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This is the accepted version of a paper published in *Social Science and Medicine*. This paper has been peer-reviewed but does not include the final publisher proof-corrections or journal pagination.

Citation for the original published paper (version of record):

Darin-Mattsson, A., Andel, R., Celeste, R K., Kåreholt, I. (2018)
Linking financial hardship throughout the life-course with psychological distress in old age: Sensitive period, accumulation of risks, and chain of risks hypotheses.
Social Science and Medicine, 201: 111-119
<https://doi.org/10.1016/j.socscimed.2018.02.012>

Access to the published version may require subscription.

N.B. When citing this work, cite the original published paper.

Permanent link to this version:

<http://urn.kb.se/resolve?urn=urn:nbn:se:hj:diva-38999>

Linking financial hardship throughout the life-course with psychological distress in old age: sensitive period, accumulation of risks, and chains of risk hypotheses

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Abstract

The primary objective was to investigate the life course hypotheses – sensitive period, chain of risks, and accumulation of risks – in relation to financial hardship and psychological distress in old age. We used two Swedish longitudinal surveys based on nationally representative samples. The first survey includes people 18-75 years old with multiple waves, the second survey is a longitudinal continuation, including people 76+ years old. The analytical sample included 2990 people at baseline. Financial hardship was assessed in childhood (retrospectively), at the mean ages of 54, 61, 70, and 81 years. Psychological distress (self-reported anxiety and depressive symptoms) was assessed at the same ages. Path analysis with WLSMV estimation was used. There was a direct path from financial hardship in childhood to psychological distress at age 70 (0.26, $p=0.002$). Financial hardship in childhood was associated with increased risk of psychological distress and financial hardship both at baseline (age 54), and later. Financial hardship, beyond childhood, was not independently associated with psychological distress at age 81. Higher levels of education and employment decreased the negative effects of financial hardship in childhood on the risk of psychological distress and financial hardship later on. There was a bi-directional relationship between psychological distress and financial hardship; support for health selection was slightly higher than for social causation. We found that psychological distress in old age was affected by financial hardship in childhood through a chain of risks that included psychological distress earlier in life. In addition, financial hardship in childhood seemed to directly affect psychological distress in old age, independent of other measured circumstances (i.e., chains of risks). Education and employment could decrease the effect of an adverse financial situation in childhood on later-life psychological distress. We did not find support for accumulation of risks when including tests of all hypotheses in the same model.

Keywords: accumulation; life course; financial hardship; path analysis; psychological distress; chain of risks; sensitive period; aging

Introduction

The association between socioeconomic position and health is one of the most well documented associations in social sciences. It persists over space and time, regardless of medical and technological development (Phelan & Link 2010). As a result of biological, social, behavioral and psychological factors over the life-course, poor health accumulates in old age. A better understanding of the processes through which social inequality over the life-course contributes to health outcomes in old age is therefore needed (Ben-Shlomo & Kuh 2002). Research has established that health inequalities persist into old age (Fors & Thorslund 2015), but less is known about the social mechanisms that explain these later-life inequalities.

This study uses a life-course perspective to focus on psychological distress in old age. Mental disorders are common, especially in older people. In Sweden, about 40 percent of the women and 30 percent of the men 80 to 84 years report moderate or severe symptoms of anxiety or depressive symptoms (Molarius et al. 2009). Common mental health problems such as psychological distress often stem from social conditions, inability to cope with stress, and from negative life events (Mirowsky & Ross 2003).

Linking financial hardship with psychological distress

Peoples' well-being is affected by a myriad of mechanisms, including social mechanisms such as poverty and inequality (Sederer 2016; Marmot & Wilkinson, 2005). These adverse circumstances may have negative physiological effects on the amygdala and hippocampal volumes through stress responses (Butterworth et al. 2012). Financial hardship may also affect mental health through living conditions (Lynch et al. 2000) or health behaviors (Siahpush & Carlin 2005). It is also likely that there is a selection into financial hardship, such that people who have mental disorders are more likely to encounter financial difficulties (Kiely & Butterworth 2014; Muennig 2008). The association between mental disorders and financial circumstances seems stronger than the association between mental disorders and either education or social class. (Laaksonen et al. 2007; Linander et al. 2015).

A life-course perspective on financial hardship and psychological distress

There is evidence that financial hardship and mental disorders are associated, but conflicting results regarding timing and long-term associations, including issues of bi-directional causality. In this study, we use the life-course perspective as a theoretical framework to investigate three central hypotheses about the relationship between financial hardship and psychological distress across the life-course – sensitive period, accumulation of risks, and chains of risks (Ben-Shlomo & Kuh 2002).

Sensitive period

Sensitive period refers to a period with rapid individual change when adverse exposures might have long-lasting, detrimental effects on later health (Kuh et al. 2003). The idea that childhood is a sensitive period has become central to the life-course perspective (Kuh et al 2014). In 1994, Duncan and colleagues found that family income and poverty were strongly associated with cognitive development and behavior of children (Duncan et al. 1994). Growing up in poverty was found to affect children's short-term memory, feelings of mastery and helplessness, psychological stress (allostatic load), and externalizing symptoms that have impact on future life (Evans 2016). In addition, if a family becomes poor during one's upbringing affect socioemotional behavioral problems in adolescence (Wickham et al. 2017). Adverse childhood living conditions have been linked with lower cognition and more mental disorders in later life (Laaksonen et al. 2007; Fors et al. 2009). Others did not find support for childhood as a sensitive period because that the association was explained by education (Quesnel-Vallée & Taylor 2012; Berndt & Fors 2015).

