

Variations in Early Elderly Health and Disease Status in a Longitudinal Perspective for Eastern and Western Germany

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1. Introduction

In general, the health status at old age has an important meaning for individual and social life. Within the ageing process the vulnerability to develop specific diseases increases because of physiological and morphological changes in the organism and in the central nervous system. The physiological health status has a direct impact on the onset of disabilities and the risk of dying. In Germany – as in the other European countries – the main causes of death are circulatory diseases, neoplasm, diseases of the respiratory system and diseases of the digestive system (Statistisches Bundesamt 2007a, Nolte et al. 2000). Beside this, the ‘hospital diagnostic statistics’ reveal circulatory diseases and neoplasm as the main causes of nursing home at age 60 and older. The close relation of ageing to the onset of diseases becomes further clear of the fact that 77 % of all circulatory diseases were first diagnosed among persons aged 60+, as well as 64% of neoplasm, 51% of digestive diseases and 44% of all respiratory diseases (Statistisches Bundesamt 2007b).

Increasing physiological and psychological impairments by age does not mean that ageing is equivalent to illness, diseases or dependency, however. In fact, earlier studies showed that neither the onset nor the pathogenesis of any disease is exclusively caused by the process of ageing (Steinhagen- Thiessen & Borchelt 1996). In this context, Brody and Schneider (1986) distinguished ‘age-dependent’ and ‘age-related’ diseases. Age-dependent diseases are involved in the ageing process and cause an exponentially increasing mortality risk with an increase of age like heart and cerebral vascular diseases. Age-related diseases like musculoskeletal diseases are only temporally connected with age and do not directly increase the risk of dying.

The presence or absence of diseases is strongly associated with individual health, but only the presence or absence of diseases is insufficient to characterize a health condition since health is of multi-dimensional nature involving the dynamic and multi-factorial influences on the physiological, psychological and social functioning of an individual. Apart from the influence of health on an individual’s well-being, the analysis and comprehension of health determinants are important for reducing health risks and for increasing the (healthy) length of lives. Many studies revealed a high number of health determinants which can be differentiated into hereditary (e.g., Vaupel et al. 1998, Christensen et al. 2006, Guimarães 2007), socioeconomic (e.g., Wilkinson 2001) and behavioural (e.g., Blaxter 1990) factors. Above all, the strong effect of socioeconomic status as determinant of individual health, physical disabilities and mortality is known by many studies (e.g., Wadsworth 1997, Marmot & Wilkinson 2006). The existence of a concave social gradient was demonstrated for mortality, coronary heart diseases (Kaplan & Keil 1993) and respiratory diseases (Calverley & Pride 1995). Earlier life experiences of stress (Leserman et al. 1998, Bartley 1991) and unemployment (Bartley 1994) also increase the probability of poor health. However, the direction of causation is indeterminate. On one side, poverty is a risk factor for increasing morbidity and mortality (causation, on the other side illness and the presence of diseases and disabilities reduce the chances to reach a higher socioeconomic status (selection). So far, the impact of social inequality on health was

mainly examined for the working age population (Feinstein 1993). Results of the relation between health and social inequality in older age are less consistent than findings for working age individuals. Some studies (House et al. 1990, House et al. 1994) demonstrated the weaker effect of income, education, occupation and race for people aged 65 or older. However, other scholars describe significant relations between socioeconomic status and health outcome for younger as well as for older age groups (Berkman & Gurland 1998, Melzer et al. 2000).

The current research distinguishes four partly detrimental hypotheses regarding the changes in the structure and the specific impacts of social inequality in older age (see Mayer & Wagner 1996): (i) the age dependency hypothesis, (ii) the destructuring hypothesis, (iii) the continuity hypothesis and (iv) the accumulation hypothesis. The age dependency hypothesis assumes that social status of older people decreases with the decline of physiological and psychological ability. Above all care-dependency is causing severe declines in self-determination, social and cultural activity and social status (Mollenkopf & Walker 2007). Additionally, the economic status can also decrease by the supplemental costs for illness and care. The continuity hypothesis, however, implies that social status of earlier life will be stable in older age (Kneesebeck & Schäfer 2006). Thereby, social ageing would be a differential process with different progresses for different social strata or certain socioeconomic characteristics. In contrast, the destructuring hypothesis assumes that differences in social status disappear after leaving working age. Therefore, the process of social ageing is the same for all persons independent of socioeconomic background. Finally, the accumulation hypothesis (Blane 2006) assumes an interaction between age and socioeconomic differentiations. Earlier social circumstances influence adult socioeconomic positions by assuring savings, investments and pension in old age. Cross-sectional studies on the socioeconomic situation of younger elderly in Germany supported the continuity thesis as well as the accumulation thesis (Kneesebeck et al. 2003, Mayer & Wagner 1996).

Apart from socioeconomic differences in health, there is a substantial literature on variations according to health behaviours and lifestyle characteristics. Smoking, alcohol consumption, nutrition, physical activity, living arrangement and social networks are behaviours and lifestyle factors which are known to be related to health. But the unravelling causal associations are complex and interrelated with an individual's socioeconomic status (Blaxter 1994). Smoking shows probably the most negative effect on health and survival (USDHHS 2004, Haustein 2001). Smokers reduce their life by about ten years and do not or fewer improve from overall benefits in longevity (Doll et al. 2004). The risk of cardiovascular disease, chronic respiratory diseases, lung cancer and other forms of cancer is significantly higher for smokers than for non-smokers. Recent studies showed significant socioeconomic differences in smoking behaviour. This gradient results not only from the fact that lower educated persons smoke more frequently at middle and early old age but also from the fact that higher educated individuals have higher rates of quitting smoking (Cavelaars et al. 1998). Further, smokers are likely associated with low income, low occupational prestige and higher risk of unemployment (Helmert et al. 2001, Gruer et al. 2009).

The effect of alcohol intake on health is more complex, compared to the clear impact of smoking. Heavy alcohol consumption is associated with higher risk of liver diseases, neoplasms of digestive tracts, cognitive changes, ischemic stroke and behavioural problems (Beresford & Katsoyannis 1995, Corrao et al. 1998, Mukamal et al. 2005, Sacco et al. 1999, Thun et al. 1997). In contrast, moderate intake lowers the risk of cardiovascular diseases and mortality (Abramson et al. 2001, Thun et al. 1997). Likewise, Mäkelä et al. (1997) have shown that relative socioeconomic differentials are present to a larger extent in alcohol-related mortality than in overall mortality. Beside this, health and mortality preventive behaviour is also associated with physical activity.

Physical fitness appears to be a graded, independent long-term predictor of mortality by cardiovascular diseases (Sandvik et al. 1993). A high level of fitness was even shown to lower mortality of all causes of death (USDHHS 1996). Moderate physical activity has a protective effect beyond age 80 (Lindsted et al. 1991) since it helps maintaining normal blood-pressure and avoiding obesity (Paffenberger et al. 1993).

