

Rostocker Zentrum zur Erforschung des Demografischen Wandels  
Rostock Center for the Study of Demographic Change  
Konrad-Zuse-Strasse 1 · D-18057 Rostock · Germany  
Tel.: + 49 (0) 381 2081 – 0 · Fax: +49 (0) 381 2081 – 202  
[www.rostockerzentrum.de](http://www.rostockerzentrum.de)

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ROSTOCKER ZENTRUM – DISKUSSIONSPAPIER  
ROSTOCK CENTER – DISCUSSION PAPER

No. 12

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Germany between 1986 and 2005**

Uta Ziegler  
Gabriele Doblhammer

Mai 2007

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**Uta Ziegler**

*University of Rostock*  
[ziegler@demogr.mpg.de](mailto:ziegler@demogr.mpg.de)

**Gabriele Doblhammer**

*University of Rostock and  
Rostock Center for the Study of Demographic Change*  
[doblhammer@rostockerzentrum.de](mailto:doblhammer@rostockerzentrum.de)

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# COHORT CHANGES IN THE INCIDENCE OF CARE NEED IN WEST GERMANY BETWEEN 1986 AND 2005

UTA ZIEGLER\*  
GABRIELE DOBLHAMMER

Rostock, Mai 15, 2007

\*corresponding author, both authors work at:  
University of Rostock  
Wirtschafts-und Sozialwissenschaftliche Fakultät  
Lehrstuhl für empirische Sozialforschung  
Ulmenstrasse 69  
18057 Rostock  
Germany

e-mail: [ziegler@demogr.mpg.de](mailto:ziegler@demogr.mpg.de)  
[doblhammer@rostockerzentrum.de](mailto:doblhammer@rostockerzentrum.de)

tel.: +49-381-4984396  
fax: +49-381-2081498

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## Abstract

Is the increase in the share of the older population in Germany inevitably connected with a parallel increase in frail people? We analyse the development of care need incidence in West Germany between 1986 and 2005 on the basis of longitudinal data from the German Socio-Economic Panel. A lower transition risk into care need exists for each successive cohort when all degrees of care need are taken into account. However, no change occurs if only severe care need is measured.

## Introduction

The German population is aging. Between 2006 and 2050 the share of the population aged 60+ will increase from 24% to 40% and the share of over 80-year-olds will more than triple from 4,6% to 14.6% (Statistisches Bundesamt, 2006). In 1950 this share of people aged 60+ and 80+, respectively, was still 14% and 1.0%. The assumptions from the Statistical Office concerning life expectancy that underlie these projections must be seen as conservative. It is very likely, that the life expectancy in Germany in 2050 is higher than currently assumed (Oeppen and Vaupel, 2002).

Is an increase in the proportion of older people inevitably connected with an increase of frail people? The following three hypotheses have been put forward: the expansion-of-morbidity hypothesis (Gruenberg, 1977; Kramer, 1980; Olshansky et al., 1991; Verbrugge, 1984), the compression-of-morbidity hypothesis (Fries, 1980) and the hypothesis of the dynamic equilibrium (Manton, 1982). No consistent pattern for all countries nor for time could be demonstrated, yet. Recent studies, however, generally draw a positive picture for various countries (Crimmins et al., 1989, 1997; Doblhammer and Kytir, 2001; Robine and Romieu, 1998). For an international review about disability trends among elderly people see e. g.: Jacobzone et al. (2000); Robine et al. (2003); Waidmann and Manton (2000). While Jacobzone et al. (2000) project a compression of morbidity in OECD countries, Robine et al. (2003) also point out, that a redistribution of the levels of disability took place - besides the decrease of the most severe levels, an increase in the prevalence of the less severe levels occurred. This would

rather support the dynamic equilibrium hypothesis from Manton (ibid). For Germany Klein and Unger (1999, 2002) and Unger (2006) show that the increase in life expectancy is accompanied by an increase in disability-free years. This paper explores trends in the incidence of care need in West Germany over the period 1986 to 2005 with data from the German Socio-Economic Panel. From the various disability measurements we chose self-reported care need, because we want to specify people who are dependent on the help of other people. However, we have to be aware that our results might be influenced by political changes regarding care during that time. In April 1995 the Long-Term Care Insurance (LTCI; Social Statutes XI - SGB XI) was introduced in Germany. It allowed payments for home care and from July 1996 also payments for nursing home care. 90% of the German population are covered by this public insurance and about 9% by a private health insurance. Before that time care was primarily the responsibility of the family and only in very severe cases it was covered by the state by tax-money (Theobald, 2004).

