



Poverty and transitions in health in later life[☆]

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ABSTRACT

Using a sample of Europeans aged 50+ from 12 countries in the Survey of Health, Ageing and Retirement in Europe (SHARE), we analyse the role of poor material conditions as a determinant of changes in health over a four- to five-year period. We find that poverty defined with respect to relative income has no effect on changes in health. However, broader measures of poor material conditions, such as subjective poverty or low wealth, significantly increase the probability of transition to poor health among the healthy and reduce the chance of recovery from poor health over the time interval analysed. In addition to this, the subjective measure of poverty has a significant effect on mortality, increasing it by 65% among men and by 68% among those aged 50–64. Material conditions affect health among older people. We suggest that if attempts to reduce poverty in later life and corresponding policy targets are to focus on the relevant measures, they should take into account broader definitions of poverty than those based only on relative incomes.

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1. Introduction

In the developed world, demographic trends have made poverty in later life a central concern for policymakers. This population ageing is accompanied by worries about the financial sustainability of pension systems and systems of old-age income support. Ensuring the current and future stability of these systems comes at the cost of inability to guarantee adequate pensions and material safety nets for all individuals. Thus, changing population structures are increasingly exacerbating the trade-off between current income and future pension provisions (OECD, 1998; European Commission, 2012). Naturally, in most discussions of poverty, improving individuals' material circumstances is not only an objective on its own but also a way to improve the quality of life. Health is clearly one of the most important aspects of quality of life in general, and is particularly crucial for policies related to ageing. Better health implies direct improvements in older people's welfare and also translates into potential savings on health expenditure, the size of which will grow as the proportion of older people increases in the coming decades.

There is growing evidence that poverty is correlated with outcomes at later stages in life, in particular with physical and mental health (Dahl and Birkelund, 1997; Huisman et al., 2003) as well as broader aspects such as life satisfaction and happiness (Adena and

Myck, 2013). Kok et al. (2008) show that low levels of wealth and education are positively correlated with poor general health and with some specific health outcomes such as heart attacks and diabetes, while Delavande and Rohwedder (2011) find correlations between poverty and the self-assessed probability of earlier death. Loss of employment has been shown to affect both mental health and mortality (Clark and Oswald, 1994; Morris et al., 1994). Haan and Myck (2009) have also demonstrated dual causality between health and employment in the joint model of risks. Poor material conditions are thus very likely to be correlated with poor health, but the complexity of the relationship makes identifying the role of poverty extremely difficult (Adams et al., 2003). Although the epidemiological literature devotes considerable attention to the relationship between socio-economic inequalities and health (e.g. Hahn et al., 1995; Mackenbach et al., 1997; Singh-Manoux et al., 2003; Demakakos et al., 2008), the link between material circumstances and broader life-quality outcomes in older age is still relatively poorly understood.

Since Grossman's seminal contribution (1972), the economic literature has adopted an approach in which health is treated as a stock of human capital that produces healthy time. The stock of health can be increased by making investments in health and depreciates with age. The relationship between health and various economic outcomes, such as employment and material well-being, is thus extremely complex. Good health can, on the one hand, increase employment opportunities and productivity and with them lifetime resources. On the other hand, material resources facilitate higher investment in health stock through medical treatment, care and other aspects of a healthy lifestyle, while other aspects of human capital such as education contribute to better health by improving the individual's efficiency in "producing" good health. Financial resources are thus very likely to be strongly correlated with health. This may be particularly the case if, as the Grossman model suggests, the shadow price of health grows with age due to increased depreciation of health stock in later life. This depreciation can only be slowed down by increased investment, which in turn implies that limited material resources should be reflected in a more rapid deterioration in health.

The public debate concerning material conditions in later life continues to focus on income-based "old-age poverty", although there are a number of important reasons, related to Grossman's theory, why this measure is likely to be a poor approximation of material well-being – particularly among older people. Deterioration in health in the Grossman model can be slowed down by health investments out of the resources remaining in individuals' "full wealth". Limitations in these resources restrict investments and lead to faster deterioration in health. Among older individuals, current income may capture only a fraction of the resources at their disposal. Thus we consider a wealth-based poverty measure as potentially more appropriate in this context than an income-based measure. At the same time, numerous other aspects of life, such as disabilities, mobility limitations and support through social networks are not taken into account in income comparisons, and they may significantly affect the level of resources available for health improvements conditional on the current level of income. Therefore the third measure of material resources we consider is a broad subjective assessment of individual material conditions.

An additional problem in analysing the relationship between health and material conditions is how to measure the other side of the equation. "Good health" can be expressed through a number of measures that differ in their degree of objectivity. These range from subjective health assessment (Lindeboom and van Doorslaer, 2004; Kalwij and Vermeulen, 2008) to mortality, and also include a long list of intermediate measures covering number of illnesses, number

of symptoms of poor health, functional limitations, number of hospital stays and other variables.

