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Tracing the origins of successful aging: The role of childhood conditions and social inequality in explaining later life health

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ABSTRACT

This study investigates the role of childhood conditions and social inequality in older Europeans' propensity to age successfully, controlling for later life risk factors. Successful aging was assessed following Rowe and Kahn's conceptualization, using baseline interviews from the first two waves of the Survey of Health, Ageing and Retirement in Europe (SHARE). These data were merged with retrospective information on participants from 13 Continental European countries, collected as part of the SHARELIFE project. Our sample consists of 22,464 men and women, who are representative of the non-institutionalized population aged 50 or older (mean age: 63.3) in their respective country. Estimating multilevel logistic models, we controlled for demographics (age, sex), childhood conditions (SES, health, cognition), later life risk factors (various dimensions of SES and health behaviors), as well as social inequality (measured by country-specific Gini coefficients). There is an independent association of childhood living conditions with elders' odds of aging well. Higher parental SES, better math and reading skills, as well as self-reports of good childhood health were positively associated with successful aging, even if contemporary characteristics were controlled for. Later life SES and health behaviors exhibited the expected correlations with our dependent variable. Moreover, lower levels of income inequality were associated with a greater probability of meeting Rowe and Kahn's successful aging criteria. We conclude that unfavorable childhood conditions exhibit a harmful influence on individuals' chances to age well across all European welfare states considered in this study. Policy interventions should thus aim at improving the conditions for successful aging throughout the entire life course.

Introduction

In the preamble to the Constitution of the World Health Organization (WHO), health is defined as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity." Against the background of growing concern about trends in the health of older people in particular (see Crimmins & Béltran-Sánchez, 2011, for a recent review), Rowe and Kahn (1997, 1998) introduced a highly influential conceptualization of 'successful aging', which added a social component to merely biomedical conceptualizations of healthy aging. Rowe and Kahn's (1997: 439) definition of successful aging as "avoidance of disease and disability, maintenance of high physical and cognitive function, and sustained engagement in social and productive activities" thus corresponds well to WHO's multidimensional definition of health and has become a commonly applied "gold standard of aging" (Dillaway & Byrnes, 2009: 706).

Numerous studies have shown that current socioeconomic status (SES), health behaviors, or religious beliefs, for example, are strong predictors of successful aging (e.g., Crowther, Parker, Achenbaum, Larimore, & Koenig, 2002; Haveman-Nies, de Groot, & van Staveren, 2003; McLaughlin, Connell, Heeringa, Li, & Roberts, 2010). While these characteristics mainly describe elders' contemporary circumstances, recent research suggested that early- or midlife factors, such as family background, work characteristics, or the experience of incarceration, matter as well (e.g., Britton, Shipley, Singh-Mannoux, & Marmot, 2008; Pruchno, Wilson-Genderson, Rose, & Cartwright, 2010). Moreover, a growing body of evidence indicates that childhood SES and health, for example, exhibit long-term influences on individuals' health (e.g., Blackwell, Hayward, & Crimmins, 2001; Haas, 2008; Luo & Waite, 2005) and mortality (e.g., Frijters, Hatton, Martin, & Shileds, 2010; Galobardes, Lynch, & Smith, 2004; Hayward & Gorman, 2004). To our knowledge, though, there has been little research explicitly aimed at tracing the origins of successful aging to a broader array of childhood conditions (see Schafer & Ferraro, 2011, for an exception).

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A first objective of the present study, therefore, was to explore the potential role of parental SES as well as childhood health and cognition in determining whether individuals succeed in aging well, controlling for contemporary individual characteristics. Data was drawn from the Survey of Health, Ageing and Retirement in Europe (SHARE), including recently collected retrospective information on participants aged 50 or over from 13 Continental European countries who participated in the SHARELIFE study. We complemented this life course perspective on successful aging with a multilevel perspective. Since previous comparative research revealed significant cross-national variation in the prevalence of successful aging (Hank, 2011a), we secondly tested whether and how contemporary societal context contributes to aging well, focusing on the role of income inequality.

The remainder of this article is structured as follows: the next section provides a brief overview of previous research investigating associations between childhood conditions and social inequality with later life health. From this review we derive our hypotheses for the present study. We then describe the data and methods used in the analysis, followed by a presentation of empirical findings. We present our conclusions in the final section.

Previous research & hypotheses

Studies relating childhood living conditions to adult health

Although a large number of early life circumstances may affect adult health, research indicating negative impacts of adverse childhood conditions on later life health has suggested that two aspects in particular might be important: early health and SES. These factors may affect adult health directly or indirectly. On one hand, early nutritional deprivation, for example, might directly initiate negative health trajectories during the individual's childhood, which may persist or even aggravate during the aging process, independent of adult SES ('latency model'; e.g., Huang, Soldo, & Elo, 2011; Zhang, Gu, & Hayward, 2008). On the other hand, poor health and economic deprivation in childhood might impact later life health indirectly through impaired adult socioeconomic attainment ('pathway model'; e.g., Case, Fertig, & Paxson, 2005; Haas, 2008).