Chains of risks

What defines the chain of risk model is that one negative factor (or positive) increases the probability of the same negative factors at next time point, and so on, and that the last time point in the chain is associated with the outcome. This model is also called the trigger model (Kuh et al. 2003). . Chains of risks can involve mediating factors and when modelled it has previously been called pathway model (Hertzman et al. 2001).

Wickham and colleagues (2017) have shown that transitioning into poverty in childhood increases the risk for socioemotional problems in adolescence; others have found that mental disorders in adolescence increase the risk for educational underachievement and unemployment (Fergusson & Woodward 2002). However, education has been found to be a mediating factor from adverse childhood conditions to old age health (Quesnel-Vallée & Taylor 2012; Berndt & Fors 2015), whereas others have not found evidence that education is a mediator between financial hardship and mental health (Laaksonen et al. 2007). Moreover, unemployment and low levels of education increase the risk for mental disorders in midlife (Linander et al. 2015). In addition, lower socioeconomic position and adverse work related exposures in midlife increase the risk of negative psychological outcomes in later life (Darin-Mattsson et al. 2015; Darin-Mattsson et al. 2017). In sum, adverse childhood conditions seem to increase the risk for underachieved education that, in turn, increase the risk for less qualified occupation with adverse working environment and lower salary, which finally increase the risk of adverse health outcomes in old age.

Accumulation of risks

Risks can accumulate independently of the chain effect, through exposure to one risk factor at many occasions or exposure over time (Dannefer 2003). It has previously been empirically

tested either as a time varying dose-response relationship (Kjellsson 2013) or as number of occasions in a certain state (Lynch et al. 1997). Exposure to financial hardship on more occasions during the life-course is associated with more adverse later health outcomes (e.g., worse mental health, worse self-rated health, functional impairment, and more limitations in activities of daily living) (Lynch et al. 1997; Laaksoonen et al. 2007; Kahn & Pearlin 2006; Shippee et al. 2012).

Researchers have argued that the distinction between these models is more conceptual than empirical (Hallqvist et al. 2004) and suggested that tests of all these hypotheses should be included in one model for a more complete understanding (Rosvall et al. 2006). Therefore, we test all these hypotheses simultaneously.

We acknowledge that it is hard to disentangle the concepts of sensitive period, chains of risks, and accumulation hypotheses, both conceptually and empirically. They are all complementary, while at the same time there are elements of competing explanations. However, our data make it possible to explore them in the same model simultaneously. Moreover, most studies of health inequality and social determinants of health have to consider whether the association is driven by social causation or health selection. Research supports both hypotheses (e.g. Kiely & Butterworth 2014; Muennig 2008). In a literature review and meta-analysis, Kröger et al. (2015), found support for both hypotheses. The question of social causation or health selection is important for understanding the relationship, and to define social policies aiming to increase psychological health and decrease the influence of social conditions on health. Although this question is not the focus of the present study, it deserves a full investigation on its own. However, our data, spanning approximately 30 years, including repeated measures, allow us to compare the strength of the direction of the association. In addition, while all longitudinal studies suffer from attrition, we were able to include a test of the impact of attrition on our results.

Aim

The overall aim was to investigate the most common life course hypotheses (sensitive period, accumulation of risks, and chains of risks), using Swedish data spanning the whole life course. Studying financial hardship and psychological distress, we posed the following questions:

- 1) Are there direct and indirect effects of financial hardship in childhood on psychological distress in old age?
- 2) Do education and employment mediate the relationship between financial hardship and psychological distress?
- 3) Is financial hardship associated with psychological distress in old age independently at each of the three points of measurement of financial hardship?

Methods

Data

We used two Swedish surveys based on nationally representative samples. The Swedish Level of Living Survey (LNU) and the Swedish Panel Study of Living Conditions among the Oldest Old (SWEOLD). LNU includes people between 18 and 75 years. It has been conducted in 1968, 1974, 1981, 1991, 2000, and 2010 and is based on face-to-face interviews of a longitudinal sample. Younger cohorts and immigrants are added each wave to maintain the national cross-sectional representativeness (Fritzell & Lundberg 2007). Response rates for the waves included in this study varied between 78.3% and 90.8% (n≈6000–8000). SWEOLD draws on the same sample as LNU but includes people who have passed the upper age limit of LNU (75 years). SWEOLD has been conducted in 1992, 2002, 2004, 2011, and 2014; response rates were between 84.4% and 95.4% (n≈600–1000) (Lennartsson et al. 2014).

The study sample we assessed was drawn from the longitudinal sample of both LNU and SWEOLD. To obtain a higher number of observations, we combined three cohorts in the analyses (Table 1).