Healthy behaviour and its protective effect on health and mortality is closely related to an individual's social ties (Berkman & Glass 2000, Gorman & Sivaganesan 2007), what becomes especially clear from its close relation to marital status (Lillard & Panis 1996). Marriage provides social support comprising emotional support (family integration, stress reduction) as well as instrumental support (care giving in time of illness). These protective effects are known to be associated with reduced health impairments for both sexes (Grundy & Holt 2000, Waldron et al. 1996, Wyke & Ford 1992). However, significant associations between marital status and survival were only reported for males (Waldron et al. 1996, Scafato et al. 2008). Beside the strong effect of living arrangement a few studies also found a linkage of mortality to fertility with a J-shaped mortality risk from nulliparous to higher parity females (Green et al. 1988, Lund et al. 1990, Doblhammer 2000, Grundy & Tomassini 2005). Furthermore, childbearing in early life is also associated with higher mortality, whereas birth after age 40 is related to lower risk of dying (Doblhammer 2000, Grundy & Tomassini 2005). Men's survivorship, however, seems to be independent from the number of biological children (Friedlander 1996).

In general, the specific health determinants are interrelated to each other in a complex manner and show an age-dynamic similar to health itself. The life course approach in epidemiological research is focused on critical periods and the accumulation of adverse environmental conditions and unhealthy behaviours to explain variations in health (Graham 2002, Kuh et al. 2003, Kuh & Ben-Shlomo 2004). The epidemiologic approach integrates different concepts of health and treats ageing as through-life-sequence of events and experiences with their consequences for an individual's health status.

Our study focuses on the importance of social, socioeconomic and behavioural factors for health and mortality in a longitudinal setting and in a life-course perspective. Our analysis is driven by two aims. First, we want to identify those factors which determine the health status of elderly people in Germany. Based on this, our second and main aim is to find the factors that determine the transition of a good general health status or the absence of specific diseases, respectively, into a bad general health status or into the presence of specific diseases. Therefore, the most important age-dependent and age-related diseases are analysed separately as well as combined to multi-morbidity. Although many determinants of health and mortality have been identified, there are still several open questions regarding the role of these determinants in specific population settings. The specific characteristic of our study is to analyse the role of these determinants regarding gender differences in populations whose members spent the most time of their lives in western and eastern European societies. We investigate the impact of 17 potential health determinants on seven health outcomes as well as mortality over a time of 13 years (western Germany) and seven years (eastern Germany), respectively. The life course concept is incorporated by two different ways. First, the analysis includes the longitudinal effects of specific health determinants and characteristics of the people on health over the mentioned time spans among ageing individuals. Many of the analysed baseline conditions are results of earlier life course experiences themselves. For instance, the level of income depends on the education level and the occupational career. Second, for some variables we could consider directly the development during the previous life course, i.e., smoking, fertility history and migration history. This allowed us to model life stages which promise to affect the

later health conditions, for instance the age at starting to smoking or the age at quitting smoking.

The eastern and western Germany populations provide the unique possibility to study the effects of eastern and western European backgrounds in one population. The two pre-war German regions were characterized by a demographic composition and demographic conditions that were almost identical until 1945, followed however by 45 years of different political and socio-economic structures and resulting in demographic developments that were entirely characterized by the eastern and western European systems (Gjonça et al. 2000, Vaupel et al. 2003). In the following paragraphs we will briefly describe the data and methods used for this study and summarize the main findings of the altogether 46 models with 72 different health transitions of our analysis. A detailed description and presentation of the results can be found in the corresponding working paper (Wegner & Luy 2009).

2. Data and Methods

2.1 Data

For our analysis we used longitudinal data from the German Life Expectancy Survey (LES) of the German Federal Institute of Population Research (BiB). The LES is a two-wave panel study on the relation between lifestyle, health and mortality for western and eastern Germany, restricted on persons with German citizenship (Gärtner 2001). The data contain individual information about demographics, economic and social status, social networks, health behaviours, life attitudes and a variety of health indicators for the cohorts born between 1914 and 1952. The first wave belongs to the Heart Circulation Prevention Study (HCP), including representative population samples for western Germany of the years 1984 to 1986. After unification the HCP was extended to eastern Germany with the first HCP survey being conducted there in the years 1991 and 1992. The LES comprises second interviews with the samples of the first HCP surveys of 1984-1986 and 1991-1992, respectively, which were conducted by the BiB in 1998 for both parts of Germany. Consequently, the follow-up time span of the LES differs between the eastern and western German sub-samples, being approximately seven years for the former and 13 years for the latter.

We restricted our analysis on respondents aged 60 or older at the time of the second interview. Thus, the analysed sub-sample included respondents of the second wave and those who got lost between the two survey waves because of death or attrition. Missing cases of covariates were excluding after having approved their independent distribution. The original West sample includes 4,865 individuals. Of these, 3,944 (81%) reported the full information for analysis, 2,091 males and 1,853 females (see Table 1). From those females, 871 participated in the second wave, 184 died between the two survey waves and 798 got lost due to other reasons. The corresponding numbers of the western German males are 951 participants in the second wave, 435 deaths and 705 cases of attrition. The original East sample includes 831 respondents of which 805 (97%) provided complete information without any missing cases. Of these, 444 persons were females and 361 were males. Of those, 229 females and 189 males participated in the second wave, whereas 44 females and 53 males died and 171 females and 119 males dropped out between the two survey waves.

2.2 Measures

2.2.1 Health

The change in health was analysed for several specific health conditions. All information is self-reported by the respondents. Thus, the information on health and

specific diseases reflects the subjective health status of the respondents rather than their objective health. However, subjective health is closely related to objective health and known to be a good predictor for mortality (Mossey & Shapiro 1982). Furthermore, recent research indicates that the subjective health status is a better predictor of an individual's future physical constitution than vice versa (Maddox & Douglass 1973). The general health status was defined on basis of the question "how do you rate your health in general?" indicating a person's perceived physical and psychological health condition as consequence of the presence or absence of impairments in daily activities (Kneesebeck 1998). Beside the general health status, we analysed nine specific diseases which are known to be closely related to death and disability, respectively. Thus, the analysed diseases can be expected to have a significant impact on an individuals' quality of life. Specifically, in terms of the ICD-9 classification the analysed diseases are 'heart diseases', 'cerebral vascular diseases', 'hypertension', 'other diseases of the circulatory system', 'endocrine, nutritional and metabolic diseases', 'diseases of the musculoskeletal system and connective tissue', 'diseases of the digestive system', 'diseases of the genitourinary system' and 'diseases of the respiratory system'. Finally, we addressed the state of multi-morbidity by summarising the number of diseases out of those four of the analysed diseases which are closely related to the risk of dying (see below).

The number of self-reported diseases differs between the samples for western and eastern Germany and between the survey waves. In the first wave, the West sample contains information about the presence (or absence) of 37 specific diseases, whereas the East sample includes only 35 specific diseases. The difference results from the lack of information about diseases of the respiratory system in eastern Germany. The second wave of the LES includes 40 self-reported diseases. For defining the specific disease groups we selected 28 diseases of the western and 25 diseases of eastern German sample. Appendix A summarises these diseases and shows how the nine groups of specific diseases were classified in detail.

All analysed health variables were dichotomised into 'good' and 'bad' in the case of the general health status and into 'presence' and 'absence' for each specific disease and multi-morbidity. In the original questionnaire, the general health status was measured by a five item scale ('very good', 'good', 'fair', 'bad' and 'poor'). We defined those with 'very good' and 'good' general health into the category 'good' and the rest into the category 'bad'. The original questions for the specific diseases contained four categories to characterize the disease status during the last 12 months preceding the surveys: (1) *have disease at the moment*, (2) *had disease earlier, but not anymore*, (3) *don't know, whether disease is still present*, and (4) *never had that disease*. We merged the answer categories (1) and (3) into the new category '*present*' and the categories (2) and (4) into '*absent*'.¹ The status 'absent' was valid when all diseases within a summarised disease group were either never experienced or if one or more diseases were experienced only in the past, respectively. If at least one specific disease of a disease group was reported as being present during the 12 months preceding the survey the disease was defined as 'present'.

