Nordic countries and Britain.

### *8.1.4. Socioeconomic mortality differentials in sub-populations.*

Interdependencies between education and marital status, motherhood and economic activity were observed. However, cause specific mortality differentials by education as well as occupational class, were very similar in all sub-groups defined by these three variables. Similarly, for most causes of death the pattern of socioeconomic mortality

differentials did not greatly vary by women's age or according to any other socioeconomic variable.

The lack of interactions, i.e. the lack of variation in the pattern of socioeconomic mortality differentials in population sub-groups is noteworthy as it indicates that the analysis of mortality differentials can, to a large extent and without causing serious bias, be carried out for the population as a whole. Rarely is there a need to stratify the analysis by any of the three role variables (motherhood, marital status and economic activity). From the point of view of significant interactions the need to combine the 'social stratification' and 'role' frameworks (e.g. Arber 1991) seems thus to be somewhat overemphasized in the Finnish mortality context.

Two exceptions to the general observation of no variation in the pattern of socioeconomic mortality differentials in population sub-groups are worth mentioning. Firstly, single women have larger educational mortality differentials than other marital status groups. Secondly, educational breast cancer differentials vary by age. These will be discussed in more detail in the following after which a few comments are made on cross-classifying different indicators of socioeconomic status.

*Single women and socioeconomic mortality differentials*

Single women departed from the general pattern of mortality differentials. Depending on cause of death educational differentials in mortality varied between 50 and 150 per cent among single women. For other marital status groups the variation stayed in the range of 10 to 60 per cent. Large socioeconomic mortality and morbidity differentials among single women have been observed previously (e.g. Moser et al. 1990a; Koskinen and Martelin 1993; Arber 1989).

It may be that the relatively large educational mortality differentials among single women are a reflection of very low mortality among single women with more than basic education. Among single women (Table 5.3) it is relatively more common to have a higher or intermediate level of education than in other marital status groups (for Britain see Kiernan 1988). Some of these better educated women may have remained single out of conscious choice e.g. to be better able to proceed in a career, without the interference

of childbearing and a husband. Staying single would have thus been a positive decision and not an unfortunate consequence of being 'left over' in a highly competitive marriage market, a market where about 75 per cent of 35-64-year-old men in Finland are married at any one point and where 'stable and responsible disposition', health and health potential play an important role (see e.g. Hu and Goldman 1990; Goldman and Hu 1993). On the other hand, single women in general may more likely be emotionally unstable or physically unhealthy (e.g. Gove 1973; Goldman and Hu 1993; see also Kobrin and Hendershot 1977; Helsing et al. 1981) and thus find it more difficult to marry. It is not unreasonable to assume that this group is overrepresented among single women with only basic education. This differential selection of people, who initially have a greater likelihood of death, to remain single could conceivably explain some of the very large educational mortality differentials.

Among single men educational mortality differentials are similar to those among married and divorced men. Furthermore, single men are worse educated and are more often employed in manual occupations than the population as a whole (e.g. Kiernan 1988).

*Socioeconomic breast cancer mortality differentials by age*

For most causes of death women's relative socioeconomic mortality differentials were very similar in each of the six five-year age-groups (35-39, 40-44, 45-49, 50-54, 55-59 and 60-64) irrespective of the measure of socioeconomic status used. This result is in agreement with some other studies (e.g. Kitagawa and Hauser, 1973; Valkonen et al. 1990; Andersen 1985) and is of particular interest as mortality differentials have been known to vary strongly with age among men at similar ages (e.g. Kitagawa and Hauser 1973; Leclerc et al. 1990; Valkonen et al. 1990; Andersen 1985). It should, however, be emphasised that this study does not, of course, provide any evidence to assume that socioeconomic mortality differentials are constant in a different age ban e.g. 15-59-years which is often used in analyses on the OPCS longitudinal study (e.g. Moser et al. 1990a). Many young women in the age-group from 15 years to about 30 years are still to finish their education and are at the beginning of their occupational careers and are maybe about to buy their first car or apartment. Classifying young women (or men) into any one category is highly inaccurate and, furthermore, increasing evidence suggest that

socioeconomic differentials in health are very small among adolescents (Macintyre and West 1991).

Of all causes of death only breast cancer indicate varying socioeconomic differentials by age. A detailed analysis carried out for education showed that the reverse socioeconomic mortality gradient for breast cancer, also observed in several other countries e.g. Sweden (Vågerö and Persson 1986) and England and Wales (Moser et al. 1990a), is a produce of mortality at older ages: only among 50-64-year-old women is the mortality of those with basic education lower than mortality among women with intermediate education.

At least two causes for the age differentials can be put forward. Firstly, it could be an indication of a 'cross-over' in breast cancer mortality (see also Moser et al. 1990a), similar to the one that has occurred for ischaemic heart disease between 1950 and 1960 in England and Wales (Marmot et al. 1978; Koskinen 1985) and also in other countries (Vågerö 1991; Mackenbach 1992). In the IHD mortality cross-over relatively high mortality among upper socioeconomic classes was transformed into a relatively low mortality. The change in the socioeconomic pattern of IHD may have partly taken place because of changes in specific etiologic factors, in particular smoking and diet (Marmot et al. 1978). A similar cross-over for breast cancer may have begun and it may be first observed in the younger age-groups. The causes of this possible transition are unclear. They may be related to changes in risk factors or developments in diagnosis (and awareness of the disease) and treatment that both favour the upper socioeconomic categories.