Next to showing a consistently negative correlation between low early life SES and self-rated health in adulthood, studies have also revealed a significant relationship between socioeconomic conditions during childhood and elders' risk of suffering from functional limitations (e.g., Haas, 2008; Huang et al., 2011; Wen & Gu, 2011) or cognitive impairment (e.g., Fors, Lennartsson, & Lundberg, 2009; Wen & Gu, 2011; Zhang et al., 2008), for example. In their comprehensive study, Luo and Waite (2005) reported similar associations, also observed when taking into consideration chronic conditions and depressive symptoms (also see Gilman, Kawachi, Fitzmaurice, & Buka, 2002; Haas, 2007).

Along the same lines, poor childhood health was shown to have long-term negative effects on, for example, individuals' functional status (e.g., Haas, 2008; Huang et al., 2011) and chronic health conditions (e.g., Blackwell et al., 2001; Haas, 2007). Recently, Banks, Oldfield, and Smith (2011) traced the origins of differences in physical health between older Americans and their English counterparts back to their childhood years. The authors not only showed that the older US population reported higher rates of specific childhood health conditions, but also suggested that the transition of this population into poor later life health tends to be higher in America than in England.

Despite being correlated with each other, early health and SES also appear to bear independent associations with adult health. Research by Case et al. (2005), for example, indicated that even if parents' income, education, and social class are controlled for, adults who suffered from poor childhood health exhibit significantly worse health outcomes than adults who did not experience poor health during their childhood (also see Blackwell et al., 2001; Haas, 2007).

From this research we derive our first hypothesis: even when controlling for contemporary micro- and macro-level characteristics there should be independent negative relationships between poor childhood SES, health, and cognition on the one hand, and individuals' odds of aging successfully on the other hand. This hypothesis is supposed to hold for Rowe and Kahn's composite indicator of successful aging as well as for each of its individual components (i.e., chronic diseases, functional limitations, cognitive functioning, and social activity; see the 'Methods' section for details).

Studies relating societal context to individuals' health

Both early life and contemporaneous contextual factors have been shown to contribute to explaining health at older ages. A number of recent single-country studies assessed the relationship of later life health and mortality with, for example, high infant mortality rates or economic recession during childhood (e.g., van den Berg, Lindeboom, & Lopez, 2009; Delaney, McGovern, & Smith, 2011; Portrait, Alessie, & Deeg, 2010), suggesting long-term effects of the latter on the former. Frequently discussed contemporary macro-level determinants of health are, for example, public health care expenditures and a country's gross domestic product (e.g., Carrin & Politi, 1995; Jürges, 2007; Swift, 2011). Beyond a certain level of GDP, however, the association between economic development (or, income) and adult health (or, mortality) has been shown to weaken (e.g., Clark, 2011; Deaton, 2003). Instead, the distribution of income across a society seems to have become a relevant contextual determinant of population health in highly developed (e.g., European) countries.

For this reason, our study focuses on the role of income inequality in explaining successful aging (Wilkinson and Pickett (2006, 2009) as well as Subramanian and Kawachi (2004) provide excellent reviews of the related literature; also see Kondo et al.'s (2009) meta-analysis of multilevel studies). Several – complementary rather than mutually exclusive – mechanisms have been proposed to be working here, suggesting associations between income inequality and (a) individuals' endowment with social capital, (b) status differentiation and exposure to psychosocial stress, or (c) investments in social infrastructures and services (see Layte, 2011, for a recent test of these hypotheses). A growing body of methodologically sound empirical evidence provides a clear indication of adverse effects of income inequality (usually measured by the Gini coefficient) on individuals' morbidity and mortality (as well as a variety of other social problems; cf. Wilkinson & Pickett, 2009). The reported findings tend to be stronger if countries rather than smaller-area geographic entities are considered (e.g., Subramanian & Kawachi, 2004; Wilkinson & Pickett, 2009: Fig. 7).

An important issue is the question of when and how income inequality affects individuals' health during the life course. Torre and Myrskylä (2011) found that increases in income inequality increase infant and child mortality, but were not able to identify the responsible underlying mechanism (lack of social services or parental stress). While most studies investigating adult health measure income inequality around the time when the outcome is observed, Subramanian and Kawachi (2004) pointed out that lag effects of income inequality might also exist. When investigating contemporaneous and 25- or 15-year lagged effects of state income inequality on individual self-rated health in the United States, though, Subramanian and Kawachi (2006) did not find significant differences between contemporaneous and lagged effects.

The scope of our multilevel analysis is limited to the consideration of current income inequality. That is, we neither account for potential lag effects, nor are we able to assess directly the role of early life

macro conditions. However, Kawachi (2006: 990) suggested that income inequality – as well as social capital – might be considered as "aggregate markers of deeper political and social arrangements (e.g., neoliberalism vs. support for the welfare state, and/or provision of universal primary care services) that are contingent on the history of each country." The extent of income inequality is heavily influenced by a country's welfare regime, whose basic set-up – 'liberal', 'corporatist', 'social democratic', etc. – is deeply rooted in a country's socio-cultural context and thus characterized by relative inertia (e.g., Pfau-Effinger, 2005). A contemporary measure of income inequality might therefore also reflect – indirectly and to a limited extent – some of the more general social and economic conditions under which the individuals in our sample grew up.

