Trends and Determinants of Severe Cognitive Impairment – Longitudinal Results from the Survey of Health, Ageing and Retirement in Europe (SHARE)

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Introduction

Mental and behavioural disorders represent 4 of the 10 leading causes of disability worldwide and are estimated to account for 12% of the global burden of disease (World Health Organization, 2001). European and Northern American studies show that about one fourth of the population above age 65 is suffering from a mental health problem. About 6% to 10% account for severe dementia and severe functional psychoses (Bickel 2003, Hendrie 1998). The number of sufferers from dementia in the beginning of the 21st century is estimated to about 25 million people worldwide. 46% of them live in Asia, 30% in Europe and 12% in North America (Wimo et al. 2003). A lower number is provided by Eurostat (2003), who estimate for the year 2000 that 4,624 million Europeans (EU25) between ages 30 and 99 suffered from different types of dementia (12.3 per 1000 inhabitants). Due to their higher mean age more women are affected, 2.9 million compared with 1.7 million men. In the year 2006 the number provided by the 'European Community Concerted Action on the Epidemiology and Prevention of Dementia group' (EURODEM) (Alzheimer Europe 2006) already rose to 5.37 million people. In industrialized countries dementia is the fourth most common cause of death after heart diseases, malignant growth and cerebrovascular diseases (Bickel 2003).

With the aging of the population also the fear of a dramatically increasing number of cognitively impaired people increases. Can the slightly positive findings of morbidity – a recent review generally supports the 'dynamic equilibrium' hypothesis that people get older and the proportion of years with bad health stays about the same, but disabilities are less severe (Christensen et al. 2009) – be transferred for cognitive health?

In this article we use data from the Survey of Health, Ageing and Retirement in Europe (SHARE) to analyze a trend in severe cognitive impairment in 11 European countries between the two waves in 2004/5 and 2006/7. Furthermore we look at factors that influence severe cognitive impairment: which determinants exist and can we avoid some of them?

Data and Method

The SHARE (www.share-project.org) is a cross-national panel survey of micro data on health, socio-economic status and social and family networks. More than 40,000 individuals aged 50 or over from 11 European countries participated at the baseline wave

in 2004. Data for the second wave were collected in 2006/07. All countries for which longitudinal analysis is possible are included. The data were restricted to people above age 60. In both waves there are more than 17,000 people who meet the criteria. The target population in the SHARE is usually defined in terms of (private) households and thus the institutionalized population is not included in the baseline except for Denmark and Sweden. However, also in other countries some people in institutions are included but not at random. This is a major drawback of many surveys because the care effort of dementia is very high in the end states of the disease often people have to move into institutions (Hallauer 2002) and therefore the prevalence of dementia and severe cognitive impairment is much higher in institutions than in private households (Jagger 2000, Ruitenberg 2001) and an unknown proportion of people with severe cognitive impairment (SCI) is not included in our analysis.

Several variables exist in the SHARE data that measure the cognitive function. Questions are partly based on the mini-mental-state-examination (MMSE) or the Dementia Detection (DemTect) scale. This is a very detailed battery of cognitive function, however, the diagnosis of dementia has to be ascertained by a medical professional and therefore in this analysis we do not call the worst cognitive status dementia but 'severe cognitive impairment' (SCI). From the five items orientation, numeracy, verbal fluency, recall 1 and recall 2 a new variable 'severe cognitive impairment' (SCI) with a maximum of 18 points is build. The cut-off point for SCI is 7. For a more detailed description of the operationalization of the variables and the data problems (exclusion of the institutionalized population) see Ziegler (forthcoming).

Results

Cross-Sectional Results - Severe Cognitive Impairment in the SHARE Countries

In the first wave 9.9% of all people above age 60 in the 11 European countries have SCI. This proportion decreases to 7.9% in the second wave. The weighted average of the variable 'cognitive function' of all people above age 60 is 13.35 (95% CI: 13.29-13.42) in the first wave, and increases significantly to 13.91 (95% CI: 13.85-13.97) in the second wave. The DemTect scale developed by Kessler et al. (2000) has some different questions, but also 18 points as a maximum. The average score of non-demented people above age 60 was 15.4 (SD 2.1) and the cut-off points were eight for 'possible dementia', 9-12 for 'moderate cognitive impairment' and 13-18 for 'normal cognition'. The average score in the DemTect is higher than the average in this scale and thus the lower cut-off point we use seems justified. Kessler et al. (2000) found in discriminant analyses with a cut-off score of $\geq$11 in the DemTect that 92% of patients and controls were correctly classified.

The country-specific mean values can be seen in table 1. The results, as well as all following results, are age-standardized to ensure that no age effect exists. The Mediterranean countries, especially Spain and Italy, have a lower score of 10 and 11 points, while people in Greece, France and Belgium have average scores of 13 points,

and the other countries reach about 14-15 points. In all countries there is a significant increase in the mean value of the cognitive function in the second wave.

It is difficult to say if the country differences can be interpreted as real differences. Literature reviews about regional differences in dementia prevalence are contradictory and also contradict these results (Ziegler fortcoming). The lower cognitive score, especially in Spain, Italy and Greece, could be influenced by the sampling procedure. People with care needs and cognitive problems are more likely to live with their families in these countries, which increases the chance that they will participate in the SHARE survey. In Northern and Western European countries, they often move into special housing for the elderly, which are not included at random, and therefore a healthier sub-population might be captured. For the descriptive analyses all countries are pooled and thus the differences are neglected. In the multivariate analyses the countries are included as control variables.

Table 1: Mean Scores of Cognitive Impairment above Age 60 in 11 SHARE Countries, Age-Standardized

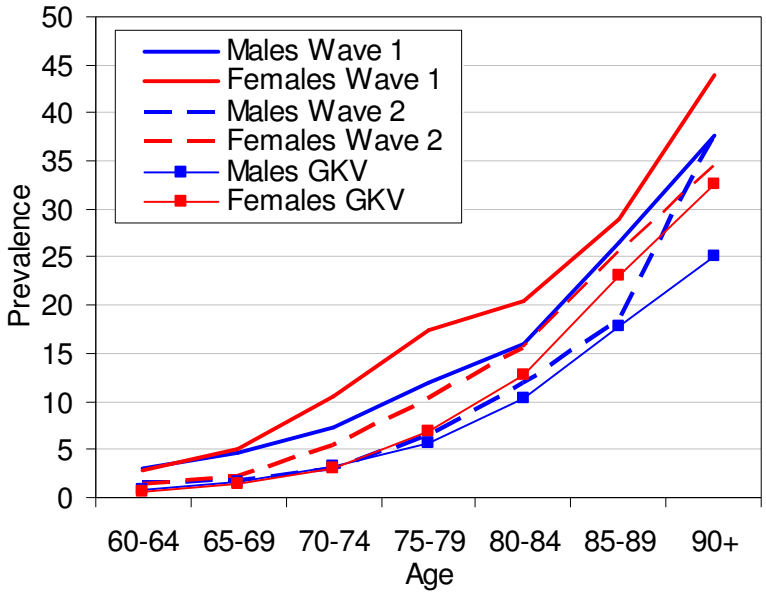
	Wave 1			Wave 2		
Country	Mean	CI -	CI +	Mean	CI -	CI +
Spain	10.04	9.82	10.25	10.54	10.30	10.77
Italy	10.97	10.77	11.16	11.86	11.67	12.04
Greece	12.58	12.41	12.74	13.06	12.90	13.21
France	12.99	12.79	13.18	13.40	13.19	13.60
Belgium	13.31	13.15	13.46	14.07	13.91	14.24
Netherlands	14.02	13.84	14.21	14.68	14.51	14.86
Austria	14.13	13.92	14.34	14.93	14.68	15.18
Germany	14.18	14.01	14.35	14.82	14.65	15.00
Denmark	14.54	14.30	14.78	14.91	14.73	15.09
Switzerland	14.73	14.46	14.99	15.27	15.07	15.48
Sweden	14.76	14.59	14.93	15.29	15.13	15.45