Table 1. Description of data and cohorts

Baseline /follow-up	Mean age (SD)	Data source	Cohort 1	Cohort 2	Cohort 3
			Born 1907-15	Born 1917-25	Born 1926-35
			Survey year		
	Childhood	LNU (retrospective) ¹			
Baseline	54 years (3.7)	LNU	1968	1974	1981
1	61 years (3.0)	LNU	1974	1981	1991
2	70 years (2.7)	LNU	1981	1991	2000
3	81 years (2.5)	SWEOLD	1992	2002	2011
Number of observations at baseline			n=1019	n=1053	n=918

¹Respondents were asked about their childhood living conditions the first time they participated in a LNU survey (mostly LNU 1968).

This sampling procedure resulted in a total of 2990 observations.

Measures

Psychological distress was assessed at baseline (see Table 1), follow-up 1, follow-up 2, and follow-up 3 by asking: “Have you had any of the following diseases or disorders during the last 12 months?” A multi-item list of symptoms and disorders followed; we used the responses regarding anxiety and depressive symptoms. Response alternatives were “no,” “yes, slight,” and “yes, severe” and were coded 0, 1, or 2. Responses were then summarized in an index that ranged from 0 (“no” to both questions) to 4 (“yes, severe” to both questions).

Financial hardship in childhood was assessed with the question "Did your family have financial difficulties during your upbringing?" Response alternatives were "no" or "yes" (coded 0 or 1). Financial hardship in childhood was assessed from the first wave of LNU the respondents participated in (mainly LNU 1968). For cohort 1, childhood conditions were assessed at baseline (1968). For cohort 2 with baseline 1974, 98.6% was assessed 1968 (6 years before baseline) and 1.4% at the baseline. For cohort 3 with baseline 1981, 94.2% was assessed in 1968 (13 years before baseline), 2.5% in 1974, and 3.3% at the baseline.

Financial hardship at baseline, follow-up 1, follow-up 2, and follow-up 3 was assessed with the question "If a situation suddenly arise where you need to raise X SEK in a week, would you be able to?". In 1968, the amount was 2000 SEK; thereafter it was adjusted to have the same purchase value at each wave of interviews as 2000 SEK had in 1968. The amount of 2000 SEK in 1968 corresponded to 15,000 SEK in 2011. Response alternatives were "no," "yes – by bank loan, help from friends or relatives" or "yes – by myself or with help from family". "No" was considered severe financial hardship, "yes – by bank loan, help from friends or relatives" was considered as slight financial hardship and "yes – by myself or with help from family" was considered no financial hardship.

Educational level was assessed at baseline for each cohort. Educational level was coded as 0=compulsory school + vocational training, 1=lower secondary school + vocational training, 2=upper secondary school, 3=upper secondary school + vocational training, and 4=university degree.

Employment (employed or not employed) was assessed at baseline and follow-up 1. People who reported any hours of paid work the year before the survey year were considered employed; others, not employed, including people not in the labor force.

Covariates

Sex (0=men and 1=women) and age was assessed at baseline. Age was included as a continuous variable.

We also included attrition variables (0=participant, 1=dropout) after each follow-up. Respondents were coded as having dropped out if they did not respond to one or more of the subsequent follow-up waves after the survey wave in question.

Cohorts were included as dummy variables.

Statistical analyses

The statistical analyses were performed with MPlus 7.11 and STATA 14. We performed path analysis in Mplus. Path analysis is an extension of multiple regression and aims to estimate the effect size and significance of pathways in a hypothesized causal network of variables. All pathways were estimated at the same time and as dependent on the other pathways included in

the model. The weighted least squares mean and variance adjusted (WLSMV) estimator was used to calculate the estimates of the associations between the observed ordinal variables in our analysis. The WLSMV estimator uses pairwise deletion and does not impute values, thereby we assume missing at random. The WLSMV estimator outperforms maximum likelihood under these conditions with categorical variables (Beauducel & Herzberg 2006). Indirect, direct, and total effects from financial hardship in childhood on later psychological distress were estimated. STATA was used for descriptive statistics.

We started with a conceptual model that simultaneously incorporated tests of the life-course hypotheses (see Figure 1). This was done to see which hypothesis received the strongest statistically significant support. We then removed paths with $p > 0.10$ one by one, starting with the path with the highest p-value (Jöreskog & Yang 1996). This was done until all paths in the model were significant at $p < 0.10$.

A statistically significant path from financial hardship in childhood to psychological distress in old age (70 years or older) would be interpreted as support for the hypothesis that childhood is a sensitive period. Each statistically significant pathway from childhood to old age would be interpreted as support for chains of risks hypothesis, which indirect effects between financial hardship in childhood and psychological distress in old age would also indicate. Statistically significant, independent associations between each measured point of financial hardship and psychological distress in old age would be interpreted as support for accumulation of risks hypothesis. Cross-lagged paths between repeated measures of financial hardship and psychological distress were analyzed to interpret the strength and direction of the associations between financial hardship and psychological distress over the life-course (health selection or social causation).

