Preliminary version, do not quote

Gender Differences in trajectories of health limitations in Germany between 1995 and 2001. A study based on the German Socio-Economic Panel.

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Abstract

This study analyzes individual disability trajectories in Germany on the national level, focusing on the1995-2001 period. We look at trajectories of disability and use annual information provided by the German Socio-Economic Panel (SOEP). Our objectives are (1) to identify different course types of disability, (2) to assess their relative frequency, and (3) to analyze their association with subsequent deaths between 2002 and 2005. Exploring gender differences in health trajectories, we aim to improve our knowledge of why women live longer but at the same time suffer from worse ill-health than men. We analyze the trajectories of 3,919 persons aged 50+ in 1995. We perform a cluster analysis based on four aspects of the individual trajectory. This method groups individuals with similar levels and time courses into separate clusters. Our study identifies eleven clusters. They can be regrouped into the state of being healthy (26%), of having moderate disability (38%), and severe disability (36%). The shares of men and women in these groups are only significantly different in the youngest and oldest age group. Age and high education is associated with better health, the difference between East and West Germany is not significant, and so is the marital status. The interaction between sex and disability shows (1) that gender does not influence mortality differences between moderate und severely disabled persons and (2) that the gender mortality gap is smaller when individuals enjoy good health and that the gap is of the same size in the groups of moderately compared to severely disabled. Severe disablement does not make men and women more equal in the face of death. Sex differences in disability trajectories are attributed to an earlier onset of disease and to lower mortality among women with disability. The differences are possibly explained by a different distribution of diseases.

Introduction

The measurement and analysis of a population's health status is important in order to monitor health trends, find predictors of health and disability, and to provide and evaluate instruments of care and prevention. Many population-based longitudinal studies on health and disability, however, do not fully take advantage of the information available. Further, they use two points in time and a dichotomous measurement of disability (for a review see Doblhammer et al. 2007). While the transition from the state of not disabled to disabled is studied most, only few studies focus on recovery from disease and disability (Gill, Robison & Tinetti 1997; Al Snih, Markides, Ostir, Ray & Goodwin 2003; Mendes de Leon, Glass, Beckett, Seeman, Evans & Berkman 1999; Crimmins & Saito 1993) and very few look at course types or disability trajectories that have more than two points in time and more than two levels of disability (Deeg 2005; Nusselder, Looman & Mackenbach 2006). The concentration on the onset of diseases and disability is important for prevention; however, for the prevalence of disability and the provision of health care in an aging society, the progression of an illness and the chances of recovery are relevant factors. This is because even in older ages, the health status of individuals is not just declining. A disease does not necessarily entail further functional decline (Guralnik & Simonsick 1993; Deeg, Kardaun & Fozard 1996; Beckett, Brock, Lemke, Mendes de Leon, Guralnik, Fillenbaum et al. 1996; Crimmins & Saito 1993; Manton 1988). A functional decline may not be gradual, it may rather be non-linear or it may have fluctuating patterns (Hardy, Dubin, Holford & Gill 2005). The factors that cause the onset of disability may be different from the predictors of further progression or recovery (Hoffmann 2006; van Doorslaer & Gerdtham 2003). To gain deeper insights

into the disablement process, it is crucial to understand the heterogeneity of disabled persons by identifying distinct courses of disability.

Two recent studies contribute to the knowledge in this research area (Deeg 2005, Nusselder et al. 2006). Deeg (2005) analyzed the first three cycles of the Longitudinal Aging Study Amsterdam (LASA). This sample included 3,107 persons aged 55-85 at baseline, observed over a period of six years. Eight distinct course types of functional limitation were identified by a cluster analysis. Three of them have death at the end of their trajectory. Functional limitation was measured by three activity items (climbing stairs, cutting one's own toe nails, and the use of one's own or public transportation). Socio-demographic characteristics (sex, age, education, partner, institution) and nine chronic conditions have been found to be predictive factors of these trajectories.
Nusselder et al. (2006) used a longitudinal study of 2,867 Dutch persons aged 15-74. Their study is based on six measurements of disability, observed over a period of six years. They differentiated between nine trajectories of disability, measured with six items of disability. A tenth group included persons who died during follow-up. The trajectories were partly associated with age (but not with sex) and with four chronic diseases: asthma/chronic obstructive pulmonary disease (COPD), heart disease, severe low back complaints, and diabetes mellitus.

Most of the identified trajectory groups are very similar in both studies, e.g. in their relative frequency in the population. This is not surprising and shows that the applicability of the proposed method is valid because the target population of the two studies is very similar despite the differences in the age range: Deeg (2005) used a sample of the population of the Netherlands aged 55-85, and Nusselder used a sample

from Eindhoven and surrounding municipalities aged 15-74, both with a six year follow-up in the 1990s.