The cognitive status of people living in special housing for the elderly and nursing homes is lower than for the total population; the mean over all countries is about three points lower: 10.28 in wave 1 and 10.65 in wave 2. The mean of the population in private households does not differ significantly from the total population; the numbers of people in institutions provided in the sample are too low to have an impact. The biggest difference is seen for the Netherlands: without the institutionalized population, there is an increase in the mean number of points by 0.37 in the first and 0.24 points in the second wave. All other differences are far smaller.

Determinants of Severe Cognitive Impairment

Many factors influence the prevalence of dementia and SCI, as has been discussed in Ziegler (forthcoming). In the SHARE several variables are included to analyze SCI: age, gender, education, partnership status, number of children, physical health and certain illnesses. Age has shown to be the main risk factor. Our data also shows that people with SCI are on average older: the mean age in wave 1 is 77.7, compared with 71.4 for the total sample, while in wave 2 the mean age is 79.7, compared with 71.6 years for the total sample. The proportion of women is higher in the group of people with SCI compared with the total population. The age-specific prevalence by gender is displayed in figure 1. Results on dementia from the literature and from own analyzes with data from the German Sickness Funds (GKV data) (Ziegler & Doblhammer 2009, Ziegler forthcoming) are confirmed for SCI: the risk increases with age and is higher for females than for males. The level for SCI is higher, which is expected because of the higher total prevalence. The comparison is done to set the prevalence and further down the incidence of SCI in relation with the prevalence and incidence of dementia to see to what extent the results on determinants obtained in this analysis can be assigned for demented people in general.

Figure 1: Prevalence of SCI in 11 SHARE Countries in Comparison with the Prevalence of Dementia in Germany with the GKV Data



The comparison between the waves shows a lower prevalence among both males and females in the second wave over all age groups. Over age 90, there is a wider difference between the women in waves 1 and 2, and a narrowing for males. However, this relationship is inversely to the proportion of the missing cases.

Table 2 shows the distribution of the demographic variables. The groups with SCI and 'missing cognitive status, proxy respondent' (MiP) are significantly older than the total

sample, including many more elderly people over age 75 and fewer below. In the second wave, the age distribution of the two impaired groups seems to be slightly older than in the first wave. In the total sample, the age profile seems to be stable. The proportion of women is higher in the SCI and lower in the MiP group compared with the total population, while living with a partner does not seem to be different between the groups. Maybe men have more often a proxy respondent in case of severe health constraints. Education is differentiated into low and high education for people below and above 13 years of education and training. In the total sample, more people have high education than people in the SCI and MiP groups. There is no clear tendency regarding the number of children.

Table 2: Distribution of Several Demographic Variables in the Two Waves for the Total Sample, the 'Severe Cognitive Impairment' Group and the 'Missing Cognitive Status' Group (in %)

		Total Sample		SCI Group		MIP Group	
		W 1	W 2	W 1	W 2	W 1	W 2
Age	60-64	24.9	24.7	7.2*	5.6*	10.7*	9.4*
	65-69	21.9	21.4	10.7*	6.6*	7.7*	9.7*
	70-74	19.7	18.4	17.8	12.4*	15.8	11.4*
	75-79	15.2	15.5	22.6*	20.5*	15.0	16.3
	80-84	11.1	12.2	20.2*	26.3*	21.3*	18.8*
	85-89	4.8	5.6	12.8*	18.6*	15.1*	21.1*
	90+	2.4	2.1	8.7*	10*	14.4*	13.4*
Gender	Females	56.5	56.0	60.4*	62*	49.1*	52.2*
	Males	43.5	44.0	39.6*	38*	50.9*	47.8*
Education	Low	83.8	82.0	95.6*	97.7*	86.1	89.8*
	High	16.2	18.0	4.4*	2.3*	13.9*	10.2*
Partner	With	60.0	62.8	50.9*	59.9	59.6	66.0
	Without	40.0	37.2	49.1*	40.1*	40.4	34.0*
Children	No	21.4	19.7	19.6*	17.8*	19.2	19.7
	1+	78.6	80.3	80.4	82.2	80.8	80.3

W1=Wave 1, W2=Wave 2
Variables gender, education, partner and children are age-standardized
*Difference to total sample (same wave) is significant on the 5% level

The table shows that there is a large degree of age dependence in belonging to a group. Therefore, in the following, all results are calculated as age-standardized rates. When the variables for this table 2 are age-standardized, there is still a gender effect in the SCI group showing a higher proportion of women than in the total population, of 60.4% (62.0% wave 2), compared with 56.5% (56%). In the MiP group, the proportion is lower, at 49.1% (52.1%). We also find that the effect of low education persists: 95.6% (97.7%

wave 2) of people in the SCI group have low education, while this proportion in the total population is about 83.8% (82.0%), and in the MiP group it is 86.1% (89.8%). Rates of childlessness are about 20% for all groups in both waves. The proportion of people with a partner is about 60% (62.8%) in the total sample, and only 50.9% for the SCI group, but increases to 60.0% in the second wave, or 59.6% (66.0%) for MiP.

General Health Measures

In this section, general physical and mental health measures of the total population and the SCI and the MiP sub-populations are shown. The operationalization and data problems are described in Ziegler (forthcoming).

Generally, we can see in table 3 that people in the groups with SCI and MiP have significantly more health constraints than people in the total sample. People with MiP have even higher constraints than SCI people. For example, 14% of the total sample have an ADL limitation in the first wave. This proportion rises in the SCI group to more than one-fourth (27.9%) and in the MiP group to more than one-third (38.3%). While for the total population all physical health constraints are about stable or even decrease slightly over time, they increase in the two other groups. This finding is in accordance with the item 'health is worse in the second wave', to which a higher proportion in the SCI and MiP groups respond with 'yes'. There is no consistent difference in obesity, but, more importantly, these groups are more likely to have a BMI of less than 18.5, and to suffer from weight loss of at least 10 kilos.

In addition, the mental health of the SCI and MiP populations is worse than in the total population. Depression occurs nearly twice as often in the SCI group and in the MiP group in the second wave. The self-rated QoL and optimism levels are much lower in the SCI group and the participants more often say they are not prepared for the future. Results for the MiP group are unreliable due to a very high number of missing cases, as is also the case for most other mental health questions.

