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The role of adult socioeconomic and relational reserves regarding the effect of childhood misfortune on late-life depressive symptoms

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A B S T R A C T

Background: Childhood misfortune is associated with late-life depressive symptoms, but it remains an open question whether adult socioeconomic and relational reserves could reduce the association between childhood misfortune and late-life depressive symptoms.
Methods: Using the Survey of Health, Ageing and Retirement in Europe (SHARE), data from 8'357 individuals (35'260 observations) aged 50–96 years and living in 11 European countries were used to examine associations between three indicators of childhood misfortune (adverse childhood events, poor childhood health, and childhood socioeconomic circumstances) and late-life depressive symptoms. Subsequently, we tested whether these associations were mediated by education, occupational position, the ability to make ends meet, and potential or perceived relational reserves; that is family members or significant others who can provide help in case of need, respectively. Analyses were stratified by gender and adjusted for confounding and control variables.
Results: Adult socioeconomic reserves partly mediated the associations between adverse childhood events, poor childhood health and late-life depressive symptoms. The associations with the third indicator of childhood misfortune (childhood socioeconomic circumstances) were fully mediated by adult socioeconomic reserves in men, and partly mediated in women. None of the associations were mediated by relational reserves. However, perceived relational reserves were associated with fewer late-life depressive symptoms.
Conclusion: Childhood socioeconomic disadvantage can be mitigated more easily over the life course than adverse childhood events and poor childhood health, especially in men. Perceived relational reserves work primarily as a protective force against late-life depressive symptoms and may be particularly important in the context of the cumulative effect of childhood adversities.

1. Introduction

Depression is the most common mental health problem in late life with a substantial increase among the oldest old (Luppa et al., 2012). An important risk factor for mental health is early-life stress (Schwarzbach, Luppa, Forstmeier, Konig, & Riedel-Heller, 2014). Studies have shown that late-life depression is associated with disadvantaged childhood socioeconomic circumstances (CSC) (Angelini, Howdon, & Mierau, 2018), adverse childhood experiences (ACE) (Ege, Messias, Thapa, & Krain, 2015), and poor childhood health (Arpino, Guma, & Julia, 2018). However, whether this effect of childhood misfortune on late-life depressive symptoms can be mitigated by socioeconomic and relational reserves over the life course is still unclear. As conceptualized by Cullati, Kliegel, and Widmer (2018), different types of reserves (e.g. cognitive, economical, relational, etc.) can be assembled over the life course. These reserves need to be developed and

maintained by individuals. Their availability has been shown to affect an individual's vulnerability to life course stressors (Ihle et al., 2016). Relational reserves in particular are at stakes for promoting physical and mental health, increasing individual resilience against non-normative events by activating resources from others (family, close friends) in case of need. Therefore, these reserves might carry an important protective function against deterioration of late-life mental health.

First, socioeconomic reserves acquired in young and late adulthood (Galobardes, Shaw, Lawlor, Lynch, & Davey Smith, 2006) may alleviate the effect of childhood misfortune on late-life depressive symptoms by providing individuals with resources derived from education and occupational position. However, previous findings on potential mediation by adult socioeconomic reserves are inconsistent. European studies showed either no mediating effect by adult socioeconomic factors (Angelini et al., 2018) or a mediating effect of adult educational attainments on the association between CSC and late-life depressive symptoms, but not on the association between childhood health and late-life depressive symptoms (Arpino et al., 2018).

Second, social relations could reduce the effect of childhood misfortune on late-life depressive symptoms. In the present study, we focus on social relations conceptualized as reserves, which can be formed, maintained and restored over the life course. Relational reserves are the latent matrix of relationships established by active exchanges and reciprocity with family members and friends (e.g. doing someone a favor) (Widmer, 2016). Over the life course, these interactions form stable convoys of significant others, likely to stand by someone's side if needed (Antonucci & Akiyama, 1995). Individuals are likely to accumulate such relational reserves over time. Relational reserves are potential resources which can be activated in case of need (e.g. adverse life event) to receive help or support (Cullati et al., 2018). Hence, the study included variables of potential relational reserves (close family relations) which are known to incorporate intimate positions in the personal convoy of significant others (Antonucci & Akiyama, 1995). Further, to integrate potential help which can be quickly activated in case of need, we integrated a variable of perceived relational reserves ("If I were in trouble, there are people in this area who would help me"). People on whom individuals can rely in times of need can help to delay or modify processes of health decline in late life, such as depressive symptoms (Cullati et al., 2018). Although a systematic review on social relations and depression in late life has shown that social support of good quality can buffer depressive symptoms in late life (Schwarzbach et al., 2014), up to now, it is not known if relational reserves can mediate the effect of an adverse start in life on late-life mental health.

We hypothesize, that socioeconomic and relational reserves acquired over the life course could alleviate a bad start in life and reduce its effect on late-life depressive symptoms. Therefore, the present study examined whether adult socioeconomic and relational reserves mediate the associations between three childhood misfortune indicators and late-life depressive symptoms (Fig. 1).