'Multi-morbidity' was defined as the co-occurrence of diseases, in contrast to the concept of 'co-morbidity' which specifies additional diseases beside the specific disease under study (Akker et al. 1996). The co-occurrence of diseases is associated with impairments in physical degree, the requirement of complex therapy and care as well as increased needs for social, medical, and health care (Akker et al. 1998). We

¹ Defining answer category (3) as 'present' disease was based on the idea that the word "still" in the question implies that the respondent must have experienced the disease at some time in the past and he or she does just not know whether that disease is still present. Nevertheless, the case numbers of this category are so low that the definition of the disease being 'present' or 'absent' does not have any significant influence on the results of the analysis.

analysed multi-morbidity as cumulative occurrence of heart diseases, cerebral vascular diseases, diseases of the respiratory system and diseases of the digestive system. The scale was dichotomized to '*present*' and '*absent*' in the logic that was already described for the specific disease groups. Thus, the state '*absent*' (multi-morbidity) includes all persons who experienced one or none of the four mentioned diseases at the time of the survey. Individuals who experienced two, three or all of these four diseases were defined to the group '*present*' (multi-morbidity). Unfortunately, multi-morbidity could only be analysed for western Germany due to the small size of the eastern German LES sample.

2.2.2 Individual life conditions

In our analysis of health status we included totally 17 control variables, i.e., sex, age, education level, occupational status, household net income, living arrangement, social contacts, consumption of high-proof alcohol, weekly sportive activity, general consideration of health, general satisfaction with life, body mass index, 'type A' behaviour, experience of unemployment, smoking status and history, number of children, and migration background. All of these variables were defined by their characteristics at the moment of the first survey and are expected to reflect properly the life condition, the socioeconomic status, the social arrangement, the health lifestyle, and earlier life events of the respondents as most important determinants of status and changes of their health condition. Again, the questions are not identical in the eastern and western German samples, and they also differ between the two survey waves. We restricted the analysis to control variables which were available for both parts of Germany and for both waves. The consideration of information from both waves enabled to minimise the number of missing cases in the control variables since missing information in the first survey could be substituted when the corresponding information was given in the second survey. For eastern Germany (and in some cases for western German females as well) it was necessary to aggregate categories as they were used for western German males because of the small sample size(s). Note that due to this different categorization the results for eastern and western Germany (and in some cases also for females and males) are not directly comparable. However, for both samples it is possible to investigate if a specific life condition has any impact on health or not.

Age was classified into four groups: 'up to age 50', '51 to 55', '56 to 60' and 'older than 60' for western Germany and into three groups 'up to age 60', '61 to 70' and 'older than 70' for eastern Germany, always referring to the age at baseline.² Socioeconomic status was measured by three variables: education level, occupational status and household net income. Education level was measured by means of the international standard classification of education ISCED-97 (OECD 1999). For western Germany, the corresponding categories are primary, secondary and high education level. For the eastern German sample the education level was dichotomised into two groups: 'up to secondary education' and 'higher education'. The current or last occupational status was classified into blue collar, white collar, civil servants and self-employed for western German males. The occupational status of western German females was categorized into blue collar, white collar and civil servants, self-employed and housewives. The latter were defined on basis of the current employment status as those females, who were never employed or who resigned from employment before the age of 50. In the East sample the occupational status had to be reduced to the dichotomous status 'blue collar' and 'others' for both sexes. Household net income was originally classified in

² In this way the age groups cover comparable birth cohorts in the eastern and in the western German LES sample.

more than ten income groups. For both parts of Germany we categorized the net household income by the corresponding tertiles into low, middle and high.

Living arrangement and number of friends were used as indicators for an individual's social background. For the western German sample, living arrangement was operationalized as a combination of marital status and the number of persons living in the same household. The category 'married' comprises all married persons, regardless whether they are living together with the spouse or living alone. Divorced, widowed or never married respondents were classified into two groups 'living together with at least one other person' and 'living alone'. For eastern Germany, the living arrangement had to be dichotomized into the groups 'living together with at least one other person' and 'living alone', thus, the information about the marital status was excluded here. The number of friends was derived from the question "To how many persons outside your household are you so close that you don't want to miss their friendship?". Respondents who stated three or more such persons were grouped into the category 'many social contacts'. All persons with less than three close persons were categorized into 'few social contacts'. In this case, the classification was done identical for eastern and western Germany.

Individual lifestyle was characterised by a set of four variables for both eastern and western German sample, namely the consumption of high-proof alcohol, weekly sportive activity, health-consciousness and the general satisfaction with life. All of these variables were dichotomised into one group with specific characteristics and the rest category. Regarding alcohol consumption the respondents were separated into people who never drunk high-proof alcohol and all others. Respondents who exercised sports regularly at least once per week were classified as 'sportive active'. Health-consciousness was measurement on basis of the question "How much do you take care of your own health?" with the possible answers 'very much', 'much', 'medium', 'almost not' and 'not at all'. We defined health-conscious people as those who answered with 'much' or 'very much' to this question. The general satisfaction with life was characterised by the two categories 'satisfied' and 'unsatisfied' (based on a similar five-scale question and combining 'much' and 'very much' satisfied to the group of people being satisfied with their life in general). In the West sample we included additional information on the body mass index and the so-called 'type A behaviour'. Based on the definition of Jenkins (1976: 1034) type A describes "a style of behaviour characterized by some or all of the following: intense striving for achievement; competitiveness; easily provoked impatience; time urgency; abruptness of gesture and speech; overcommitment to vocation or profession; and excesses of drive and hostility" and is known to being closely related to heart diseases. We measured and classified the type A on a three item scale (low/middle/strong) as suggested by Luy & Di Giulio (2005).

Beside these characteristics of respondents at the moment of the first interview (or in the 12 preceding months, respectively) we were able to reconstruct some former life-course events using information provided by the LES. These life-course events are experience of unemployment, smoking history (in combination with the current smoking status), fertility history and migration background. The reconstruction of the corresponding life-course variables was based either on information about their timing and duration or by information about the past experiences of the events. The experience of unemployment could be traced for the samples of both parts of Germany. The current smoking status could be separated into 'never smoker', 'ex-smoker' and 'current smoker' for the western German sample and for eastern German males. For eastern German females the smoking status could only be separated into 'never smokers' on the one side and 'current and ex-smokers' on the other side. For the western German sample we could further use information about the age at starting smoking and the age at quitting smoking. Using this data we calculated the number of

smoking years (measured as continuous variable) and combined this information with the current smoking status. Our measurement of fertility history comprises a combination of the number of biological children and the age at birth. Therefore, the age at birth was dichotomised into 'below mean age at birth' and 'above mean age at birth' for both LES samples. Regarding parity we could separate into 'no child', 'one child', 'two children' and 'three and more children' for western Germany, whereas in eastern Germany only the parities 0, 1 and 2+ could be analysed. The last included covariate is the migration background of the respondents. For western Germany we characterised the migration background of those who ever migrated by the number of years since when the respondents live in the current residence. Unfortunately, further information about reasons or number of migrations was not available. For eastern Germany we could only separate between persons who ever migrated against all others.