## Data and Method

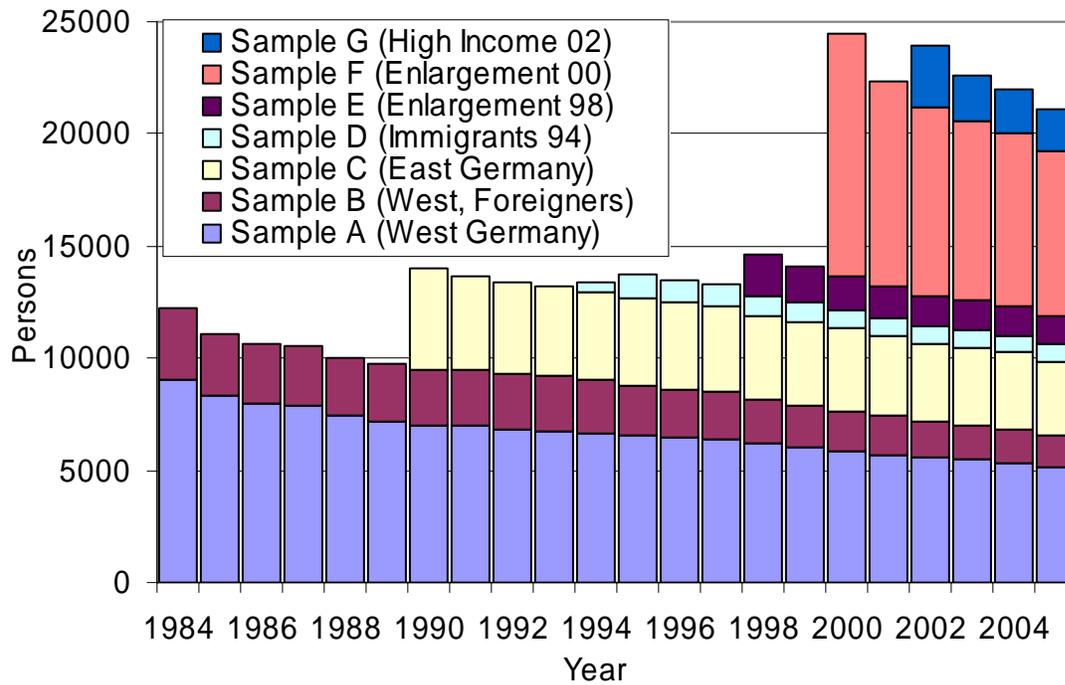
### Data

We use data from the German Socioeconomic Panel (SOEP) to analyse the change in the incidence of care need in West Germany between 1986 and 2005. This yearly panel study started in 1984 in West Germany with 5921 households in which 12290 people above age 16 were surveyed. In 1990 East Germany was included in the panel with 2179 households and 4453 people. The question about self-reported care need is included since 1985 and because we want to analyse the incidence of care need our analysis time starts in 1986. 3,352 persons aged 60+ were observed in the period 1986 to 2005. 1,511 (45%) of them were males and 1,841 (55%) females.

The data from the SOEP consist of seven samples. The original samples that exist since the start of the SOEP are sample A, "residents in the FRG" and sample B "Foreigners in the FRG". In 1990 sample C has been drawn from "German Residents in the GDR". In 1994/95 an "Immigrant" sample was added and to overcome panel attrition new people were included in 1998 (sample E "Refreshment") and 2000 (sample F "Innovation"). Furthermore in 2002

a "High Income Sample" (sample G) was drawn (Haisken-DeNew and Frick, 2002). For the analyses we only use sample A from 1986 until 2005.

Figure 1: Longitudinal development of the Samples A to F in the SOEP



Source: SOEP

Figure 1 displays the graphical distribution of the different samples. In longitudinal data sets panel mortality is an unavoidable problem. Besides natural missings due to deaths there are a lot of losses due to response refusals. These losses from response refusals become problematic if they evolve from systematic non-response. It can be assumed that people in a bad state of health are more often unable or unwilling to answer the interview. However, Unger (2003) does not find significant differences between healthy and disabled people. Furthermore the question about care need is included in the household questionnaire, which means that even for people who do not answer the personal interview the information about care need can be followed if other people live in the household.