Accordingly, our second hypothesis states that, controlling for early- and later life individual characteristics, there should be a negative multilevel relationship between higher levels of income inequality in a society and individuals' odds of aging successfully. This hypothesis is also supposed to hold for various specifications of our dependent variable.

Methods

Data

This study uses baseline interviews from the first two waves of the Survey of Health, Ageing and Retirement in Europe (SHARE; cf. Börsch-Supan, Hank, Jürges, & Schröder, 2010), which were conducted in 2004–05 and 2006–07, respectively. These data were complemented with retrospective information on participants' childhood living conditions, collected in 2008–09 during the survey's third round as part of the SHARELIFE project (see Schröder, 2011, for methodological details). SHARELIFE data are available for non-institutionalized respondents aged 50 or older from 13 Continental European countries (Austria, Belgium, the Czech Republic, Denmark, France, Germany, Greece, Italy, the Netherlands, Poland, Spain, Sweden, and Switzerland) who had already participated in at least one of the previous SHARE waves. Our analytic sample consists of 22,464 men and women aged 50–96 at baseline (mean: 63.3 years), excluding older adults who required proxy respondents; see Table 1 for descriptive statistics.

Dependent variable

Following Rowe and Kahn's conceptualization, we computed a binary indicator defining successful aging as having (a) no major disease, (b) no activity of daily living (ADL) disability, (c) obtaining a median or higher score on tests of cognitive functioning, (d) no more than one difficulty with six measures of physical functioning, and (e) being actively engaged (also see Hank, 2011a; McLaughlin et al., 2010). Accordingly, our dependent variable equals 1, if all of the above conditions were fulfilled, 0 otherwise. The single items on which this composite measure of successful aging is based were operationalized as follows:

(a) Respondents were considered to have no major disease if they neither reported that a doctor had ever told them they had any of the following chronic diseases: cancer, chronic lung disease, diabetes, heart disease, or stroke, nor obtained a score of four or more on the EURO-D depression scale (see Castro-Costa et al., 2008).
(b) Respondents were classified as having no disability if they did not report difficulties performing any of the following ADLs: walking across a room, dressing, bathing or showering, eating, getting in or out of bed, and using the toilet.
(c) Participants were considered to have high cognitive functioning if they achieved a median or higher score on a cognitive functioning index based on the following items (see Dewey & Prince, 2005): naming correctly the day of the week, day, month, and year (1 point for each correct answer: max. 4); an immediate and a delayed 10-word recall test (1 point for each correctly recalled noun: max. 20); and a mathematical performance test (1 point for each correct answer: max. 5). For missing cognitive items, we computed scores of 0. Participants could obtain a maximum score of 29.
(d) Participants were classified as having high physical functioning if they reported difficulties with no more than one of the six following activities: climbing one flight of stairs; climbing several flights of stairs; lifting or carrying items weighing more than 10 lbs.; stooping, kneeling, or crouching; pulling or pushing large objects; and walking 100 m.

Table 1
Pooled sample characteristics (unweighted).

Successful aging		
Global measure	26%	$n = 5868$
- No major disease	58%	$n = 12,954$
- No disability	92%	$n = 20,745$
- High cognitive functioning	66%	$n = 14,740$
- High physical functioning	76%	$n = 17,159$
- Actively engaged	56%	$n = 12,552$
Contemporary individual controls		
Demographics		
Age		
- 50–59	41%	$n = 9194$
- 60–69	33%	$n = 7469$
- 70 or older	26%	$n = 5801$
Sex: female	55%	$n = 12,256$
SES		
Education		
- Low	47%	$n = 10,658$
- Medium	33%	$n = 7414$
- High	20%	$n = 4392$
Income	23,434 €	$n = 22,464$
Wealth	305,749 €	$n = 22,464$
Health behaviors		
Smoking		
- Never	52%	$n = 11,611$
- Stopped	28%	$n = 6237$
- Current	21%	$n = 4616$
Alcohol consumption in last three months		
- Never	36%	$n = 8165$
- Twice a month or less often	12%	$n = 2752$
- At least once a week	27%	$n = 5992$
- Almost every day	25%	$n = 5555$
Vigorous physical activities	52%	$n = 11,586$
Childhood conditions		
SES		
- No. of individuals per room	1.9	$n = 22,464$
- No. of books in household		
0–10 books	43%	$n = 9643$
11–25 books	23%	$n = 5180$
26–100 books	21%	$n = 4783$
101–200 books	6%	$n = 1439$
More than 200 books	6%	$n = 1419$
Cognition – math skills		
- Worse than others	14%	$n = 3176$
- Same as others	51%	$n = 11,400$
- Better than others	35%	$n = 7888$
Cognition – language skills		
- Worse than others	13%	$n = 3027$
- Same as others	50%	$n = 11,230$
- Better than others	37%	$n = 8207$
Childhood health ('excellent' → 'poor')		
- Excellent	36%	$n = 8052$
- Very good	34%	$n = 7535$
- Good	23%	$n = 5119$
- Fair	6%	$n = 1298$
- Poor	2%	$n = 460$
Macro-level indicator		
Gini coefficient	30.3	$n = 13$

Source: SHARE (Waves 1–3); OECD (2008).