2.3 Method

The analysis was separately done for eastern and western Germany as well as for males and females. Thus, our analysis led to four independent sets of results. In a first step we analysed the impact of the considered covariates on the various health and disease statuses at the moment of first interviews (baseline) by means of standard logistic regression. In a second step we analysed the transitions of general health, specific diseases and multi-morbidity after follow-up by applying multinomial logistic regression models (Hosmer & Lemeshow 2000) separately for each health variable. Results of the multinomial logistic regression models are to be interpreted as results of standard logistic regression models. In all models persons without changes during the follow-up comprise the reference group.

Figure 1 presents the corresponding variety of health transitions for each health variable in our analysis. Each individual was identified to belong to one specific transition. Depending on the case numbers of the LES sub-samples the number of analysed transitions differs between each other. Regarding general health the full set of possible transitions from good or bad health status at baseline was possible only for western Germany. For eastern Germany only the transition from bad health at baseline could be analysed. The number of people suffering from the specific diseases at baseline was generally too low to enable a detailed analysis of transitions during the observation time. Thus, transitions of disease statuses could only be analysed for the state of disease absence at baseline. Likewise, the transitions of multi-morbidity were only analysed for respondents without co-occurrence of the considered diseases at baseline. Table 2 gives an overview of the applied transition models for the four analysed LES sub-samples.

3. Main Findings and Discussion

3.1 Limitations of the study

The specific characteristics of the LES to offer extensive data on health conditions and health determinants in a longitudinal setting and for two sub-populations which mainly lived in an eastern respective western European society makes this survey unique. However, we have to be aware that the LES and the corresponding analysis contain several limitations which have to be remembered when interpreting the main results of this study. First, the information about the general health and the presence or absence of specific diseases stem from self-reports of the respondents. On one hand, self-rated health is known to provide reliable information about a person's experiences with illness, disabilities and health behaviour (Manderbacka 1998, Simon et al. 2005). On the other hand, the correctness of the information regarding the prevalence of diseases

can be seen sceptically. Our analysis which was based on these self-reports revealed indeed the well-documented association between the prevalence of diseases at baseline and mortality during follow-up. Thus, we think that the information provided by the LES is reliable. Unfortunately, the data did not allow analysing neoplasm because of few cases reported in the LES, although neoplasm is the second most frequent cause of death in Germany. We assume that such irregularities arise because some specific diseases were underreported or substituted by other diseases. For instance, lung cancer could be reported as disease of the respiratory system. Another bias regarding gender differences in the prevalence of diseases was possibly caused by the fact that women had higher rates of physicians' services and hospital care (David & Kaplan 1995, Mustard et al. 1998, Statistisches Bundesamt 2007b). Thus, it could be that females had better information about the presence of specific diseases than males.

Second, the results of health and disease transitions are not representative for both parts of Germany. The respondents who were loss to follow-up were significantly different from those who were re-interviewed. For both the eastern and western German sample, the females who participated in the second survey were younger, more educated and more likely to have middle or high amount of household net income than all women included in the first LES wave. Further, the western German female participants of the second wave were more sportive active and more of them lived at least since 30 years at the same residence. The re-interviewed men from the West sample included more civil servants but less self-employed persons, were more likely to have a strong type A behaviour, were more satisfied with life and to a higher proportion non- or ex-smokers. The eastern German males who participated in the second wave were younger, had more friends, were more satisfied with life and had less frequently experienced digestive diseases at the moment of first interview. Therefore, we can conclude that both samples were biased to subjects with higher socioeconomic status and healthier lifestyles.

Third, the comparisons of the results for eastern and western Germany and for women and men suffer from the characteristics of the LES data. Regarding the comparison of eastern and western Germany it is obvious that the different observation times make the two sub-samples not directly comparable. In addition, the small size of the eastern German sample made it necessary to reduce the number of categories in the variables education and occupational status. Furthermore, body mass index, type A behaviour, diseases of respiratory system and multi-morbidity could not be analysed at all with the eastern German LES sample. Focusing on a life course perspective required to operate some variables differently for men and women and for eastern and western Germany, as was described in the previous section).

Finally, we have to note that some characteristics of the studied population are or might be cohort-specific and are thus not directly transferable to the elderly of the future. For instance, among the studied western German cohorts males had a higher chance to reach high education than females. The occupational status for most females was homemaking as a consequence of male bread-winner model which was the predominant partnership model among the analysed generations. Therefore, the household net income of females depended mainly on the income of their husbands. But also occupied women had a 70% lower level of income than males (Geisler 1996). In case of husband's death the only income of housewives was widow's pension which is lower than recent husband's pension. The female employment rate was significantly higher in eastern Germany. However, the relative differences in wages between the sexes were equal to western Germany (Geisler 1996). Furthermore, the proportion of smokers is considerably higher among males (76% East / 79% West) than among females (19% East / 30% West). The mean age of quitting smoking was equal for both sexes in western Germany with 43 years, but the mean number of smoking years was

higher for men (25 years) than for women (20 years). The different number of smoking years was also valid for current smokers with the absolute number of smoking years being ten years higher on average. According to the eastern German LES sample, females and males exhibited an equal amount of 30 smoking years on average. The fertility history offered that females were on average three years younger at first birth in western Germany. However, eastern German women and men showed no differences in the age at first birth.

3.2 Main Results

In this section we summarize briefly the main findings of our analysis. The detailed results of all analysed models can be found in the corresponding paper (Wegner & Luy 2009). Figures 2 and 3 illustrate the most important results graphically. Reading the graphs should start with the rectangle in the centre which includes the initial health conditions of our health transition models, i.e., a good health status and the absence of specific diseases in the case of western Germany. For eastern Germany we could only analyse transitions from the absence of specific diseases (see description of data and methods). From this starting point solid arrows show which factors increase the risk of dying in the upward direction and which factors increase the risk of onset of some specific diseases in the downward direction. Gender-specific effects are given on the left for females and on the right for males. The dotted rectangles on the utmost left and right side of the figures indicate the main characteristics of those female and male respondents who got lost during the observation period because of attrition.

In western Germany age, the status of being current smoker (3% higher odds per additional smoking year) and sportive inactivity were associated with higher likelihood of dying for both females and males (see Figure 2). Among males also former smoking increased the risk of dying, whereas among females low household net income and low education were associated with an increased mortality risk. Thus, an effect of education on mortality was only measurable for females, in contrary to other studies which found a stronger effect of educational differences in mortality among males (Lin et al. 2003). More in line with our findings is a study of Klein (1996) who found higher educational differences in life expectancy among females than among males during the years 1984 to 1993. The influence of the typical socioeconomic variables on mortality among men could be covered by the significant protective effect of later fatherhood with two children (not shown in Figure 2). Other fatherhood constellations were not statistically significant but they tended to lower the risk of dying as well. Beside the biological explanation for the (mainly) positive influence of fertility on mortality among women (Friedlander 1996) we can assume a cumulative positive effect of marital status, i.e., the well known protective effects of partnership and the effect of health selection (Ross & Mirowsky 2002). Only a small proportion of western German males had no children (15%) whereas 20% were unmarried and lived alone. In contrary to other studies we could not find a similar positive effect of fertility on mortality for females (see, e.g. Grundy & Tomassini 2005, Spence & Eberstein 2009).