The lifestyle variables smoking, drinking and exercise were included. Current and past smoking does not show clear effects; the proportion of ex-smokers is somewhat lower in the SCI group, but higher in the MiP group. The proportion of people who drink alcohol almost daily is quite high in the total population, or about every fourth person. Except in the first wave for the SCI group, this proportion is a little lower for the SCI group in the second wave and for MiP. Moderate alcohol consumption is lower in the SCI and MiP groups, or about half that of the total population. More than half of the cognitively impaired people in the SCI and MiP groups drank no alcohol at all within the last six months, or only about one-third in the total population (the numbers do not add to 100% because there is another category 'light drinking', which measures drinking one to three times a month). The proportion of people over age 60 doing 'no sports or activities that are vigorous' is only about 50% in the total population and even rises in the SCI and MiP groups. Also moderate activities ('activities requiring a moderate level of energy') are much less common.

Table 3: Health of the Total Population, People with Severe Cognitive Impairment and People with Missing Cognitive Status (Age-Standardized)

		Total Sample		SCI Group		MIP Group	
		W 1	W 2	W 1	W 2	W 1	W 2
Health Behaviour	Current Smoker	14.1	14	15.4	11.4*	7.1*	16.6*
	Ex-Smoker	27.8	28.8	20.4*	18.7*	34.9*	29.9
	Alcohol ≥5/week	26.5	25.6	25.2	17.5*	18.6*	19.6*
	Alcohol 1-4 /week	21.8	22.8	10.0*	8.9*	10.8*	12.8*
	No Alcohol	33.1	32.7	55.5*	63.1*	61.1*	56.1*
	%Often Vigorous Act.	28.1	28.6	14.8*	9.6*	16.0*	10.5*
	No Vigorous Act.	50.3	49	72.1*	75.1*	72.7*	80.2*
	%Often Moderate Act.	66.5	66	48.7*	39.4*	42.1*	32.4*
	No Moderate Act.	15.5	15.2	32.9*	43.2*	37.7*	50.8*
Physical Health	1+ ADL Limitations	14.0	13.4	28.0*	34.4*	38.9*	46.0*
	1+ IADL Limitations	22.7	21.9	43.0*	54.7*	52.3*	60.5*
	Long-Term Illness	54.6	51.4	64.5*	70.2*	74.6*	78.6*
	2+ Chronic Diseases	49.9	47.6	56.9*	61.3*	48.2	54.5*
	Sev. Limited Activities	16.3	16.5	26.5*	34.3*	46.3*	52.1*
	Health 2nd Wave Worse		30.6		51.9*		59.0*
	BMI <18.5	1.7	1.9	2.2*	2.7*	3.4*	7.3*
	BMI ≥30	16.2	17.5	18.1*	22.9*	11.0*	18.4
	Lost Weight (≥10 kg)		4.6		8.0*		15.6*
Mental Health	Depression (EURO-D)	26.9	22.6	50.9*	52.7*	36.4*	49.5*
	QoL Low (CASP-12)	35.0		60.0*		34.5°	
	Optimism Low	36.6	33.2	51.1*	48.8	39.3°	55.2*°
	Future - Not Prepared	9.3	9.3	20.3*	12.7*	13.4*	29.2*°

W1=Wave 1, W2=Wave 2
*Difference to total sample (same wave) is significant on the 5% level.
No data available if cell is empty.
°Large proportion of missing cases

Morbidity

In the following, the prevalence of certain diseases which were diagnosed by a medical doctor within the total and the SCI and MiP populations are examined. Results in table 4 show, that the prevalence is higher for most diseases when people are cognitively impaired, especially cerebral vascular diseases, diabetes mellitus, arthritis or rheumatism and PD, but also heart and chronic lung diseases. The prevalence of cancer and tumours seems to be a little lower in cognitively impaired people.

Table 4: Morbidity of the Total Population, People with Severe Cognitive Impairment and People with Missing Cognitive Status (Age-Standardized)

	Total Sample		SCI Group		MIP Group	
	W 1	W 2	W 1	W 2	W 1	W 2
Heart Problems (+ Attack)	15.7	14.8	17.2*	20.2*	20.1*	23.8*
High Blood Pressure	36.7	39.0	35.9	42.1	30.0*	28.4*
High Blood Cholesterol	20.8	22.1	21.4	24.1*	16.1*	20.8
Cerebral Vasc. D. (+ Stroke)	5.2	4.6	9.1*	11.5*	15.8*	22.9*
Diabetes Mellitus	11.5	12.5	19.2*	20.9*	16.4*	15.3*
Chronic Lung Disease	6.3	6.3	9.1*	9.5*	5.3*	10.4*
Asthma	5.0	4.9	4.8	5.7*	2.6*	2.5*
Arthritis or Rheumatism	23.3	23.9	29.5*	34.7*	20.9*	23.2
Osteoporosis	9.6	10.7	11.1*	11.9*	7.9*	9.0*
Cancer or Malignant Tumor°	6.7	5.0	4.8*	3.0*	7.9*	9.0*
Benign Tumor°		2.5		1.3*		1.0*
Stomach Ulcer°°	6.2	4.0	7.4*	5.5*	4.0*	3.1*
Parkinson's Disease	1.1	1.1	3.0*	3.6*	3.7*	4.6*
Cataracts	12.3	10.6	11.5	8.7*	10.3*	9.3*
Hip or Femoral Fracture	2.8	2.5	3.7*	3.9*	3.7*	4.3*
Other Conditions	16.4		21.7*		24.5*	
Alzheimer's D., Dementia**		2.1		9.4*		20.0*

W1=Wave 1, W2=Wave 2

*Difference to total sample (same wave) is significant on the 5% level.

**'Alzheimer's disease, dementia, organic brain syndrome, senility or any other serious memory impairment': Question was only asked in Wave 2.

°'Benign Tumor' is asked separately in the second wave, which should explain the lower numbers for the category 'Cancer or Malignant Tumor'

°°Stomach, Duodenal or Peptic Ulcer

The prevalence of 'AD, Dementia, Senility', increases in the SCI group to 9.4%, compared with 2.1% in the total population. It increases even more in the MiP group to 20.0%.

Longitudinal Results - Changes in Cognitive Status and Health over Time

For the longitudinal analysis, 11,133 people provide information about changes over time. Figure 2 furthermore shows that the panel attrition rate is 32%, and 2.8% drop out because of death. Panel attrition by country shows that rates range from 20.8% in Greece to 49.0% in Germany.

Often systematic differences exist between these groups relative to the longitudinal group, they differ in their age and gender distribution. The mean age in the group participating in both waves is significantly lower, at 70.0 years, than in wave 1, at 71.7 years. In the two groups, 'Waves 1&2' and 'Attrition' (not including people who died), about 54.4% and 55.2% are females. In the group of people who died, 46.6% are females.

Only 50.6% of people who died lived with a partner, while 68.9% in the attrition group and 68.6% in the longitudinal sample live with a partner.