(e) Respondents were defined as being actively engaged if they reported, first, having done 'any paid work' or 'voluntary or charity work' in the month preceding the interview, or having provided any grandchild care during the past 12 months, and, second, living with a partner, having 'provided help to family, friends, or neighbors' or having 'gone to a sport, social, or other kind of club' in the month preceding the interview.

While the biomedical and social activity dimensions of our dependent variable have been shown to constitute fairly distinct components of successful aging (cf. Hank, 2011a: 233), there is considerable correlation between some of the biomedical items (e.g., between ADL limitations and physical functioning). To check the robustness of our initial findings, we thus decided to perform a supplementary set of analyses, decomposing Rowe and Kahn's global measure into its initial components and running separate regressions for each of the five items described above.

Contemporary explanatory variables

We control for two demographic variables, namely sex and age, as well as three measures of the individual's current SES: first, the highest educational degree ever achieved ('low' = lower secondary or second stage of basic education or less; 'medium' = (upper) secondary education or post-secondary non-tertiary education; 'high' = first stage of tertiary education or higher); second, the household equivalent income; and, third, household wealth (in €). We defined binary indicators of country-specific, purchasing power adjusted income and wealth quartiles, using imputed income and wealth data for respondents with initially missing values (see Christelis, Japelli, Paccagnella, & Weber, 2009, for a description of multiple imputation procedures in SHARE). Moreover, we account for three relevant health behaviors: smoking, frequency of alcohol consumption in the last three months prior to the interview, and regular (i.e., weekly or more often) engagement in vigorous physical activities (such as sports, heavy housework, or a job that involves physical labor). Finally, we include country-specific Gini coefficients (OECD, 2008) in our model, indicating the extent of income inequality in a society. Focusing on this single macro-level indicator is justified conceptually (see our discussion above) and is necessary econometrically, because the relatively small number of observations at the country-level ($n = 13$) allows us to consider at most one such explanatory variable at a time (e.g., Maas & Hox, 2005).

Childhood explanatory variables

Parental SES when the respondent was 10 years old was measured by (a) the average number of persons sharing a room in the accommodation, and (b) the number of books available in the household (indicated by five categories ranging from 'none or very few (0–10 books)' to 'enough to fill two or more bookcases (more than 200 books)'). After a positive test for linearity, both indicators entered the regression as continuous variables. Cognitive abilities at age 10 were assessed by respondents' self-evaluation of their math and language skills at school in comparison to their classmates (better, same, or worse). Finally, we account for individuals' subjective general health during childhood (five categories ranging from 'excellent' to 'poor'), which entered our model as a continuous variable. Using alternative indicators of childhood health, such as the number of diseases or absence from school due to health problems, did not provide any findings different from those reported below (see e.g., Haas, 2007, for an evaluation of the reliability of retrospective childhood health reports).

Statistical analysis

For the multivariate analysis we estimated multilevel models, specifically random intercept models for binary dependent variables (cf. Gelman & Hill, 2007: Part 2A; Guo & Zhao, 2000). That is, in the analysis performed here, all regression coefficients other than the intercept are constrained to be fixed across countries, i.e., we assume that the effect of the explanatory variables does not differ between contexts. The equation for this kind of model is

$$y_{ij} = b_0 + b_1 x_{ij} + b_2 v_j + u_{0j} + \varepsilon_{ij} \quad [1]$$

where y_{ij} represents the outcome of the dependent variable y for individual i within context j, x_{ij} is the individual-level explanatory variable, and v_j the macro-level explanatory variable. The random intercept's fixed component b_0 and the slopes b_1 and b_2 are the parameters of the equation. The error term is more complex than in traditional regression equations, since it includes not only the micro error ε_{ij}, but also the macro error u_{0j}. The latter indicates that the intercept may vary over contexts, i.e., u_{0j} measures the deviation of each context from b_0 (between-context variance). It captures otherwise unobserved regional effects and accounts for the correlation between individuals nested within the same context. All ε_{ij} are assumed to be independent of each other with expectation zero and variance σ^2_ε. The macro-level disturbances u_{0j} are independent of the individual-level disturbances, have expectation zero and variance σ^2_u. If the variance of u_{0j} turns out to be statistically significant from zero, context effects are present.