2. Methods

2.1. Study design

Data were drawn from the Survey of Health, Ageing and Retirement in Europe (SHARE) (Börsch-Supan et al., 2013) which took place every two years between 2004 (wave 1) and 2015 (wave 6). Depressive symptoms, adult socioeconomic reserves and potential relational reserves were assessed at waves 1, 2, 4, 5, and 6. Information on childhood misfortune was assessed during SHARELIFE (retrospective survey on life histories in wave 3). The question on perceived relational reserves ("If I were in trouble, there are people in this area who would help me") was only integrated in waves 5 and 6. In this study, participants were included if (A) they participated in the third wave, (B) provided at least one measurement of depressive symptoms in any of
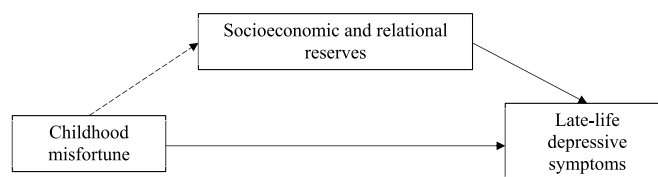

Fig. 1. Hypothesized mediating effect of socioeconomic and relational reserves. The dashed arrow represents a theoretical link which was not analyzed in the present study.

the other five waves, and (C) provided at least one measurement of relational reserves in waves 5 and 6. The final sample included 8357 individuals (35,260 observations) aged 50–96 years and living in 11 European countries.[1] Participants contributed an average of 4.2 observations to the model.

2.2. Outcome: depressive symptoms

The EURO-D scale is a validated measure of late-life depressive symptoms, which permits comparing depressive symptoms across European countries (Copeland et al., 2004; Kok, Avendano, Bago d'Uva, & Mackenbach, 2012; Prince et al., 1999). It includes 12 items: Depression, Pessimism, Wishing death, Guilt, Sleep, Interest, Irritability, Appetite, Fatigue, Concentration, Enjoyment, and Tearfulness. Depressive symptoms were measured in all SHARE waves, except wave 3. In the analysis, depressive symptoms are treated as a continuous variable.

2.3. Measures

2.3.1. Childhood misfortune

Following a multidimensional approach of childhood adversities (Ferraro, Schafer, & Wilkinson, 2016; Pearlin, Schieman, Fazio, & Meersman, 2005), three self-reported indicators of childhood misfortune were created: ACE (no ACE, 1 ACE, 2 or more ACE), poor childhood health (no childhood health problems vs. 1 or more childhood health problems), and a CSC index with five categories ranging from "most disadvantaged" to "most advantaged". These retrospective measures of SHARE were found to reflect well the experienced childhood circumstances (Havari & Mazzonna, 2015; Lacey, Belcher, & Croft, 2012) though another study suggested that recalled life-course data tended to underestimate real childhood circumstances (Batty, Lawlor, Macintyre, Clark, & Leon, 2005).

ACE were assessed using six indicators of traumatic events occurring between birth and the age of 18 (Ege et al., 2015): growing up in care (children's home or foster family), parental death (no parental death, either father or mother, or both), parental mental illness, parental drinking abuse, period of hunger, and property being taken away. These six indicators were combined, resulting in an ACE score with the categories "no ACE" (i.e., participants who only answered "no"), "1 ACE" (i.e., participants who answered "yes" once), and "2 or more ACE" (i.e., participants who answered "yes" at least twice). Participants with missing information for all six indicators were excluded.

The score for childhood health is composed of three recoded binary variables of health conditions until the age of 15 (Arpino et al., 2018): long or multiple hospitalizations, 1 or less vs. 2 or more childhood diseases (e.g., polio, asthma, meningitis, encephalitis), and none vs. 1 or more serious childhood health conditions (severe headaches, psychiatric problem, fractures, heart trouble, cancers, and physical injury that has led to permanent handicap, disability or limitation in daily life). These three indicators taken together resulted in a two-level categorical

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[1] It should be noted that the analysis also included Greece and Poland, but their results were not considered as they provided very low numbers of participants (see Table 1).

variable of "no childhood health problems" (i.e., participants who answered "no" to all indicators) and "1 or more childhood health problems" (i.e., participants who answered "yes" to at least one indicator). Participants with missing information for all three indicators were excluded.

Childhood socioeconomic circumstances were assessed by four retrospective indicators at the age of 10 (SHARELIFE; wave 3) (Wahrendorf & Blane, 2015), which are known to have long-lasting effects on adult health (Chittleborough, Baum, Taylor, & Hiller, 2006). First, the occupational position of the main breadwinner of the household during childhood was derived from the International Standard Classification of Occupations (Wahrendorf, Blane, Bartley, Dragano, & Siegrist, 2013). These 10 main occupational groups were regrouped into four skill-levels, and then dichotomized into "low" and "high" occupational position. Second, having ten books or less at home compared to having more than ten books indicated socioeconomic disadvantage (Evans, Kelley, Sikora, & Treiman, 2010). Third, household overcrowding – more than one person per room – (Marsh, 1999), was computed using the number of people living in a household and the number of rooms per household (excluding kitchen, bathrooms, and hallways). Fourth, housing quality was assessed by the presence of the following facilities: fixed bath, cold and hot water supply, inside toilet, and central heating (Dedman, Gunnell, Davey Smith, & Frankel, 2001). If the household had none of them, it was coded as "disadvantaged". These four binary indicators served to create an index of childhood socioeconomic circumstances with five categories ranging from "most disadvantaged" to "most advantaged". Disadvantaged CSC have been shown to predict a wide range of health indicators, including muscle strength (Cheval, Boisgontier, et al., 2018), lung function (Cheval, Chabert, et al., 2018), frailty (van der Linden et al., 2017), disability (Landös et al., 2018), and physical inactivity (Cheval, Sieber, et al., 2018).