It is thus clear, in our view, that more research is required to improve the understanding of the factors determining material well-being as well as the relationship between material well-being and key aspects of older individuals' quality of life. This paper provides a detailed analysis of the relationship between health and different measures of material well-being for the population aged 50+. For this purpose, we use data from the Survey of Health, Ageing and Retirement in Europe (SHARE) for 12 European countries – Austria, Belgium, the Czech Republic, Denmark, France, Germany, Italy, the Netherlands, Poland, Spain, Sweden and Switzerland. We take advantage of the longitudinal dimension of the data to examine the effect of material circumstances on deterioration (or improvement) in several measures of health. The data cover the period from 2006 to 2012 and rely primarily on information from Waves 2 and 4 of the survey. Given the above discussion, in this paper we take a broad spectrum of measures of health ranging from self-assessed health, through measures related to symptoms of poor health and functional limitations in activities of daily living, to the most objective measure, namely mortality. Transitions in these measures of health are examined conditional on three different measures of poor material conditions – income-based relative poverty, self-declared difficult material conditions, and poverty as reflected by occupying a low relative position in the assets distribution.

2. SHARE data and sample statistics

The analysis in this paper focuses on transitions in health status between Waves 2 and 4 of the SHARE survey (Börsch-Supan and Jürges, 2005; Schröder, 2011; Malter and Börsch-Supan, 2013a, 2013b). Transitions are examined as binary changes from good to bad health states (or vice versa), conditional on being in the good (or the bad) state in the initial period (Wave 2). We thus analyse determinants of the following transition probability in the case of transition from good to bad states:

$$P(y_{W4} = 1 | y_{W2} = 0) = G(\beta'X_{W2} + \gamma\Pi_{W2}) \quad (1)$$

where $y_{W2} = 0$ stands for being in the good health state in Wave 2 and $y_{W4} = 1$ indicates being in the bad state in Wave 4. X_{W2} is a vector of controls measured at the time of Wave 2 and Π_{W2} is a poverty measure defined at the time of Wave 2. Function $G(\cdot)$, which in our estimations is the logistic function, takes values between 0 and 1. In the case of transition from bad to good states, the empirical specification takes the following form:

$$P(y_{W4} = 0 | y_{W2} = 1) = G(\beta'X_{W2} + \gamma\Pi_{W2}). \quad (2)$$

We use data from Waves 2 and 4 of SHARE collected in 12 countries. Wave 2 interviews were conducted in 2006 and 2007, while Wave 4 took place between 2010 and 2012. The average time between the two interviews was 4 years and 3 months. As we show in Table 1, the Wave 2 sample for the analysed countries includes information on 28,042 individuals aged 50+. The number of interviews repeated in Wave 4 is 17,325 (sample T). Additionally, we have information that 1423 individuals died between Wave 2 and Wave 4 (sample D).

2.1. Health measures

We examine four binary outcomes measuring the health status of respondents. The first measure is subjective self-assessed health status (SAH), which treats individuals as unhealthy if they declare

Table 1
Descriptive statistics: sample sizes by country.

Sample ID	Total sample in Wave 2	Sample used for analysis	Alive in W4, in good health in W2			Alive in W4, in bad health in W2			Died by W4 W2
			SAH	3+ SMT	3+ ADL	SAH	3+ SMT	3+ ADL	
Country	W2	T	A1	B1	C1	A2	B2	C2	D
SE	2581	1523	1129	1214	1273	394	309	250	137
DK	2431	1620	1297	1346	1385	323	274	235	141
DE	2457	1330	861	1061	1054	469	269	276	76
NL	2531	1578	1168	1385	1341	410	193	237	77
BE	2981	2045	1535	1611	1580	510	434	465	136
FR	2692	1738	1162	1337	1371	576	401	367	124
CH	1359	982	839	865	876	143	117	106	41
AT	1116	564	399	452	416	165	112	148	41
ES	2018	1301	716	993	899	585	308	402	145
IT	2856	1936	1128	1481	1418	808	455	518	147
PL	2361	1458	595	877	811	863	581	647	224
CZ	2659	1250	755	938	975	495	312	275	134
Total	28042	17325	11584	13560	13399	5741	3765	3926	1423

Notes: SAH – subjective assessment of health (declaring fair or poor health status); 3+ SMT – at least three symptoms of poor health; 3+ ADL – at least three limitations in activities of daily living. W2 sample includes individuals with all necessary information at the time of Wave 2 but might be missing necessary information at the time of Wave 4 due to death or attrition. This sample is used in robustness checks related to attrition. T sample includes individuals with all necessary information at the time of Wave 2 and Wave 4, which is used for the analysis. Samples A1, B1 and C1 include individuals who are defined as healthy at the time of Wave 2, while samples A2, B2 and C2 are in the bad health states in Wave 2. The numbers of those who had died by the time of Wave 4 (and for whom we have all relevant information at the time of Wave 2) are given as sample D. The mortality analysis is conducted on the sample T + D.

Source: Authors' calculations using SHARE data, Waves 2–4.

either “fair” or “poor” health status on a five-point scale (excellent, very good, good, fair, poor). Two further measures rely on declared symptoms of poor health and limitations in performing activities of daily living (ADLs). In the first case (“3+ SMT”), individuals are treated as unhealthy if they declare at least three out of 12 listed symptoms such as breathlessness or persistent cough; in the latter case (“3+ ADL”), they are considered unhealthy if they have limitations in at least three out of 23 ADLs, which include such activities as walking 100 m or pushing large objects as well as instrumental ADLs such as dressing, showering or taking medication. Mortality is the fourth health measure used in the analysis. Since mortality information in SHARE relies on direct contact with relatives or acquaintances of the deceased, this is likely to give an underestimate of total mortality.