Multilevel generalized linear models (GLIM) can be used to overcome some of the shortcomings of simple random coefficient models, such as the underlying assumption of a normal error distribution. Hierarchical GLIM therefore allow the application of multilevel logistic regression models for the analysis of discrete dependent variables. The two-level model for a binary response variable is conceptually equivalent to equation [1]. The probability of the binary outcome to be one is defined as $p_{ij} = \Pr(y_{ij} = 1)$, where p_{ij} is modeled using a logit link function. With the standard assumption that y_{ij} has a Bernoulli distribution, the multilevel logistic model can be written as

$$\log\left[p_{ij}/\left(1 - p_{ij}\right)\right] = b_0 + b_1 x_{ij} + b_2 v_j + u_{0j} + \varepsilon_{ij} \quad [2]$$

where the same assumptions as in the case of multilevel linear models apply to u_{0j}, i.e., the random effect is assumed to be normally distributed, with expected value 0 and variance σ^2_u, while ε_{ij} has a logistic distribution with a variance of $\pi^2/3$. – The results of the logistic regressions are presented as odds ratios (OR).

Results

The explanatory variables were included stepwise into the regression, that is, we started with a so called 'empty' model that contained only the constant and the macro-level error term (Model 1). The contemporary (i.e., later life) micro-level control variables were introduced in Model 2, which was complemented by our set of childhood variables in Model 3. Finally, we added the Gini coefficient as a macro-level variable in Model 4 (see Table 2). Note that all findings reported here are based on the pooled SHARE sample. In addition, we conducted separate analyses for men and women as well as for different age groups (cohorts, respectively), which did not provide any further insights, though (results are available from the authors upon request).

We begin our description of results by examining the outcomes of the contemporary micro-level control variables (Model 2). The coefficients of individuals' basic demographic characteristics show that the odds of meeting Rowe and Kahn's successful aging criterion

sharply decreased with age and were significantly lower among women than men. We also found the expected positive socioeconomic gradient: the chances of aging well increased steadily with individuals' educational attainment and across all income and wealth quartiles. Finally, health behaviors were shown to matter greatly: while former and current smokers exhibited the lowest odds, individuals reporting to consume alcohol at least occasionally as well as respondents who were physically active were most likely to age successfully.

The inclusion of childhood variables (Model 3) barely changed the coefficients of the contemporary controls, but significantly improved the model fit (LR-test: 91.62**). Both measures of parental SES suggested that individuals who experienced a higher socioeconomic position at age 10 had a higher propensity to age well than their less advantaged counterparts (number of persons per room: OR = 0.91, 95% CI = 0.88–0.94; number of books in household: OR = 1.04, 95% CI = 1.01–1.07). Individuals reporting below average cognitive skills (in terms of math and/or language proficiency) at age 10 were significantly more likely to fail the successful aging criterion, as were those reporting poorer levels of general health during their childhood (OR = 0.85, 95% CI = 0.82–0.88). Note that the findings reported here for the pooled sample of countries also held for most countries individually (see Table A1).

Table 2
Results of multilevel logistic regressions for global 'successful aging' measure – odds ratios (95% confidence intervals).

	Model (1)	Model (2)	Model (3)	Model (4)
Contemporary individual controls				
Demographics				
Age				
- 50–59[a]		1.00	1.00	1.00
- 60–69		0.50** (0.46–0.54)	0.50** (0.47–0.54)	0.50** (0.46–0.54)
- 70 or older		0.16** (0.14–0.18)	0.16** (0.14–0.18)	0.16** (0.14–0.18)
Sex: female		0.69** (0.64–0.74)	0.68** (0.63–0.73)	0.68** (0.64–0.74)
SES				
Education				
- Low[a]		1.00	1.00	1.00
- Medium		1.55** (1.44–1.68)	1.37** (1.27–1.49)	1.37** (1.26–1.49)
- High		2.06** (1.88–2.26)	1.73** (1.56–1.91)	1.69** (1.53–1.87)
Wealth				
- 1st quartile[a]		1.00	1.00	1.00
- 2nd quartile		1.38** (1.24–1.53)	1.33** (1.20–1.48)	1.34** (1.21–1.49)
- 3rd quartile		1.60** (1.45–1.78)	1.53** (1.38–1.70)	1.54** (1.40–1.71)
- 4th quartile		1.71** (1.54–1.90)	1.61** (1.45–1.79)	1.62** (1.46–1.81)
Income				
- 1st quartile[a]		1.00	1.00	1.00
- 2nd quartile		1.26** (1.13–1.40)	1.24** (1.12–1.39)	1.24** (1.11–1.38)
- 3rd quartile		1.71** (1.54–1.90)	1.67** (1.50–1.85)	1.67** (1.50–1.85)
- 4th quartile		2.02** (1.82–2.25)	1.95** (1.75–2.17)	1.95** (1.75–2.17)
Health behaviors				
Smoking				
- Never[a]		1.00	1.00	1.00
- Stopped		0.82** (0.76–0.89)	0.83** (0.76–0.90)	0.83** (0.76–0.90)
- Current		0.83** (0.762–0.909)	0.81** (0.74–0.89)	0.82** (0.75–0.89)
Alcohol consumption (3 months)				
- Never[a]		1.00	1.00	1.00
- Twice a month or less often		1.39** (1.24–1.56)	1.41** (1.26–1.58)	1.38** (1.23–1.55)
- At least once a week		1.54** (1.41–1.69)	1.54** (1.41–1.69)	1.51** (1.37–1.65)
- Almost every day		1.37** (1.25–1.52)	1.33** (1.21–1.47)	1.35** (1.23–1.49)
Vigorous physical activities		1.62** (1.51–1.74)	1.60** (1.49–1.71)	1.60** (1.49–1.71)
Childhood conditions				
SES				
No. individuals per room			0.91** (0.88–0.94)	0.92** (0.89–0.95)
No. of books in household			1.04* (1.01–1.07)	1.04** (1.01–1.08)
Cognition – math skills				
- Worse than others			0.77** (0.68–0.87)	0.77** (0.68–0.87)
- Same as others[a]			1.00	1.00
- Better than others			1.10* (1.02–1.20)	1.10* (1.02–1.19)
Cognition – language skills				
- Worse than others			0.88* (0.79–1.00)	0.89+ (0.79–1.00)
- Same as others[a]			1.00	1.00
- Better than others			1.04 (0.96–1.13)	1.04 (0.95–1.13)
Childhood health ('excellent' → 'poor')			0.85** (0.82–0.88)	0.86** (0.83–0.89)
Macro-level indicator				
Gini coefficient				0.94** (0.93–0.94)
BIC	24,761	21,073	20,960	20,966
LL	−12,371	−10,441	−10,350	−10,348
LR-Test		1929.17**	91.62**	2.05
Variance (country)	0.14	0.14	0.14	0.07
Standard error	0.01	0.01	0.01	0.01
ICC	0.04	0.04	0.04	0.02
No. of observations				
Persons	22,464	22,464	22,464	22,464
Countries	13	13	13	13