The onset of bad general health, heart diseases and diseases of the respiratory system was related to increasing age among western German females. The status of current smoking (at the moment of first interview) was also associated with an increased risk of developing heart diseases and diseases of respiratory system as well as with diseases of the digestive system during follow-up. Western German males with low household net income had higher odds of developing heart diseases and diseases of the respiratory system during the observation time. Furthermore, ex-smokers at the moment of first interview also exhibited an increased risk of heart diseases and bad health status. The presence of multi-morbidity was statistically significantly associated

with experiences of unemployment for both males and females (results for multi-morbidity not shown in figure 2).

Figure 3 presents the main risk factors for eastern German women and men. Due to the mentioned data restrictions only few statistically significant effects could be detected in the eastern German LES sample. Equivalent to the western German population, increasing age and sportive inactivity increased the risk of dying for both sexes. Beside this, low education and dissatisfaction with life were associated with a higher mortality risk among females. Among males those who ever smoked in their life also exhibited a higher risk of dying. The transitions to the onset of specific diseases offer that among females only the transition to diseases of the musculoskeletal system and connective tissue could be associated with specific risk factors, i.e. smoking and dissatisfaction with life. Diseases of the musculoskeletal system and connective tissue are not closely related to death but to severe impairments in daily mobility. Among eastern German men, increasing age was related to a higher likelihood for developing circulatory diseases. Further, low education and smoking (current and former) led to higher odds for the onset of diseases of the digestive system.

3.3 Conclusions

From our analysis three main conclusions can be drawn:

(i) Our first conclusion is of technical nature. The analysis of the transition of the health status for eastern and western German women and men from longitudinal data reveals basically the same risk factors than those found in cross-sectional studies. Especially, the influence of socioeconomic differences on morbidity is consistent with recent cross-sectional analysis for Germany (Mielk 1994, Helmert et al. 1997, Lüschen et al. 1997, Mielk et al. 2000, Knesebeck et al. 2003). This is an important finding when it comes to identify typical risk factors for other populations. Nevertheless, the broad variety of specific diseases in the LES enabled us to extent the set of diseases associated with socioeconomic status (Helmert et al. 1989, Rathmann et al. 2006, Hach et al. 2006).

(ii) The analysis for western Germany showed that an increased risk of dying was associated with behavioural determinants among males and with socioeconomic factors among females. The transition into a bad general health status and the onset of specific diseases revealed the reverse picture. Among men, socioeconomic factors were the main drivers for a higher likelihood of the onset of diseases and for worsening general health. In contrast, among women the risk of onset of diseases was mainly associated with behavioural factors. In this context it is important to note that an adjustment of health behaviours can be observed recently among women and men, and we can expect that this process will continue in the near future. The percentage of deaths attributable to smoking stagnates among males since the 1970s on a level of around 22% but increases continuously among females from 1.2% in 1970 to 5.4% in the year 2000 (Peto 2006). Therefore, we can expect that the mortality and morbidity schedules of females will be affected negatively by their increasing smoking hazards and close the gender gap toward the men. Furthermore, the discrepancies within the education level between women and men will reduce in the future. The proportion of females at university increased since 1960 from 28% to 43% in the year 1994 (Geisler 1996). In line with this trend, the employment rate of females increased what leads to an independent and additional income and pension later in life. However, among the cohorts included in the LES we could not find any signs of a relationship between occupational stress and/or dual burden and later health outcomes among females. With a further adjustment of gender roles and health behaviours we might expect that these effects will substitute the impact of socioeconomic factors that we found in the present study. For eastern Germans we could not find reverse effects of socioeconomic factors on health as might be expected from the higher female

employment rates among the studied cohorts. However, the gained results suggest that in eastern European societies psychological well-being quantified by life satisfaction might play a more important role for mortality and morbidity at later old age than other factors, especially for females.

(iii) Finally, our analysis reveals a very strong and overall positive effect of sportive activity. For both sexes and in both parts of Germany, sportive activity reduced the risk of dying significantly. Considering the fact of different age groups at baseline in the eastern and western German LES samples, this result indicates that physical fitness is a guaranty for a longer and healthier life. According to the findings of other studies we can expect that this effect will further increase in the future. Through an analysis of the German Socioeconomic Panel Becker et al. (2006) found that the proportion of males and females who were sportive active at least once per week increased from 26% in 1992 to 30% in 2001. The percentage of sportive inactivity, on the other side, declined from 51% to 45%. Although the percentage of physical activity is lower among eastern Germans they exhibit a higher rate of increase than their western German counterparts (see Luy 2005). Thus, it is likely that the future elderly will profit from an increased sportive activity. This holds likewise for both parts of Germany and for both sexes.

References

- Abramson, J.L. et al. (2001): Moderate alcohol consumption and risk of hear failure among older persons. *The Journal of the American Medical Association*, 285(15), 1971-77.
- Akker, M.v.d., Buntix, F., Knottnerus JA. (1996): Comorbidity or multimorbidity: What's in a name. A review of literature. *European Journal of General Practice*, 2, 65-70.
- Akker, M.v.d. et al. (1998): Multimorbidity in general practice: Prevalence, incidence, and determinants of co-occurring chronic and recurrent diseases. *Journal of Clinical Epidemiology*, 51(5), 367-75.
- Bartley, M. (1991): Health and labour force participation: stress, selection, and the reproduction costs of labour power. *Journal of Social Policy*, 20(3), 327-64.
- Bartley, M. (1994): Unemployment and ill health: understanding the relationship. *Journal of Epidemiology and Community Health*, 48, 333-37.
- Becker, S., Klein, T., Schneider, S. (2006): Sportaktivität in Deutschland im 10-Jahres-Vergleich: Veränderungen und soziale Unterschiede. *Deutsche Zeitschrift für Sportmedizin*, Jg. 57(9), 226-232.
- Beresford, T.P., Katsoyannis, K.K. (ed.) (1995): *Alcohol and aging*. Oxford University Press, New York.
- Berkman, C.S., Gurland, B.J. (1998): The relationship among Income, other Socioeconomic Indicators, and Functional Level in Older People. *Journal of Ageing and Health*, 10(81), 81- 98.
- Berkman, L.F., Glass, T. (2000): *Social Integration, Social Networks, Social Support and Health*. In: Berkman & Kawachi (Eds.), *Social Epidemiology*, Oxford University Press, New York, 2000.
- Blane, D. (2006): The life course, the social gradient, and health. Marmot, M. & Wilkinson, R.G. (ed.): *Social Determinants of Health*. Oxford University Press, New York, 2006.
- Blaxter, M. (1990): *Health and lifestyle*. Routledge, London & New York.
- Brody, J.A., Schneider, E.L. (1986): Diseases and disorders of aging: A hypothesis. *Journal of Chronic Diseases*, Vol. 39, pp. 871-76.
- Calverley, P., Pride, N. (ed.) (1995): *Chronic Obstructive Pulmonary Diseases*. Chapman and Hall, London.
- Cavelaars et al. (2000): Educational differences in smoking: international comparison. *British Medical Journal*, 320, 1102-07.
- Christensen, K., Johnson, T.E., Vaupel, J.W. (2006): The quest for genetic determinants of human longevity: Challenges and insights. *Nature Review Genetics*, 7, 436- 48.
- Corrao, G., Bagnardi, V., Zambon, A., Torchio, P. (1998): A meta-analysis of alcohol intake in relation to risk of liver cirrhosis. *Alcohol & Alcoholism*, 33, 381-92.
- David, J.L., Kaplan, H.B. (1995): Gender, social roles and health care utilization. *Applied Behavioral Science Review*, 3(1), 39-64.