The distribution of respondents into good and bad states in any of the health dimensions at the time of Wave 2 determines the sample sizes for the estimation of transitions from good to bad states and vice versa (except for mortality, which is conducted on the sample T + D). This distribution is presented in Table 1. There are important differences in health status according to all four measures of health. We find a very similar cross-country pattern in the distribution of 3+ SMT and 3+ ADL, with Poland having the highest proportions identified as being in poor health and Switzerland having the lowest proportions. In all countries, the share of individuals who are identified as being in poor health according to SAH is higher than the shares according to the two other measures.

Transition probabilities – for changes from good to bad states (and vice versa) – are presented in Table 2. There is relatively high variation in these rates, both between countries and between measures. It is notable that the data reflect a relatively high degree of recovery from poor health. For example, about 30% of the individuals in poor health at the time of Wave 2 by the SAH and 3+ ADL definitions and almost 40% by the 3+ SMT definition are in good health at the time of Wave 4. This is in line with some earlier results from the literature (e.g. Gill et al., 1997) and shows that, despite a high degree of persistence in poor health, improvements are still possible and are in fact quite likely, which leaves room for policy interventions.

2.2. Measuring material circumstances

Three definitions of poverty are used here to identify respondents with insufficient material resources. The first is the standard definition of income-based relative poverty (referred to as “income poverty” and labelled “Income” in all tables), according to which we identify poor people with reference to the official poverty thresholds published by EUROSTAT and defined as 60% of the median equivalised household net income. The second approach is based on subjective declarations by respondents (“subjective poverty” – “Subjective”). In this case, respondents are identified as poor on the basis of a question on how easily they can “make ends meet”. If the answer is “with some” or “with great” difficulty, the individuals in the household are classified as poor. The third

Table 2
Descriptive statistics: transition rates by country.

Sample ID	Transition rates from good to bad states				Transition rates from bad to good states		
	SAH	3+ SMT	3+ ADL	DEATH	SAH	3+ SMT	3+ ADL
SE	0.234	0.128	0.139	0.083	0.414	0.447	0.401
DK	0.132	0.120	0.101	0.080	0.362	0.449	0.318
DE	0.225	0.200	0.173	0.054	0.240	0.372	0.286
NL	0.191	0.110	0.123	0.047	0.373	0.410	0.371
BE	0.196	0.176	0.180	0.062	0.353	0.333	0.272
FR	0.217	0.188	0.172	0.067	0.266	0.343	0.201
CH	0.113	0.105	0.099	0.040	0.380	0.526	0.495
AT	0.257	0.133	0.185	0.068	0.329	0.500	0.442
ES	0.320	0.211	0.231	0.100	0.229	0.360	0.244
IT	0.243	0.154	0.181	0.071	0.266	0.376	0.221
PL	0.342	0.181	0.193	0.133	0.240	0.416	0.322
CZ	0.250	0.262	0.214	0.097	0.340	0.382	0.342
Total	0.215	0.163	0.163	0.076	0.298	0.394	0.299

Notes: SAH – subjective assessment of health (declaring fair or poor health status); 3+ SMT – at least three symptoms of poor health; 3+ ADL – at least three limitations in activities of daily living. Unweighted transition rates.

Source: Authors' calculations using SHARE data, Waves 2–4.

definition refers to respondents' wealth ("wealth poverty" – "Wealth"), with individuals classified as poor if they are in the bottom third of the country-specific wealth distributions. Wealth for this purpose is defined as the sum of real assets (net of any debts) and gross financial assets.

In the case of income- and wealth-defined poverty, we equalise those measures by using the modified OECD scale (with weights equal to 1 for the first adult, 0.5 for other adults and 0.3 for children aged under 15). Additionally in these cases, given a relatively high degree of item non-response, we use imputed values for the financial variables (five imputations for each missing value) available in the public release of SHARE data (Christelis, 2011). For example, in the case of bank account savings, we are missing specific values at varying levels depending on the country, ranging from 22% of cases in Sweden to 56% of cases in Belgium. In total, we are missing around 40% of specific answers, but of these for a large majority (35% of all answers) we have information on ranges within which actual savings fall, which improves the precision of imputations. While the use of imputed values potentially limits the degree of variance in the data, using multiple imputations allows for reliable estimates of variance and has been increasingly common in the literature (see e.g. Klebanoff and Cole, 2008).

Table 3 provides basic descriptive statistics on poverty rates in Wave 2. There is a high degree of heterogeneity in poverty rates between the countries and in some cases substantial differences in the rates of subjective and income poverty within countries. The highest rates of income poverty are observed in Spain, Italy and Poland, while the lowest are found in Sweden, the Czech Republic and the Netherlands. We see a very large difference between income and subjective poverty in the Czech Republic: while it is among the countries with the lowest income-based poverty levels, the Czech poverty level defined by the subjective measure is one of the highest. Furthermore, the similarity in rates of poverty within some countries may hide the fact that the different definitions identify different people as "poor". Table 3 presents the overlaps between the three poverty measures. In each country, a third of the population is considered poor by the value of their (equalised) wealth. In countries where poverty rates based on income and subjective assessment are low (e.g. Denmark), the degree of overlap with the wealth-based measure is naturally low. In Poland, where three-quarters of the 50+ population define themselves as poor, the income- and wealth-defined sets are almost fully contained in the subjectively defined one. Whereas in Denmark and Sweden

there is little overlap between all measures, the overlap is much higher in Spain and Italy.