2.3.2. Prior confounders and covariates

All models were adjusted for the following confounders: birth cohort (1919–1928, 1929–1938 [Great Depression], 1939–1945 [World War II], and After 1945) (Yang, 2007), country of residence (Austria, Belgium, Czech Republic, Denmark, France, Germany, Greece, Italy, Netherlands, Poland, Spain, Sweden, Switzerland), and participant attrition by death (Boe, Balaj, Eikemo, McNamara, & Solheim, 2017).

Due to their strong association with depressive symptoms, four health status variables were included as covariates: (1) chronic disease score (less than 2 vs. 2 or more of the following conditions: stroke, heart attack, hypertension, diabetes, cancer, Parkinson's disease, or asthma) (Huang, Dong, Lu, Yue, & Liu, 2010); (2) daily life physical activity (physically active [more than once a week] vs. physically inactive [once a week or less]) (Cheval, Sieber, et al., 2018; Lindwall, Larsman, & Hagger, 2011); (3) limitations of activities of daily living (0 vs. 1 or more) (4); limitations of instrumental activities of daily living (0 vs. 1 or more) (Ormel, Rijsdijk, Sullivan, van Sonderen, & Kempen, 2002).

2.3.3. Mediators

Adult socioeconomic reserves: Potential adult socioeconomic mediators over the life course included participants' highest level of education, main occupational position, and the ability to make ends meet with their household income. UNESCO's International Standard Classification of Education (ISCED) was used to group participants into primary, secondary, and tertiary levels of education. The variable for participants' main occupational position during adult life was determined in the same manner as the variable describing the main breadwinner during childhood (see 2.2.1 Childhood misfortune). Additionally, participants who had never done paid work were assigned to a separate category. The answer to the question "Thinking of your household's total monthly income, would you say that your household is able to make ends meet?" reflected socioeconomic conditions in late-life, ranging from 1 ("with great difficulty") to 4 ("easily") (Litwin &

Sapir, 2009). All three indicators were measured at each wave, except wave 3.

Relational reserves: Potential reserves (measured at all waves, except wave 3) included partnership status (living with a partner vs. not living with a partner) (Kamiya, Doyle, Henretta, & Timonen, 2013), number of children still alive (0 vs. 1 or more) (Grundy, van den Broek, & Keenan, 2017), and number of siblings still alive (0 vs. 1 or more) (Rajkumar et al., 2009). *Perceived* relational reserves were measured in wave 5 and 6 by the statement of "If I were in trouble, there are people in this area who would help me" (yes vs. no) (Schwarzbach et al., 2014).

2.4. Statistical analysis

To estimate the associations, linear mixed-effects regressions were performed (Boisgontier & Cheval, 2016). These models allow accounting for the nested structure of the data. In our case, observations (repeated measurement of depressive symptoms) were nested within participants. Moreover, linear mixed-effects regressions avoided excluding participants with missing observations, because these models do not require an equal number of observations for all participants. Analyses were stratified by gender as previous studies showed that women were at greater risk of depression than men (Djernes, 2006; Luppa et al., 2012).

Model 1 investigated the association between the three childhood misfortune indicators and late-life depressive symptoms adjusted for confounders. Age was centered at the midpoint of the sample's age range (73 years old). To test potential mediations, adult socioeconomic indicators were added in Model 2 and relational reserves were included in Model 3. Finally, health status covariates were added in Model 4.

To formally test the mediation between childhood misfortune and depressive symptoms through adult socioeconomic reserves, 5000 bias-corrected accelerated bootstraps with 95% confidence intervals were reported for the difference in the coefficient estimates of the childhood misfortune effects between the model without the mediator (i.e., total effect) and the model with the mediator (i.e., direct effect). To take into account the structure of the data, an R function was created to resample individual and observation-level model parameters instead of participants.

To test a potential mediation by relational reserves independently of adult socioeconomic indicators, a supplementary analysis was performed adding the relational reserves directly in Model 2 (see supplementary material – Table S1). Statistical assumptions associated with linear mixed models, including normality of the residuals, linearity, multicollinearity (variance inflation factors), and undue influence (Cook's distances), were met.

3. Results

3.1. Descriptive results

Details on the 8357 participants' characteristics (4909 women) can be found in Table 1. Symptoms of depression increased with age, with a faster increase for men (b = 0.50) than for women (b = 0.32).

3.2. Association between childhood misfortune and late-life depressive symptoms

ACE and childhood health were associated with higher levels of late-life depressive symptoms, but the coefficients were generally lower for men than for women (Model 1).