A standardized coefficient size close to 0.10 was interpreted as a small effect, a size close to 0.30 as a medium effect; and a size larger than 0.50 as a strong effect (Kline 1994). We relied on the goodness-of-fit indices provided by MPlus software to analyze the models. A Root Mean Square Error of Approximation (RMSEA) under 0.05 indicated a good fit. If the model had Comparative Fit Index (CFI) and Tucker-Lewis Index (TLI) greater than 0.90, we considered the fit to be acceptable. A Weighted Root Mean Square Residual (WRMR) score of less than 1.0 we interpreted it as good fit. All goodness-of-fit indices were considered simultaneously (Schermelleh-Engel & Moosbrugger 2003).

There were cohort differences in the prevalence of financial hardship and psychological distress; we did not anticipate any differences in pathways between the cohorts. However, we tested for interaction effects, and there were no statistically significant ($p < 0.10$) interaction effects between cohorts and the variables included in the model. In addition, we tested the model with and without adjustment for cohort. Cohort did not affect any paths, or change estimate size in any substantial way. The final model without cohort outperformed the final model with

cohort on all model fit indices. We therefore pooled all cohorts and analyzed them as one dataset, excluding cohort as a control variable in the presented model.

Results

Descriptive statistics are presented in Table 2. The number of observations decreased with each follow-up because of non-participation or death. However, the distribution of the independent variables remained rather stable. Approximately a third of the sample reported that they experienced financial hardship in childhood. Approximately a fourth of the sample reported financial hardship at baseline, and about 14%, at follow-up 3. Most of the sample (80%) did not have psychological distress; this was the case at all the follow-ups except follow-up 3, when about 30% reported psychological distress.

Table 2. Descriptive statistics: the study population at baseline and follow-ups 1 through 3

	Baseline		Follow-up 1		Follow-up 2		Follow-up 3	
Observations	n=2710		n=2382		n=1871		n=1280	
Mean age	54 years		61 years		70 years		81 years	
	Number	%	Number	%	Number	%	Number	%
Women	1361	50.2	1203	50.5	992	53.0	753	58.8
Men	1349	49.8	1179	49.5	879	47.9	527	41.2
Education								
Lowest level	2309	85.2	2012	84.5	1539	82.5	1023	82.2
1	236	8.7	214	9.0	183	9.8	122	9.8
2	35	1.3	28	1.2	26	1.4	15	1.2
3	59	2.2	58	2.4	52	2.8	40	3.2
Highest level	70	2.6	70	2.9	65	3.5	45	3.6
Employed or not								
Employed	2076	77.7	1499	63.6	-	-	-	-
Not employed	595	22.3	857	36.4	-	-	-	-
Financial hardship in childhood¹								
No	1734	67.3	1553	67.3	1254	67.1	830	68.2
Yes	841	32.7	753	32.7	614	32.9	387	31.8
Financial hardship								
No	1858	74.1	1778	81.3	1572	84.5	1076	86.1
Slight	328	13.1	178	8.1	102	5.5	33	2.6
Severe	322	12.8	231	10.6	187	10.1	141	11.3
Psychological distress								
No	1984	79.2	1769	80.8	1528	82.2	864	68.5
1	315	12.6	234	10.7	200	10.8	230	18.2
2	114	4.6	99	4.5	86	4.6	96	7.6
3	35	1.4	33	1.5	21	1.1	27	2.1
Severe	56	2.2	54	2.5	24	1.3	44	3.5

¹ Financial hardship in childhood was assessed retrospectively the first time respondents were interviewed in LNU; this was mainly LNU 1968.

Figure 1 shows the initial model. The model includes the tests of sensitive period, chains of risks, and accumulation hypotheses.