Altogether the 3,352 people spent 27,551 person years during the analysis time. We included three time constant and seven time varying covariates in our model. The time constant variables are cohort, sex and education. The cohorts were divided into 5 groups: people born (1) 1893-1905, (2) 1906-1915, (3) 1916-1925, (4) 1926-1935 and (5) 1936-1944. People born in 1945 turn 60 in 2005, however, they cannot enter our data healthy and transit to the unhealthy state in the same year. Thus 1944 is the youngest cohort included. Education was grouped into the categories missing, low education (maximum 8 or 9 years of schooling with no degree or a degree from the Haupt- or Realschule) and middle or high education (middle: 10 years, Realschule or Polytechnical High School (POS); high: at least 12 years of education, Gymnasium or Advanced High School (EOS)). The high proportion of people with no or basic education is not surprising since nearly all people have finished their education before the onset of the expansion of education which started in the 60s (Konietzka, 1999). The time varying variables are income, house-ownership, region, marital status, having a partner or children and the number of persons per household. 'Income' was measured as the imputed yearly post-government personal equivalent income. It was divided into about three equal groups: below 10,000 Euro, between 10,000 and 15,500 Euro and above. For the regional difference the states Hamburg, Schleswig-Holstein, Bremen, Niedersachsen, Nordrhein-Westfalen and Berlin were grouped into the region 'Northwest' and the states Hessen, Rheinland-Pfalz, Saarland, Baden-Württemberg and Bayern belong to the 'Southwest' region. The following table 1 displays how much time (in %) is spent in the corresponding categories for each variable.

Table 1: Person-Years and Time spent in % by Characteristics of the Respondents

Variable	Person-Years	%
<b>Cohort</b>		
1893-1905	665	2%
1906-1915	4,135	15%
1916-1925	9,170	33%
1926-1935	9,772	36%
1936-1944	3,809	14%
<b>Sex</b>		
Male	11,729	43%
Female	15,822	57%
<b>Marital Status</b>		
Married	17,622	64%
Widowed	7,485	27%
Single	966	4%
Divorced	1,478	5%
<b>Partner</b>		
Yes	18,191	66%
No	9,360	34%
<b>Children</b>		
Yes	21,842	79%
No	5,709	21%
<b>Household Size</b>		
1 Person	7,817	28%
2 Persons	15,776	58%
3+ Persons	3,958	14%
<b>Region</b>		
Northwest Germany	12,870	47%
Southwest Germany	14,681	53%
<b>Education</b>		
Missing	712	2%
No/Low Degree	19,455	71%
Medium or High Degree	7,384	27%
<b>Income</b>		
Low	9,439	34%
Middle	10,059	37%
High	8,053	29%
<b>House-Ownership</b>		
House	15,899	58%
Rent	11,652	42%

Source: SOEP, own calculations

The available question to analyse care need in the SOEP is: "Does someone in your household need constant care due to old age or illness?" It is asked since 1985. If yes, 5 grades of care need were differentiated: (1) errands outside the house, (2) running the household (including preparation of meals and drinks), 3) daily tasks in the household, (4) simple personal care (dressing, washing, etc.) or (5) difficult personal care (getting in and out of bed, bowel movement etc.). However, possible answer categories changed over time: from 1985 until 1990 categories 1, 3 and 5, and from 1991 onwards the four categories 1, 2, 4 and 5 were asked.

For the analysis we used all categories together. The changing of the answer categories should have no influence on the analysis because first the general question if care need exists or not is asked.

A disadvantage of the panel is that it only includes private households. We do not have information about people in need of care who live in institutions. This population is different from people in need of care in private households: usually they are older and in more severe care need and have less often a partner or children who could look after them when they need care. Although the institutional population is not included in the SOEP, people who move into an institution are followed. However, this applies only to 7 people of our sample (out of which 4 changed to the care-need status; the results did not change when we excluded them from the analysis). When a proportional sample would be included in the panel, one could explore whether a possible change in the risk of care is caused by a changing composition of private and institutional households. However, the proportion of people in need of care in institutional homes increased only slightly between 1991 and 2005, from 29% to 32%, respectively (Schneekloth et al., 1996; Statistisches Bundesamt, 2007).