The cross-over is unlikely to result from advantageous changes in the reproductive behaviour of younger women in higher educational groups e.g. a lowering of the age at first birth (or parity), believed to be one of the more important risk factors for breast cancer (La Veccia et al. 1989; Kelsey and Gammon 1990; Kogevinas 1990; Kvåle 1992). Favourable changes in the use of dietary fats, alcohol consumption or exercise are more likely to have taken place among better educated. There is, however, no consensus on the harmful or beneficial effects of these factors for the development of breast cancer (Kelsey and Gammon 1990; Kinlen 1991; Adlercreutz et al. 1992). Nationwide mammographic screening for 50-59-year-olds, that started in Finland in 1987 (Hakama et al. 1991) is, of course, unlikely to have had an effect.

An alternative explanation for the different mortality patterns by age is that the various risk factors affect mortality differently in different age and socioeconomic groups. At a younger age dietary habits, for example, may be more important risk factors and favour the better educated, but at later ages the age at first birth may play a more important role in the development of breast cancer and favour the less educated. No cross-over would thus be taking place. Research on breast cancer trends by age and education is under way.

*Cross-classifying socioeconomic indicators*

As with marital status and age mortality differentials according to any one socioeconomic indicator may vary in groups of another socioeconomic indicator. By cross-classifying two (or more) socioeconomic indicators the extent of this variation can be assessed. 'Cross-classifications' (and composite measures) of socioeconomic status are, thus, sometimes used as they can provide a more detailed account of mortality or morbidity differentials (see e.g. Arber 1989; Moser et al. 1990a; Davey Smith 1990). One such cross-classification is that between one's own and spouse's occupational status. In the Finnish data this particular measure did not, however, indicate mortality differentials over and above those already displayed by its' two separate parts, i.e. the pattern of mortality differentials by own occupational status were similar in all groups of spouse's occupational status and vice versa. Despite few exceptions, a similar conclusion is reached for the other cross-classifications analysed in this study.

Furthermore, the relationship between two socioeconomic variables was usually such, that only relative few observation end up in the socioeconomically discordant groups e.g. upper white collar women married to manual men. There was simply not enough population and deaths in the socioeconomically incongruent groups to make interactions possible. On the other hand, relative rates for the cross-classifications of two socioeconomic indicators very seldom even gave a hint of a possible interaction. It seems thus that understanding socioeconomic status mortality differentials among 35-59-year-old Finnish women is little enhanced by trying to incorporate complex cross-classifications (or interactions if one likes to use the more technical term) of several socioeconomic indicators into the analysis.

Of course the range of differentials were larger according to any of the cross-classification used in this study, but this simply reflects the additive main effects of the two variables. If two (or more) socioeconomic variables indicate mortality differentials, then the range of differentials obtained by comparing a group defined by being advantageous according to both of the variables to group defined by being disadvantageous according to the same variables is larger than that obtained for any of the single variable (unless the variables are fully correlated). When two or more socioeconomic measures are additively related to mortality, the rational or the insights gained by analysing a cross-classification of these measures, other than being able to present very large mortality differentials, are not very many (see however Martelin 1993 forthcoming). An advantage of combining socioeconomic variables is, however, their ability to distinguish small groups. These groups can be used to monitor changes in differentials. The advantage of smaller groups, although prone to random fluctuation, would be that they can more readily pick up changes.

As has been mentioned above, the use of multiple indicators of socioeconomic status is, however, advantageous. It enables to assess the contribution of different aspects of socioeconomic status to mortality differentials and increases the overall validity and reliability of the measurement. Unless an important interaction exists, an interaction that should explicitly be studied and tested, the use of cross-classifications should, however, be avoided as they complicate the analysis considerably.

The use of composite scales has also been proposed (Roberts and Barker 1986; Moser et al. 1988, 1990b). These are socioeconomic scales that combine information on several aspects of a person's socioeconomic circumstances. Often the aggregation is such that the information on the individual components is lost. It is a matter to be debated, whether to combine the available occupational and other data into a single index of socioeconomic status or to use separate 'one-dimensional' variables in the analyses. Composite variables should not, perhaps, be used when the relationship between individual components and cause specific mortality has not been firmly established (e.g. Kitagawa and Hauser 1973, Liberatos et al. 1988) or when the analysis of the individual components can potentially be informative. From these two premises the analysis of the Finnish data suggest that composite scales should be used with caution.

*8.2. Marital status, economic activity and motherhood: the effects of multiple roles on mortality*

Two hypotheses have been put forward to understand the effects of increasing employment and many roles in general on women's health and mortality. The role accumulation hypothesis asserts that in addition to improved self-esteem and a more extensive network of social ties, economically active women gain financial independence from men and are freed, at least partially, from tedious and little respected household work. Thus women with many roles will enjoy better health and lower mortality. The possible mechanisms are poorly understood, but they may include improved coping resources or host resistance and a healthier lifestyle.