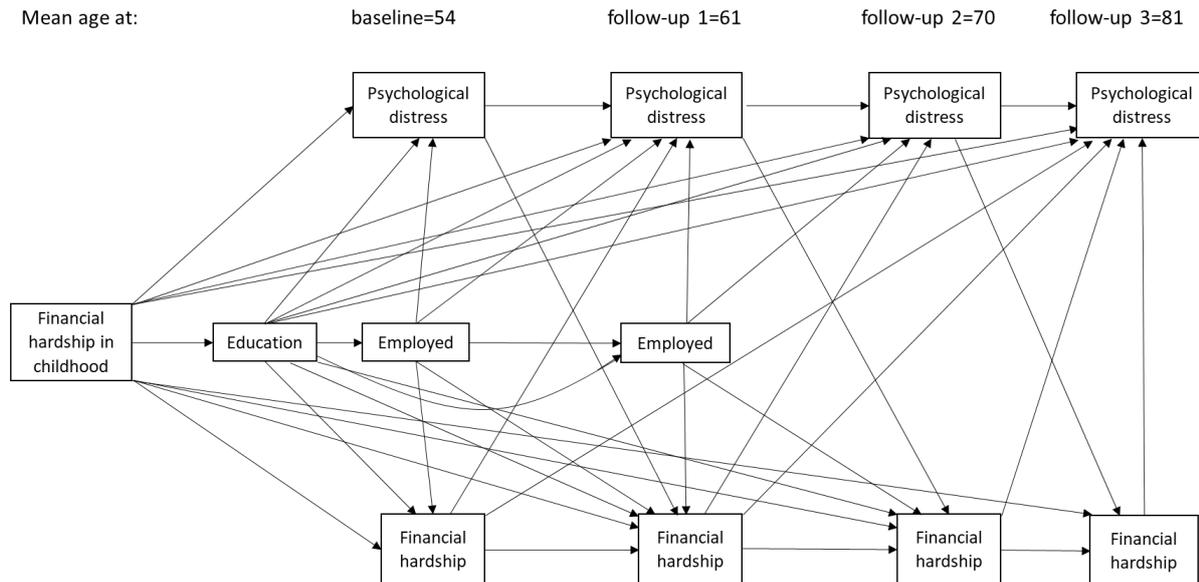


Figure 1. Conceptual model, including all paths representing tests of sensitive period, chains of risks, and accumulations of risks hypotheses. Paths from childhood financial hardship to old age variable indicate tests of childhood as a sensitive period. Pathways between childhood and old age through earlier psychological distress and financial hardship, education, and employment indicate tests of the chains of risks hypothesis. Independent paths from financial hardship at each point of measurement to psychological distress in old age indicate tests of the accumulation of risks hypothesis. Pathways from psychological distress to financial hardship later on, and from financial hardship to psychological distress later on indicate tests of social causation versus health selection. For clarity reasons, control variables (age and sex) and attrition are not shown in the figure.

There was no independent association between financial hardship in childhood and psychological distress at follow-up 3 (age 81) (Table 3). However, financial hardship in childhood had a medium-size indirect effect on psychological distress at follow-up 3 (0.27, $p < 0.01$). Financial hardship in childhood had an independent effect on psychological distress at baseline (0.28, $p < 0.001$) and psychological distress at age 70 (follow-up 2) (0.26, $p = 0.002$). All indirect and total effects were statistically significant ($p < 0.01$).

Table 3. Standardized estimates of direct, indirect, and total effects of financial hardship in childhood on psychological distress at baseline, follow-up 1, follow-up 2, and follow-up 3

	Psychological distress			
	Baseline	Follow-up 1	Follow-up 2	Follow-up 3
Direct effect	0.28 ¹	<i>ns</i>	0.26	<i>ns</i>
Indirect effect	0.06	0.33	0.23	0.27
Total effect	0.33	0.33	0.49	0.27

¹All estimates presented are statistically significant at $p < 0.01$. *ns* = $p \geq 0.10$

Figure 2 and Table 4 show the final model, in which all pathways were statistically significant at $p < 0.10$. In the final model, there was no chain of risks through financial hardship to psychological distress in old age; the last segment of the pathway was not significant. In addition, our results do not support accumulation of risks hypothesis: there were no independent associations between financial hardship at each measured point in time and psychological distress at follow-up 3. In contrast, hardship in childhood increased the probability of psychological distress at baseline, which increased the probability of psychological distress in old age through a chain of risks. Moreover, the model showed that educational level and employment mediated the effects of financial hardship in childhood; this can also be seen in the indirect and total effects (Table 3).

Financial hardship in childhood was associated with psychological distress in old age via psychological distress earlier in life. Higher educational level and being employed were positive; they mediated the negative association between financial hardship in childhood and later psychological distress (this also applied to financial hardship).

The results show that psychological distress was associated with more financial hardship later on. Except for financial hardship in childhood, financial hardship was only statistically significantly associated to psychological distress between baseline and follow-up 1 (0.17, $p < 0.001$).

Figure 2. Final model. For clarity reasons, control variables (age and sex) and attrition are not shown in the figure. Thick lines indicate $p < 0.05$ and thin lines indicate $p < 0.10$.