Our study for the first time analyzes disability trajectories in Germany (from 1995 to 2001) to show similarities and differences to the pattern revealed by Deeg and Nusselder et al. Our objectives are (1) to identify different course types of disability, (2) to assess their relative frequency in a representative sample of the German population, and (3) to analyze their association with subsequent deaths in the 2005-2005 period. By exploring gender differences in health trajectories, we aim to improve our knowledge of why women live longer but experience worse health, an issue that is the subject of a long series of articles (see e.g., Idler 2003, McIntyre et al. 1999, McIntyre et al. 1996, Molarius & Janson 2002, Case & Paxson 2005, Nusselder & Looman 2004).

The article is structured as follows: the next sections focus on the data and methods used, followed by a presentation of our results. The results section is divided into four parts: first, we perform a cluster analysis of disability trajectories among the survivors from 1995 to 2001; second, we do a similar analysis of persons who died during this period. Third, we present a multinomial logistic regression of risk factors for the survivors and deceased in the same period; fourth, for persons who survived the 1995-2001 period, we use additional information on subsequent mortality between 2002 and 2005. The last section discusses the results of our analyses.

Data

The German Socio-Economic Panel Study started in 1984 in West Germany. A total of 5,921 households, i.e., 12,290 persons aged above 16 were surveyed. In 1990, East Germany was included into the panel, expanding it by 2,179 households and 4,453 persons. The data of the SOEP consist of seven samples. The original samples, introduced at the start of the SOEP, are Sample A "Residents in the FRG" and Sample B "Foreigners in the FRG". In 1990, Sample C was drawn from German residents in the GDR (Haisken-DeNew & Frick 2005). We limit our analysis to Samples A and C.

The German Socio-Economic Panel includes a variety of health and disability questions posed over different time periods. Between 1984 and 1987, in 1992, and between 1995 and 2001 the respondents were asked to answer a question on self-perceived disability: “Not regarding occasional illnesses, is the fulfilment of everyday activities, e.g. in the household, your job or education hindered by your condition of health, and, if so, to what extent?” The question had three possible answer categories: not at all, slightly, to a great extent.

We have chosen to use this variable on self-perceived disability for our analysis because it has been used for a long period of time without interruption or changes in the wording and because it comes closest to the meaning of functional limitation and disability. This means that the disability score used in our analysis has three discrete levels, ranging from 1 to 3. We admit that the concept of functional limitations is not the same as the concept of disability. Not all single functional limitations lead to disability, suffice to mention a limitation that can be outbalanced by a technical device just as glasses are used in remedy of problems in vision. However, the

meaning of disability and functional limitation is similar (Verbrugge & Jette 1994). In the literature important definitions of disability have been developed by Katz et al. (1963), Lawton and Brody (1969), Rosow and Breslau (1966), and Nagi (1976). Functional limitations are less well defined than disability and are denoted and measured as functional status, physical function, and functional competency. Although there are differences in concepts and measurements of disability versus functional limitations, we use the term disability for the status that is measured by the SOEP question above.

We look at the 1995-2000 period, which means that we follow health trajectories of individual respondents over a seven-year period, with seven points in time. In 1995, a total of 3,919 persons in the SOEP were aged 50+. These respondents are divided into three groups: 2,639 respondents who survived until 2001 and have information about their disability level for each of the seven years. A total of 191 persons are excluded. They were part of the 1995 sample and survived to 2001 but have information missing on their disability level. A different set of calculations with these respondents included produced similar results (not shown here).

The second group consists of 497 individuals who died between 1995 and 2001. However, only 165 of them (who died in 1999, 2000 or 2001 and where complete information on health is available) can be analyzed in full detail. This is because at least four health observations (1995-1998) are necessary to calculate the parameters, the latter which are input to the cluster analysis (see below). For each of the three possible years of death, the trajectories of the decedents are analyzed separately; 69 individuals who do not have full health information prior to death are excluded.

Persons who died between 1995 and 1998 are grouped under “immediate death”, regardless of the availability of health information. The third group comprises 592 individuals who were lost to follow up. Table 1 gives an overview of the individuals included, of the persons lost to follow-up, and of the number of deaths.

We also have information on deaths and attrition of the 2002-2005 period. There have been 230 deaths and 314 cases of attrition; these will be used to analyze the subsequent mortality and loss to follow-up after the core observation period.

Method

This paper relies heavily on the methods developed in the two articles authored by Deeg (2005) and Nusselder et al. (2006). A two-step procedure is followed in order to identify similar trajectories of disability among individuals.

First, the level and time course of disability for each respondent is characterized by four aspects: the level, direction, the concavity/convexity, and the variability of the trajectory. We use separate linear regression to asses the four aspects for each individual. The level of disability is defined as the intercept of a linear regression model that regresses the year on the disability outcome. The slope of the model is used to indicate the direction of the change. A positive slope indicates deterioration; a negative one indicates an improvement in disability. The concavity/convexity of the time trend is measured by adding a quadratic term to the equation and by measuring the distance between the quadratic regression curve and the straight linear regression

line. A positive difference indicates a convex shape, a negative one indicates a concave shape. All of the three measures are estimated for the middle of the time period that the individual lived through. The fourth aspect, the variability of the trajectory, is measured by the root mean square error of the quadratic function.