3. Baseline results

In this section, we present results from the baseline estimations of the transition probabilities in health statuses between Wave 2 (W2) and Wave 4 (W4) of the SHARE survey. In addition to the different poverty indicators, country dummy variables and controls for the time between the two interviews, we include a broad set of other control variables in all estimations. These include basic demographic characteristics (age and education polynomials, gender and town size) as well as other controls from W2 potentially related to health transitions (controls for the level of physical activity – moderate or vigorous; social activity; family networks – partnership status, number of children and grandchildren; lifestyle – current smoking and alcohol consumption). We examine different additional specifications and discuss some of them in Section 4. The results we obtain in the chosen specifications are robust to the choice of additional controls. In all estimations we use calibrated weights for W2 which are calculated separately by country and provided in SHARE release 2.6.0.

3.1. Poverty and transitions in health

Baseline estimates for transitions from good to bad health and from bad to good health are presented in Table 4 and Fig. 1. For each health outcome, we estimate three separate models, in each case controlling for a different measure of poverty. The estimated relationship between health transitions and poverty is reported in the form of odds ratios on the poverty measure. In the discussion below, we interpret these as ratios of risks and discuss the results in terms of the effects on the probability of transitions. For the range of probabilities we examine, odds ratios can be considered as good approximations of risk ratios (Norton et al., 2004). The results are thus interpreted as the effects of being poor in W2 on the probability of transition from good to bad health (or vice versa) relative to those who are not poor in W2.

As we can see in Table 4, the magnitudes of all estimated odds ratios on poverty measures in the transitions from good to bad states indicate the negative effect of poverty on changes in the four health measures, including mortality. For example, individuals defined as poor according to the subjective poverty definition are about 38–48% more likely to become ill in W4 according to all three

Table 3
Poverty statistics and overlap of poverty measures: wealth, income and subjective poverty.

	Poverty shares			Overlap of poverty measures							
	Income	Wealth	Subjective	Income only	Wealth only	Subjective only	Income and wealth	Income and subjective	Wealth and subjective	All	None
SE	0.079	0.333	0.183	0.027	0.216	0.072	0.018	0.010	0.093	0.014	0.551
DK	0.135	0.333	0.130	0.045	0.199	0.036	0.056	0.010	0.062	0.024	0.568
DE	0.168	0.333	0.270	0.043	0.151	0.088	0.032	0.026	0.093	0.062	0.505
NL	0.116	0.333	0.195	0.050	0.207	0.058	0.020	0.012	0.083	0.034	0.535
BE	0.195	0.333	0.290	0.068	0.153	0.090	0.032	0.030	0.104	0.056	0.467
FR	0.146	0.333	0.354	0.027	0.155	0.119	0.013	0.038	0.108	0.060	0.479
CH	0.169	0.333	0.173	0.064	0.193	0.046	0.049	0.023	0.067	0.035	0.523
AT	0.210	0.332	0.244	0.068	0.166	0.073	0.043	0.035	0.070	0.065	0.480
ES	0.372	0.332	0.530	0.077	0.069	0.167	0.039	0.144	0.116	0.135	0.254
IT	0.331	0.333	0.612	0.043	0.053	0.222	0.020	0.125	0.119	0.147	0.272
PL	0.276	0.333	0.752	0.027	0.040	0.325	0.014	0.120	0.177	0.122	0.175
CZ	0.115	0.333	0.546	0.027	0.117	0.288	0.005	0.026	0.195	0.028	0.314
Total	0.222	0.333	0.422	0.044	0.116	0.155	0.025	0.071	0.113	0.089	0.388

Notes: data weighted using Wave 2 sample weights.

Source: Authors' calculations using SHARE data, Waves 2–4.

Table 4
Odds ratios on poverty variables in the probability models of health transitions.

	Outcomes:											
	SAH			3+ SMT			3+ ADL			DEATH		
	Poverty definition:			Poverty definition:			Poverty definition:			Poverty definition:		
	Income	Wealth	Subjective	Income	Wealth	Subjective	Income	Wealth	Subjective	Income	Wealth	Subjective
<i>From good to bad</i>												
Odds ratio	1.384**	1.326***	1.418***	1.042	1.293**	1.378***	1.189	1.456***	1.475***	1.056	1.203	1.296*
s.e.	(0.148)	(0.106)	(0.118)	(0.117)	(0.121)	(0.124)	(0.131)	(0.134)	(0.130)	(0.115)	(0.124)	(0.137)
Sample size		11584			13560			13399			18748	
<i>From bad to good</i>												
Odds ratio	0.757*	0.761**	0.573***	0.911	0.727**	0.700**	1.045	0.735*	0.712**	–	–	–
s.e.	(0.093)	(0.076)	(0.058)	(0.118)	(0.086)	(0.086)	(0.144)	(0.088)	(0.092)	–	–	–
Sample size		5741			3765			3926		–	–	–