## Method

The event studied is the transition into care need which occurs the first time a person states to be in need of care. People are censored when they are lost to follow-up or at the end of the survey period when they are still healthy. Due to the panel structure of the data the cases are left truncated in 1986 for cohorts until 1926. Cohorts who turn 60 after 1986 enter the study in the

year they turn 60. We started in 1986 so we could exclude prevalence cases: people who were already in need of care in 1985.

An event-history analysis is applied to the longitudinal data. To measure the age dependent hazard of care  $\mu_0(x)$  multiplicative intensity-regression models are estimated. The process starts when people are healthy and at least 60 years old. It ends when they either become dependent on care or when they drop out, die or are still healthy at the end of the observation period. To estimate the force of care need at age  $x$  we use a Cox proportional hazard model of the form:

$$\mu(x) = \mu_0(x) * e^{z_1\beta_1+z_2\beta_2+z_s\beta_s} \quad (1)$$

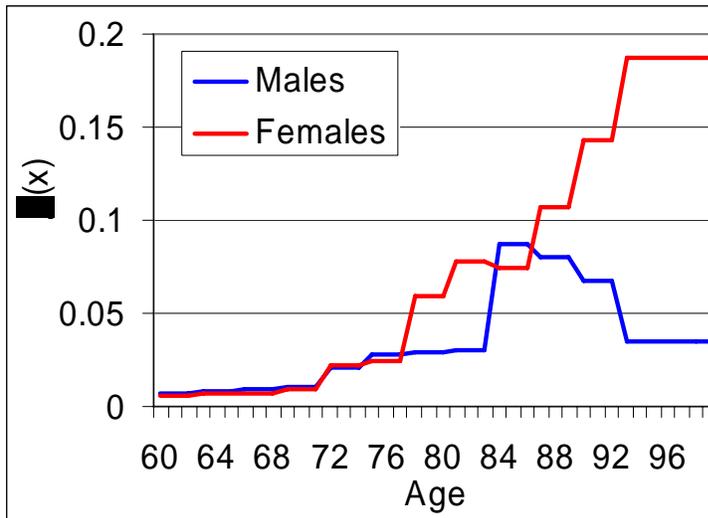
Where  $\mu_0(x)$  is the baseline hazard and  $\beta_i$ , ( $i=1,2,\dots,s$ ) are the parameters of the covariates  $z_i$ . We also tried parametric specifications of the baseline hazard (Weibull, Gompertz), however, in both cases the fit of the model baseline hazard to the empirical hazard is not satisfactory.

The parameters are estimated by maximizing the likelihood function. Survival functions are estimated with Kaplan-Meier survival curves. The differences in the survival function were tested with the log-rank test for equality of survivor functions and the Wilcoxon (Breslow) test.

## Results

The incidence of care need is primarily a function of age (Figure 2) and increases almost exponentially with age. This is true for both sexes up to age 84. Among males, however, the incidence of care need decreases after this age while it still increases among females. The most probable explanation is selection: while women have a higher survival with frailty, men die earlier. The ones who survive until high ages are usually fitter than average and therefore have a lower risk of becoming disabled.

Figure 2: The effect of age on the incidence of care need ( $\mu(x)$ ) (occurrences divided by exposures) in the SOEP data.