Second, the four aspects are the input variables for a cluster analysis that groups individuals with similar levels and time courses into separate clusters. In order to assure that each of the four aspects influences the cluster analysis equally, we standardize them, using their mean and standard deviation. We perform a hierarchical agglomerative complete linkage cluster analysis based on Euclidian distances. The number of clusters is decided on on the basis of the Calinski-Harabasz pseudo-F statistic. Contrary to earlier studies (Deeg 2005; Nusselder et al. 2006), we treat the stable disability trajectories (stable healthy, stable moderate disability, stable severe disability) separately and do not include them in the cluster analysis. Differently from the study by Nusselder et al. (2006), we use the method of cluster analysis also to identify disability trajectories among the deceased.

Results

1. Trajectories of disability among survivors

Among the survivors of the seven-year period, the cluster analysis identifies eight trajectories in addition to the three stable trajectories of respondents who had no change in their disability level. These trajectories can be divided into three groups according to the number of years spent in disability. The first group (26% of the respondents surviving from 1995 to 2001) comprises all trajectories that are primarily healthy (Figure 1). About 12% remain fully healthy and 4% show a delayed but fast disablement process in the last two to three years of the seven-year period. A total of 2% experience some recovery, followed again by severe disability, and 6 % recover from severe disability.

The second group includes respondents who follow trajectories of moderate disability (38%, Figure 2): a total of 9% have stable moderate disability, 13% experience continuous deterioration to moderate disability and 16 % experience a slight improvement.

The third group (36%) consists of four trajectories that include primarily severe disability. A total of 10% become severely disabled after some moderate improvement and 20 % experience slight deterioration, 2 % experience severe deterioration of health, followed by complete recovery, and about 4 % have a severe disability that is stable.

All groups that experience substantial improvement over the whole or over a part of the observation period combined add up to 25% of those who survived in the 1995-

2001 period. The two most frequent trajectories both start with moderate disability, one slightly deteriorating (20%), the other slightly improving (16%).

Table 2 presents the frequencies for all 11 trajectories and for gender specific differences. At this detailed level, significant gender differences only exist for two trajectories: more men have “stable good health” (17% versus 9%) and more women belong to the cluster “moderate disability, deterioration, stable” (22% versus 18%).

The order of appearance in Table 2 is from favorable to unfavorable health trajectories, measured in terms of the proportion of years spent with moderate and/or severe disability

In principal, the identified trajectories apply over the whole age range above age 50. Therefore we are not able to ascribe certain trajectories to certain distinct age groups. However, different trajectory groups have different frequencies across age groups, shown in Table 3. For the presentation of the results that is to follow, we use the reduced number of three trajectory groups, i.e. not the eleven trajectories originally identified.

Among men aged 50-59 in 1995, a total of 35% follow a healthy trajectory, 33% experience trajectories with moderate disability and 32% have severe disability. This age group has more healthy men than women and more moderately disabled women than men but almost the same proportion of men and women that are severely disabled. The difference between the two sexes is significant at p=0.063. In the next two age groups (60-69 and 79-79), the basic gender pattern remains, and this despite a

general shift from healthy trajectories to trajectories with moderate and severe disabilities. The differences between the two sexes tend to become non-significant. The two sexes differ most at the highest ages (80+): only 7 % of women follow a healthy trajectory compared to 34 % of males. At the same time, 60 % of females but only 25 % of males at these ages experience trajectories of severe disability. Despite the small numbers, the gender differences are significant at p=0.054.

2. The deceased between 1995 and 2001

The analysis of the deceased is separated into two groups of persons: one group, classed as "immediate death", died between 1995 and 1998; the other group survived long enough (at least four years) to allow estimating the four aspects of the level and the time course of the individual health trajectory (see the section on methods). In the latter group, three groups are analyzed separately: those who had their last interview in 1998 and died in 1999 (n=60), those who died in 2000 (n=54), and those who died in 2001 (n=51).

The cluster analysis of the deceased in 1999 identifies three health trajectories in addition to three stable disability courses. The cluster analysis of the deceased from 2000 and 2001 only identified two trajectories each (in addition to three stable disability courses). To summarize the results, we only present the trajectories of persons who died in 2001 (Figure 4). This is because the identified five trajectories "moderate disability, recovery, deterioration" and "moderate disability, deterioration, stable" plus the three stable trajectories are similar in all three years.

Table 4 presents the frequencies for the three stable trajectories and for the two deteriorating trajectories presented in Figure 4. The frequencies are based on all of the three years (1999, 2000 and 2001). The table also includes a very small recovery group that is only found among persons who died in 1999 (not shown in Figure 4). Again, we combined trajectories with generally "moderate" and "severe" disability in order to reduce their number. A slightly greater number of men than women have moderate disability and more women than men have severe disability prior to death. Dying healthy is much more common among men, dying in stable severe disability is more common for women. Less men die during the first four years (immediate death), a fact that can be attributed to the age structure.

Comparing the profiles of the two deteriorating trajectories among the deceased with the health courses among the survivors, we find large similarities with the two trajectories "moderate disability, deterioration, stable" and "moderate disability, recovery, deterioration". We thus give them the same names. Both among the survivors and the deceased, the two trajectories are among the largest trajectory groups.