- Doblhammer, G. (2000): Reproductive history and mortality later in life: A comparative study of England and Wales and Austria. *Population Studies*, 54(2), 169-76.
- Doll, R., Peto, R., Boreham, J., Sutherland, I. (2004): Mortality in relation to smoking: 50 years' observations on male British doctors. *British Medical Journal*, 328, 1519-33.
- Feinstein, J.S. (1993): The relationship between socioeconomic status and health. *The Milbank Quarterly*, 71, 279- 322.
- Friedlander, N.J. (1996): The relation of lifetime reproduction to survivorship in women and men: A prospective study. *American Journal of Human Biology*, 8, 771-83.
- Gärtner, K. (2001): Lebensstile und ihr Einfluss auf Gesundheit und Lebenserwartung -Der Lebenserwartungssurvey des BIB-, Projekt- und Materialdokumentation. Bundesinstitut für Bevölkerungsforschung, Wiesbaden.
- Geisler, R. (1996): Die Sozialstruktur Deutschlands. Westdeutscher Verlag, Opladen.
- Gjonça A., Brockmann H., Maier H. (2000): Old-age mortality in Germany prior to and after Reunification. *Demographic Research* 3: Article 1.
- Gorman, B.K., Sivaganesan, A. (2007): The role of social support and integration for understanding socioeconomic disparities in self-rated health and hypertension. *Social Science and Medicine*, 65(5), 958-75.
- Gramham, H. (2002): Building an inter-disciplinary science of health inequalities: the example of lifecourse research. *Social Science & Medicine*, 55(11), 2005- 16.
- Green, A., Beral, V. & Moser, K. (1988): Mortality in women in relation to their childbearing history. *British Medical Journal*, 297, 391-95.
- Gruer, L., Hart, C.L., Gordon, D.S., Watt, G.C.M. (2009): Effect of tobacco smoking on survival of men and women by social position: a 28 year cohort study. *British Medical Journal*, 338.
- Grundy, E., Holt, G. (2000): Adult life experiences and health in early old age in Great Britain. *Social Science and Medicine*, 51(7), 1061-74.
- Grundy, E., Tomassini, C. (2005): Fertility history and health in later life: A record linkage study in England and Wales. *Social Science and Medicine*, 61(2), 217-28.
- Guimarães, R.M. (2007): Health capital, life course and ageing. *Gerontology*, 53, 96- 101.
- Hach, I. et al. (2006): Obesity and the risk for mental disorders in a representative German adult sample. *European Journal of Public Health*, 17(3), 297-305.
- Haustein, K.O. (2001): Tabakabhängigkeit. Gesundheitliche Schäden durch das Rauchen. Ursachen-Folgen-Behandlungsmöglichkeiten-Konsequenzen für Politik und Gesellschaft. Deutscher Ärzte-Verlag, Köln.
- Helmert, U. et al. (1989): Social class and risk factors for coronary heart disease in the Federal Republic of Germany. Results of the baseline survey of the German Cardiovascular Prevention Study (GCP). *Journal of Epidemiology and Community Health*, 43, 37-42.
- Helmert, U., Mield, A., Shea, S. (1997): Poverty and health in West Germany. *Sozial- und Präventivmedizin*, 42(5), 276-85.
- Helmert, U., Borgers, D., Bamman, K. (2001): Soziale Determinanten des Rauchverhaltens in Deutschland: Ergebnisse des Mikrozensus 1995. *Sozial- und Präventivmedizin*, 46(3), 172-81.
- Hosmer, D.W., Lemeshow, S. (2000): Applied logistic regression. John Wiley & Sons Inc., New York.
- House, J.S., Kessler, R., Herzog, A. (1990): Age, socioeconomic status, and health. *Milbank Memorial Fund Quarterly*, 68, 383- 411.
- House, J.S. et al. (1994): The social stratification of aging and health. *Journal of Health and Social Behavior*, 35(3), 213-34.
- Jenkins, C.D. (1976): Recent evidence supporting psychologic and social risk factors for coronary disease. In: *The New England Journal of Medicine*, 294, 1033-38.
- Kaplan, G.A., Keil, J.E. (1993): Socioeconomic factors and cardiovascular disease: a review of the literature. *Journal of the American Heart Association*, 88 (4), 1973-98.
- Klein, T. (1996): Mortalität in Deutschland - Aktuelle Entwicklungen und soziale Unterschiede. Zapf W., Schupp, J. & Habich, R. (ed.): *Lebenslagen im Wandel: Sozialberichterstattung im Längsschnitt*. Campus-Verlag, Frankfurt, 1996.
- Knesebeck, O.v.d. (1998): Subjektive Gesundheit im Alter. Soziale, psychische und somatische Einflüsse. Lit Verlag, Münster.
- Knesebeck, O.v.d., Lüschen, G., Cockerham, W.C., Siegrist, J. (2003): Socioeconomic status and health among the aged in the United States and Germany: A comparative cross-sectional study. *Social Science and Medicine*, 57(9), 1643-52.