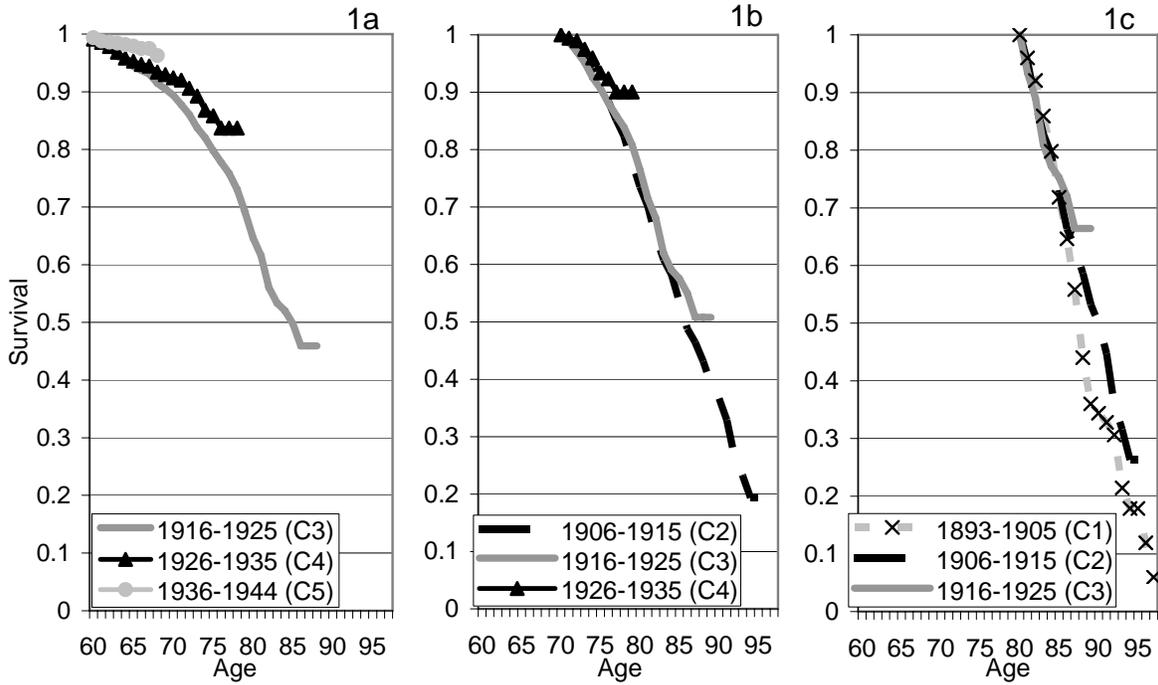
### Kaplan-Meier Survival Function

Between 1986 and 2005, from the 3,352 people followed, 536 declared to have become dependent on care. The most important finding is that the care need risk decreases for each successive cohort. This can be seen in figure 2 for different starting ages. The figure displays the Lexis diagram of the analysed cohorts together with the Kaplan-Meier survival curves. Below each graph is the corresponding Lexis-diagram. They display the age over time each 10-year cohort contributes to the analysis. E. g. in graph A2 cohort 3 (born between 1916 and 1925) are already older than 60 in 1986. When they enter the study in 1986 their age ranges from 60 to 71. In 2005 they are 80 to 90 years old. They are compared with cohorts 4 and 5 who enter age 60 between 1986 and 1995 (C4) and 1996 and 2005 (C5). In graph B2 the same cohort 3 is compared with cohorts 2 and 4. Here the analysis age starts at age 70. Therefore the youngest birth cohort enters in 1986, the others enter age 70 until 1995. In 2005 this cohort is between 80 and 90 years old. In each of the three graphs above the Lexis-diagrams (A1, B1, C1) the survival without care need is displayed for three cohort groups that have the same starting age of 60, 70 and 80 years, respectively. In A1 the youngest cohorts 3, 4 and 5, starting from age 60 can be seen, in B1 the three middle cohorts 2, 3 and 4 from age 70 and in C1 the