Significance: **$p < 0.01$, *$p < 0.05$, +$p < 0.1$.
[a] Reference category. Source: SHARE (Waves 1–3).

Finally, we turned to cross-country differences in and income inequality as a societal determinant of successful aging. Consistent with descriptive findings from previous research (Hank, 2011a), the 'empty' Model 1 clearly indicated a statistically significant regional variation of the constant, with an intra-class correlation (ICC) of 4% (an order of magnitude we also find in similar studies; see, for example, Hank, 2011b). The ICC did not change, if we controlled for contemporary (Model 2) and childhood (Model 3) individual characteristics. If, however, we controlled for countries' level of income inequality (Model 4), the ICC was reduced by about half to 2%. The Gini coefficient itself was statistically significant, suggesting that individuals living in welfare states characterized by greater levels of income inequality were less likely to enter old age successfully (OR = 0.94, 95% CI = 0.93–0.94). This correlation remained significant even if we controlled for differences in countries' gross domestic product (details of model not shown; the Gini's OR = 0.98, 95% CI = 0.97–0.99).

Although some coefficients failed to meet conventional levels of statistical significance, the results of our supplementary analysis with five separate regressions for disease and disability, cognitive and physical functioning, as well as active engagement (see Table 3) generally confirmed the findings reported in Table 2 for Rowe and Kahn's global measure of successful aging. It did not come as a surprise that the association between 'successful aging' and childhood cognition was mainly driven by the correlation between the latter and later life cognitive functioning, but overall we observed an impressive consistency in the relationship between various elements of childhood living conditions and specific dimensions of successful aging. This was also the case when we looked at income inequality, which bore statistically significant negative associations with most of our indicators of aging well, except disability and disease.

Discussion

Exploiting new data from the SHARELIFE project, which allowed us to integrate life course and multilevel perspectives on successful aging, the present study had two main objectives: first, to explore the potential role of parental SES as well as childhood health and cognition in determining whether Europeans succeed in aging well; second, to test whether and how social inequality (measured by a country's Gini coefficient) relates to individuals' odds of meeting Rowe and Kahn's (1997, 1998) successful aging criteria.

For a relatively broad set of 13 Continental European countries, our findings confirmed results of previous research – mainly single-country studies conducted in non-European contexts – in several regards. Most importantly, we observed an independent association of childhood living conditions with elders' probability to have no disease and no disability, to enjoy high cognitive and physical functioning, and to be actively engaged, even if later life SES and health behaviors are controlled for. In addition to statistically significant correlations between higher parental SES, better math and reading skills, or self-reports of good childhood health with specific elements of aging well, our analysis also revealed positive associations of favorable circumstances earlier in life with Rowe and Kahn's composite indicator of successful aging. Despite criticism on both conceptual and methodological grounds (cf. Dillaway & Byrnes, 2009), 'successful aging' thus appears to be a simple but powerful measure of multiple dimensions of older people's well-being, whose origins we were able to trace back to individuals' childhood years.