According to the multiple role hypothesis, on the contrary, multiple roles are detrimental to women's health. This arises mainly from the exhausting responsibilities and diverse expectations of simultaneous roles that create role overload and stress, which in turn cause poor health or health degrading behaviour and high mortality.

In this study women with all three roles of a spouse, a mother and an employee had low mortality as compared to any other group of women. This low mortality was a reflection of low mortality according to each of the three dimensions, not an interaction accentuating the effects of these more simple main effects. A mortality component formed by an interplay of marital status, motherhood and economic activity, an interplay that creates low or high mortality over and above the more simple main effects could only be observed among lone mothers with two or more children, who had higher mortality than was expected on the basis of the statistical main effects.

The broad finding that three simultaneous roles (spouse, mother, employee) do not seem to have a **strong** detrimental or a beneficial effect on female mortality under variable conditions is in accordance with other studies (Kotler and Wingard 1989; Hibbard and Pope 1991, 1993). A similar conclusion can also be reached on the basis of data on physical health presented by Verbrugge (1983a 1983b). However, in countries where part-time work is available full-time work among young married women with children may have detrimental effects on self-reported 'restricted activity days due to illness' (Arber, Gilbert and Dale 1985; and also e.g. Thoits 1987 and McBridge 1990 on various

indicators of mental health). Other interactions between job and family characteristics and health have also been reported (e.g. Waldron and Jacobs 1989).

Mortality and health are, of course, not the same phenomena. One should, thus, be very careful when supporting results from mortality studies by referring to evidence from morbidity studies. Even if combining work and family roles cause 'anxiety' (Haavio-Mannila 1986) or 'distress' (Cleary and Mechanic 1983) under some conditions or that it may be beneficial under some other conditions, this does not have to be the case for mortality. Mortality would be an extreme outcome of multiple roles. The effects of combining job and family roles on outcomes of varying severity is highlighted by Haavio-Mannila (1986). She shows that the effects of combining roles are possibly manifest on a less severe outcome of anxiety, but cannot be observed for more serious outcomes of physical morbidity or mental hospitalisation.

Poor health or high mortality, over and above the main effects model, among lone mothers (in this study, however, only with two or more children) has also been observed in this study, as well as several other studies in the United States and Britain (Verbrugge 1983a; Arber, Gilbert and Dale 1985; Kotler and Wingard 1989). The observation has in some studies been cast aside because of small numbers, but it seems that lone motherhood is related to poor health and high mortality in Finland as well as in Britain and the United States. The similarity of results of this study and other studies is impressive when one considers the differentials in women's labour market participation and part-time work in these societies (see Section 8.1.2 and Dex and Walters 1989) and the differences in the study periods (from late 60's to early 80's). Furthermore, Finland offers more extensive childcare facilities and benefits to lone mothers than Britain and the United States. From the public health point of view it is, however, useful to note that lone mothers with two or more children constitute only about 4 per cent of all 35-64-year-old women in Finland.

The results of this study are in some respects more reliable than the results obtained so far. Firstly, previous studies on mortality (Kotler and Wingard 1989) or a combination of mortality and serious morbidity (Hibbard and Pope 1991, 1993) are based on fewer events than this study. The power of the data to detect interactive effects is thus reduced. Real interactions may go unnoticed and cause specific analysis becomes very difficult.

Secondly, many of the previous studies are cross-sectional (Verbrugge 1983b) or rely on measurement of background variables at the survey baseline and accumulate events over a long period of time, usually up to 15 or 18 years (Kotler and Wingard 1989; Hibbard and Pope 1991, 1993). Women's characteristics are likely to change several times during such a long follow-up. As most of the events tend to occur during the later years of the study period researchers are actually relating events to characteristics that may be on average more than a decade apart. This is a problem of all prospective studies, including this one. The follow-up in the Finnish data is, however, only 5 years. Less status transitions are thus likely to have occurred.

Finally, many of the Anglo-American studies use a variable of labour force participation (or economic activity) that is not particularly good. Employed women and women looking for a job are classified as in the labour force. All other women are out of the labour force and, if they are married, are sometimes called 'housewives' or 'homemakers'. These 'housewives' then include women that have been forced out of the labour market possibly because of severe illness and are unable to take part in any of the traditional housewife roles. Under these conditions it should not be surprising that 'housewives' without children have poor health (Verbrugge 1983b). Some of these women are possibly too ill to work and also too ill to carry children.

Possibly fussy categories are also included in other works. Who are, for example, the white women in Waldron and Jacobs study (1988, 1989) 40-54-years of age at the beginning of the study period, not belonging to the labour force, not being married and constituting about 4 per cent of the white women's sample? The interaction between labour force status and marital status in their work is completely based on the existence of this group.

Multiple role stress, the intervening variable most often proposed by those putting forward a hypothesis that multiple roles are harmful to women's health (for intervening variables see e.g. Arber, Gilbert and Dale 1985), if experienced at all, does not seem to be strong enough to have an effect on mortality under a wide range of multiple role conditions. For most women the stress seems to be counterbalanced by the benefits acquired from multiple roles or the stress does not simply have such grave and extreme consequences as mortality.