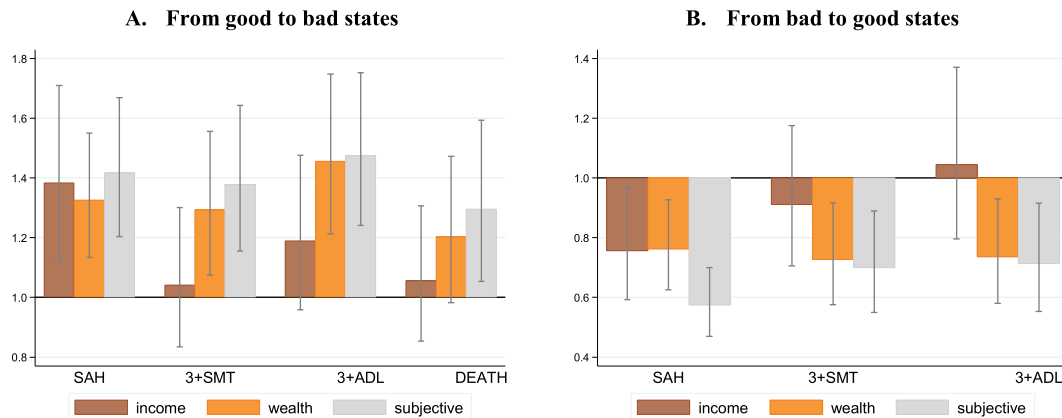
Notes: samples for transitions from good to bad states (see Table 1): A1 (SAH), B1 (3+ SMT), C1 (3+ ADL), T + D (DEATH); samples for transitions from bad to good states: A2 (SAH), B2 (3+ SMT), C2 (3+ ADL). Other controls include: country dummies, number of months between interviews, gender, age, age squared, years of education, years of education squared and location of main residence; partnership status, children and grandchildren controls, controls for physical activity (vigorous or moderate) and social activity, and lifestyle controls (smoking and drinking) at the time of Wave 2. Data weighted using Wave 2 sample weights. Standard errors in parentheses; significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Full results in online Appendix, Tables A1 and A2. Source: Authors' calculations using SHARE data, Waves 2–4.

health measures and, importantly, are 30% more likely to die. We find similar effects for wealth-defined poverty, of 29–46% and 20% for dying, although in the case of mortality the effect is not statistically significant. On the other hand, the effects of income-defined poverty are not clear-cut. We find significant effects for the change in subjective health (38%), but the effects on deteriorations in health as measured by 3+ SMT and 3+ ADL are small and not significant. A very similar pattern is observed with respect to the estimates in the opposite direction, although one of the estimated effects (of income poverty on the transition from bad to good health defined by 3+ ADL) is positive, but in this case the effect is statistically insignificant. It is notable that, in most cases, the estimated effects of poverty on transitions from good to bad states are the mirror images of those from bad to good states both in terms of the direction of the effect and in terms of its statistical significance. Individuals identified as poor according to the wealth-based and subjective definitions are less likely to recover from bad health by W4 according to all measures used. For income poverty, we only find a lower probability of recovery in the subjective dimension.

It is important to note that the close “mirror” correspondence of results with respect to transitions in the two directions gives additional weight to the causal interpretation of our findings, since

issues related to sample selection into healthy and unhealthy subsamples in W2 do not seem to influence the interpretation of our results. At the same time, a note of caution is perhaps needed with respect to the estimates of the effect of subjective poverty. These effects might be biased upward due to unobserved factors such as general dissatisfaction with life or generally negative attitudes that could simultaneously affect poor assessment of material status and individual health trajectories. We believe, however, that the broad set of controls we use should limit such potential bias. In fact, our sensitivity analysis in Section 4 shows that the results are very similar with a much broader set of controls related to individual background and life histories.

The coefficient estimates on other controls such as gender, education, age, physical and social activities, or smoking, have the expected signs and are statistically significant (detailed estimates are reported in the online Appendix, Tables A1 and A2). In addition to that the results show that the family network (partner and children) has a mitigating effect on transitions from good to bad states, although the effects are not statistically significant. Similarly, social activity, which may reflect some broader aspects of the social network, also reduces the probability of transition into the bad states and increases the rates of recovery.



Notes: See notes for Table 4. Bars represent odds ratios on the poverty dummy variables; spikes are 95% confidence intervals.

Fig. 1. Poverty and transitions in health: odds ratios by poverty definition.

Table 5
Heterogeneity analysis – effect differentiation by gender and age group: transitions from good to bad states.