3. Multinomial regression of the determinants of the trajectories of the survivors and the deceased

The following multinomial logistic regression integrates survivors and deceased persons in one model by calculating the odds ratios for five alternative outcomes. These outcomes are: immediate death, severe disability, moderate disability (for the

deceased), and healthy and moderate disability for the survivors. The reference group are persons who survived whilst being severely disabled.

Women following the healthy trajectories have an odds ratio of 0.83, which implies a 17% lower chance than men to survive healthy instead of surviving with severe disability. The chance to survive healthily declines with increasing age, and high education is associated with better health. No significant gender differences exist for moderate disability versus severe disability whereas the effects of age and education remain significant.

The right column of Table 5 shows that the risk of dying instead of surviving with severe disability increases steeply with age. Being a women substantially reduces the risk of dying: women have a 42% lower risk of dying with moderate disability than men (instead of surviving with severe disability), a 36% lower risk of dying whilst in severe disability, and a 53% lower risk of dying between 1995 and 1998 ("immediate death"). The similar impact of the sex variable on the risk of dying on different disability levels suggests that this impact is relatively independent from the health status. The east/west and partner variables do not have a significant impact on the disability trajectories.

4. Subsequent mortality between 2002 and 2005 of the survivors of the 1995 - 2001 period

Additional data was available for the persons who survived from 1995 to 2001, data that include subsequent death and attrition between 2002 and 2005. It allows for

another multinomial logistic regression, with mortality and attrition as the two possible outcomes. As before, we distinguish between three types of trajectories over the past seven years: “healthy”, “moderate disability”, and “severe disability”. Since we are mainly interested in the mortality difference between men and women for a given disability status, we include an interaction effect between sex and the respective disability trajectory (Table 6).

For both sexes, mortality is highest among those who suffered primarily from severe disability during the last seven years. The mortality disadvantage of persons with severe disability is almost the same for the two sexes. Age and educational gradients in mortality are highly significant and follow the expected direction, i.e. mortality rises with age and low education. There are no significant differences between East and West Germany. Interestingly, attrition does not differ significantly by the past disability trajectory. However, it increases significantly with age.

In a second step, we standardize the interaction effect such that males represent the reference group in each of the disability trajectories, and we run repeated models to estimate the significance of the sex difference within each trajectory (Figure 5). We find that for both moderate and severe disability, women have about half the mortality risk of men. This shows that severe disability compared to moderate disability does not change the gender gap in mortality. Compared to healthy persons, disability seems to increase the mortality difference between men and women: after seven relatively healthy years, the gender gap is smaller and, due to low case numbers, not statistically significant.

Discussion

This study is the first analysis of German data that concentrates on disability trajectories using a large data set (SOEP) that offers a long observation period and many observations per person. We applied a method already used in a similar manner by Deeg (2005) and Nusselder et al. (2006) to identify distinct health trajectories over the seven year observation period. A cluster analysis identified eleven trajectories, which we grouped into three categories according to their average level of disability, i.e. healthy, moderate disability, severe disability. We determined the relative frequency of these three groups and of the eleven single trajectories, using a representative German sample.

The youngest and the oldest age group (50-59 and 80+) have significant gender differences in the distribution across different health groups. We also analyzed mortality within the observation period (1995-2001) and thenafter (2002-2005). The results reveal that deceased persons follow trajectories similar to survivors. As expected, we find higher mortality but lower disability for men. Applying multinomial regression, we find that sex, age, and education have an impact on the disability status and on mortality and that the marital status and East/West German differences exerts an influence that is very small. Table 5 shows that women have a lower mortality level and that this gender difference does not depend on the disability level preceding death.

In the fourth result section we showed that gender does not influence the impact of severe disability on mortality (Table 6) and, more surprisingly, that the level of disability has a slight impact on gender differences in mortality in the opposite direction to what we expected (Figure 5).

One of our purposes was to produce comparable results to earlier studies by Deeg (2005) and Nusselder et al. (2006). Contrary to the study of Deeg (2005), we observed disability scores for each of the seven years. In contrast to Nusselder et al. (2006), we focused solely on the middle-aged and the elderly. However, in terms of the methods applied, we closely followed the approach described in the two studies. Nevertheless, our results are very different. Our study identified eleven course types among survivors of a seven year-period who were aged 50-100 at baseline in the year 1995. Of these, eight course types were identified by cluster analysis, and another three by adding the three stable course types. Deeg and Nusselder et al., by contrast, report five and nine trajectories, respectively. The time path of the trajectories as well as the proportion of the population experiencing a certain disability course are difficult to compare between the three studies. Deeg (2005) as well as Nusselder et al. (2006) assign a large proportion of the population to the category entirely non-disabled: 53% among those aged 55-85 of the Deeg sample compared to 74% of the Nusselder sample, aged 15-74. In our sample (persons aged 50+), however, we only find 14% of individuals who do not have any disability. This may partly be due to the number of measurements used: with seven measurements the chance of always providing an answer in the best health category is smaller than it is with the three measurements used by Deeg (2005), even if the total observation time is very similar in all of the three studies. However, Nusselder et al. have six measurements and their results also show a much higher proportion of stable non-disabled persons (see above). The trajectory of severe disability that is stable is 4% in our study, this compares to 3% in Deeg's sample and between 1 and 2% of the sample used by Nusselder et al.