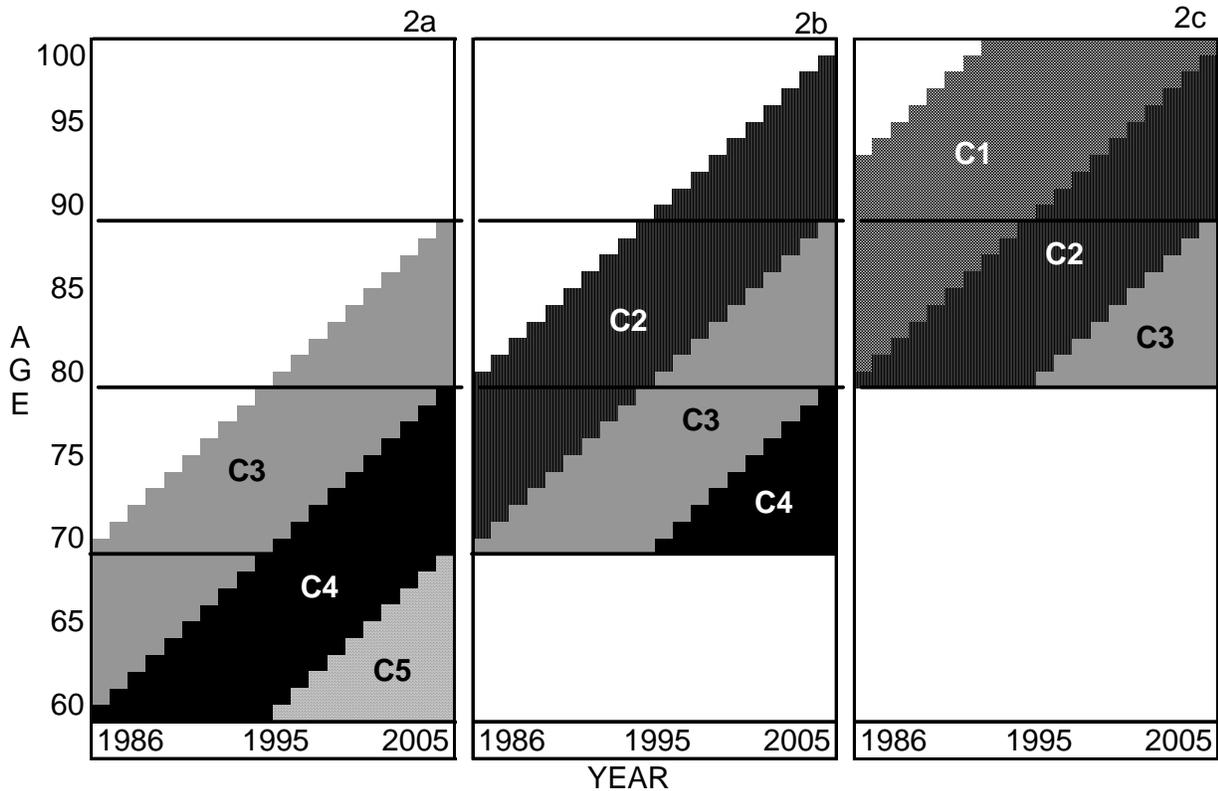
oldest cohorts 1, 2 and 3 from age 80. One can see that until age 80 (graph 1a and 1b) successive cohorts have a better survival without care need which is statistically significant (log-rank test for equality of survivor functions:  $p_{1a}=0.000$   $p_{1b}=0.024$   $p_{1c}=0.391$ ; Wilcoxon (Breslow) test:  $p_{1a}=0.000$   $p_{1b}=0.035$   $p_{1c}=0.662$ ).

Figure 3: Survival Without Care Need for 10-Year Cohorts at Entry Ages 60, 70 and 80

**Survival without Care Need for 10-Year-Cohorts at Entry Ages 60, 70 and 80**



**Ageing of 10-Year-Cohorts Over Time According to Graphs Shown Above**



## Multivariate Survival Model

In Table 2 the results are presented for the multivariate model based on equation 1 when all covariates are included. A strong positive cohort effect can be seen: compared with cohort C4, cohort C3, C2 and C1 have a 41%, 37% and 33% higher risk for care need. Each successive cohort has a lower transition risk (not significant for the oldest cohorts C1). Also the last cohort C5 has a 42% significantly lower risk than C4. Also when cohort is included as a continuous variable (not displayed here) a 1.1% decrease of the risk of care need for each successive birth year is found, however, it is not significant at conventional significance levels ( $p=0.20$ ). In addition to cohort some of the included covariates influence the risk of care need risk. Compared to people with no or low education those with higher education have a 24% significantly ( $p=0.01$ ) lower transition risk. A low income increases the risk by 25% ( $p=0.03$ ) compared to people with medium income. A high income has no significant effect anymore. Living for rent increases the risk by 43% ( $p=0.00$ ) compared to people who live in an own house or flat. Never married have a 29% ( $p=0.33$ ) lower risk, widowed a 1% ( $p=0.96$ ) lower risk but divorced a 22% ( $p=0.53$ ) higher risk than married people. However, since these groups are very small, the results are not significant. More important are the variables partner, children and number of people in the household: Those who live alone have a 35% ( $p=0.16$ ) lower transition risk compared with people who live together with a partner and people with children have a 21% ( $p=0.03$ ) lower risk compared to childless people. The household size is very important: when 2 people live together in one household the risk increases by 60% ( $p=0.00$ ), for 3 and more people by 105% ( $p=0.00$ ) compared to people who live alone. For sex and region no significant difference in the care need transition exists.