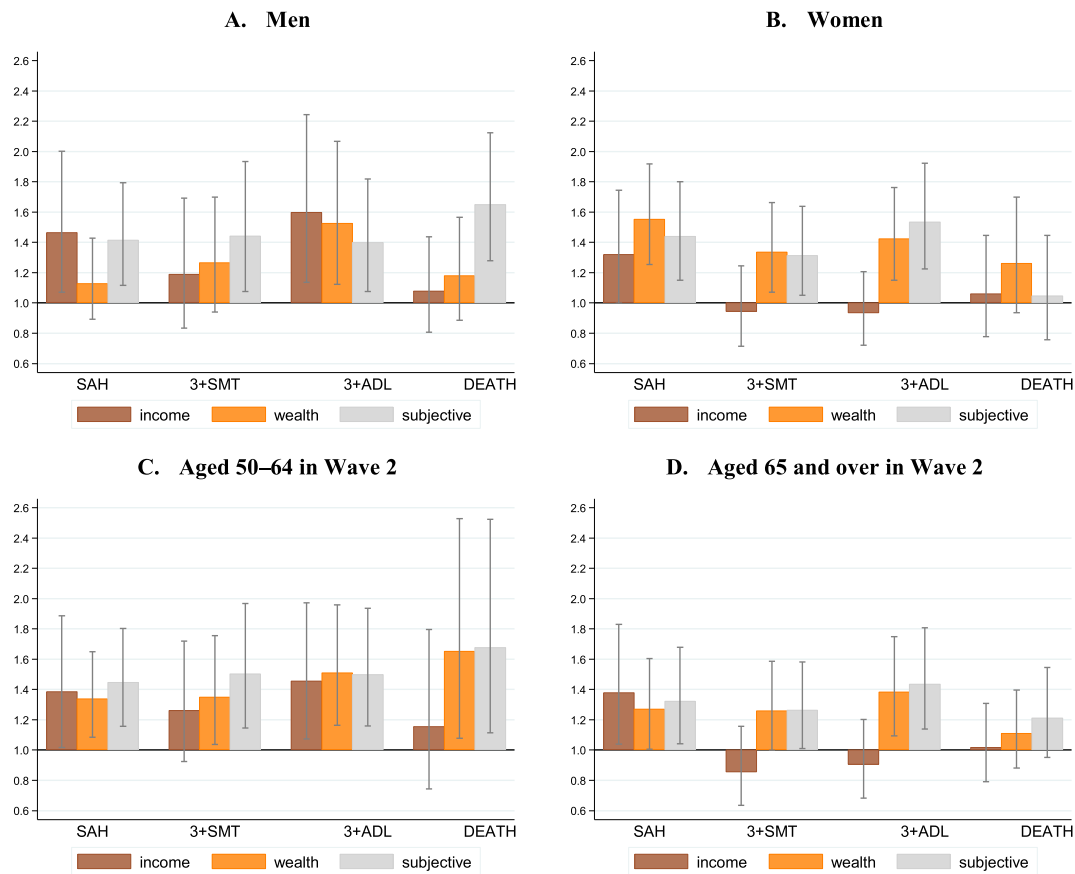
	Outcomes:											
	SAH			3+ SMT			3+ ADL			DEATH		
	Poverty definition:			Poverty definition:			Poverty definition:			Poverty definition:		
	Income	Wealth	Subjective	Income	Wealth	Subjective	Income	Wealth	Subjective	Income	Wealth	Subjective
Specification: gender												
<i>Men</i>												
Odds ratio	1.464*	1.128	1.415**	1.188	1.265	1.442*	1.597**	1.524**	1.399*	1.077	1.179	1.649***
s.e.	(0.231)	(0.135)	(0.171)	(0.213)	(0.189)	(0.216)	(0.276)	(0.232)	(0.187)	(0.158)	(0.169)	(0.213)
Sample size	5409			6585			6508			8537		
<i>Women</i>												
Odds ratio	1.320*	1.551***	1.439**	0.942	1.335**	1.312*	0.932	1.423**	1.535***	1.060	1.261	1.046
s.e.	(0.186)	(0.168)	(0.165)	(0.133)	(0.149)	(0.149)	(0.122)	(0.155)	(0.177)	(0.168)	(0.192)	(0.173)
Sample size	6175			6975			6891			10211		
Specification: age												
<i>Aged 50–64</i>												
Odds ratio	1.386*	1.338**	1.445**	1.261	1.349*	1.502**	1.455*	1.510**	1.498**	1.156	1.652*	1.676*
s.e.	(0.214)	(0.143)	(0.163)	(0.198)	(0.181)	(0.207)	(0.225)	(0.199)	(0.196)	(0.259)	(0.350)	(0.350)
Sample size	7072			8056			8161			9992		
<i>Aged 65+</i>												
Odds ratio	1.380*	1.270*	1.323*	0.857	1.259*	1.263*	0.906	1.383**	1.434**	1.017	1.109	1.212
s.e.	(0.199)	(0.151)	(0.161)	(0.130)	(0.148)	(0.145)	(0.131)	(0.165)	(0.169)	(0.131)	(0.130)	(0.150)
Sample size	4512			5504			5238			8756		

Notes: see notes for Table 4. Respective samples divided by gender and age group.

3.2. Differentiating effects by gender and age categories

To examine the relationship between health outcomes and poverty in more detail, we repeat the estimations in order to

determine the effects of poverty on health transitions separately for men and women (“Specification: gender”) and for individuals who at the time of W2 were aged 50–64 and 65+ (“Specification: age”). The odds ratios for these specifications for the transitions from



Notes: See notes for Table 5 and Figure 1.

Fig. 2. Poverty and transitions in health: transitions from good to bad states by gender and age – odds ratios by poverty definition.

Table 6
Poverty and attrition between Waves 2 and 4.