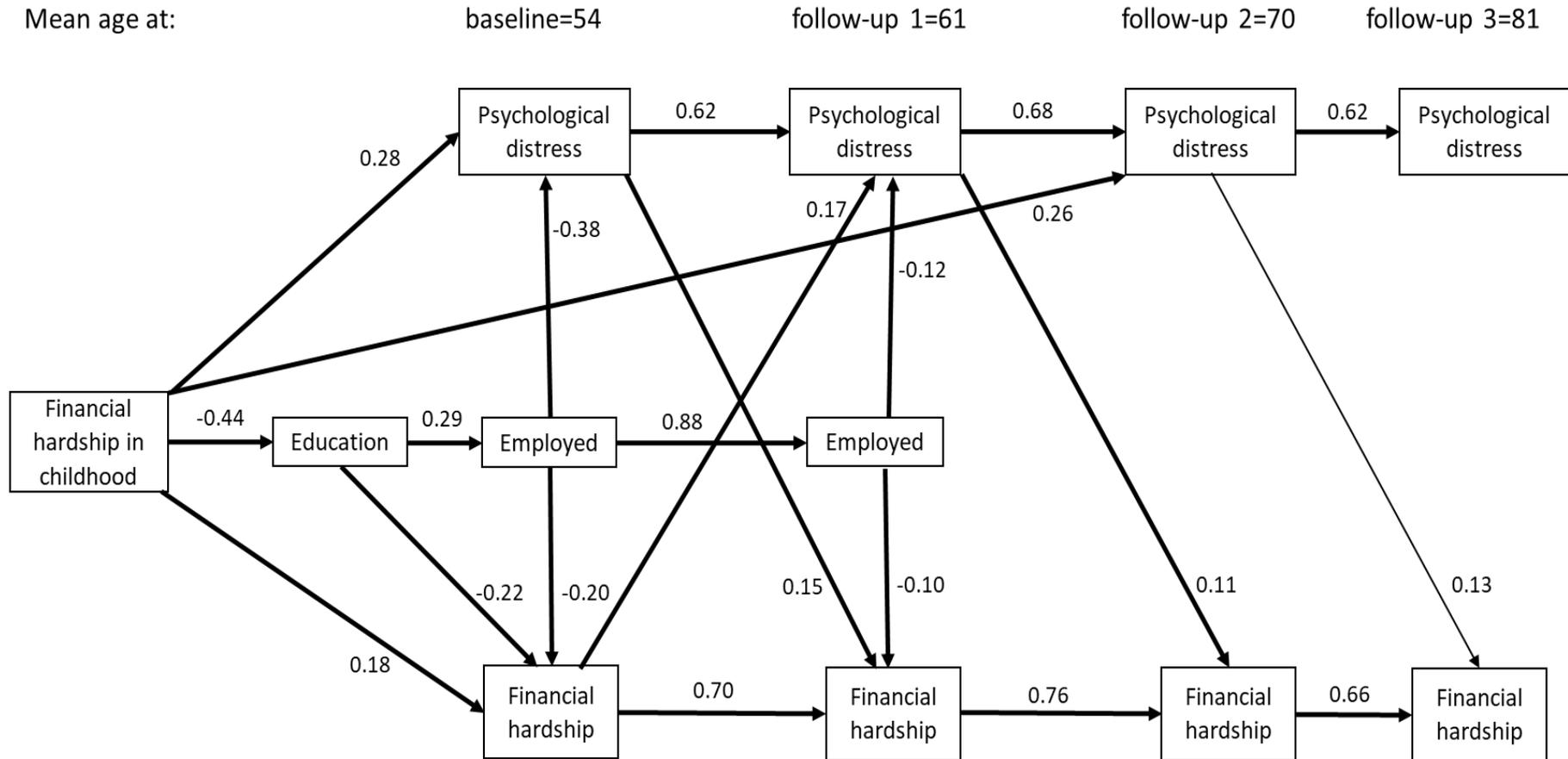


Table 4, presents all paths and p-values in the final model, and all paths when including attrition variables. Including attrition in the model did not change any paths or sizes of the estimates in any substantial way. Model fit indices were very similar between the different models (Table 4).

Table 4. Standardized estimated effects, the final model, and the final model including attrition variables.

Pathways	Final model Estimates (p-value)	Final model with attrition Estimates (p-value)
To psychological distress at follow-up 3, from:		
-Psychological distress at follow-up 2	0.62 (p<0.001)	0.62 (p<0.001)
-Age	-0.12 (p=0.001)	-0.12 (p=0.001)
To psychological distress at follow-up 2, from:		
-Psychological distress at follow-up 1	0.68 (p<0.001)	0.68 (p<0.001)
-Financial hardship in childhood	0.26 (p=0.002)	0.26 (p=0.002)
-Women	0.40 (p<0.001)	0.41 (p<0.001)
To psychological distress at follow-up 1, from:		
-Psychological distress at baseline	0.62 (p<0.001)	0.62 (p<0.001)
-Financial hardship at baseline	0.17 (p<0.001)	0.13 (p<0.001)
-Employed at follow-up 1	-0.12 (p=0.002)	-0.11 (p=0.001)
-Age	0.06 (p=0.057)	0.05 (p=0.071)
To psychological distress at baseline, from:		
-Financial hardship in childhood	0.28 (p<0.001)	0.28 (p<0.001)
-Employed at baseline	-0.38 (p<0.001)	-0.38 (p<0.001)
To financial hardship at follow-up 3, from:		
-Psychological distress at follow-up 2	0.13 (p=0.061)	0.15 (p=0.024)
-Financial hardship at follow-up 2	0.66 (p<0.001)	0.66 (p<0.001)
Financial hardship at follow-up 2 on		
-Psychological distress at follow-up 1	0.11 (p=0.012)	0.11 (p=0.014)
-Financial hardship at follow-up 1	0.76 (p<0.001)	0.77 (p<0.001)
To financial hardship at follow-up 1, from:		
-Psychological distress at baseline	0.15 (p<0.001)	0.15 (p<0.001)
-Financial hardship baseline	0.70 (p<0.001)	0.70 (p<0.001)
-Employed at follow-up 1	-0.10 (p=0.015)	-0.10 (p=0.010)
To financial hardship at baseline, from:		
-Financial hardship in childhood	0.18 (p=0.004)	0.18 (p=0.003)
-Education	-0.22 (p<0.001)	-0.21 (p<0.001)
-Employed at baseline	-0.20 (p<0.001)	-0.21 (p<0.001)
To education, from:		
-Financial hardship in childhood	-0.44 (p<0.001)	-0.43 (p<0.001)
-Women	-0.18 (p=0.003)	-0.18 (p=0.002)
-Age	-0.25 (p<0.001)	-0.25 (p<0.001)
To employment at follow-up 1, from:		
-Employed at baseline	0.88 (p<0.001)	0.88 (p<0.001)
-Age	-0.18 (p<0.001)	-0.18 (p<0.001)
To employment at baseline, from:		
-Education	0.29 (p<0.001)	0.30 (p<0.001)
-Women	-0.93 (p<0.001)	-0.93 (p<0.001)