Only among lone mothers with two or more children does the stress of having to come to terms with multiple demands without the support of a marital partner seems to cause high mortality. Some of the remarks on the high mortality of lone mothers are not, however, strictly related to role strain and conflict as defined by Sieber (1974, see Section 2.2.1 of this study), but to notions of deviancy (Kotler and Wingard 1989). The leap from relationship to causality is, however, fraught with difficulty. Strong selection mechanisms may be operating: unhealthy lone mothers may feel 'forced' to work because of the responsibility for the family welfare. Furthermore, those who have children out of wedlock and are unable or unwilling to marry may be a highly select group. Nevertheless, hardship brought about by lone motherhood (especially if one has two or more children) that might cause concern and stress are many. These range from financial problems and difficulties in household work and child care to lack of emotional support when times are hard. The stress hypothesis may be further validated by the fact that the excess mortality of lone mothers is observed only for causes of death related to accidents and violence and circulatory diseases, causes of death that are commonly thought to be responsive to increased stress. Although divorce and out of wedlock births have become more common since 1965 (Kotler and Wingard study) in all western societies, thus making the lone parent role less deviant, and social services for lone parents have improved, the excessive demands of being a lone parent may have remained.

The cross-sectional nature of the measurement of explanatory variables in this study, although data on status transitions between censuses would have been available, has not enabled one to examine actual transitions into employment. The study of such transitions is of potential importance when analysing whether taking an additional role of an employee has harmful effects on female mortality. Although labour force participation has increased rapidly in Finland, as well as in other countries, even in the 1970's and early 1980's, actual transitions into employment have, however, to a large degree taken place among women in their mid-thirties to mid-forties, groups that are not the most relevant for mortality analysis. The large increase in the participation rates of 35-44-year-old women (Jallinoja 1985; for Sweden see e.g. Axelsson 1992), an age-group that is part of this study, is a reflection of the increasing willingness to re-enter the labour force between childbirths and shortly after the end of child bearing careers at a time when children are still young.

Thus, taking an additional role as an employee in the 35-64-year age-group takes place in the early part of the age-interval and is mainly related to re-entry after the end of child bearing careers. In fact, in a society of high labour force participation, the decision of extending role responsibilities is for most women, a decision to become a mother. Only relatively few women (for the purposes of mortality analysis) decide or can enter the labour force for the first time at a later age. Even in the face of rapidly rising labour force participation the volume of transitions among women in age-groups where mortality analysis is feasible is small. The value of actual transition analysis and also the value of the two hypotheses for mortality analysis is thus more limited than some authors have believed.

A final point, the results of this study are not more encouraging for the convergence hypothesis as they are for the hypotheses on multiple roles. It seems fruitless to speculate that sex mortality differentials will decline in the future because of women's increasing employment, if, in a society of high labour force participation, on all counts employed women are healthier than non-employed women.

To conclude, although a lot has been said about the high mortality of lone mothers with two or more children, the main result is, that the effects of different combinations of marital status, motherhood and economic activity on mortality in the Finnish data are small and are not observed where role accumulation or multiple role hypotheses most strongly predicted. That is, women with all three roles of a mother, a wife and an employee did not clearly have either relatively high or low mortality. It is not the multitude or lack of roles per se that is important for creating excess mortality, but the life situation that a particular constellation of roles or lack of roles defines. One must strongly suspect the relevance of multiple role and role accumulation hypotheses when trying to understand the level and changes in female mortality.

The way forward for future research is to try to better understand the main effects of each role and leave the study of complicated interactions for less attention. If we do not adequately understand the selection effects leading into marriage and motherhood or the contribution of the 'healthy worker effect' in creating low mortality for the employed, studying multiple roles seems to be trying to stretch our data and understanding too far. We should first try to understand, for example, why the excess mortality of single Finnish women from causes of death related to accidents and violence is closely related to these

women being more often childless than married women? Is single women's health suffering from the lack of social contacts of motherhood or are accident prone women likely to stay childless and unmarried in the first place?

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*APPENDICES*

The following symbols or abbreviations are used when referring to statistical significance levels and variables in the model:

* = 5 per cent significance level
** = 2.5 per cent significance level
*** = 1 per cent significance level

aga = Age (three 10-year age-groups)
age = Age (six 5-year age-groups)
edu = Education
sed = Spouse's education
mar = Marital status
sin = Dummy: single - all others
maa = Dummy: married - all others
eco = Economic activity
occ = Own current occupational status (1980). For housewives spouse's occupational status and for pensioned previous occupational status.
oca = Dummy: occ-category 'others' - all others
poc = Own previous occupational status (1975 or 1970)
poa = Dummy: poc-category 'others' - all others
soc = Spouse's occupational status (1980)
soa = Dummy: soc-category 'others' - all others
inc = Family disposable income
hou = Housing tenure
sex = Sex
mot = Motherhood
nuc = Number of children living in the household
nua = Truncated nuc (1 child, 2+ children, no children)
agc = Age of the youngest child living in the household

In the appendices the manner of indicating the terms included in the model or added to the model is similar to that used in the GLIM statistical package. When referring to a model with several explanatory variables the names of the variables are separated by the plus-sign. Furthermore, when a term is added to a model it is preceded by a plus-sign.