One explanation for the divergence is the difference in the age range of the study populations. Another possible explanation is the fact that different indicators of disability were used in the three studies. While our study uses a question on being limited in conducting daily activities, a question that has three possible outcomes, Deeg explores whether the respondent had any difficulty with one of the following three tasks: climbing stairs, cutting one's toenails, and using one's own or public transportation. The response categories ranged from 0=no difficulty to 3= not able to perform. Nusselder et al. used answers to 12 disability questions that have response categories similar to those of Deeg, and they calculated the weighted means of the twelve variables by applying the method of principal component analysis.

Our main interest focuses on gender differences in disability. It is a fact that women have a lower general mortality than men and that this is true at almost all ages, in almost all health conditions, and in almost all situations. Although women have a higher life expectancy, they have on average worse health than men, both in terms of self-rated health and functional status (Verbrugge 1984 and 1989; Arber & Ginn 1993; Christensen 2001; Liang et al. 2002). Surprisingly, some research findings suggest that although women have the same probability of contracting illnesses, their overall health status is worse than that of men (Klein 1999). This would imply that they recover less easily from diseases than men. Our results do not support this explanation since we do not find a significant greater number of men in trajectory groups that show the potential to recover. However, our results demonstrated that women have a health disadvantage.

We find that a significantly larger proportion of women follow disadvantaged disability trajectories (Table 3). However, this only applies to the youngest (50-59) and oldest age group (80+). We explain this age pattern by the different timing of disablement and death: women become disabled earlier than men, and this may explain the difference at ages 50-59. Then, men catch up during the disablement process, and this reduces the gender difference in disability at ages 60-79. At the same time, selection is stronger among males than females as males have a higher mortality. The result is that at the highest age group, 80+, many disabled men already died, again improving the average disability status in that group; this, in turn, results in generally better health trajectories. The finding implies that women not only live longer when they have moderate and severe disabilities but also that they start to develop disabilities earlier in life.

It is not yet known why women have a health disadvantage. The health advantage may be due to biological differences, i.e., genetically, men and women have different physical constitutions and different health and mortality trajectories (Christensen 2001). The difference is explained in part by the fact that women have a different self-assessment of their body. They perceive more problems, they have more sorrows, and they are more prone to depression (Delbès & Gaymu 2002: 900ff). As a result, they may be likely to report less serious ailments (Spiers et al. 2003). Women understand their bodies better, they admit to having illnesses more readily (Idler 2003, Verbrugg 1989), and in medical examinations, they rank their health worse than men, they also follow more medical treatments than men (Oakes & Rossi 2003:103), and they generally exhibit better health behavior (Luy & Di Giulio 2005). The following statement nicely captures these gender differences: “Women suffer, men die”. In this

study, we cannot examine further the influence of subjective assessment as we only use a single subjective health measure.

The odds ratios of mortality in Table 6 show that both sexes have the same relative mortality disadvantage when they follow a severe disability trajectory instead of a moderate one preceding death. This finding is supported by Figure 5. It shows that a moderate disability level has no difference in the gender mortality gap compared to a severe disability level. This is surprising because one understanding of the interplay between disability and mortality is that persons who have a higher level of disability are more advanced in the process of disablement, therefore they are closer to death. Other influencing factors, such as sex, should have less of an impact on mortality when a person is already disabled. In other words, we would have expected that the gender gap in mortality narrows with growing disability. However, we find that this is not true and that sex has a strong influence on mortality that is independent and that does not go via the disability status. The gender gap in mortality seems to be even larger when health is worse.

One explanation is that women suffer from different chronic diseases than men. Nusselder and Looman (2004) decomposed differences in health expectancies by cause of death and by cause of disability. They showed that most of the additional years that women spend in disability are caused by disability arising from arthritis, followed by disability that is not attributable to diseases. The two types of diseases largely counterbalance the mortality advantage that women have in terms of heart disease and cancer. The finding is supported by Case and Paxson (2005), who explained gender differences in self-reported health entirely by sex-specific differences in the distribution of chronic diseases. However, the effects of disability in

terms of hospitalization and mortality seem to be more severe for men than they are for women, and this is particularly true for smoking-related causes of death, such as asthma, bronchitis, or emphysema.

Mortality selection is another explanation that may integrate the disparate findings of better health and higher mortality. If men have a higher mortality throughout their life, possibly because they have a different physical constitution or because they play a more stressful role in society (Klein 1999), then it is possible that the average health status of the surviving men is better than that of women because many unhealthy men have already died. While this possibly explains part of the findings, it does not explain all of the health differences between men and women: Table 3 showed that substantial health differences already exist in the age group 50-59, i.e. at a time when the number of men who have died probably is not large enough to change the health composition of the remaining male population.