Figure 2: Sample Composition of the SHARE Data (Ages 60+) in Waves 1 and 2

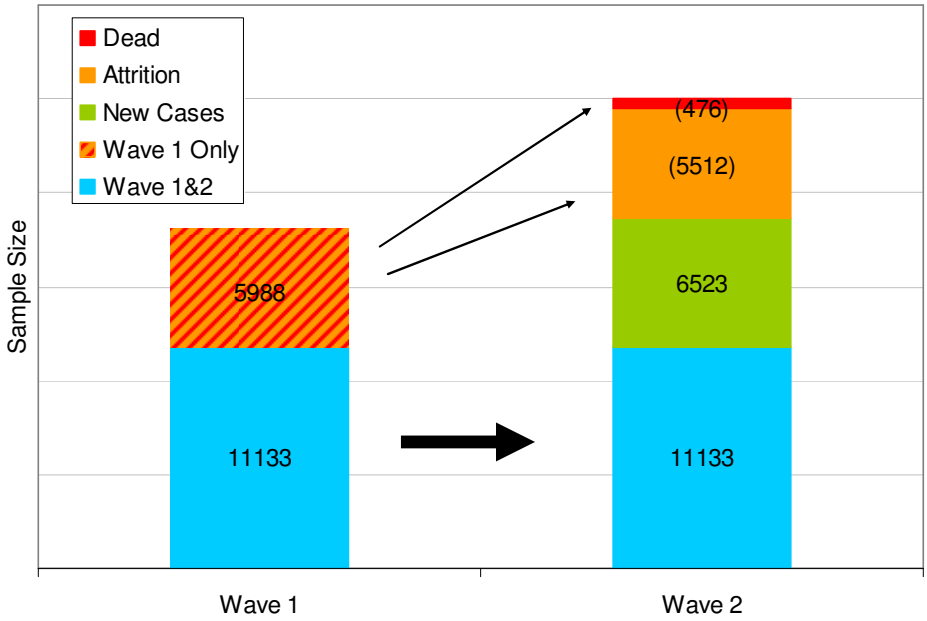


Table 5 shows that regardless of what health definition is examined, people who died are found to have been in worse health. This is also true, but to a lesser and sometimes insignificant degree, for people who only participated in wave 1 and then dropped out for reasons other than death ('attrition'). This is also true for the proportion with SCI; it is much higher for people who died shortly after wave 1, and it is also significantly higher for people who dropped out after wave 1. The mean number of cognitive points decreased for each group. The health behaviour was rated as worse regarding physical activities. Alcohol consumption was lower among people who died, but less difference is seen for people who participated only in wave 1 relative to the longitudinal sample. The proportion of people who were current or ex-smokers is higher in the group of people who died.

Table 5: Proportion of People in Bad Health/with Support Differentiated by Participation in Both Waves, Attrition and Death after Wave 1

		Wave 1&2	Attrition°	Died
Health Behaviour	Current Smoker	13.2	14.2	24.3*
	Ex-Smoker	29.1	27.5	38.1*
	Alcohol ≥5/week	27.7	24.9*	24.6
	Alcohol 1-4 /week	22.5	21.1	17.4
	No Alcohol	31.4	35.4*	45.5*
	No Vigorous Act.	47.1	52.9*	71.5*
	No Moderate Act.	13.0	16.4*	32.3*
Physical Health	1+ ADL Limitations	12.4	13.5	28.2*
	1+ IADL Limitations	19.9	23.6*	40.4*
	Long-Term Illness	53.0	55.9	72.5*
	Sev. Limited Activities	14.4	17.6*	32.7*
	BMI <18.5	1.3	1.6	3.4*
	BMI ≥30	17.4	15.4*	19.6
Mental Health	Severe Cognitive Impairment	8.1	12.0*	18.4*
	Mean Number of Cog. Points	11.2	10.7*	9.6*
	Depression (EURO-D)	25.5	26.9	38.7*
	QoL Low (CASP-12)	34.0	37.0	49.1*
	Optimism Low	35.5	38.6	49.0*
	Future - Feel Not Prepared	8.9	9.2	15.9*

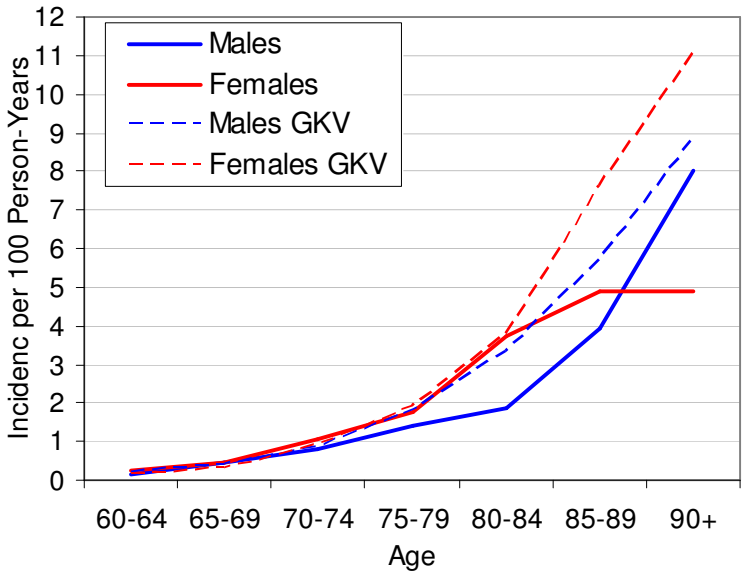
*Difference to wave 1&2 is significant on the 5% level
°Attrition due to other reasons but death

Incident Severe Cognitive Impairment

The strength of longitudinal data are that the same people can be followed and status changes analyzed. This makes it possible to not only look at the prevalence of SCI, but also at the incidence: people without SCI in wave 1 who enter this status group in wave 2. In wave 1, 7.3% of the people in the longitudinal sample have SCI, and in wave 2, 6.1% have SCI. 3.0% of all people had this condition in both waves, from 0.45% with SCI in wave 2 the cognitive status in wave 1 is missing. Substracting the prevalent cases and the missings leads to 2.65% incident cases, a rate of 2.82% over a period of about 2.35 years. If all SCI-missing cases from wave 1 were incident cases, the proportion would rise to 3.30%. Of the incident cases, 72% seem to have been already moderately cognitively impaired in wave 1 with a score of between eight and twelve points. Yearly incidence rates (the average interview time of 2.35 years between the two waves is taken as a calculation basis) show an increase with age in figure 3. It is stronger for women, but stagnates at ages 80-84. For males, the increase starts later but continues steadily.

A comparison with the incidence dementia rates from the GKV data (incidence for women and men above age 60 is 1.63 and 0.93 per 100 person-years) shows just a slightly lower incidence until about ages 75-79 for males and ages 80-84 for females. After these ages, a lower increase occurs for males, and a dispersion takes place among women, with a much stronger increase for females seen in the GKV data. If the missing cases (cognitive status in wave 1 is missing, in wave 2 SCI) were included into the graphs, the trajectories would have had the same pattern on a slightly higher level; e.g., at age 90+ males would have had an incidence of 8.2 cases per 100 person-years, instead of 8.0; and females would have had an incidence of 5.6 cases per 100 person-years instead of 4.9. Since the prevalence of SCI in figure 1 is higher than the prevalence of dementia in the GKV data, the SCI incidence was also expected to be slightly higher. The finding that it is lower might be an underestimation of true cases either because of panel attrition or because of missing answers within the data.

Figure 3: Incidence of SCI in 11 SHARE Countries in Comparison with the Incidence of Dementia in Germany with the GKV Data



Another way to look at cognitive developments is to examine the changes in the number of points. To create this new variable the 18-point scale built for waves 1 and 2 is taken, and the difference between the waves is measured. On average, the cognitive function is not worse in the second wave, as can be seen in figure 4; the mean of the new variable is 0.013, and is not significantly different from zero. Positive values indicate a decrease in the number of cognitive points. The interquartile range is 2.0, 89% of the changes are within four and negative four points. People with no cognitive change (including a one-point decrease to a one-point increase) have the lowest mean age of about 68.8. People with decreasing cognitive function are on average older than people with no change or an improvement: 71.2 years with two to four points, and more than 73 years when a greater decrease happens. Extreme cases are briefly described in Ziegler (forthcoming).