Appendix 1. Selected statistical significance tests for education. 35-64-year-old Finnish women.

| Compared models | d.f. | Change in scaled deviance: Breast cancer | Other cancers | Circul. dis. | Other dis. | Accid. & violence | All causes |
|---|---|---|---|---|---|---|---|
| A. All women | | | | | | | |
| A1. age+edu | | | | | | | |
| +aga.edu | 4 | 12** | 1 | 1 | 9 | 10* | 10* |
| +age.edu | 6 | 10 | 4 | 8 | 2 | 7 | 6 |
| A2. age+par+edu | | | | | | | |
| +par.edu | 2 | 0 | 1 | 3 | 1 | 10*** | 5 |
| A3. age+mar+edu | | | | | | | |
| +sin.edu | 2 | 2 | 8** | 11*** | 15*** | 1 | 36*** |
| +mar.edu | 4 | 10* | 1 | 0 | 2 | 4 | 2 |
| B. Married women | | | | | | | |
| B1. age+par+edu | | | | | | | |
| +par.edu | 2 | 0 | 2 | 5 | 1 | 4 | 8** |
| B2. age+sed | | | | | | | |
| +edu | 2 | 5 | 8** | 36*** | 12*** | 15*** | 31*** |
| B3. age+edu | | | | | | | |
| +sed | 2 | 6* | 1 | 29*** | 13*** | 3 | 21*** |
| B4. age+edu+sed | | | | | | | |
| +edu.sed | 4 | 4 | 10* | 3 | 3 | 6 | 11* |
| B5. age+sed | | | | | | | |
| +aga.sed | 4 | 9 | 7 | 3 | 5 | 5 | 7 |
| +age.sed | 6 | 15** | 4 | 5 | 6 | 6 | 2 |

Appendix 2. Selected statistical significance tests for education and occupational class. 35-64-year-old Finnish economically active and pensioned women.

| Compared models | d.f. | Change in scaled deviance: Breast cancer | Other cancers | Circul. dis. | Other dis. | Accid. & violence | All causes |
|---|---|---|---|---|---|---|---|
| A. Economically active and pensioned | | | | | | | |
| A1. age+eco+edu | | | | | | | |
| +eco.edu | 2 | 5 | 6* | 1 | 0 | 2 | 5 |
| A2. age+eco+occ[1] | | | | | | | |
| +eco.oca[1] | 1 | 2 | 5* | 3 | 2 | 1 | 2 |
| +eco.occ[1] | 2 | 1 | 5 | 3 | 7* | 3 | 3 |
| A3. age+eco+poc | | | | | | | |
| +eco.poa | 1 | 0 | 1 | 10*** | 11*** | 1 | 21*** |
| +eco.poc | 2 | 3 | 5 | 1 | 6* | 2 | 3 |
| A4. age+eco+soc+eco.maa | | | | | | | |
| +eco.soa | 1 | 2 | 6** | 2 | 0 | 0 | 6** |
| +eco.soc | 2 | 6* | 7* | 2 | 3 | 4 | 6* |
| B. Economically active | | | | | | | |
| B1. age+occ | | | | | | | |
| +edu | 2 | 1 | 7* | 19*** | 1 | 8** | 14*** |
| B2. age+edu | | | | | | | |
| +oca | 1 | 0 | 1 | 8*** | 5* | 4* | 12*** |
| +occ | 2 | 15*** | 0 | 1 | 0 | 6* | 0 |
| B3. age+occ | | | | | | | |
| +age.oca | 5 | 13** | 3 | 6 | 1 | 4 | 1 |
| +aga.occ | 4 | 2 | 4 | 4 | 3 | 4 | 4 |
| +age.occ | 6 | 8 | 6 | 4 | 14* | 3 | 6 |
| B4. age+occ+edu | | | | | | | |
| +edu.oca | 2 | 1 | 2 | 1 | 2 | 0 | 4 |
| +edu.occ | 4 | 9 | 5 | 0 | 5 | 6 | 4 |
| B5. age+par+occ | | | | | | | |
| +par.oca | 1 | 0 | 0 | 3 | 16*** | 4* | 9*** |
| +par.occ | 2 | 1 | 5 | 2 | 1 | 1 | 1 |
| B6. age+mar+occ | | | | | | | |
| +mar.oca | 3 | 3 | 1 | 6 | 6 | 28*** | 23*** |
| +mar.occ | 6 | 9 | 4 | 11 | 3 | 5 | 2 |
| C. Pensioned | | | | | | | |
| C1. age+poc+edu | | | | | | | |
| +edu.poa | 2 | 3 | 1 | 0 | 0 | 3 | 1 |
| +edu.poc | 4 | 1 | 3 | 3 | 6 | 8 | 5 |

1 = Pensioned are classified according to their previous occupation.