Including childhood conditions was shown to significantly improve the model fit compared to models solely accounting for contemporary micro-level characteristics. However, our study also suggests that the consideration of societal context is relevant for our understanding of differences in individuals' chances to age successfully: including country-specific Gini coefficients as a measure of social inequality contributed to explaining cross-national variations in the proportion of elders aging well (cf. Hank, 2011a). Furthermore, the Gini coefficient is consistently shown to bear significant negative associations with global and specific measures of successful aging (except disease and disability). That is, higher levels of income inequality not only harm well-being in the general population (e.g., Wilkinson & Pickett, 2006), but might also constitute a threat to aging well.

Unfortunately, we could not determine specific mechanisms underlying the observed associations between childhood conditions, social inequality, and successful aging. Moreover, although we were able to derive the measures used in our analysis from an unusually rich database, SHARELIFE, we are still aware of several limitations in both our dependent and explanatory variables:

Table 3
Results of multilevel logistic regressions for five dimensions of 'successful aging' – odds ratios (95% confidence intervals).[a]

	(a) No major disease	(b) No disability	(c) High cognitive functioning	(d) High physical functioning	(e) Actively engaged
Childhood conditions					
SES					
No. individuals per room	0.95** (0.93–0.97)	0.95** (0.92–0.99)	0.96** (0.94–0.98)	0.96** (0.94–0.99)	1.00 (0.98–1.03)
No. of books in household	0.99 (0.96–1.02)	0.97 (0.92–1.02)	1.18** (1.14–1.22)	1.03+ (1.00–1.07)	1.05** (1.02–1.08)
Cognition – math skills					
- Worse than others	0.86** (0.79–0.94)	0.89 (0.76–1.04)	0.69** (0.63–0.77)	0.92 (0.83–1.03)	0.92+ (0.83–1.01)
- Same as others[b]	1.00	1.00	1.00	1.00	1.00
- Better than others	0.98 (0.92–1.06)	0.94 (0.82–1.07)	1.28** (1.18–1.39)	1.01 (0.93–1.11)	1.04 (0.97–1.12)
Cognition – language skills					
- Worse than others	0.87** (0.80–0.96)	0.93 (0.79–1.10)	0.93 (0.84–1.03)	0.86** (0.77–0.96)	0.98 (0.89–1.09)
- Same as others[b]	1.00	1.00	1.00	1.00	1.00
- Better than others	0.96 (0.90–1.03)	0.98 (0.86–1.12)	1.30** (1.20–1.41)	0.92+ (0.85–1.01)	1.03 (0.96–1.11)
Childhood health ('excellent' → 'poor')	0.85** (0.83–0.87)	0.86** (0.82–0.91)	1.02 (0.98–1.05)	0.84** (0.81–0.87)	0.95** (0.92–0.98)
Macro-level indicator					
Gini coefficient	0.99 (0.99–1.00)	1.01+ (1.00–1.03)	0.98** (0.97–0.99)	0.95** (0.94–0.96)	0.94** (0.93–0.94)
BIC	28,713	11,113	23,275	20,359	25,695
LL	−14,221	−5421	−11,502	−10,044	−12,712
Variance (country)	0.10	0.26	0.08	0.20	0.14
Standard error	0.01	0.04	0.01	0.04	0.01
ICC	0.03	0.07	0.02	0.06	0.04
No. of observations					
Persons	22,464	22,464	22,464	22,464	22,464
Countries	13	13	13	13	13

Significance: $^{**}p < 0.01$, $^{*}p < 0.05$, $+p < 0.1$.
[a] Coefficients of contemporary individual controls are not displayed.
[b] Reference category. Source: SHARE (Waves 1–3).

First, while there are good reasons to employ relatively broad indicators of successful aging, whose appeal lies in their multidimensionality, it also seems important to further our understanding of how childhood and societal circumstances are related to specific health outcomes in later life, such as cardiovascular diseases (e.g., van den Berg, Doblhammer, & Christensen, 2011; O'Rand & Hamil-Luker, 2005). Furthermore, non-biomedical indicators of 'success', such as life-satisfaction, clearly deserve our attention, since self-ratings and lay views of successful aging regularly documented greater diversity and more domains than those accounted for in academic conceptualizations (e.g., Hung, Kempen, & De Vries, 2010; Strawbridge, Wallhagen, & Cohen, 2002). This seems particularly relevant for future cross-national research, because specific domains of successful aging might be valued differently by older people across cultures (e.g., Fernández-Ballesteros et al., 2008; Hung et al., 2010).

Second, when analyzing the role of childhood misfortune as a threat to avoiding disease in later life, Schafer and Ferraro (2011: 9) recently argued "that childhood represents a more basic life stage that merits attention in its own right". Parallel to a possibly more inclusive conceptualization of 'successful aging', future research should thus aim at accounting more comprehensively for potentially relevant adverse childhood experiences, including abuse and family dysfunction (e.g., Dube, Felitti, Dong, Giles, & Anda, 2003).

Third, even though it might not be possible to obtain the necessary time series macro data for the full sample of countries covered by our study, it clearly seems desirable to consider the role of early life and contemporaneous macro conditions in explaining later life health (e.g., Portrait et al., 2010). Moreover, next to considering the Gini coefficient as a potentially important societal determinant of successful aging, future research should also investigate the role of further – and potentially confounding – indicators of a country's welfare state arrangement (see Hank, 2011b, for a related discussion).