Among women, results showed a gradient across CSC categories: the more advantaged CSC a woman grew up in, the lower her risk for late-life depression symptoms. For men, only the CSC categories "middle", "advantaged" and "most advantaged" were associated with late-life depressive symptoms. A gradient among these three categories was

Table 1
Characteristics of the participants.

	Women	Men
	N (%)	N (%)
Age, years, mean (SD)	62.0 (8.882)	61.9 (8.419)
Countries		
Austria	198 (4.0)	124 (3.6)
Belgium	614 (12.5)	487 (14.1)
Czech Republic	383 (7.8)	176 (5.1)
Denmark	555 (11.3)	410 (11.9)
France	509 (10.4)	356 (10.3)
Germany	298 (6.1)	246 (7.1)
Greece	1 (0.02)	2 (0.06)
Italy	582 (11.9)	426 (12.4)
Netherlands	526 (10.7)	368 (10.7)
Poland	9 (0.2)	3 (0.1)
Spain	482 (9.8)	285 (8.3)
Sweden	432 (8.8)	330 (9.6)
Switzerland	320 (6.5)	235 (6.8)
Birth cohort		
After 1945	2201 (44.8)	1501 (43.5)
Between 1919 and 1928	408 (8.3)	235 (6.8)
Between 1929 and 1938	1148 (23.4)	825 (24.0)
Between 1939 and 1945	1152 (23.5)	887 (25.7)
Attrition		
No dropout	4797 (97.3)	3336 (96.8)
Death	112 (2.3)	112 (3.3)
Childhood socioeconomic circumstances (CSC) at age 10		
Most disadvantaged	708 (14.4)	480 (13.9)
Disadvantaged	1147 (23.4)	773 (22.4)
Middle	1730 (35.2)	1188 (34.5)
Advantaged	999 (20.4)	774 (22.5)
Most advantaged	325 (6.6)	233 (6.8)
Adverse childhood events (ACE) score at age 18		
No ACE	3659 (74.5)	2558 (74.2)
1 ACE	1003 (20.4)	693 (20.1)
2 or more ACE	247 (5.0)	197 (5.7)
Childhood health problems until age 15		
No problems	3564 (72.6)	2473 (71.7)
1 or more	1345 (27.4)	975 (28.3)
Education		
Primary	1419 (28.9)	750 (21.8)
Secondary	2527 (51.5)	1766 (51.2)
Tertiary	963 (19.6)	932 (27.0)
Main occupational position		
High-skilled	930 (19.0)	1297 (37.6)
Low-skilled	3466 (70.6)	2133 (61.9)
Never worked	513 (10.5)	18 (0.5)
Ability to make ends meet with household income		
Easily	2021 (41.2)	1770 (51.3)
Fairly easily	1485 (30.3)	1017 (29.5)
With some difficulty	1002 (20.4)	489 (14.2)
With great difficulty	401 (8.2)	172 (5.0)
Potential relational reserves		
Partnership status		
Not living with a partner	1876 (38.2)	759 (22.0)
Living with a partner	3033 (61.8)	2689 (78.0)
Number of children alive		
No children	4438 (90.4)	3049 (88.4)
1 or more	471 (9.6)	399 (11.6)
Number of siblings alive		
No siblings	3347 (68.2)	2297 (66.6)
1 or more	1562 (31.8)	1151 (33.4)
Perceived relational reserves		
Help available in case of need		
No	522 (10.6)	397 (11.5)
Yes	4387 (89.4)	3051 (88.5)
Activities of daily living (ADL)		
No ADL limitations	4598 (93.7)	3299 (95.7)
1 or more ADL limitations	311 (6.3)	149 (4.3)
Instrumental activities of daily living (IADL)		
No IADL limitations	4244 (86.5)	3246 (94.1)
1 or more IADL limitations	665 (13.6)	202 (5.9)
Physical activity		
High (more than once a week)	3608 (73.5)	2791 (81.0)
Low (once a week or less)	1301 (26.5)	657 (19.0)

Table 1 (*continued*)

	Women	Men
	N (%)	N (%)
Number of chronic diseases		
2 or more	2250 (45.8)	1285 (37.3)
Less than 2	2659 (54.2)	2163 (62.7)
Depressive symptoms, mean (SD)	2.594 (2.269)	1.608 (1.764)

observable, but again less pronounced than for women.

3.3. Mediation by adult socioeconomic reserves

In women, associations of childhood misfortune and late-life depressive symptoms were partly mediated by adult socioeconomic reserves (Table 2, Model 2). For ACE, the associations decreased by 18.9% (none vs. 1 adverse childhood experience), and 9.7% (none vs. 2 or more adverse childhood experiences). For childhood health, the association decreased by 6.6% (none vs. 1 or more childhood health problems). For CSC, the associations decreased by 64.0 (most disadvantaged vs. disadvantaged CSC), 55.4% (most disadvantaged vs. middle CSC), 62.4% (most disadvantaged vs. advantaged CSC), and 66.5% (most disadvantaged vs. most advantaged CSC). More importantly, the results of the bootstrapped 95% CI revealed that all mediating pathways were significant (Table 2, Model 2, bootstrap results).