Appendix 3. Selected statistical significance tests for education and occupational class. 35-64-year-old Finnish married economically active women and housewives.

| Compared models | d.f. | Change in scaled deviance: Breast cancer | Other cancers | Circul. dis. | Other dis. | Accid. & violence | All causes |
|---|---|---|---|---|---|---|---|
| A. Married economically active women and housewives | | | | | | | |
| A1. age+eco+edu | | | | | | | |
| +eco.edu | 2 | 0 | 1 | 0 | 0 | 3 | 0 |
| A2. age+eco+occ[1] | | | | | | | |
| +eco.oca[1] | 1 | 0 | 1 | 5* | 3 | 0 | 8*** |
| +eco.occ[1] | 2 | 4 | 1 | 6* | 1 | 1 | 3 |
| A3. age+eco+soc | | | | | | | |
| +eco.soa | 1 | 0 | 2 | 4* | 3 | 2 | 8*** |
| +eco.soc | 2 | 1 | 1 | 3 | 1 | 4 | 2 |
| B. Married economically active women | | | | | | | |
| B1. age+soc | | | | | | | |
| +oca | 1 | 1 | 0 | 2 | 0 | 1 | 1 |
| +occ | 2 | 16*** | 1 | 8** | 1 | 3 | 1 |
| B2. age+occ | | | | | | | |
| +soa | 1 | 4* | 2 | 1 | 1 | 2 | 2 |
| +soc | 2 | 1 | 1 | 10*** | 0 | 5 | 2 |
| B3. age+occ+soc | | | | | | | |
| +occ.soa | 3 | 1 | 2 | 13*** | 7 | 4 | 7 |
| +oca.soc | 2 | 2 | 1 | 0 | 0 | 0 | 0 |
| +occ.soc | 4 | 6 | 7 | 2 | 3 | 4 | 3 |
| B4. age+occ+edu | | | | | | | |
| +edu.oca | 2 | 1 | 2 | 1 | 3 | 2 | 7* |
| +edu.occ | 4 | 6 | 4 | 2 | 3 | 6 | 3 |
| C. Married housewives | | | | | | | |
| C1. age+soc | | | | | | | |
| +age.soa | 5 | 7 | 2 | 3 | 7 | 1 | 1 |
| +aga.soc | 4 | 4 | 10* | 1 | 2 | 8 | 1 |
| +age.soc | 6 | 6 | 5 | 6 | 1 | 5 | 5 |
| C2. age+soc+edu | | | | | | | |
| +edu.soa | 2 | 1 | 0 | 1 | 1 | 8** | 1 |
| +edu.soc | 4 | 6 | 3 | 4 | 11* | 4 | 8 |

1 = Housewives are classified according to their spouse's occupation.

Appendix 4. Selected statistical significance tests for family disposable income and housing tenure. 35-64-year-old Finnish economically active and married women.

| Compared models | d.f. | Change in scaled deviance: Breast cancer | Other cancers | Circul. dis. | Other dis. | Accid. & violence | All causes |
|---|---|---|---|---|---|---|---|
| 1. age+inc | | | | | | | |
| +aga.inc | 6 | 5 | 10 | 6 | 3 | 11 | 15** |
| +age.inc | 9 | 11 | 16 | 6 | 10 | 22*** | 15 |
| 2. age+inc+edu | | | | | | | |
| +edu.inc | 6 | 1 | 5 | 4 | 7 | 6 | 3 |
| 3. age+hou | | | | | | | |
| +aga.hou | 2 | 0 | 4 | 2 | 1 | 5 | 0 |
| +age.hou | 3 | 8* | 4 | 1 | 3 | 6 | 5 |
| 4. age+hou+edu | | | | | | | |
| +edu.hou | 2 | 2 | 4 | 0 | 7* | 1 | 0 |

Appendix 5. Selected statistical significance tests for comparing men and women in different sub-populations. 35-64-year-old Finns.

| Compared models | d.f. | Change in scaled deviance: Breast cancer | Lung cancer | Other cancers | Circul. dis. | Other dis. | Accid. & violence | All causes |
|---|---|---|---|---|---|---|---|---|
| A. All men and women | | | | | | | | |
| A1. age+sex+edu +sex.edu | 2 | - | 4 | 2 | 8** | 2 | 32*** | 49*** |
| B. Married men and women | | | | | | | | |
| B1. age+sex+sed +sex.sed | 2 | - | 35*** | 3 | 1 | 1 | 2 | 47*** |
| C. Economically active men and women | | | | | | | | |
| C1. age+sex+occ | | | | | | | | |
| +sex.oca | 1 | - | 0 | 1 | 3 | 1 | 0 | 0 |
| +sex.occ | 2 | - | 2 | 1 | 3 | 3 | 28*** | 52*** |
| D. Married economically active men and women | | | | | | | | |
| D1. age+sex+soc | | | | | | | | |
| +sex.soa | 1 | - | 4 | 1 | 4* | 4* | 4* | 7*** |
| +sex.soc | 2 | - | 2 | 2 | 1 | 1 | 10*** | 19*** |

Appendix 6. Selected statistical significance tests for men in different sub-populations. 35-64-year-old Finns.