- Knesebeck, O.v.d., Schäfer, I. (2006): Gesundheitliche Ungleichheit im höheren Lebensalter. Richter, M. & Hurrelmann, K. (ed.): Gesundheitliche Ungleichheit - Grundlagen, Probleme, Konzepte. VS Verlag für Sozialwissenschaften, Wiesbaden 2006.
- Kuh, D. et al. (2003): Life course epidemiology. *Journal of Epidemiology and Community Health*, 23, 778- 83
- Kuh, D., Ben-Shlomo, Y. (2005): Life course approach to chronic disease epidemiology, 2nd Edition. Oxford University Press, Oxford & New York.
- Leserman, J. et al. (1998): How multiple types of stressors impact on health. *Psychosomatic Medicine*, 60, 175-81.
- Lillard, L.A., Panis, C.W.A. (1996): Marital status and mortality: The role of health. *Demography*, 33(3), 313-27.
- Lin, C.C. et al. (2003): A further study of life expectancy by socioeconomic factors in the national longitudinal mortality study. *Ethnicity and Disease*, 13, 240-47.
- Lindsted, K.D., Tonstad, S., Kuzma, J.W. (1991): Self-report of physical activity and patterns of mortality in seventh-day Adventist men. *Journal of Clinical Epidemiology*, 44, 355-64.
- Lund, E., Arnesen, E., Borgan, JK. (1990): Pattern of childbearing and mortality in married women - a national prospective study from Norway. *Journal of Epidemiology and Community Health*, 44, 237-70.
- Lüschen, G. et al. (1997a): After unification: Gender and subjective health status in East and West Germany. *Social Science and Medicine*, 44(9), 1313-23.
- Luy, M. (2005): West-Ost-Unterschiede in der Sterblichkeit unter besonderer Berücksichtigung des Einflusses von Lebensstil und Lebensqualität. In: Gärtner et al. (ed.): Lebensstile, Lebensphasen, Lebensqualität. Interdisziplinäre Analysen von Gesundheit und Sterblichkeit aus dem Lebenserwartungssurvey des BIB. VS Verlag, Wiesbaden, 333-364.
- Luy, M., Di Giulio, P. (2005): Der Einfluss von Verhaltensweisen und Lebensstilen auf die Mortalitätsdifferenzen der Geschlechter. In: Gärtner et al. (ed.): Lebensstile, Lebensphasen, Lebensqualität. Interdisziplinäre Analysen von Gesundheit und Sterblichkeit aus dem Lebenserwartungssurvey des BIB. VS Verlag, Wiesbaden, 365-392.
- Maddox, G.L., Douglass, E.B. (1973): Self-assessment of health: A longitudinal study of elderly subjects. *Journal of Health and Social Behavior*, 14(1), 87-93.
- Mäkelä, P., Valkonen, T., Martelin, T. (1997): Contribution of deaths related to alcohol use to socioeconomic variation in mortality: register based follow up study. *British Medical Journal*, 315, 211-16.
- Manderbacka, K. (1998): Examining what self-rated health question is understood to mean by respondents. *Scandinavian Journal of Public Health*, 26(2), 145-53.
- Marmot, M., Wilkinson, R.G. (ed.) (2006): Social determinants of health, 2nd edition. Oxford University Press, Oxford & New York.
- Mayer, K.U., Wagner, M. (1996): Lebenslagen und soziale Ungleichheit im hohen Alter. Mayer, K.U. & Baltes, P.B. (ed.): Die Berliner Altersstudie. Akademie Verlag, Berlin 1996.
- Melzer, D., McWilliams, B., Brayne, C., Johnson, T., Bond, J. (2000): Socioeconomic status and the expectation of disability in old age: estimates for England. *Journal Epidemiological Community Health*, 54, 286- 92.
- Mielk, A. (ed.) (1994): Krankheit und soziale Ungleichheit. Sozialepidemiologische Forschung in Deutschland. Leske+Budrich, Opladen.
- Mielk, A. et al. (2000): Comparison of health inequalities between East and West Germany. *European Journal of Public Health*, 10(4), 262-67.
- Mollenkopf, H., Walker, A. (2007): Quality of life in old age -International and multi-disciplinary perspective. Springer, Dordrecht.
- Mossey, J.M., Shapiro, E. (1982): Self-rated health. *American Journal of Public Health*, 72, 800-808.
- Mukamal, K.J. et al. (2005): Alcohol and risk for ischemic stroke in men: The role of drinking patterns and usual beverage. *Annals of Internal Medicine*, 142, 11-19.
- Mustard, C.A. et al. (1998): Sex differences in the use of health care services. *The New England Journal of Medicine*, 338(23), 1678-83.
- Nolte, E., Shkolnikov, V., McKee, M. (2000): Changing mortality patterns in East and West Germany and Poland. I: Long term trends (1960-1997). *Journal Epidemiol. Community Health*, 54, 890- 98.

- OECD (1999): Classifying Educational Programmes. Manual for ISCED-97. Implementation in OECD Countries. Organisation for Economic Co-Operation and Development, Washington.
- Paffenberger, R.S. et al. (1993): The association of changes in physical-activity level and other lifestyle characteristics with mortality among men. *The New England Journal of Medicine*, 328(8), 538-45.
- Rathmann, W. et al. (2005): Sex differences in the associations of socioeconomic status with undiagnosed diabetes mellitus and impaired glucose tolerance in the elderly population: The KORA survey 2000. *European Journal of Public Health*, 15(6), 627-33.
- Ross, C.E., Mirowsky, J. (2002): Family relationships, social support and subjective life expectancy. *Journal of Health and Social Behavior*, 43(4), 469-89.
- Sacco, R. et al. (1999): The protective effect of moderate alcohol consumption on ischemic stroke. *Journal of the American Medical Association*, 281, 53-60.
- Sandvik, L. et al. (1993): Physical fitness as a predictor of mortality among healthy, middle-aged Norwegian men. *The New England Journal of Medicine*, 328(8), 533-37.
- Scafato, E. et al. (2008): Marital and cohabitation status as predictor of mortality: A 10-year follow-up of an Italian elderly cohort. *Social Science and Medicine*, 67(9), 1456-64.
- Simon, J.G. et al. (2005): How is your health in general? A qualitative study on self-assessed health. *European Journal of Public Health*, 15(2), 200-208.
- Spence, N.J. & Eberstein, I.W. (2009): Age at first birth, parity, and post-reproductive mortality among white and black women in the US, 1982-2002. *Social Science and Medicine*, 68(9), 1625-32.
- Statistisches Bundesamt (2007a): Todesursachen in Deutschland. Gestorbene in Deutschland an ausgewählten Todesursachen. Statistisches Bundesamt, Wiesbaden.
- Statistisches Bundesamt (2007b): Diagnosedaten der Patienten und Patientinnen in Krankenhäusern (einschl. Sterbe- und Stundenfälle). Statistisches Bundesamt, Wiesbaden.
- Steinhagen- Thiessen, E. & Borchelt, M. (1996): Morbidität, Medikation und Funktionalität im Alter. Mayer, K.U. & Baltes, P.B. (Ed.): *Die Berliner Altersstudie*. Akademie Verlag, Berlin 1996.
- Thun, M.J. et al. (1997): Alcohol consumption and mortality among middle-aged and elderly U.S. adults. *The New England Journal of Medicine*, 337(24), 1705-14.
- U.S. Department of Health and Human Services (1996): *Physical activity and health: A report of the surgeon general*. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, 1996.
- US Department of Health and Human Services (2004): *The health consequences of smoking: A report of the surgeon general*. US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health. USDHHS, Atlanta, Georgia.
- Vaupel, J.W. et al (1998): Biodemographic trajectories of longevity. *Science*, 280, 855-60.
- Vaupel J.W., Carey, J.R., Christensen, K. (2003): It's never too late. *Science* 301: 1679-1681.
- Waldron, I., Hughes, M.E., Brooks, T.L. (1996): Marriage protection and marriage selection - prospective evidence for reciprocal effects of marital status and health. *Social Science and Medicine*, 43(1), 113-23.
- Wardsworth, M.E.J. (1997): Health inequalities in the life course perspective. In: *Social Science and Medicine*, 44 (6), 859-69.
- Wegner, C., Luy, M. (2009): Variations in early elderly health and disease status in a longitudinal perspective for eastern and western Germany. VID Working Paper 05/2009 (http://www.oeaw.ac.at/vid/download/WP2009_05.pdf)
- Wilkinson, R.G. (2001): *Kranke Gesellschaften. Soziales Gleichgewicht und Gesundheit*. Springer Verlag, Wien & New York.
- Wyke, S., Ford, G. (1992): Competing explanations for association between marital status and health. *Social Science and Medicine*, 34(5), 523-32.