Separate analyses for each mediator showed that education and the ability to make ends meet contributed equally strongly to the reduction of the association between CSC and late-life depressive symptoms among women (about 37%), with occupational position being the weakest mediator (about 8%). Furthermore, there was a gradient regarding education and the ability to make ends meet, with a decreasing risk of late-life depressive symptoms for women with higher education and an increasing risk of late-life depressive symptoms for women who had greater financial difficulty.

In men, ACE and childhood health were partly mediated, whereas CSC was fully mediated by adult socioeconomic reserves (Table 3, Model 2). For ACE, the associations decreased by 21.9% (none vs. 1 adverse childhood experience), and 8.7% (none vs. 2 or more adverse childhood experiences). For childhood health, the association decreased by 6.2% (none vs. 1 or more childhood health problems). For CSC, the association of most disadvantaged vs. middle CSC showed a total decrease, while the decrease of most disadvantaged vs. advantaged CSC, and of most disadvantaged vs. most advantaged CSC was 85.0% and 87.3% respectively. Again, results of the bootstrapped 95% CI revealed that all mediating pathways were significant (Table 3, Model 2, bootstrap results).

Separately analyzing each mediator revealed that the associations between CSC and late-life depressive symptoms among men were primarily mediated by education (about 68%), then by the ability to make ends meet (about 47%), and the weakest mediator was occupational position (about 30%). As for women, there was a gradient regarding education and the ability to make ends meet. Having never worked was associated with more symptoms of depression, but this was not robust when adjusting for health status (Model 4).

Interactions between childhood misfortune and adult socioeconomic reserves were tested and results showed no clear interactions.

3.4. The role of potential and perceived relational reserves

When adding potential and perceived relational reserves (Model 3), there was no mediation of the associations between the three childhood misfortune indicators and late-life depressive symptoms. This result was robust, when running supplementary analysis which included relational

Table 2

Associations between childhood misfortune and late-life depressive symptoms among women.

	Model 1		Model 2		Model 3		Model 4	
	b (95%CI)		b (95%CI)		b (95%CI)		b (95%CI)	
Women								
Age	0.32 (0.25–0.40)	< 0.001	0.32 (0.25–0.40)	< 0.001	0.32 (0.25–0.40)	< 0.001	0.33 (0.25–0.40)	< 0.001
Age^2	0.16 (0.13–0.20)	< 0.001	0.16 (0.13–0.20)	< 0.001	0.16 (0.13–0.20)	< 0.001	0.16 (0.13–0.20)	< 0.001
ACE score at age 18 (ref. no ACE)								
1 ACE	0.31 (0.19–0.42)	< 0.001	0.25 (0.14–0.36)	< 0.001	0.24 (0.13–0.35)	< 0.001	0.21 (0.10–0.31)	< 0.001
2 or more ACE	0.62 (0.41–0.83)	< 0.001	0.56 (0.35–0.76)	< 0.001	0.53 (0.33–0.74)	< 0.001	0.40 (0.20–0.59)	< 0.001
Childhood health problems (ref. no problems)								
1 or more	0.37 (0.27–0.48)	< 0.001	0.35 (0.25–0.45)	< 0.001	0.35 (0.24–0.45)	< 0.001	0.27 (0.18–0.37)	< 0.001
CSC (ref. Most disadvantaged)								
Disadvantaged	-0.25 (-0.40–0.09)	0.002	-0.09 (-0.24–0.07)	0.261	-0.09 (-0.24–0.06)	0.254	-0.07 (-0.21–0.08)	0.352
Middle	-0.56 (-0.72–0.40)	< 0.001	-0.25 (-0.41–0.09)	0.002	-0.25 (-0.41–0.09)	0.002	-0.18 (-0.33–0.03)	0.019
Advantaged	-0.60 (-0.77–0.43)	< 0.001	-0.24 (-0.41–0.06)	0.009	-0.23 (-0.41–0.05)	0.011	-0.17 (-0.34–0.01)	0.042
Most advantaged	-0.67 (-0.90–0.44)	< 0.001	-0.22 (-0.46–0.01)	0.064	-0.23 (-0.47–0.00)	0.053	-0.15 (-0.37–0.08)	0.199
Education (ref. Primary)								
Secondary	–		-0.30 (-0.43–0.18)	< 0.001	-0.31 (-0.43–0.18)	< 0.001	-0.25 (-0.36–0.13)	< 0.001
Tertiary	–		-0.35 (-0.53–0.17)	< 0.001	-0.35 (-0.52–0.17)	< 0.001	-0.23 (-0.40–0.07)	0.006
Main occupational position (ref. High-skilled)								
Low-skilled	–		0.06 (-0.08–0.20)	0.379	0.06 (-0.08–0.20)	0.386	0.04 (-0.08–0.17)	0.504
Never worked	–		-0.10 (-0.30–0.11)	0.35	-0.08 (-0.28–0.12)	0.423	-0.16 (-0.34–0.03)	0.108
Ability to make ends meet (ref. Easily)								
Fairly easily	–		0.23 (0.12–0.35)	< 0.001	0.22 (0.11–0.34)	< 0.001	0.18 (0.07–0.28)	0.001
With some difficulty	–		0.71 (0.57–0.84)	< 0.001	0.69 (0.55–0.82)	< 0.001	0.54 (0.41–0.67)	< 0.001
With great difficulty	–		1.60 (1.41–1.79)	< 0.001	1.57 (1.39–1.76)	< 0.001	1.20 (1.03–1.38)	< 0.001
Potential relational reserves								
Living with a partner (ref. Not living with a partner)	–		–		0.03 (-0.07–0.13)	0.503	0.09 (-0.01–0.18)	0.066
Number of children alive (ref. No children)	–		–		0.08 (-0.08–0.24)	0.316	0.08 (-0.07–0.23)	0.279
Number of siblings alive (ref. No children)	–		–		0.02 (-0.07–0.12)	0.633	-0.00 (-0.09–0.09)	0.977
Perceived relational reserves								
Yes, help available in case of need (ref. No help available)	–		–		-0.44 (-0.59–0.29)	< 0.001	-0.41 (-0.55–0.28)	< 0.001
1 or more ADL limitations (ref. No ADL limitations)	–		–		–		0.45 (0.25–0.64)	< 0.001
1 or more IADL limitations (ref. No IADL limitations)	–		–		–		0.85 (0.70–0.99)	< 0.001
Low physical activity (ref. High physical activity)	–		–		–		0.43 (0.32–0.53)	< 0.001
Less than 2 chronic diseases (ref. 2 or more chronic diseases)	–		–		–		-0.60 (-0.69–0.50)	< 0.001
Bootstrap of the mediation by adult socioeconomic reserves (difference between total and direct effect)								
ACE score at age 18 (ref. no ACE)								
1 ACE			95% CI (0.055; 0.067)					
2 or more ACE			95% CI (0.059; 0.077)					
Childhood health problems (ref. no problems)								
1 or more			95% CI (0.020; 0.030)					
CSC (ref. Most disadvantaged)								
Disadvantaged			95% CI (0.141; 0.176)					
Middle			95% CI (0.272; 0.342)					
Advantaged			95% CI (0.320; 0.409)					
Most advantaged			95% CI (0.382; 0.505)					