| Compared models | d.f. | Change in scaled deviance: Breast cancer | Other cancers | Circul. dis. | Other dis. | Accid. & violence | All causes |
|---|---|---|---|---|---|---|---|
| A. All men | | | | | | | |
| A1. age+mar+edu +mar.edu | 6 | - | 2 | 20*** | 12 | 10 | 23*** |
| B. Economically active men | | | | | | | |
| B1. age+edu+occ +edu.occ | 6 | - | 8 | 2 | 4 | 2 | 5 |
| B2. age+occ +edu | 2 | - | 28*** | 60*** | 2 | 26*** | 93*** |
| B3. age+edu | | | | | | | |
| +oca | 1 | | 4* | 5* | 38*** | 10*** | 14*** |
| +occ | 2 | - | 9** | 8** | 12*** | 148*** | 93*** |
| C. Married men | | | | | | | |
| C1. age+sed +edu | 2 | - | 54*** | 127*** | 7* | 39*** | 222*** |
| C2. age+edu +sed | 2 | - | 17*** | 115*** | 22*** | 31*** | 168*** |
| C3. age+edu+sed +edu.sed | 4 | - | 2 | 1 | 6 | 2 | 4 |
| D. Married and economically active men | | | | | | | |
| D1. age+occ+soc +occ.soc | 9 | - | 12 | 12 | 14 | 7 | 19* |

Appendix 7. Selected statistical significance tests for multiple role models separately for married and economically active women. 35-64-year-old Finnish economically active women and housewives.

| Compared models | d.f. | Change in scaled deviance: Breast cancer | Other cancers | Circul dis. | Other dis. | Accid. & violence | All causes |
|---|---|---|---|---|---|---|---|
| A. Economically active women | | | | | | | |
| A1. age+mot+maa | | | | | | | |
| +mot.maa | 1 | 3 | 0 | 7*** | 3 | 2 | 4* |
| A2. age+mot+maa+edu | | | | | | | |
| +mot.maa | 1 | 2 | 0 | 4* | 2 | 2 | 2 |
| A3. age+mot+mar | | | | | | | |
| +mot.maa | 1 | 2 | 0 | 5* | 1 | 0 | 1 |
| +mot.mar | 2 | 1 | 1 | 1 | 1 | 1 | 0 |
| A4. age+nuc+mar+mot.maa | | | | | | | |
| +nua.maa | 1 | 1 | 1 | 10*** | 0 | 5** | 11*** |
| +nuc.maa | 2 | 2 | 0 | 11*** | 3 | 6* | 7* |
| +nuc.mar | 8 | 13 | 3 | 7 | 9 | 9 | 6 |
| A5. age+nuc+mar+edu+mot.maa | | | | | | | |
| +nua.maa | 1 | - | - | 10*** | - | 5* | 11*** |
| +nuc.maa | 2 | - | - | 12*** | - | 6* | 7* |
| A6. age+agc+mar+mot.maa | | | | | | | |
| +agc.maa | 3 | 5 | 1 | 2 | 1 | 0 | 3 |
| +agc.mar | 8 | 5 | 9 | 7 | 4 | 8 | 2 |
| A7. age+nuc+maa+aga.nuc+aga.maa+nuc.maa | | | | | | | |
| +aga.nua.maa | 4 | 5 | 3 | 2 | 4 | 2 | 2 |
| +aga.nuc.maa | 4 | 4 | 2 | 0 | 2 | 3 | 1 |
| A8. age+nuc+maa+edu+edu.nuc+edu.maa+nuc.maa | | | | | | | |
| +edu.nua.maa | 4 | 3 | 7 | 1 | 2 | 4 | 3 |
| +edu.nuc.maa | 4 | 7 | 5 | 1 | 2 | 5 | 2 |
| B. Married women | | | | | | | |
| B1. age+mot+eco | | | | | | | |
| +mot.eco | 1 | 1 | 0 | 2 | 0 | 1 | 2 |
| B2. age+mot+eco+edu | | | | | | | |
| +mot.eco | 1 | 1 | 0 | 2 | 0 | 1 | 2 |
| B3. age+nuc+ecu+mot.eco | | | | | | | |
| +nuc.eco | 3 | 1 | 3 | 7 | 3 | 3 | 4 |
| B4. age+agc+eco+mot.eco | | | | | | | |
| +agc.eco | 3 | 3 | 2 | 0 | 3 | 2 | 6 |
| B5. age+mot+eco+aga.mot+aga.eco+mot.eco | | | | | | | |
| +aga.mot.eco | 2 | 1 | 0 | 0 | 2 | 5 | 1 |
| B6. age+mot+eco+edu+edu.mot+edu.eco+mot.eco | | | | | | | |
| +edu.mot.eco | 2 | 2 | 1 | 5 | 0 | 2 | 0 |

Appendix 8. Person-years and deaths according different socioeconomic indicators and cause of death in the period 1981-5. 35-64-year-old Finnish women in different sub-populations.