Table 2: Relative risk of care for people above age 60 in Germany 1986-2005

	Model 1	p
<b>Cohort</b>		
1888-1905 (C1)	1.33	0.29
1906-1915 (C2)	1.37	0.10
1916-1925 (C3)	1.41	0.02
1926-1935 (C4)	1	
1936-1944 (C5)	0.58	0.07
<b>Sex</b>		
Male	1	
Female	1.10	0.36
<b>Marital Status</b>		
Married	1	
Widowed	0.99	0.96
Single	0.71	0.33
Divorced	1.22	0.53
<b>Partner</b>		
Yes	0.65	0.16
No	1	
<b>Children</b>		
Yes	0.79	0.03
No	1	
<b>Household Size</b>		
1 Person	1	
2 Persons	1.60	0.00
3+ Persons	2.05	0.00
<b>Region</b>		
Northwest Germany	1	
Southwest Germany	1.03	0.70
<b>Education</b>		
Missing	0.64	0.19
No/low Degree	1	
Medium or High Degree	0.76	0.01
<b>Income</b>		
Low	1.25	0.03
Middle	1	
High	1.08	0.53
<b>House-Ownership</b>		
House	1	
Rent	1.43	0.00
"-2 log likelihood	6761.68	

Source: SOEP

In another model (not shown) we calculated the model only with the most severe degree of care need: (5) difficult personal care (getting in and out of bed, bowel movement etc.), which is available for all years. 200 persons transit into this category during the analysis time. However, here we do not find a significant change over time for successive cohorts.

## Discussion

Our study shows a decrease in the risk of care need for younger cohort groups. Controlled for age this means that successive cohorts have a lower transition risk into care need. This is the first study that analyses trends in care need in Germany on the basis of a longitudinal data set. Other trend studies on health in Germany are done by Klein and Unger (2002) and Unger (2006). They use different definitions of disability from the SOEP from 1984 to 1998 and 1984 to 2003, respectively. Dinkel (1999) attests for West Germany an increase in active years between 1978 and 1995 with data from the German Microcensus. All results are consistent showing a positive development regarding active life expectancy, and, thus, support the compression-of-morbidity hypothesis. To exclude the effect of the introduction of the care need insurance (Pflegeversicherungsgesetz (SGB XI)) in the year 1995 and 1996 we calculated another model with different period categories and still found a steady decrease of the transition risk, not only for the referring period. Thus it does not seem to be a policy effect. However, when we only take severe care need into account we do not find a significant change over time. Thus only the less severe care need seems to reduce. This is contradictory to the findings from Robine et al. (2003), who show a decrease of the severe levels of disability and an increase of the less severe levels. However, they look at disability, not care need.

We find an equal transition risk into care need for males and for females. From the literature, however, it is widely known that women spend a higher proportion of their lives in disability. (e.g. Robine et al. (2003); Unger (2003)). This higher prevalence of disability also translates into a higher care need prevalence. Data from the ministry for health and social security and results from a study about care need in private households in Germany (Schneekloth and Leven, 2002) show that in 2002 of the 1.3 million people in need of care at home 64% are women. In the SOEP data the higher prevalence for women is confirmed (Doblhammer and Ziegler, 2006). A higher prevalence, however, does not imply higher incidence rates, since women live longer than men. The literature often supports our results (Leveille et al., 2000), however, a recent meta-analysis shows that more often higher incidence rates for women are found (Doblhammer et al., 2007). Our study shows no difference between the North and the South in West Germany. The assumption was, that differences within the country (e.g. lower unemployment rates in southern Germany and a resulting higher prosperity and a slightly higher life expectancy,

especially in Bayern and Baden-Württemberg) could result in differing transition risks. However, we found no difference between the regions.

We have several variables which control for the socio-economic status: education, income, ownership. All three indicators show a lower transition risk with increasing SES. People with middle or high education, who live in their own house and have a medium income have a significantly 24%, 30% and 19%, respectively, lower risk, compared to people with low education or income or who live for rent. This is consistent with other studies where it is widely acknowledged that higher social class has a positive influence on the health status. (e.g. Doblhammer and Kytir (1999); Klein (1999); Mackenbach et al. (1997); Mielck et al. (2000); Siegrist (1999); Unger (2003)). These social differences appear to be most distinctive between the ages 35 - 64, but are still clearly recognizable in the retired population (Siegrist, 1999). Various reasons account for this fact. Groups with a lower socio-economic status are faced with more financial constraints and therefore worse housing. They have more difficult working conditions, live an unhealthier lifestyle (e.g. smoking, nutrition, alcohol, less exercise) and are exposed more often to socio-economic and psycho-social distress. Other authors also analyze education separately (Klein, 1999; Mackenbach et al., 1997; Unger, 2003). Most importantly, higher education seems to lead to a more conscious awareness of the importance of prevention and health. Healthier lifestyles, a better nutrition, more exercises and a more frequent use of medical checkups can be found among higher educated people, smoking and excessive alcohol use are less prevalent.