-Age -0.13 (p<0.001) -0.13 (p<0.001)

To attrition between follow-up 1 and 2, from:

-Financial hardship at baseline 0.08 (p=0.017)

-Education -0.08 (p=0.025)

-Women -0.04 (p=0.007)

-Age -0.11 (p<0.001)

To attrition between follow-up 2 and 3, from:

-Psychological distress at follow-up 1 -0.08 (p=0.067)

-Employed at follow-up 1 -0.11 (p=0.014)

-Women -0.19 (p=0.011)

-Age -0.14 (p=0.018)

To attrition between follow-up 3 and 4, from:

No statistically significant associations (p<0.1)

Model fit indices		
RMSEA	0.028	0.024
CFI	0.979	0.973
TLI	0.967	0.957
WRMR	1.120	1.061

Discussion

This study used a life-course framework to investigate the interplay between financial hardship and psychological distress from childhood to old age. We included the three most common life-course hypotheses in one model and analyzed them using individual level data. Two prospective nationally representative surveys were combined, resulting in repeated measures from childhood to old age. We found some support for the hypothesis that childhood is a sensitive period with respect to psychological distress in old age (changes from 61 to 70). In addition, we found that financial hardship in childhood triggers subsequent psychological distress in adulthood that in turn increases the probability of psychological distress in old age. However, we did not find any statistically significant associations between financial hardship in late adulthood and psychological distress in old age. The results show that higher levels of education and being employed (modifiable factors) decrease the psychological distress that can result from financial hardship. Moreover, our results indicate that health selection has a somewhat stronger effect than social causation; that is, psychological distress has a stronger effect on later financial hardship than financial hardship has on later psychological distress. However, the question of social causation or health selection needs further investigation. In contrast to the results of earlier studies, the results of this study do not support the accumulation of risks hypothesis.

Childhood plays a central role in the life course approach, as it has impact on peoples' life later on. How childhood conditions impact later health is not fully understood. For example, some

studies have found a direct association between childhood socioeconomic position and mental health later on (Evans 2016; Fors et al. 2009), whereas others have found the effect to be mediated through other factors, such as education and income (Quesnel-Vallée & Taylor 2012; Laaksonen et al. 2007; Berndt & Fors 2015). In the current study, which used a model that simultaneously tested the sensitive period, chains of risks, and accumulation of risks hypotheses, financial hardship in childhood was independently associated with psychological distress in old age at follow-up 2 (changes from age 61 to 70) but not follow-up 3 (age 81). We interpret this finding as providing support for the sensitive period hypothesis. It is possible that the absence of a significant association at follow-up 3 could be explained by the low residual variation of psychological distress between 70 and 81 years combined with smaller sample size. This low variation might indicate that the majority of the effects of childhood financial distress on psychological distress in old age had manifested itself by the time people reached 70 and simply continued to 81 years. The indirect effect of childhood conditions indicated that there are ways to amend disadvantage in early life; namely, education and employment.

Financial hardship in childhood was associated with more psychological distress and more financial hardship in adulthood. In addition, those who had experienced financial hardship in childhood had a lower probability of higher education than those who had not. Financial hardship in childhood, psychological distress and financial hardship in adulthood, lower education, and not being employed affect outcomes later in life and finally psychological distress in old age. In line with earlier studies, we found that education and employment mediate the link between childhood conditions and later-life health (Berndt & Fors 2015; Laaksonen et al. 2007). Our results indicate that childhood conditions affect a broad spectrum of areas related to inequality and health inequality; however, childhood conditions did not seem to have long-lasting irrevocable effects. Instead, the results indicate that education and employment, factors that are amendable, have a positive influence on later-life health outcomes.

Financial hardship takes a toll on mental health, and studies have shown that recurrent or sustained financial hardship increases the risk of mental disorders (Lynch et al. 1997; Kahn & Pearlin 2006; Shippee et al. 2012). To the best of our knowledge, the influence of financial hardship on psychological distress in old age has not been investigated in a model that includes tests of both the accumulation of risks and chains of risk hypotheses. We tested the accumulation of risks hypothesis by examining the independent relationship between financial hardship at each measured point in time and psychological distress at follow-up 3. When we adjusted for chains of risk, we found no statistically significant independent direct effects of financial hardship at each measured point in adulthood on psychological distress after the age of 61. We thus conclude that, independent of chains of risk, more instances of financial hardship during the life course do not increase the risk for psychological distress in old age. Instead, most of the effects of financial hardship in childhood seem to be mediated by earlier episodes of psychological distress. In addition to a direct effect of childhood financial hardship on psychological distress in later life, one independent association from financial hardship at ages

54, 61, or 70 on psychological distress at age 81 would have been interpreted as supporting the accumulation hypothesis.

We did not find long-term associations between financial hardship in adulthood and psychological distress later in adulthood or in old age; earlier studies that did not include tests of the chain of risks hypothesis have found such effects (Linander et al. 2015). When the life course hypotheses were put together in one model, the results provided more support for the chains of risks and sensitive period hypotheses than the accumulation of risks hypothesis.