Figure 4: Cognitive Changes between Wave 1 and Wave 2 in the SHARE Data

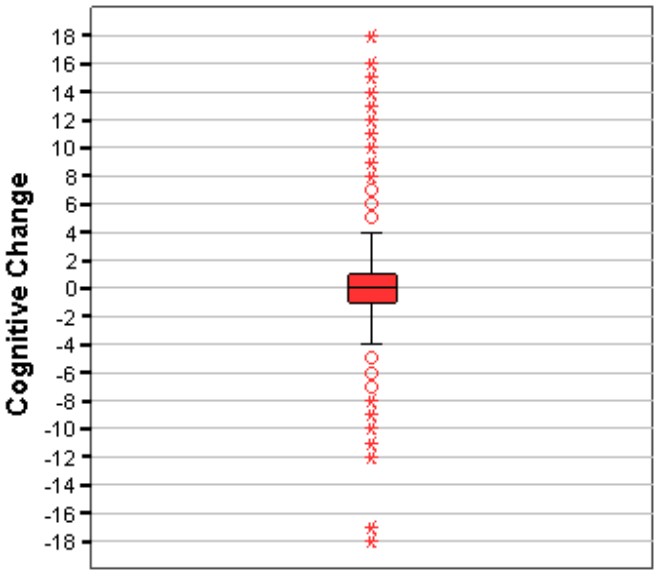


Table 6 shows the changes over time regarding some health behaviours, physical and mental health variables, as well as changes in the partnership status, body weight and living arrangements (i.e., private households or institutions). The first column shows the results for the total population, and the second a comparison with the incident SCI population (2.7%). In column 3 are the results for the group which shows a decrease in cognitive status of at least five points (5.3%).

The first two variables in table 6 below show the living arrangements in private vs. institutional homes, and with/without partner. Large differences can be seen in housing: people in any of the groups with cognitive impairment in columns 2 and 3 are significantly more likely to move into institutions than people from the total population. People with incident SCI or a strong cognitive deterioration are also significantly more likely to live in institutions. Most people live together with a partner, disregarding the cognitive status.

The next four variables show the health behaviour of the population. While in the total population and in the cognitive change group the proportion of non-smokers is just over half, it rises in the SCI group to 68.0%. The chances of stopping smoking between the two waves are non-significantly higher for people with cognitive impairment. They also have lower alcohol consumption and drink less between the waves. Stable 'much moderate activities' are most widespread in the total population. This proportion decreases considerably in all cognitively impaired groups. The decrease in activities between the two waves is strongest in the SCI group. A stable body weight is most

Table 6: Health Behavior, Physical and Mental Health of the Total Population, Incident SCI Population and People with a Deterioration of the Cognitive Status of ≥5+ Points (Proportion in %) (Age-Standardized)

		Total Population	Incidence SCI	Cognitive Change 5+
Housing°	Move into Institution	1.6	4.1*	3.7*
	Services / Nursing	1.1	2.7*	2.4*
	Private Household	96.8	93.2	93.6
	Moved out of Inst.	0.5	0.0	0.3
Partner	Loss of P in W2	2.8	1.8	4.6
	No P Stable	30.7	32.5	31.2
	P Stable	66.0	65.7	63.5
	New P in W2	0.5	-	0.7
Smoking	Smoked Never	56.6	68.0*	59.2
	Current S. (W1&W2)	10.6	8.6	10.0
	Ex-Smoker	28.1	15.7*	23.4*
	Stopped S. in W2	2.8	7.0	5.0
	Started S. in W2	1.7	0.4*	2.2
Alcohol	No A. Stable	23.7	44.8*	29.4*
	Little A. Stable	9.2	3.8 *	5.1 *
	Moderate A. Stable	13.6	5.6 *	8.3 *
	Much A. Stable	19.7	9.9 *	16.7
	Less A. in W2	19.0	23.4	21.6
	More A. in W2	14.9	11.3	17.5
Moderate Activities	No Act. Stable	7.2	21.9*	11.6*
	Moderate A. Stable	7.0	7.5	6.7
	Much Act. Stable	55.2	24.3*	42.8*
	Less Act. in W2	18.2	40.0*	26.5*
	More Act. in W2	12.3	5.1*	11.0
Weight	Loss of >10 Kilo	3.1	6.2*	5.8*
	Loss of 3-10 Kilo	19.1	24.6	23.5
	About Stable	61.9	43.8*	51.1*
	Gain of 3-10 Kilo	13.0	16.3	14.5
	Gain of >10 Kilo	2.8	9.0*	5.1*
ADL	No ADL W1, ADL W2	6.8	21.5*	12.3*
	ADL 1+ Stable	7.1	14.4*	7.8
	No ADL Stable	81.7	58.9*	73.5
	ADL W1, No ADL W2	4.5	5.2	6.4
IADL	No IADL W1, IADL W2	10.7	31.2*	21.2*
	IADL 1+ Stable	12.2	25.1*	15.4
	No IADL Stable	70.6	36.2*	57.0*
	IADL W1, No IADL W2	6.5	7.4	6.4
Limited Activities	W1 no, Sev LA W2	8.8	21.6*	16.1*
	Sev Lim Act Stable	7.6	13.1*	8.3
	No Sev Lim Act Stable	77.4	57.4*	70.0*
	Sev LA W1, No W2	6.2	7.9	5.5
Depression	No D W1, D W2	9.5	19.9*	18.1*
	D Stable	13.4	34.9*	19.2*
	No D Stable	65.5	34.2*	51.8*
	D W1, No D W2	11.7	11.0	10.9

QoL (CASP-12)	High Qol W1	37.5	20.2*	32.6*
	Medium Qol W1	29.2	20.0*	27.4
	Low Qol W1	33.3	59.8*	40.0*
Optimism	High Optimism W1	24.6	13.8*	19.6*
	Medium Optimism W1	40.4	35.6	38.8
	Low Optimism W1	35.0	50.7*	41.6*

*Difference to total population is significant on the 5% level.
° 'Housing with Services for Elderly'. Includes nursing homes in wave 2.

prevalent in the total population. All other groups have a higher loss of body weight, but also a higher proportion of weight gain

Significant differences can be seen for the three physical health variables. A stable condition without ADL, IADL or limited activities is highest within the total population; all other groups have a high stable prevalence of these limitations, and also a high incidence in wave 2. The two groups with proxy interviews are in the worst health state by far.

The situation is similar regarding mental health: the prevalence and incidence of people with depression is significantly higher in the cognitively impaired groups compared with the total population. The self-estimated QoL (only wave 1) and optimism levels in wave 1 are lowest for the SCI group.

Determinants of Incident Severe Cognitive Impairment

So far only descriptive results have been shown. Multivariate analysis can exclude effects that exist between explaining variables. To find out more about the influence of various factors on incident SCI, we have run logistic regressions, which are described in more detail in Ziegler (forthcoming).

Excluded from the analysis were prevalence cases from wave 1 and people with missing information about their cognitive status as well as one person with missing information about ADL and IADL. This left 9,977 people, of whom 295 (2.96%) had an incident SCI in wave 2. Different models are calculated, and the results are displayed in tables 7 and 8. The lifestyle variables from both waves are taken into account to see if the status stayed stable or if it changed.