Abbreviations: CSC, childhood socioeconomic circumstances, ACE, adverse childhood events; ADL, activities of daily living; IADL, instrumental activities of daily living; CI, confidence interval.

All models are adjusted for confounders: birth cohort, country of residence, attrition.

reserves without adding adult socioeconomic reserves (see Table S1). Among potential relational reserves, the number of living children and siblings was not associated with depression, irrespective of gender. Living with a partner reduced the level of late-life depression in men (not in women) and this association remained robust after adjusting for health status (Model 4). The supplementary analysis excluding socioeconomic reserves confirmed a reduced risk for late-life depressive symptoms for men living with a partner (p < 0.001), which was also true for women (p < 0.05), although to a lesser extent.

Regarding perceived relational reserves, women and men who thought that someone would be around to provide help them if they were in trouble, had a significantly lower risk for late-life depressive symptoms (p < 0.001) compared to those who had nobody. This association between perceived relational reserves and depressive symptoms was robust after adjusting for health status (Model 4). Moreover, this association was also found in the supplementary analysis with a slightly stronger negative effect, indicating a lower risk of late-life depressive symptoms among women.

Table 3
Associations between childhood misfortune and late-life depressive symptoms among men.

	Model 1		Model 2		Model 3		Model 4	
	b (95%CI)		b (95%CI)		b (95%CI)		b (95%CI)	
Men								
Age	0.50 (0.43–0.57)	< 0.001	0.50 (0.43–0.57)	< 0.001	0.50 (0.42–0.57)	< 0.001	0.48 (0.41–0.55)	< 0.001
Age^2	0.19 (0.15–0.22)	< 0.001	0.19 (0.15–0.22)	< 0.001	0.19 (0.15–0.22)	< 0.001	0.18 (0.15–0.22)	< 0.001
ACE score at age 18 (ref. no ACE)								
1 ACE	0.24 (0.12–0.35)	< 0.001	0.19 (0.07–0.30)	0.001	0.18 (0.07–0.29)	0.002	0.14 (0.04–0.25)	0.008
2 or more ACE	0.40 (0.20–0.59)	< 0.001	0.36 (0.17–0.55)	< 0.001	0.36 (0.17–0.55)	< 0.001	0.30 (0.12–0.48)	0.001
Childhood health problems (ref. no problems)								
1 or more	0.16 (0.05–0.26)	0.003	0.15 (0.05–0.24)	0.004	0.14 (0.04–0.24)	0.006	0.10 (0.00–0.19)	0.041
CSC (ref. Most disadvantaged)								
Disadvantaged	0.02 (-0.14–0.18)	0.805	0.10 (-0.05–0.26)	0.199	0.09 (-0.06–0.25)	0.253	0.10 (-0.05–0.24)	0.199
Middle	-0.17 (-0.33–0.01)	0.032	-0.00 (-0.16–0.15)	0.954	-0.01 (-0.17–0.15)	0.907	0.02 (-0.13–0.17)	0.805
Advantaged	-0.24 (-0.41–0.07)	0.005	-0.04 (-0.21–0.14)	0.685	-0.04 (-0.22–0.13)	0.64	-0.03 (-0.20–0.13)	0.717
Most advantaged	-0.28 (-0.50–0.05)	0.015	-0.04 (-0.27–0.19)	0.764	-0.04 (-0.27–0.19)	0.742	-0.01 (-0.23–0.21)	0.913
Education (ref. Primary)								
Secondary	–		-0.19 (-0.32–0.06)	0.005	-0.18 (-0.31–0.05)	0.006	-0.17 (-0.29–0.05)	0.007
Tertiary	–		-0.24 (-0.40–0.08)	0.004	-0.23 (-0.39–0.07)	0.006	-0.18 (-0.33–0.03)	0.021
Main occupational position (ref. High-skilled)								
Low-skilled	–		0.04 (-0.06–0.15)	0.445	0.04 (-0.07–0.14)	0.498	0.01 (-0.09–0.11)	0.79
Never worked	–		0.94 (0.32–1.55)	0.003	0.89 (0.28–1.51)	0.004	0.46 (-0.12–1.05)	0.121
Ability to make ends meet (ref. Easily)								
Fairly easily	–		0.26 (0.15–0.37)	< 0.001	0.24 (0.13–0.34)	< 0.001	0.19 (0.08–0.29)	< 0.001
With some difficulty	–		0.60 (0.45–0.74)	< 0.001	0.56 (0.42–0.71)	< 0.001	0.41 (0.27–0.54)	< 0.001
With great difficulty	–		1.24 (1.02–1.46)	< 0.001	1.18 (0.96–1.40)	< 0.001	0.94 (0.73–1.15)	< 0.001