In summary, our study for the first time explored disability trajectories in Germany. We focused on gender differences in disability, and our valid measurement of disability as a trajectory across seven years confirms the finding that women have higher levels of disability than men. Moreover, we revealed that mortality differences between the two sexes remain the same when we compare moderately and severely disabled persons. We showed that differences in disability trajectories are not the result of differences in the likelihood of recovery but rather stem from an earlier onset of disease and lower mortality among women that have disability. A different distribution of chronic disease together with a higher susceptibility of men who suffer from chronic disease towards mortality explain these differences in disability trajectories.

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Figure 1: Trajectories of survivors who were primarily healthy (26%)

Figure 2: Trajectories of survivors who reported primarily moderate disability (38%)

Figure 3: Trajectories of survivors who reported primarily severe disability (36%)

Figure 4: Disability trajectories of those who died in 2001

Figure 5: Odds ratios of female versus male mortality in 2002-2005 by type of seven-year disability trajectory

Table 1: Sample size and number of deaths and attrition for 1995-2001, deaths and attrition for the follow-up period of 2002-2005

Year	Attrition[a]	Deaths[a]/ Deaths with full information on disability[b]	Persons alive 1995-2001 with full information on disability
Trajectories 1995-2001			
1995		1/	2639
1996	72	93/	2639
1997	92	87/	2639
1998	131	86/	2639
1999	121	86/60	2639
2000	92	75/54	2639
2001	84	69/51	2639
total	592	497/165	2639
2002 -2005 follow-up of survivors			
2002	66	55	
2003	64	53	
2004	88	61	
2005	96	61	
total	314	230	

[a] all cases; [b] all cases with complete health information; health information does not exist for the follow-up

Table 2: Proportions of disability trajectories of survivors during the 1995- 2001 period and of the mortality follow-up 2002-2005.

	Proportion of trajectories among survivors 1995-2001			abs.	% dying in trajectory during follow-up[a] 2002-2005	% attrition in trajectory during follow-up[a] 2002-2005
in %	Men	Women	Total			
Healthy	30	21	26	673	7	12
stable good health	17	9	14	362	6	11
healthy, delayed severe deterioration	4	4	4	113	13	19
recovery from severe disability	6	6	5	142	3	8
recovery, severe deterioration	3	2	2	56	11	16
Moderate disability	36	41	38	1003	8	12
healthy, continuous deterioration	12	14	13	352	11	11
moderate disability, slightly improving	15	17	16	414	7	11
stable moderate disability	9	10	9	237	5	17
Severe disability	35	38	36	963	13	13
moderate disability, deterioration, stable	18	22	20	535	11	12
moderate disability, recovery, deterioration	9	8	10	252	16	16
healthy, severe deterioration and recovery	3	3	2	66	6	11
stable severe disability	5	5	4	110	20	11
Total	100	100	100	2639	10	12

[a] The proportions are weighted by 1995 survey weights

Table 3: Proportion of trajectories by age and gender in 1995

	Men				Women				p-value LR Test
	Healthy	Moderate Disability	Severe Disability	Total	Healthy	Moderate Disability	Severe Disability	Total	
	%	%	%		%	%	%		
50-59	35	33	32	662	28	39	33	634	**0.063**
60-69	25	40	35	373	18	46	36	478	0.104
70-79	18	37	46	141	18	37	45	264	0.684
80+	34	40	25	24	7	33	60	63	**0.054**
total				1200				1439	

The proportions are weighted by 1995 survey weights

Table 4: Proportion of men and women in the trajectory groups of the deceased

		Proportion			Abs.
		Men	Women	Total	Total
Moderate disability		16	12	14	69
	recovery	2	1	1	6
	moderate disability, recovery, deterioration	9	8	8	42
	stable healthy	4	0	2	8
	stable moderate	2	3	3	13
Severe disability		24	25	25	96
	moderate disability, deterioration, stable	17	14	16	53
	stable severe disability	7	11	9	43
Immediate death	*death 1995-1998*	59	63	61	267
total		100	100	100	432

The proportions are weighted by 1995 survey weights

Table 5: Multinomial logistic regression of experiencing a trajectory (reference trajectory: severe disability)