In table 7, lifestyle factors and illnesses are analyzed. Model 1 shows the effects for age, gender and country. The risk increases strongly with age, but then decreases slightly in the highest age group, or ages 90+. In the first model, women have a significantly higher risk of developing a SCI. Compared with Germany, Sweden, the Netherlands, Denmark, Greece and Switzerland have lower risks, while higher risks are found for Spain and Italy. Meanwhile, Austria, France and Belgium are shown to have roughly the same risk levels as Germany. In the following models, the effects for age persist; regardless of what other variables are included, the risk of developing an SCI is found to increase strongly

with age. For gender, the effect is no longer significant when education is included. When lifestyle variables are included the effect reverses: females have a lower risk, but not significantly so. The fact that the interview involved a proxy respondent is a good indicator that the person has mental difficulties; this effect is especially clear when a proxy person is present in both waves. Education is also shown to have a strong influence, with higher education showing significantly protective effects. Partnership status is not found to have significant effects before living in an institution is controlled for. Meanwhile, the risk of developing incident SCI is shown to increase for people who live alone in both waves, relative to people living with a partner in both waves; however, when other variables are included, the significance vanishes. People who are living in or moving into an institution are found to have a much higher risk of developing incident SCI. Changing body weight is also identified as a risk factor, regardless of whether it is a decrease or an increase. Including lifestyle variables into the model shows a significant improvement of it. The findings indicate, for example, that ex-smokers have a significantly lower risk compared with people who never smoked, and that people who did not drink alcohol within the last six months before the interview in both waves had a significantly higher risk than moderate drinkers (about three to four times a week). Doing no moderate activities ('activities that require a low or moderate level of energy, such as gardening, cleaning the car, or taking a walk'), or decreasing the level of activity between the two waves, is found to increase the risk. Some illnesses in wave 1 are shown to increase the risk of incident SCI: high blood pressure sufferers who had a stroke, diabetes, chronic lung disease and asthma have an increased risk, and people with cataracts have a lower risk. The effects for stroke and diabetes become less significant when lifestyle factors are controlled for.

Table 7: Logistic Regression Results for Determinants of Incident SCI – Health Behaviour and Illnesses

		Model 1		Model 2		Model 3		Model 4		Model 5	
		Exp(B)	Sig.	Exp(B)	Sig.	Exp(B)	Sig.	Exp(B)	Sig.	Exp(B)	Sig.
Age	60-64	1		1		1		1		1	
	65-69	2.43	0.00	2.28	0.00	2.15	0.01	2.25	0.00	2.17	0.00
	70-74	3.69	0.00	3.10	0.00	2.74	0.00	3.06	0.00	2.77	0.00
	75-79	8.51	0.00	7.27	0.00	5.99	0.00	7.38	0.00	6.35	0.00
	80-84	16.34	0.00	11.79	0.00	8.92	0.00	11.78	0.00	9.54	0.00
	85-89	37.93	0.00	24.52	0.00	17.49	0.00	24.96	0.00	18.71	0.00
	90+	25.58	0.00	12.63	0.00	8.02	0.00	13.20	0.00	8.81	0.00
Gender	Males	1		1		1		1		1	
	Females	1.38	0.01	1.11	0.48	0.77	0.12	1.16	0.33	0.79	0.18
Country	Germany	1		1		1		1		1	
	Austria	0.80	0.49	0.75	0.38	0.67	0.24	0.78	0.46	0.69	0.28
	Sweden	0.35	0.00	0.35	0.00	0.44	0.03	0.39	0.01	0.49	0.05
	Netherlands	0.49	0.04	0.38	0.01	0.42	0.02	0.38	0.01	0.42	0.02
	Spain	3.78	0.00	3.31	0.00	2.72	0.00	3.51	0.00	2.91	0.00
	Italy	2.13	0.00	1.69	0.06	1.55	0.14	1.68	0.07	1.59	0.12
	France	0.99	0.97	0.90	0.71	1.03	0.92	0.91	0.76	1.06	0.84
	Denmark	0.50	0.05	0.42	0.02	0.57	0.15	0.44	0.03	0.59	0.19
	Greece	0.53	0.05	0.48	0.03	0.45	0.02	0.49	0.03	0.45	0.02
	Switzerland	0.32	0.02	0.26	0.01	0.38	0.08	0.29	0.02	0.40	0.09
	Belgium	0.66	0.14	0.65	0.14	0.75	0.33	0.67	0.16	0.75	0.32
Proxy	No Proxy			1		1		1		1	
	P in W1			2.66	0.07	2.48	0.10	2.45	0.10	2.32	0.13
	P in W2			10.29	0.00	7.42	0.00	9.74	0.00	7.08	0.00
	P in W1&W2			22.24	0.00	17.50	0.00	22.14	0.00	17.37	0.00
Education	Low			1		1		1		1	
	High			0.16	0.00	0.19	0.00	0.17	0.00	0.19	0.00
	Missing			0.64	0.66	0.62	0.64	0.63	0.65	0.63	0.66
Partner	Partner			1		1		1		1	
	Partner Loss			0.79	0.52	0.64	0.25	0.79	0.54	0.65	0.26
	No Partner			1.39	0.06	1.20	0.30	1.39	0.06	1.23	0.25
	New Partner			0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
Institution	Private HH			1		1		1		1	
	Move into I			5.08	0.00	4.12	0.00	4.68	0.00	3.99	0.00
	Live in I			4.75	0.00	4.11	0.00	4.25	0.00	3.87	0.01
	Move out of I			0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
	Missing			1.60	0.00	1.47	0.02	1.58	0.00	1.46	0.02
Weight	Stable					1				1	
	>-10 kg					1.94	0.02			1.92	0.02
	-10 to -3 kg					1.33	0.09			1.35	0.07
	3 to 10 kg					1.49	0.04			1.47	0.05
	>10 kg					1.80	0.05			1.71	0.08
	Missing					2.01	0.06			2.05	0.05
Smoking	Never					1				1	
	Stopped					1.15	0.73			1.24	0.59
	Ex Smoker					0.72	0.08			0.68	0.05
	Current					1.00	1.00			0.96	0.87
	Started					0.56	0.44			0.62	0.52
Drinking	Moderate					1				1	
	No					2.15	0.02			2.07	0.02
	Rarely					0.83	0.65			0.81	0.62
	Often					0.73	0.39			0.71	0.35

	Decrease					1.45	0.25			1.43	0.27
	Increase					1.09	0.80			1.06	0.87
	Missing					5.69	0.76			5.32	0.79
Activity	High					1				1	
	No					2.82	0.00			2.68	0.00
	Moderate					1.54	0.13			1.55	0.13
	Less					2.22	0.00			2.18	0.00
	More					1.03	0.92			0.99	0.95
	Missing					0.50	0.91			0.48	0.91
Illnesses[§]	Heart Attack							0.93	0.67	0.84	0.34
	High Bl. Pres.							1		1	
	High Bl. Chol.							0.88	0.44	0.96	0.82
	Stroke							1.78	0.02	1.51	0.10
	Diabetes							1.43	0.05	1.20	0.32
	Chron.Lung D.							1.71	0.01	1.69	0.02
	Asthma							0.55	0.09	0.47	0.04
	Arthritis							1.12	0.44	1.08	0.62
	Osteoporosis							1.05	0.82	1.00	0.99
	Cancer							1.17	0.52	1.20	0.48
	Stomach Ulcer							1.24	0.36	1.31	0.26
	Parkinson D.							1.98	0.24	1.73	0.35
	Cataracts							0.67	0.04	0.66	0.04
	Hip Fracture							1.12	0.72	1.15	0.66
	No Illness							0.95	0.80	0.99	0.98
Constant		0.006	0.00	0.006	0.00	0.005	0.00	0.006	0.00	0.004	0.00
-2 Log-Likelihood		2248.7		2078.2		1971.5		2051.9		1950.7	
Nagelkerkes R-Square		0.172		0.242		0.285		0.252		0.293	