Potential relational reserves								
Living with a partner (ref. Not living with a partner)	–		–		-0.18 (-0.30–0.07)	0.002	-0.14 (-0.25–0.04)	0.009
Number of children alive (ref. No children)	–		–		-0.01 (-0.16–0.14)	0.923	0.00 (-0.14–0.15)	0.949
Number of siblings alive (ref. No children)	–		–		0.02 (-0.08–0.11)	0.715	0.00 (-0.09–0.09)	0.938
Perceived relational reserves								
Yes, help available in case of need (ref. No help available)	–		–		-0.34 (-0.48–0.20)	< 0.001	-0.28 (-0.41–0.14)	< 0.001
1 or more ADL limitations (ref. No ADL limitations)	–		–		–		0.55 (0.32–0.78)	< 0.001
1 or more IADL limitations (ref. No IADL limitations)	–		–		–		0.74 (0.53–0.95)	< 0.001
Low physical activity (ref. High physical activity)	–		–		–		0.38 (0.27–0.50)	< 0.001
Less than 2 chronic diseases (ref. 2 or more chronic diseases)	–		–		–		-0.51 (-0.60–0.42)	< 0.001
Bootstrap of the mediation by adult socioeconomic reserves								
ACE score at age 18 (ref. no ACE)								
1 ACE			95% CI (0.045; 0.060)					
2 or more ACE			95% CI (0.026; 0.042)					
Childhood health problems (ref. no problems)								
1 or more			95% CI (0.004; 0.015)					
CSC (ref. Most disadvantaged)								
Disadvantaged			–					
Middle			95% CI (0.135; 0.200)					
Advantaged			95% CI (0.165; 0.247)					
Most advantaged			95% CI (0.187; 0.297)					

Abbreviations: CSC, childhood socioeconomic circumstances, ACE, adverse childhood events; ADL, activities of daily living; IADL, instrumental activities of daily living; CI, confidence interval.
All models are adjusted for confounders: birth cohort, country of residence, attrition.

Interactions between childhood misfortune and relational reserves were tested and the results showed no clear interactions.

4. Discussion

This study investigated whether adult socioeconomic and relational reserves mediated the association between childhood misfortune and late-life depressive symptoms. Results confirmed the long-term association between childhood misfortune and a greater number of late-life depressive symptoms (Arpino et al., 2018; Ege et al., 2015). The associations of ACE and poor childhood health with late-life depressive symptoms were partly mediated by adult socioeconomic reserves. However, the associations of CSC with late-life depressive symptoms were fully mediated by adult socioeconomic reserves for men, and partly mediated for women. Neither potential nor perceived relational reserves mediated the association between childhood misfortune and late-life depressive symptoms.

Among men, the strongest mediator was the highest educational

level achieved, followed by the ability to make ends meet, and the weakest mediator was the occupational position. For women, the mediation was less pronounced, with education and ability to make ends meet contributing equally to the mediation. This result is in line with previous results showing a stronger link between CSC and late-life depressive symptoms for women than for men (Angelini et al., 2018). In contrast to our results, Angelini et al., 2018 did not find that adult socioeconomic reserves explained the association between CSC and depressive symptoms (Angelini et al., 2018). However, they used annual household income as an indicator of adult socioeconomic status, which means that the results of both studies are not necessarily contradicting, depending on how the annual household income is linked to the main occupational position.