| | Person-years (1000's) | Breast cancer | Other cancers | Circul. dis. | Other dis. | Accid. & violence | All causes |
|---|---|---|---|---|---|---|---|
| A. All women | | | | | | | |
| Education | | | | | | | |
| Higher | 376 | 124 | 233 | 134 | 75 | 131 | 697 |
| Intermediate | 1190 | 305 | 799 | 739 | 399 | 323 | 2565 |
| Basic | 2881 | 951 | 3577 | 4392 | 1877 | 1205 | 12002 |
| All | 4447 | 1380 | 4609 | 5265 | 2351 | 1659 | 15264 |
| B. Married women | | | | | | | |
| Education | | | | | | | |
| Higher | 265 | 85 | 144 | 74 | 35 | 75 | 413 |
| Intermediate | 870 | 203 | 516 | 425 | 221 | 168 | 1533 |
| Basic | 2060 | 625 | 2264 | 2403 | 912 | 643 | 6847 |
| Spouse's education | | | | | | | |
| Higher | 350 | 104 | 216 | 135 | 73 | 83 | 611 |
| Intermediate | 855 | 225 | 563 | 453 | 191 | 193 | 1625 |
| Basic | 1991 | 584 | 2145 | 2314 | 904 | 610 | 6557 |
| All | 3196 | 913 | 2924 | 2902 | 1168 | 886 | 8793 |
| C. Economically active women | | | | | | | |
| Education | | | | | | | |
| Higher | 318 | 95 | 173 | 75 | 36 | 94 | 473 |
| Intermediate | 942 | 186 | 486 | 364 | 154 | 211 | 1401 |
| Basic | 1951 | 462 | 1723 | 1374 | 421 | 591 | 4571 |
| Occupational status | | | | | | | |
| Upper white c. | 291 | 97 | 170 | 82 | 35 | 78 | 462 |
| Lower white c. | 1268 | 285 | 770 | 571 | 211 | 300 | 2137 |
| Manual | 1133 | 228 | 935 | 725 | 224 | 345 | 2457 |
| Other | 520 | 133 | 507 | 435 | 141 | 173 | 1389 |
| All | 3211 | 743 | 2382 | 1813 | 611 | 896 | 6445 |
| C. Pensioned & other women | | | | | | | |
| Education | | | | | | | |
| Higher | 27 | 16 | 46 | 47 | 35 | 25 | 169 |
| Intermediate | 111 | 86 | 228 | 298 | 217 | 89 | 918 |
| Basic | 554 | 364 | 1440 | 2609 | 1343 | 477 | 6233 |
| Previous occupational status | | | | | | | |
| Upper white c. | 15 | 13 | 40 | 32 | 12 | 18 | 115 |
| Lower white c. | 109 | 91 | 255 | 294 | 207 | 79 | 926 |
| Manual | 174 | 110 | 440 | 678 | 275 | 142 | 1645 |
| Other | 396 | 252 | 979 | 1950 | 1101 | 352 | 4634 |
| All | 692 | 466 | 1714 | 2954 | 1595 | 591 | 7320 |

D. Married economically active women

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Education | | | | | | | |
| Higher | 220 | 62 | 105 | 46 | 20 | 52 | 285 |
| Intermediate | 677 | 123 | 311 | 220 | 86 | 116 | 856 |
| Basic | 1423 | 296 | 1139 | 827 | 238 | 353 | 2853 |
| Occupational status | | | | | | | |
| Upper white c. | 202 | 60 | 106 | 42 | 19 | 43 | 270 |
| Lower white c. | 893 | 184 | 468 | 328 | 114 | 179 | 1273 |
| Manual | 804 | 138 | 600 | 432 | 127 | 202 | 1499 |
| Other | 421 | 99 | 381 | 291 | 84 | 97 | 952 |
| Spouse's occupational status | | | | | | | |
| Upper white c. | 332 | 81 | 160 | 76 | 36 | 79 | 432 |
| Lower white c. | 410 | 91 | 226 | 157 | 55 | 71 | 600 |
| Manual | 971 | 182 | 627 | 463 | 135 | 216 | 1623 |
| Other | 607 | 127 | 542 | 397 | 118 | 155 | 1339 |
| Family disposable income | | | | | | | |
| 1. quartile | 646 | 174 | 494 | 302 | 101 | 159 | 1230 |
| 2. quartile | 677 | 131 | 382 | 282 | 82 | 155 | 1032 |
| 3. quartile | 565 | 97 | 356 | 239 | 90 | 103 | 885 |
| 4. quartile | 432 | 79 | 323 | 270 | 71 | 104 | 847 |
| Housing tenure | | | | | | | |
| Owner occupied | 1866 | 398 | 1240 | 841 | 257 | 396 | 3132 |
| Rented | 454 | 83 | 315 | 252 | 87 | 125 | 862 |
| All | 2320 | 481 | 1555 | 1093 | 344 | 521 | 3994 |

E. Married housewives

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Education | | | | | | | |
| Higher | 30 | 13 | 14 | 12 | 4 | 12 | 55 |
| Intermediate | 137 | 33 | 85 | 77 | 28 | 23 | 246 |
| Basic | 375 | 125 | 414 | 409 | 113 | 137 | 1198 |
| Spouse's occupational status | | | | | | | |
| Upper white c. | 109 | 38 | 76 | 67 | 22 | 30 | 233 |
| Lower white c. | 93 | 28 | 79 | 72 | 24 | 34 | 237 |
| Manual | 216 | 67 | 221 | 228 | 67 | 72 | 655 |
| Other | 124 | 38 | 137 | 131 | 32 | 36 | 374 |
| All | 542 | 171 | 513 | 498 | 145 | 172 | 1499 |