Dependent variable: absent in the W4 sample conditional on participation in W2	Specification 1			Specification 2		
	Poverty definition:			Poverty definition:		
	Income	Wealth	Subjective	Income	Wealth	Subjective
Poverty odds ratio	0.995	1.021	1.015	0.985	0.937	1.003
s.e.	(0.055)	(0.051)	(0.048)	(0.055)	(0.062)	(0.048)
Homeowner odds ratio	–	–	–	0.905*	0.870*	0.907*
s.e.	–	–	–	(0.044)	(0.055)	(0.045)
Sample size	28042			27714		

Notes: Data weighted using Wave 2 sample weights. Standard errors in parentheses; significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Source: Authors' calculations using SHARE data, Waves 2 and 4.

good to bad health are presented in Table 5 and Fig. 2 (results for transitions from bad to good health are given in the online Appendix, Table A3). Overall, the results do not differ from the baseline findings, but there are several notable and significant exceptions. Whereas income seems to gain more relevance for men (greater coefficient magnitudes, additional significance for 3+ ADL), for women the effect is virtually zero for all outcomes except subjective health. Similarly, in the age specification, income seems to be more important for younger participants, and to have no effect for older ones (except on subjective health). Importantly, in the gender specification, we find that subjective poverty positively and significantly influences the probability of death for men (poor men are 65% more likely to die between W2 and W4 compared to men who are not poor). In the age specification wealth-defined and subjective poverty are found to positively and significantly affect mortality for the age group 50–64 (65% and 68%). To our knowledge, our analysis provides the first evidence based on representative European data of a strong and statistically significant relationship between poor material conditions and mortality (correlations between mortality and other socio-economic characteristics such as education or occupational class were found by, for example, Mackenbach et al., 1999).

3.3. Differentiating effects by country and region

In the analysis presented so far we control for international variation in the data through country controls to account for country-specific fixed effects. Differences across countries may, however, also manifest themselves in variation with respect to the role of poverty for health transitions, in which case the estimated coefficients on the poverty measures would differ. The findings of Hank and Jürges (2010), who identify a north–south gradient concerning the support for older people in Europe, would suggest for example, that with stronger family and social network support in the Mediterranean countries, the relationship between material conditions and health could be different there than in the North of Europe, where professional care services play a more important role. Our analysis in this respect does not suggest any systematic and consistent pattern for the relationship between poverty and transitions in health. This applies both to the analysis across individual countries and groups of countries with different institutional arrangements (details are presented in the online Appendix, Tables A6 and A7). Relatively small sample sizes are to some extent behind the inability to draw statistically robust conclusions, but the answer might also be in the complexity of support patterns across countries meaning that there are no clear-cut implications for the relationship between material conditions and health (e.g. Glaser

et al., 2004, Motel-Klingebiel et al., 2005). While we find differences across regions and some statistically significant variation across countries, the overall pattern broadly reflects the full sample findings. The analysis by region (Table A7 in the online Appendix) confirms that wealth and subjective poverty have, in most cases, significant effects on health transitions across the different institutional arrangements and cultural backgrounds. The effects of either or both of these two poverty measures are, in most cases, stronger than the effect of income poverty.

4. Sensitivity analysis

To examine how the baseline results change when different specifications and estimation scenarios are applied, we conducted three broad types of robustness checks. The first relates to the bad health threshold at the value of three symptoms of poor health or limitations in ADLs, which is rather arbitrary although used in the literature (e.g. Leveille et al., 2000). We examine how sensitive the analysis is to setting a lower or higher threshold, of two or four symptoms or limitations. The results (presented in the online Appendix, Table A4), are very similar to the baseline specification in Table 4, with the exception of lack of statistical significance in the recovery analysis using the four symptoms threshold which is due to small sample sizes.

The second type of sensitivity analysis uses a broader set of controls to reduce the potential endogeneity of sample selection into the W2 good and bad health samples. Moreover, it allows us to better control for heterogeneity, which might affect the subjective measures we use and thus bias the estimated coefficients. We estimate the equations conditional on information from the intermediate Wave 3 (W3) of SHARE, which collected data on respondents' life histories. The following variables from W3 were included in addition to our basic controls: situation at home at the age of 10 (number of books at home, facilities in the household, occupation of main breadwinner); parental behaviour (smoking, drinking and mental problems); other major life events (hospital stays in childhood, ever having been disabled or seriously injured). These conditions and life events might, on the one hand, affect health status in later life (Brandt et al., 2012) and, on the other, may have influenced these individuals' material conditions as observed at the time of W2 (Claussen et al., 2003). Again the results are presented in the online Appendix (Table A5). From the above variables, we find “ever having been disabled or seriously injured” to be important for current transitions in health. We also find that hospital stays in childhood and parental behaviour (drinking and mental problems) influence health outcomes in later life. Including life-history information reduces the sample sizes by around 12–16%, as not all W4 respondents participated in W3. This particularly affects the mortality sample since, once we condition on W3 participation, we can only analyse mortality between W3 and W4. This translates into a reduction in the number of identified death cases by around one-third. As can be seen from Table A5 in the online Appendix the results of the estimates and their statistical significance change very little when we control for childhood conditions and life events.