		Survivors		Deceased	
Risk	Reference Group	OR	p-value	OR	p-value
		Healthy		Moderate Disability	
Women	Men	**0.83**	**0.07**	**0.58**	**0.05**
East Germany	West Germany	0.94	0.57	0.77	0.34
Age					
60-69	50-59	**0.56**	**0.00**	**2.42**	**0.01**
70-79		**0.40**	**0.00**	**3.52**	**0.00**
80+		**0.36**	**0.00**	**7.38**	**0.00**
High Education	Low/missing	**2.04**	**0.00**	1.00	0.99
Marital Status					
Single	Married	1.31	0.49	2.97	0.22
Widowed		1.08	0.81	0.69	0.69
Divorced		0.91	0.74	0.70	0.65
Partner	No Partner	0.83	0.51	0.76	0.73
Const.		1.50	0.18	0.06	0.00
		Moderate Disability		Severe Disability	
Women	Men	1.11	0.30	**0.64**	**0.07**
East Germany	West Germany	0.98	0.88	0.97	0.91
Age					
60-69	50-59	0.99	0.93	1.36	0.40
70-79		**0.49**	**0.00**	**5.83**	**0.00**
80+		**0.50**	**0.02**	**13.81**	**0.00**
High Education	Low/missing	**1.39**	**0.04**	0.52	0.23
Marital Status					
Single	Married	**1.96**	**0.08**	1.90	0.42
Widowed		1.19	0.55	1.03	0.97
Divorced		1.14	0.64	1.23	0.72
Partner	No Partner	1.33	0.30	1.23	0.73
Const.		0.73	0.29	0.04	0.00
		Severe Disability (RG)		Immediate Death	
Women	Men	1		**0.47**	**0.00**
East Germany	West Germany	1		1.25	0.16
Age					
60-69	50-59	1		**4.35**	**0.00**
70-79		1		**7.04**	**0.00**
80+		1		**49.53**	**0.00**
High Education	Low/missing	1		1.23	0.44
Marital Status					
Single	Married	1		0.87	0.83
Widowed		1		0.95	0.92
Divorced		1		0.86	0.75
Partner	No Partner	1		0.70	0.44
Const.		1		0.09	0.00

Table 6: Odds ratios of subsequent mortality and attrition for survivors of the 1995-2001 period

	Mortality		Attrition	
	OR	p-value	OR	p-value
Disability trajectories				
Males Healthy	0.75	0.34	1.26	0.34
Males Moderate (RG)	1		1	
Males Severe	**1.59**	**0.05**	1.11	0.68
Females Healthy	1.11	0.74	0.99	0.97
Females Moderate (RG)	1		1	
Females Severe	**1.61**	**0.04**	1.12	0.51
Age				
50-59 (RG)	1		1	
60-69	**2.12**	**0.00**	**1.52**	**0.00**
70-79	**7.12**	**0.00**	**2.84**	**0.00**
80+	**22.17**	**0.00**	**6.24**	**0.00**
Region				
West Germany (RG)	1		1	
East Germany	0.92	0.62	1.02	0.90
Education				
Low (RG)	1			
High	**0.39**	**0.00**	1.03	0.87
Constant	0.03	0.00	0.11	0.00

Figure 1: Trajectories of survivors who were primarily healthy (26%)

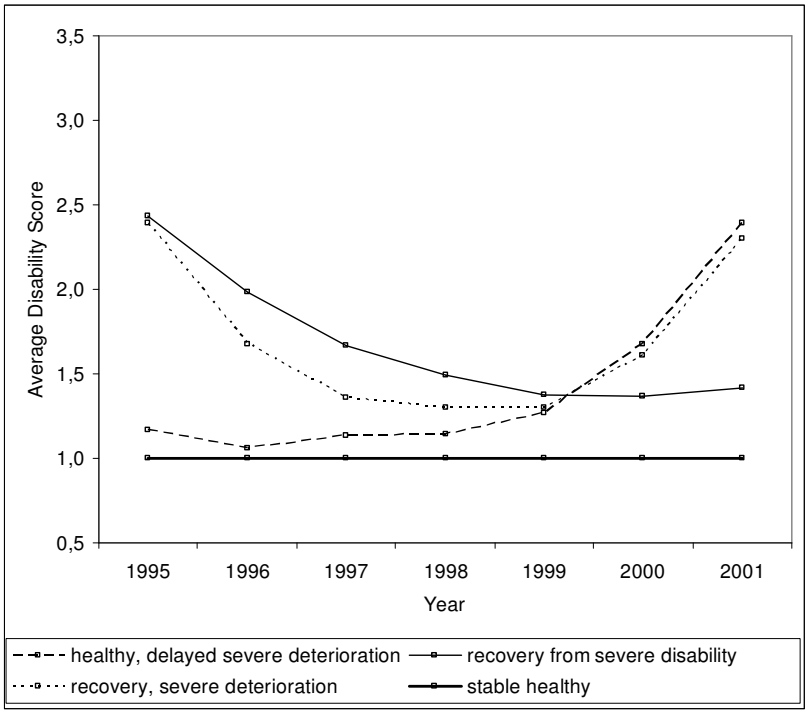

Figure 2: Trajectories of survivors who reported primarily moderate disability (38%)