***p≤0.001, **p≤0.01, *p≤0.05, °p≤0.1

[§] 1. A heart attack including myocardial infarction or coronary thrombosis or any other heart problem including congestive heart failure
2. High blood pressure or hypertension
3. High blood cholesterol
4. A stroke or cerebral vascular disease
5. Diabetes or high blood sugar
6. Chronic lung disease, such as chronic bronchitis or emphysema
7. Asthma
8. Arthritis, including osteoarthritis or rheumatism
9. Osteoporosis
10. Cancer or malignant tumor, including leukaemia or lymphoma, but excluding minor skin cancers
11. Stomach or duodenal ulcer, peptic ulcer
12. Parkinson's disease
13. Cataracts
14. Hip fracture or femoral fracture
15. None

In table 8, the influence of subjective and objective physical and mental health measures is analyzed. While constraints in ADL do not show a significant effect, people with IADL – regardless of whether these are persistent, new or only reported in wave 1 – have a higher risk of incident SCI. Having severe limitations in activities in both waves, or only in wave 2, is also shown to increase the risk. Mental problems have an influence on incident SCI: people with a stable depression and an incident depression in wave 2 have a higher risk compared with people without depression. A low QoL estimation also

Table 8: Logistic Regression Results for Determinants of Incident SCI - Physical and Mental Health

		Model 6		Model 7	
		Exp(B)	Sig.	Exp(B)	Sig.
Age	60-64	1		1	
	65-69	2.04	0.01	2.05	0.01
	70-74	2.45	0.00	2.42	0.00
	75-79	5.18	0.00	5.02	0.00
	80-84	7.28	0.00	7.17	0.00
	85-89	13.69	0.00	13.62	0.00
	90+	6.86	0.00	6.90	0.00
Gender	Males	1		1	
	Females	0.96	0.80	0.87	0.34
Country	Germany	1		1	
	Austria	0.73	0.35	0.78	0.47
	Sweden	0.39	0.01	0.41	0.01
	Netherlands	0.42	0.02	0.43	0.02
	Spain	3.81	0.00	3.28	0.00
	Italy	1.68	0.07	1.29	0.38
	France	0.92	0.77	0.73	0.29
	Denmark	0.42	0.03	0.44	0.04
	Greece	0.53	0.06	0.48	0.03
	Switzerland	0.29	0.02	0.32	0.04
	Belgium	0.67	0.17	0.63	0.12
Proxy	No Proxy	1		1	
	P in W1	2.25	0.14	2.20	0.16
	P in W2	6.96	0.00	7.16	0.00
	P in W1&W2	13.80	0.00	22.47	0.00
Education	Low	1		1	
	High	0.18	0.00	0.19	0.00
	Missing	0.71	0.74	0.71	0.74
Partner	Partner Loss	0.63	0.24	0.53	0.10
	No Partner	1.28	0.16	1.28	0.17
	Partner	1		1	
	New Partner	0.00	1.00	0.00	1.00
Institution	Private HH	1		1	
	Move in	4.05	0.00	4.23	0.00
	Live in I	4.21	0.00	4.00	0.00
	Move out	0.00	1.00	0.00	1.00
	Missing	1.57	0.00	1.54	0.01
ADL	No ADL stable	1		1	
	New ADL in W2	1.34	0.14	1.16	0.45
	ADL stable	0.88	0.59	0.75	0.22
	ADL only W1	1.03	0.90	0.96	0.88
IADL	No IADL stable	1		1	
	New IADL in W2	2.90	0.00	2.52	0.00
	IADL stable	3.43	0.00	2.90	0.00
	IADL only W1	1.71	0.04	1.60	0.07
Lim Act.	No Lim. stable	1		1	
	New Lim. W2	1.63	0.01	1.39	0.10
	Lim. Stable	1.57	0.04	1.24	0.35
	Lim. only W1	1.00	0.99	0.86	0.57
Depression	No Depr. Stable			1	
	New Depr. W2			2.31	0.00
	Depr. stable			2.33	0.00

	Depr. only W1			1.12	0.62
	Missing			2.77	0.21
CASP 12	High			1	
	Medium			1.00	0.99
	Low			1.49	0.10
	Missing			1.77	0.01
Constant		0.00	0.00	0.00	0.00
-2 Log-Likelihood		1976.8		1930.3	
Nagelkerkes R-Quadrat		0.28		0.30	

***p≤0.001, **p≤0.01, *p≤0.05, °p≤0.1

increases the risk (borderline significance). The number of missing cases is very high for this variable. Inclusion of the 'optimism' variable did not improve the model, and is therefore excluded.

Discussion

We examined determinants and trends of SCI of people above age 60 in Europe. The basis for analysis is a European longitudinal sample from 11 countries with more than 17,000 people in each wave cross-sectional, and more than 11,000 people for a longitudinal analysis.

The SHARE provides a detailed questionnaire on cognitive function from which a new variable ‘cognitive function' with a scale of 18 possible points is created. A final diagnosis of dementia requires further professional examination and therefore the worst cognitive status, measured when seven or fewer points are gained, is called SCI. It is nevertheless assumed that the SCI group reflects or at least comprises demented people.

Generally, all results could be influenced by a non-random sample, as has been described above. Furthermore, the results could be influenced by missing cases from participating people: for some people, the cognitive status variable could not be created due to missing answers in one or both waves. Additional analyses (not shown, see Ziegler (forthcoming)) show that people with missing cognitive status, with a proxy interview in wave 2 or in both waves even have worse physical and mental health and lifestyles. Thus, the results presumably underestimate the true risk of bad health and bad lifestyle on incident SCI.

When seven points are taken as the cut-off, the self-defined prevalence of SCI in the first wave 2004 for the 11 European countries is slightly higher than the prevalence of dementia in Germany in 2002, as calculated using the GKV data. It decreases in the second wave, narrowing to the prevalence of the GKV data. The better cognitive status in the second wave could be a true effect, but it could also be influenced by a learning effect. In the second wave, most respondents are already familiar with the test (Rodgers et al. 2003, Freedman et al. 2002). The longitudinal results between 2004/05 and 2006/07 could indicate slight cognitive improvements, but they have to be interpreted with caution.

The higher prevalence of SCI in the SHARE data compared with dementia prevalence in the GKV data results from the use of a different definition, in which more cases are included in the SCI group who might not be severely demented, but who are more moderately impaired. If the SCI variable were to reflect dementia more closely, we would expect to find a lower prevalence in the SHARE because of the exclusion of the institutionalized population. Dementia and SCI prevalence are much higher in institutions, as has been described above, which makes it most probable that there is an underestimation of SCI in the total population with the SHARE data.