Variables to control for the network and the family situation are marital status, the household size, having a partner or children. Our results show no effect of the marital status, a protective effect of partners and children and an increasing risk with a rising number of household members. Compared to people who live alone people who live together with one person or more than one person have a 63% or 128% higher transition risk into care need. Of course here the additional people in the household are no risk factors for care need. Since the SOEP does not include the institutionalized population, the results indicate the opportunity to stay at home with care need when a family network exists that can support the ill person. Old people can live independently as long as they are healthy. If they are in need of care the existence of a partner, children or other relatives determines whether the elderly can rely on private care arrangements

at home, or whether institutional help is needed. This is reflected by the higher risk with a rising number of household members. The spouse is most often the main caregiver and if a person is living alone but has children they are likely to take over this task (e.g. Bundesministerium für Familie, Senioren, Frauen und Jugend (2002); Wagner and Wolf (2001)). This could also be an explanation for the stable risk of severe care need and the decreasing risk for less severe levels. Maybe the supportive situation improved such that the more fragile persons could be more often looked after at home. For the marital status we do not find significant results. They indicate a lower risk for widowed and especially never married people, while divorced people have an increased risk, however, the number of divorced and single people is small. These findings are inconsistent with a large number of studies. Generally marital status differentials in mortality and morbidity show a lower risk for the married compared with the unmarried. The advantage of the married is explained by either a protection hypothesis - married people have a better-ordered life, a healthier lifestyle and more emotional balance and support from the partner (Klein, 1999; Unger, 2003) - or by a selection hypothesis, where healthier people are assumed to have better marriage opportunities (ibid.). Findings from Klein (1999); Klein and Unger (2002); Unger (2003) for Germany do not show a very clear result, but are pointing towards a protection effect of (a longer existing) marriage. Brockmann and Klein (2004) attest both, a selection and a protection effect for married people. Since it is controlled for the number of people in the household, the results for the existence of a child or a partner might be real effects, reflecting the effects described for the marital status. People with a partner or children have a 43% ( $p=0.07$ ) and 19% ( $p=0.04$ ) lower transition risk into care need than people without partner or children. An indirect effect of living with a partner or others may result from the positive influence of social networks, which are crucial in terms of support in case of care need. Analyses show that the social network becomes smaller with increasing age (Wagner and Wolf, 2001) and the proportion of relatives in this network becomes larger.

## Conclusion

Our analyses show a decrease of the transition risk into care need for successive cohorts in West Germany. These findings would confirm the compression-of-morbidity hypothesis, supported by many studies on disability, also for care need in Germany. However, this only regards care need measured with all categories. When only severe care need is measured (category 5: help needed with difficult personal care (getting in and out of bed, bowel movement etc.)) no significant change occurs (not shown here). It is a drawback of the SOEP that it only includes private households. A different selection effect into institutions cannot be excluded. Therefore, further research with the total population, including people who live in institutions, is needed.

There are many factors that influence the transition risk into care need. The family-related variables also show the expected results: people with a partner or with children have a lower transition risk into care need. The SOEP only includes private households, however, the number of people living in the household is controlled for. A rising number of people per household increases the transition risk. Thus, a bigger network on the one hand enables people in bad health to stay at home longer than people who live alone. On the other hand a bigger network also might have a real protective effect against bad health and care need.

Our results show positive effects for all three variables who measure socio-economic status and the overall socio-economic situation has improved for most people. Less financial constraints, better housing, better working conditions, more healthy lifestyles and less socio-economic and psycho-social distress could be the result which leads to better health. Today's elderly increasingly have higher education than previous cohorts. Higher education raises the awareness of the importance of healthy behaviour in the population. Less and less cohorts of men have participated in the war and are thus harmed by an injury. Medical acquisitions have improved the quality of life. These factors make it likely that the care risk has declined due to improved health and, thus, the gained years in life are spent in good health.

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