The final robustness check relates to different types of sample attrition. As can be seen from Table 1, only 62% of the total W2 sample took part in the W4 interview, and the total retention rates vary between 47% in the Czech Republic and 72% in Switzerland. The total sample attrition is driven by two main factors. One is mortality, as not all individuals lived long enough to participate in the W4 interview, and the other is refusal to participate in W4 or unsuccessful respondent tracking. Since the regressions we estimate control only for W2 information, the only outcome missing in

the case of individuals who did not participate in the W4 survey is their W4 health status.

With respect to mortality-driven attrition, we take the approach that since mortality can be safely taken as a reflection of bad health status, we can correct for attrition by treating the three other health outcomes of dead respondents as “bad health”. As far as the other forms of attrition are concerned, we test the sensitivity of the results to two assumptions: we treat the respondents absent from the W4 survey as unhealthy in the first set of estimations and as healthy in the other set. The odds ratios for the estimated coefficients are presented in the online Appendix, Fig. A1. Because we add observations with outcomes measured with error (since we essentially assume the outcomes), the estimated coefficients are, in most cases, lower than in the baseline estimation. However, the ones that are significant in the baseline estimation remain, in most cases, significant in this robustness check.

In addition to this, we follow the suggestions of Verbeek and Nijman (1992) and test the non-randomness of attrition with respect to our measures of poverty by examining the probability of leaving the sample in relation to these measures. This is done by running probability models of attrition on the full data set from W2. The models include the set of characteristics used in the transitions models and the different poverty dummies. Table 6 presents the odds ratios on the three poverty measures in two separate specifications. The second specification includes a house-ownership dummy variable in addition to the standard controls. House-ownership is very likely to affect attrition, as people who own their house may be less likely to change location and thus be easier to track in the panel. At the same time, housing is one of the major assets an individual can have and house-ownership strongly affects the probability of not being classified as poor with respect to our wealth measure. As we can see none of the measures of poverty is correlated with attrition in either of the two specifications (Table 6). While house-ownership reduces the probability of attrition, it is only weakly statistically significant, and controlling for it does not affect the significance of the relationship between our poverty measures and attrition.

5. Conclusions

In Grossman's (1972) theory, depreciation of health stock increases in later life and can only be slowed down by greater health investments. We would thus expect limitations on material resources, which constrain these investments, to be strongly related to deterioration in health. In this paper, we have examined the effect of poor material conditions on health deterioration and health improvement by looking at a broad range of health outcomes for individuals aged 50 and over. We have analysed how this effect differs according to the choice of the poverty measure – with respect to relative income, subjective declarations and relative wealth.

Our results confirm the implications of Grossman's theory and reflect the important role of material conditions in determining changes in health. Changes in subjective health as well as in health measured by symptoms of poor health and functional limitations are significantly correlated with subjective poverty and poverty defined with respect to wealth. This pattern of correlations is consistent for health deterioration and health improvement, is robust to different specifications and several potential forms of non-random panel attrition, and can in our view be given a causal interpretation. In all estimations, we control for a range of potential confounders, including education and lifestyle variables (activities, smoking, etc.). The results also hold in specifications that control for childhood background information and significant life events.

Compared with those who make ends meet easily, individuals who declare difficulties in making ends meet are 38% more likely to suffer health deterioration as measured by symptoms of poor health and 48% more likely to suffer a setback as measured by functional limitations. They are also 30% more likely to die between Wave 2 and Wave 4 of the survey. When poverty is measured with respect to relative wealth, the effects are 29%, 46% and 20% respectively, though the effects on the probability of dying are not statistically significant. Interestingly, we find no such correlations when poor material conditions are defined with respect to relative income. Our results are confirmed in a number of robustness tests and generally hold for transitions from good to bad states and vice versa. Our interpretation of this result is that current income is a poor measure of financial resources available to older people and it does not capture a number of dimensions of material well-being relevant at this stage of life. In particular, current income does not take account of assets available to older people and disregards important constraints that affect material well-being such as disability, mobility or cognitive limitations and support of the social network. This interpretation is consistent with Grossman's theory, according to which investments in health are made out of resources left in the so-called “full wealth” at particular points in life. The results also point to the weakness of widely used income-based poverty measures as reflections of material difficulties in later life, and suggest the need for a more complex approach to the measurement of poverty among older people.

In the overall sample of individuals aged 50 and over, we find a significant relationship between subjective poverty and mortality. This effect is driven by a strong and statistically significant correlation among men and among younger respondents (aged 50–64). Among people who report difficulties in making ends meet, mortality is 65% higher for men and 68% higher for those aged 50–64. To our knowledge, this is the first time that mortality has been found to be related to material conditions for older individuals in representative multi-country European survey data. Improvements in material conditions may translate not only into better quality of life but also into living longer.

Since health is a key aspect of quality of life, the results of the paper suggest that both researchers and policymakers should adopt broader measures of material well-being in later life and go beyond using income-based poverty statistics in monitoring older people's life circumstances and in designing policies aimed at improving these conditions. Such measures would need to be more in line with the specific conditions and material needs of older people.

Appendix A. Supplementary data

Supplementary data related to this article can be found at <http://dx.doi.org/10.1016/j.socscimed.2014.06.045>.

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