Studying the cross-lagged associations, financial hardship in childhood and financial hardship at age 54 were associated with more psychological distress later on while financial hardship in late adulthood and old age did not increase the risk of psychological distress. In contrast, each measured point of psychological distress increased the risk of financial hardship later on. In line with the findings of a 2015 systematic review (Kröger et al. 2015), we found support for both health selection and social causation. However, the total model provided somewhat stronger support for the hypothesis of health selection than for the hypothesis of social causation.

Strengths and limitations of the study

Like all studies, this study had both strengths and limitations. First, it is a strength to have nationally representative surveys spanning approximately the entire life course, from childhood (the data about childhood conditions were assessed retrospectively the first survey the respondents participated in, most commonly 1968) to old age, including repeated measures during the adult life. Moreover, to the best of our knowledge, this was the first time three central life course hypotheses were included in a single model instead of being studied separately. In addition, we also included cross-lagged associations between the repeated measures of financial hardship and psychological distress. The inclusion of repeated measures of our outcome allowed us to see whether childhood variables could explain the change between the two last time points. We were also able to include an analysis of attrition in the study.

A drawback of this study was the crude measure of psychological distress, which was assessed with self-reported feelings of anxiety and depressive symptoms during the last twelve months. Our measures, most likely, do not fully capture psychological distress, and people might not remember how they felt during the past twelve months. In addition, there is a risk for recall bias regarding childhood conditions. Specifically, people who experienced psychological distress on the first survey occasion might have had negative recall bias with regard to childhood conditions.

We did not include mobility or functional limitations in this study, although adverse physical functioning is associated with more severe psychological distress (Shih et al. 2006). In Sweden in 2011, life expectancy was approximately twelve years for 77-year-old women and ten years for men of the same age. Women could expect to live about 4.5 and men 5.5 of these years without mobility limitations (Sundberg et al. 2016). Moreover, we did not include other possible

confounders and mediators such as health behaviors or earlier life health conditions. If we had included such variables, we would have induced over controlling, distorting the direct effect from financial hardship in childhood on psychological distress in old age. At different times during the life course, other variables would have been both confounders and mediators in our model leading to time varying confounding problems. Research has identified ways to adjust for time varying confounding in ordinary least square regression models, aiming to estimate one causal association (Marden et al. 2017). Structural models (like ours) do not seek to investigate one causal association. Instead, many variables are treated as both exposures and outcomes and the aim is to interpret to model as a whole. Future research is needed to investigate the causal association between financial hardship and psychological distress in detail.

Even though our analysis showed that attrition had no or a very small influence on the results, approximately 50% of the initial study sample was lost to follow-up. However, we investigated life course hypothesis in relation to psychological distress in old age. Hence, our target population consisted of those who survived to old age, and most of the attrition occurred because of death.

Our study was performed with data from the Swedish population, so the generalizability of our conclusions to other populations may be limited. Sweden is well known for its egalitarian and extensive welfare state, and these conditions were more pronounced during the time this study's participants grew up than they are today. Currently, financial inequality is growing in Sweden and are becoming more like other European countries in relation to inequality and poverty (Nolan et al. 2014; Fritzell et al. 2012; OECD 2011). In addition, the effect of socioeconomic conditions on health inequalities is as great or greater in Sweden than in other European countries (Mackenbach 2012).

Our modeling of the hypotheses in question needs deeper investigation. Rosvall et al. (2006) compared the sensitive period, accumulation, and social mobility hypotheses in three different models using fit to determine the best model. All the models had approximately the same model fit and all provided support for each hypothesis, a finding that could be due to collinearity between the models. The researchers therefore could not conclude which model was "best." In a U.S. study of mortality in late life, researchers found that their results supported the accumulation of risks and the chains of risk hypotheses more than the critical period hypothesis (Pudrovska & Anikputa 2014). Hallqvist et al. (2004) have also tried to disentangle the same three hypotheses; they concluded that disentangling the hypotheses meant facing the same dilemma as trying to disentangle age, period, and cohort effects. In addition, they stressed that there might not be an empirical way to disentangle the hypotheses, but that the results should be considered in light of theoretical and mechanism-related explanations based on earlier research. We conducted an empirical test of the life course hypotheses: a method that does not suffer from collinearity and that shows how the hypotheses contribute to understanding independent of the other hypothesis. However, our results do not provide a simple answer to

the question of which life course hypothesis has the most empirical support. Instead, our results do not support the hypothesis of accumulation of risks when taking the sensitive period and chains of risks hypotheses into account. A comparison of the fit of a full model, like ours, to the fit of specific models for each hypothesis could result in a deeper understanding of the competing hypotheses.

Conclusion

We found that psychological distress in old age was affected by financial hardship in childhood through a chain of risks that included psychological distress earlier in life. In addition, financial hardship in childhood seemed to directly affect psychological distress in old age, independent of other measured circumstances (i.e., chains of risks). There are many ways that adverse conditions in childhood affect health, such as through educational achievement and employment. Improving education for and labor-market inclusion of people who experience poor childhood conditions may provide some important benefits. Targeting people with psychological distress in middle age, or even earlier, might also help decrease psychological distress and increase well-being in old age.

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