Table 1: Descriptive characteristics of the LES follow-up survey of 1998

		participated	died	loss	total
West	Females	871 (47%)	184 (10%)	798 (43%)	1853
Germany	Males	951 (45%)	435 (21%)	705 (34%)	2091
East	Females	229 (52%)	44 (10%)	171 (38%)	444
Germany	Males	189 (52%)	53 (15%)	119 (33%)	361

Table 2: Analysed health transitions for females and males in the western and eastern German LES samples

	West		East	
	Female	Male	Female	Males
Baseline				
General health status	x	x	x	x
Diseases	x	x	x	x
Multimorbidity	x	x		
Follow-up				
Transition good ► bad health status	x	x		
Transition bad ► good health status	x	x	x	x
Transition absence ► presence of disease	x	x	x	x
Transition none ► multimorbidity	x	x		

Figure 1: Analysed health transitions

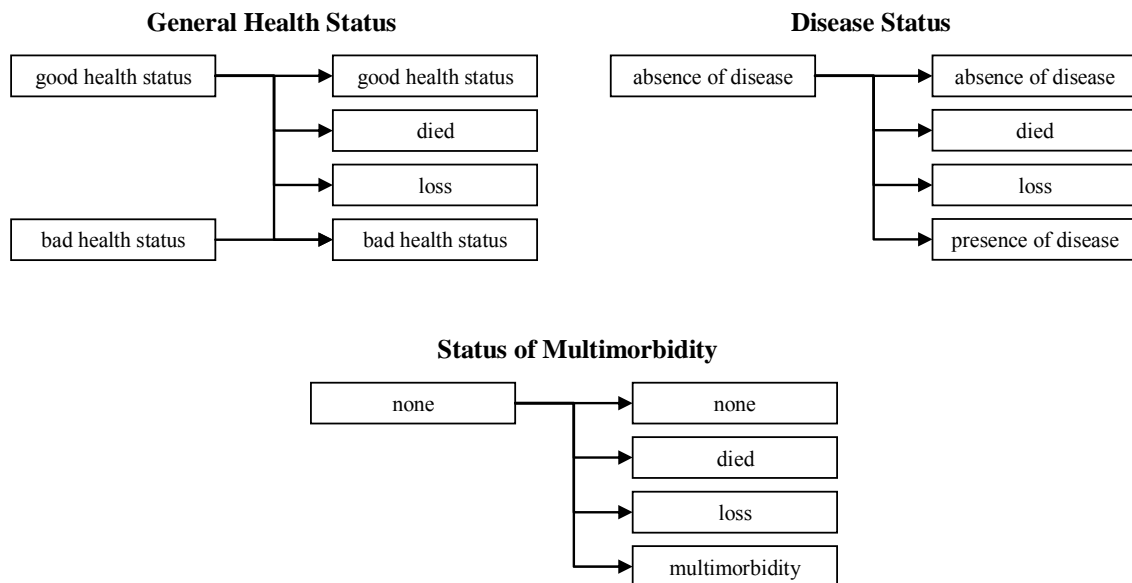


Figure 2: Main risk factors of increasing mortality and morbidity for females and males in western Germany between 1984/86 and 1998

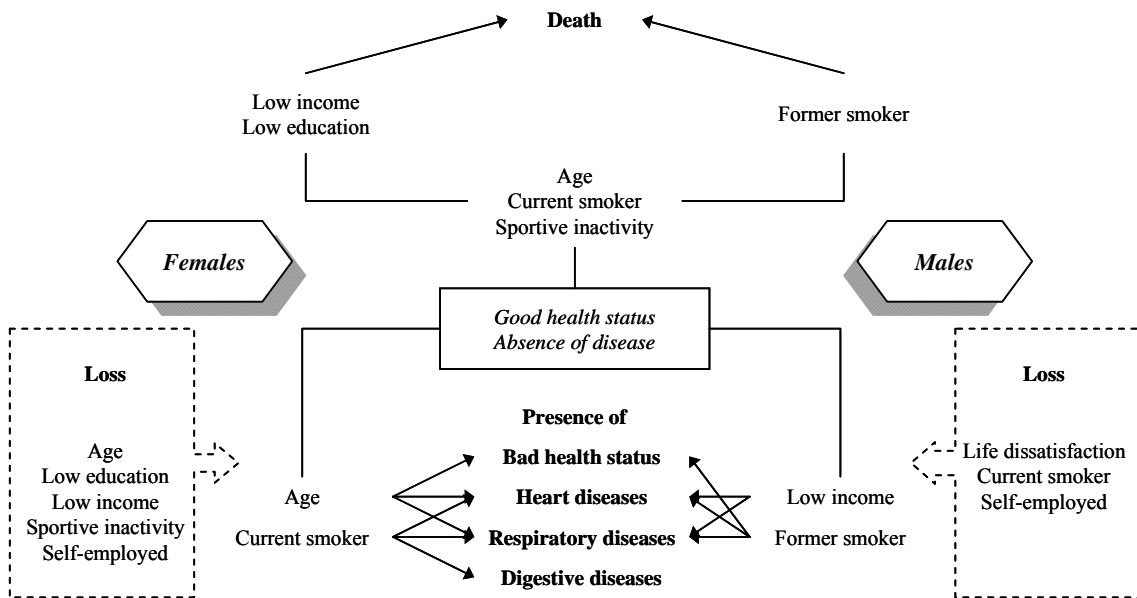
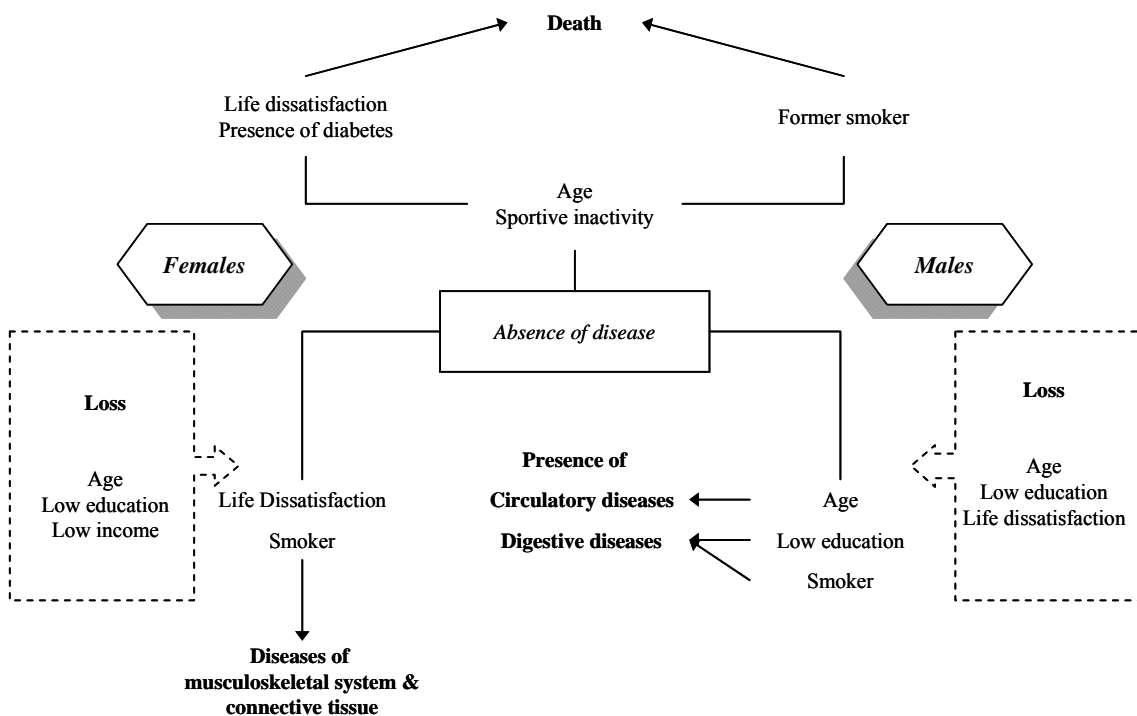


Figure 3: Main risk factors of increasing mortality and morbidity for females and males in eastern Germany between 1991/92 and 1998



Appendix: Classification of diseases based on ICD-9