The same fact might be responsible for the country differences: the higher proportion of the elderly population who are institutionalized in Northern European countries (Börsch-Supan et al. 2005, Gaymu et al. 2006, Doblhammer and Ziegler 2006, Iacovou 2000) could lead to a lower prevalence of SCI in the population living in private households, if people with SCI were to move more often to institutions. In the data, a low degree of inclusion of institutionalized people thus leads to an overestimation of the mean cognitive points. Southern European countries, where people in need of care are more often looked after in the family (Börsch-Supan et al. 2005, Gierveld et al. 2001, Tomassini et al. 2004), would then have a lower mean in cognitive function. If table 1 is compared with the institutionalization rates Ziegler (forthcoming) shows, this statement seems confirmed for Southern European countries: Spain, Italy and Greece are among the countries with the lowest institutionalization rates, and they also have the lowest mean in cognitive function. However, France also has a comparatively low mean, and some of the other countries with higher institutionalization rates do not vary greatly in the mean point of cognitive function – e.g., Austria, Germany, Netherlands, Denmark, and Switzerland – but they do vary in the proportions of the population in institutions, with Sweden, Netherlands and Denmark having the highest proportions. If the population in institutions is excluded from the analysis, the mean number of points does not increase significantly, except in the Netherlands. Thus, the country differences, with higher points seen in Central and Northern Europe might be less pronounced when institutional settings are considered, but they still seem to exist. No final conclusion regarding the cognitive status within Europe can be drawn. With the SHARE we find a lower cognitive status in Southern Europe, literature results (Ziegler forthcoming) show contradictory results.

Some people did not answer the part 'cognitive functioning' in the questionnaire. A closer look at this group revealed that these missing cases were not random. The people were older and were much more likely to have help in answering the interview questions, or to have problems understanding the questions, and were therefore taken as an extra group. If these missing cases resulted from not understanding and not being able to answer the questions due to low cognitive functioning, the true number of SCI would be underestimated. These assumptions are affirmed in table 4, where the proportion of people with AD is highest in the MiP group, at 20.0%. By contrast, the proportion is 2.1% in the total population, and 9.4% in the SCI population.

The results confirm determinants of prevalent SCI shown in the literature review in Ziegler (forthcoming). First, SCI is found to increase strongly with age. The prevalence

above age 90 is about 45% for males and 54% for females in wave 1, and 47% and 43% in wave 2. Results from the logistic regression show a decrease in the oldest age group of 90+. This could again be an effect of the under-representation of the institutionalized population: the most severe cases occur at the oldest ages, when institutionalization is also highest. Attrition, especially of the less healthy people, is also highest at these ages and therefore the true risk might be higher in this age group.

The cross-sectional results in table 2 and the logistic regression results in table 7, model 1 controlling for age and country show a higher prevalence for females than for males. But the gender effect vanishes when more variables are included into the regression. Institutionalization plays an important role: elderly women are more likely to live alone, which itself is a risk factor. However, living alone is also a risk factor for attrition when bad health occurs, which should decrease the risk in the model. But when institutionalization is controlled for, the effect of loneliness without a partner seems to be stronger. The risk for women is even lower than for men when lifestyle variables are included. Women seem to have a healthier lifestyle, which decreases their risk. It is not significant in the models shown, but in a model in which all the variables were included at the same time (not shown, most other variables do not change, -2 Log-Likelihood=1852.9, R-Square=0.332) it would be 34% lower (p=0.02).

People with SCI problems are more likely to move into institutions than people without these. The differences between Northern/Western and Southern Europe can be explained with cultural differences towards family ties, but, in general, moving into an institution is more likely for people without a spouse or a child, especially when a care need exists (Börsch-Supan et al. 2005). This fact should also lead to a gender imbalance, since more elderly women today live without a partner. We find, however, about the same proportion of women in the two groups 'participation only in wave 1' and 'participation in waves 1&2'. A selection effect already seen in the first wave of fewer single women could account for this fact. In addition, the risk of developing incident SCI is much higher for people with a proxy respondent during the interview, and for people who live in or move into institutions, which was expected given other literature findings.

Results regarding the health of people with SCI and MiP also confirm general findings in the literature. Many studies have found a correlation between mental health and cognitive functioning (see Ziegler (forthcoming)) which is confirmed here. Optimism levels and felt QoL are lower in people with SCI and MiP, and they feel less prepared for the future. This is no surprise if people know about their diagnosis and about the progressive, currently untreatable course of the disease, and taking into account the accompanying symptoms and diseases, such as depression. The prevalence of depression is found here to be higher in people with SCI and MiP and confirms literature results. Depression is also confirmed as a risk factor for incident SCI, but since a persistent as well as a new depression show increased risks, the causality cannot be determined. People who rate their QoL (CASP-12) in wave 1 as low have a higher risk of developing incident SCI. All physical health measures have a higher age-standardized prevalence in the cognitively impaired groups, with clear differences seen in ADL and IADL. People with worse physical health overall generally also have a higher risk of incident SCI. More severe

limitations, like ADL constraints and 'severe limitations in daily life' seem to be less influential than limitations with IADL. It is hard to interpret causality given that people with stable IADL are at high risk, as are people who do not have constraints in wave 1 but in wave 2, and the other way round. For ADL and limitations, the risk is about the same for people with and without these constraints in wave 1 only. The risk is highest for those with new constraints in wave 2, which therefore seem to accompany the development of incident SCI, rather than to be a causal factor. People who have a declining cognitive status can still manage their most basic body functions, like dressing and bathing (ADL), during the early stages of their disease. By contrast, certain instrumental activities such as going shopping, preparing a meal or making phone calls, are likely to become more difficult at an early point in the disease. It is the change in daily routine and a progression in the mental decline which then leads to more severe limitations.

Results on accompanying diseases confirm the results Ziegler and Dobhlammer (2009) obtained with GKV data. People with SCI have a higher co-morbidity, especially cerebral vascular diseases, diabetes mellitus, arthritis or rheumatism, PD and heart and chronic lung diseases.

Lifestyle variables also in general support the literature findings, a low and decreasing activity status and changes in weight occur more often in the group with SCI and MiP. On the one hand, a low activity status leads to a lower metabolism, which influences the risk of SCI negatively; but, on the other hand the disease also leads to less movement because people feel more insecure. SCI can lead to weight loss, as has been discussed in Ziegler (fortcoming). Being overweight can cause other metabolic diseases, such as diabetes which is a risk factor for dementia. Some results from the lifestyle variables were unexpected: e.g., that alcohol consumption is lowest in the SCI and MiP group, and that the proportion of current and ex-smokers is not higher in people with SCI. One influencing factor might be the short study time. For all lifestyle variables in general, a longer observation period is necessary. The influence of the variables on the cognitive status takes place over a longer period and changes just shortly before the survey might already have occurred, but long-term effects still influence the outcome. People who are ill change their drinking and smoking behaviour.

Results from the SHARE data confirm several risk factors of SCI and dementia. Age, gender, education and lifestyle, physical and mental health as well as some diseases influence the risk for cognitive impairment. Furthermore, results between the two waves might indicate a positive time trend with a better cognitive status in the second wave. The results are important for assumptions about future trends of age-specific dementia prevalence and incidence (e.g. Ziegler and Doblhammer 2010).

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