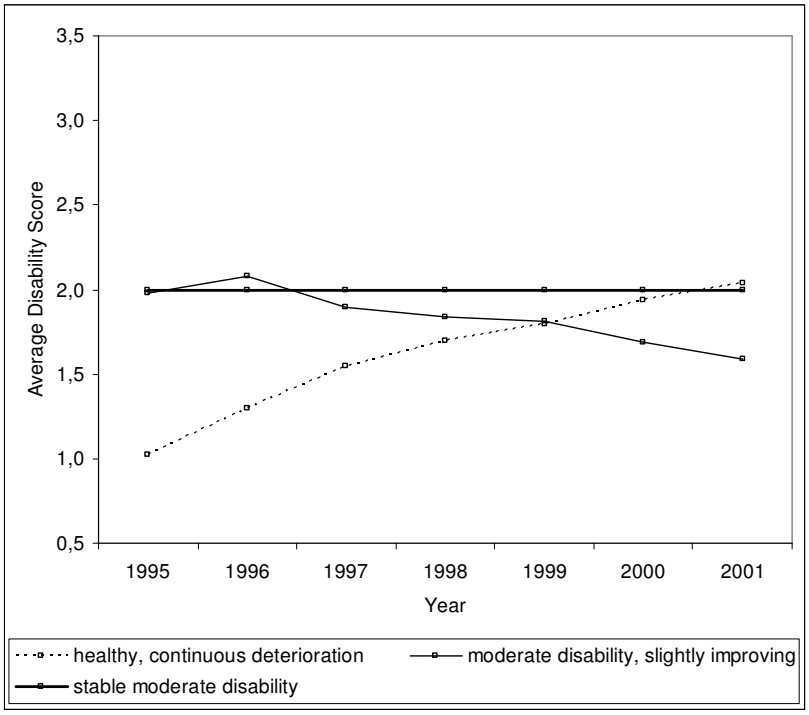

Figure 3: Trajectories of survivors who reported primarily severe disability (36%)

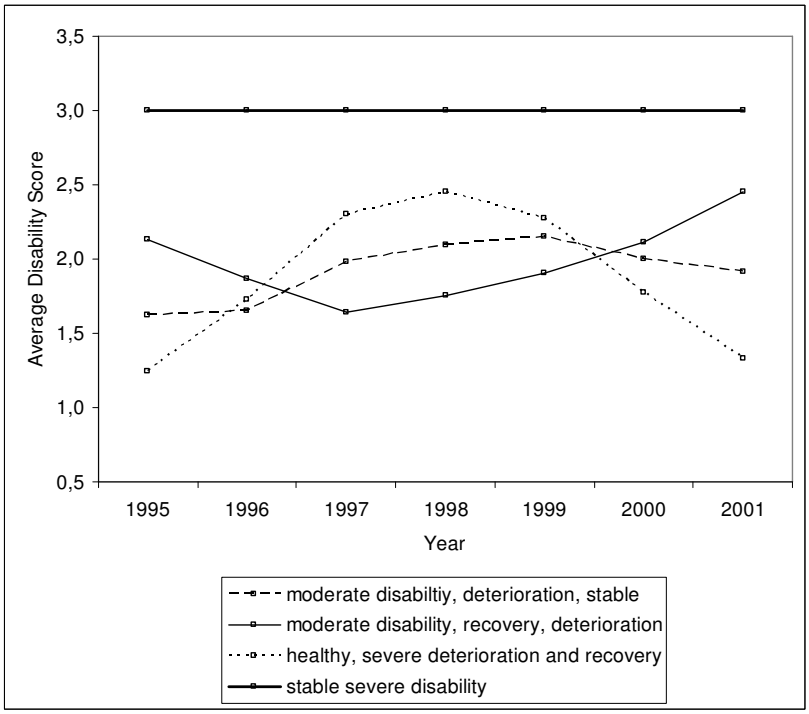

Figure 4: Disability trajectories of those who died in 2001

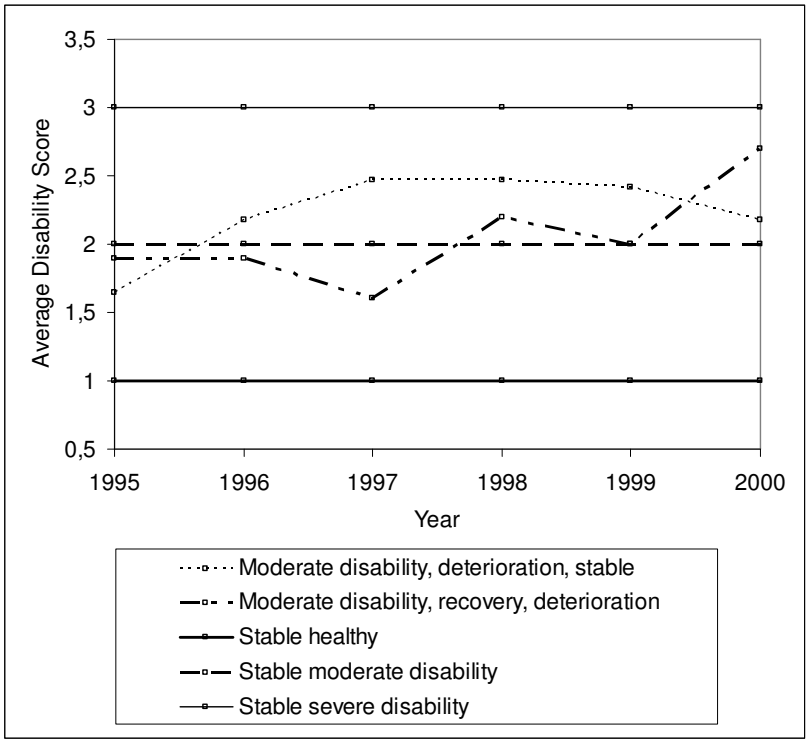

Figure 5: Odds ratios of female versus male mortality in 2002-2005 by type of seven-year disability trajectory