These potential limitations provide no argument, however, that might corrupt our overall conclusion of long-standing associations of childhood conditions and social inequality with individuals' chances to age successfully. Thus, the policy implications of our findings are clear: welfare states do play an important role in establishing opportunity structures promoting successful aging – and should act accordingly. Policy interventions should aim at improving conditions for successful aging throughout the entire life course, starting in childhood and providing individuals with equal opportunities for education and health in particular. Along these lines, the European Commission has established programs for lifelong learning (e.g., Commission of the European Communities, 2000) or healthy aging (e.g., Jamieson, 1994). In order to be effective, however, it is important that such programs' initial intervention takes place early in the individual's life course.

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Appendix

Table A1
Results of logistic regressions for global 'successful aging' measure by country – odds ratios.[a]

	SE	DK	NL	BE	FR	DE	AU	CH	ES	IT	GR	PL	CZ
Childhood conditions													
SES													
No. individuals per room	1.01	0.85+	1.01	0.87	0.90	0.83*	0.76*	0.68**	0.86	0.91+	0.95	0.92	0.99
	(0.90–1.14)	(0.71–1.02)	(0.90–1.15)	(0.71–1.08)	(0.77–1.06)	(0.70–0.98)	(0.60–0.97)	(0.52–0.90)	(0.71–1.05)	(0.82–1.01)	(0.86–1.06)	(0.84–1.02)	(0.89–1.11)
No. of books in household	1.03	0.98	0.99	1.19**	1.08	1.02	1.12	1.08	1.05	1.13	0.89	0.96	1.00
	(0.93–1.14)	(0.90–1.07)	(0.90–1.09)	(1.09–1.30)	(0.97–1.21)	(0.92–1.14)	(0.91–1.38)	(0.95–1.22)	(0.88–1.26)	(0.97–1.32)	(0.77–1.03)	(0.81–1.14)	(0.86–1.15)
Cognition – math skills													
- Worse than others	0.78	0.80	0.63*	0.72	1.05	1.55*	0.61	0.53**	0.66	0.64*	0.91	0.49+	0.62+
	(0.51–1.20)	(0.53–1.21)	(0.42–0.95)	(0.48–1.09)	(0.73–1.52)	(1.04–2.31)	(0.27–1.35)	(0.33–0.85)	(0.35–1.25)	(0.42–0.97)	(0.61–1.36)	(0.24–1.01)	(0.36–1.05)
- Same as others[b]	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
- Better than others	0.99	1.28*	0.86	0.99	1.34*	1.10	0.60+	1.23	1.25	1.30+	0.98	0.95	1.71**
	(0.78–1.26)	(1.01–1.64)	(0.67–1.12)	(0.78–1.27)	(1.01–1.78)	(0.83–1.45)	(0.35–1.03)	(0.89–1.70)	(0.79–1.99)	(0.97–1.75)	(0.71–1.35)	(0.62–1.44)	(1.14–2.56)
Cognition – language skills													
- Worse than others	1.02	0.76	0.95	0.56*	0.69+	0.90	1.13	1.70*	1.33	0.74	0.89	0.99	1.04
	(0.67–1.55)	(0.53–1.09)	(0.66–1.36)	(0.35–0.88)	(0.47–1.01)	(0.59–1.36)	(0.55–2.32)	(1.04–2.80)	(0.70–2.53)	(0.49–1.11)	(0.59–1.34)	(0.54–1.81)	(0.61–1.77)
- Same as others[b]	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
- Better than others	0.96	0.94	1.22	1.12	0.92	1.06	1.32	0.98	0.90	1.10	0.97	1.28	0.59*
	(0.75–1.22)	(0.73–1.21)	(0.94–1.60)	(0.87–1.43)	(0.69–1.22)	(0.81–1.39)	(0.78–2.24)	(0.70–1.35)	(0.56–1.46)	(0.81–1.51)	(0.69–1.35)	(0.83–1.97)	(0.39–0.90)
Childhood health	0.83**	0.74**	0.91+	0.88*	0.92	0.79**	0.83+	0.81**	1.03	0.90	0.84+	0.68**	0.97
('excellent' → 'poor')	(0.74–0.93)	(0.67–0.83)	(0.82–1.00)	(0.80–0.98)	(0.82–1.03)	(0.70–0.89)	(0.67–1.02)	(0.70–0.94)	(0.85–1.24)	(0.79–1.03)	(0.70–1.02)	(0.55–0.84)	(0.83–1.14)
No. of observations	1703	1876	1889	2509	1909	1641	719	1100	1393	2172	2337	1579	1637

Significance: $^{**}p < 0.01$, $^{*}p < 0.05$, $+p < 0.1$.
[a] Coefficients of contemporary individual controls are not displayed.
[b] Reference category. Source: SHARE (Waves 1–3).

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