Moreover, our findings supported the hypothesis that education can mitigate the negative effect of disadvantaged childhood socioeconomic circumstances on late-life depressive symptoms (Arpino et al., 2018; Grundy et al., 2017). Education might have appeared to be the most important mediator, because it usually starts in childhood and therefore acts as a structural determinant of occupational position and income (Bol, 2015). This strengthens the critical importance of education as a long-term determining factor in inequalities of health outcomes (Cheval, Sieber, et al., 2018; Davies, Dickson, Davey Smith, van den Berg, & Windmeijer, 2018; Mirowsky & Ross, 1998). Furthermore, education could play a central role regarding late-life depressive symptoms, because both are essentially connected to cognitive processing. However, there was only a marginal difference between secondary and tertiary levels, and this effect was not as strong for the associations with ACE and childhood health, which is in line with previous findings (Arpino et al., 2018). This strengthens the need for a multidimensional approach to early-life adversities (Ferraro et al., 2016).

Previous work considered that perceived social connectedness was more important than perceived social support for health and well-being of older adults (Ashida & Heaney, 2008). Our results support this hypothesis as individuals who believed that they would receive help from someone in the area when in trouble showed a reduced risk of depressive symptoms. Among potential social reserves, only partnership status was associated with late-life depressive symptoms. While there was no effect observable in women, men living with a partner had a reduced risk for depressive symptoms. This result is in line with previous studies indicating that spousal support may be more important for men than for women in late-life mental health (Santini et al., 2016). Generally, women seem to maintain larger networks of significant others than men (Walen & Lachman, 2000). This implies that men are more vulnerable to spousal loss and its related negative consequences for health than women (Stroebe, 2001). Moreover, early adversities may promote mistrust in others, making it difficult to form and keep close social ties, especially for men (Miller et al., 2009). Our findings indicated that some of the relational reserves chosen had a protective effect on late-life depressive symptoms, but no mediating effect. Future studies should focus on qualitative personal network data and variables assessing supportive social reserves to further examine the effect of relational reserves on the association of childhood misfortune and late-life mental health. Another approach would be to hypothesize that childhood misfortune restrains the assembling of relational reserves due to difficult or inexistent family relations which usually are frequent in the personal convoy of significant others (Antonucci & Akiyama, 1995). By consequence, this lack of relational resources or a high effort to form substitute relational reserves could make individuals more vulnerable to life course adversities like mental health problems.

4.1. Strengths and limitations

The strengths of this study include a large sample size, analyses stratified by gender, a validated measure of depressive symptoms (EURO-D), and a multidimensional measure of childhood misfortune.

This study also has limitations. First, even if retrospective life-course data of SHARE (wave 3) have been shown to be accurate (Havari & Mazzonna, 2015; Lacey et al., 2012), self-reported information on childhood misfortune and adult socioeconomic status (e.g. main occupational position) might still be subject to recall or social desirability bias. However, previous studies on the validity of retrospective measures of childhood social class (Batty et al., 2005) and a review on the recall of ACE (Hardt & Rutter, 2004) indicated an underestimated assessment of the data. This underlines a judicious, but nonetheless warrantable interpretation of the results. Second, the childhood misfortune indicators did not consider the exact age at which the adversities occurred and may therefore not capture childhood condition in its integrality. Hence, the differences observed between childhood misfortune indicators should be interpreted cautiously. Third, like all longitudinal studies including older adults, attrition represents a potential selection bias. By adjusting all models for attrition by death, we limited this bias. Fourth, including only participants who answered the SHARELIFE module (wave 3) resulted in a sample size reduction, which may have caused information bias on the exposure. Fifth, the measures of relational reserves may not fully reflect certain dimensions like their long term constitution, their thresholds and the circumstances in which they can be activated (Cullati et al., 2018). Sixth, it cannot be excluded that the selected sample is subject to selection bias affecting the findings. Seventh, due to the limitations of the information available in SHARE, and the limited knowledge on factors associated with reserves, we cannot exclude that an unmeasured factor might have confounded the association between the mediators and the outcome.

5. Conclusion

This study underlines the long-term association between childhood misfortune and late-life depressive symptoms. Associations of ACE and childhood health were only partly mediated by adult socioeconomic reserves. Our results suggest that the effect of some early-life adversities (e.g., disadvantaged socioeconomic circumstances) on late-life depressive symptoms are fully reversible, especially for men, whereas the effect of others can only be reduced (e.g., ACE and poor childhood health). Education turned out to be the strongest mediator of the association between CSC and late-life depressive symptoms, and more so in men than women. Relational reserves did not mediate the effect of childhood misfortune on late-life depressive symptoms. Nevertheless, perceived relational reserves were associated with fewer late-life depressive symptoms and may therefore still have a protective effect against late-life depressive symptoms among people who experienced childhood misfortune. Future studies should further investigate how perceived relational reserves interact with cumulative adversity over the life course.

Contributors

M.v.A, M.P.B., B.C, S.C. designed the analyses. S.S. did the data management. B.C. analyzed the data. M.v.A, M.P.B., S.C., drafted the manuscript. All authors critically appraised and approved the final version of the manuscript.

Ethical approval

This study used data provided by the SHARE study. During the SHARE study, the relevant research ethics committees in the participating countries approved the research design, and all participants provided written informed consent. For further use and analysis of the SHARE data, no ethical approval is needed.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https:// doi.org/10.1016/j.ssmph.2019.100434.

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