

## Article

# Determinants of long-term unemployment in early adulthood: A Finnish birth cohort study



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## ARTICLE INFO

## Keywords:

Social determinants  
Psychiatric diagnoses  
Teen-age pregnancies  
School performance  
Register-based  
Child protection action

## ABSTRACT

Cumulative contributions of social and health-related determinants to long-term unemployment during early working life among young adults are poorly understood. Therefore, we used four cumulative indices of both parental and own social and health-related determinants of such unemployment among a cohort which comprised a complete census of children born in Finland in 1987. The cohort participants were registered in the Medical Birth Register, and they were followed-up through 2015 ( $N = 46\,521$ ). We calculated predicted probabilities for long-term unemployment ( $> 12$  months) when participants were 25–28 years. Moreover, we examined whether the associations differed by unemployment at the municipal level.

During the follow-up, 4.5% of women and 7.1% of men experienced long-term unemployment. All cumulative indices of parental and own social and health-related determinants predicted the probability of long-term unemployment. The greatest probabilities were observed for own social determinants, both in municipalities with high and low unemployment although the probabilities were higher in the high-unemployment municipalities. Of the individual determinants, poor school performance showed the strongest association with long-term unemployment among women (OR 6.65, 95% CI 5.21–8.55) and men (OR 3.70, 95% CI 2.96–4.67), after adjusting for other own social determinants. The results highlight the importance of life course social equality in the prevention of long-term unemployment in early adulthood.

## 1. Introduction

Unemployment is a global social problem affecting particularly young people (Eurofound, 2016). Young people are vulnerable to unemployment as their jobs are typically insecure (Blossfeld, Buchholz, Bukodi, & Kurz, 2009). The adverse consequences of unemployment, including increased risk of suicide (Milner, Page, & LaMontagne, 2013), highlight the need to identify potential determinants of early unemployment. As unemployment in young adults predicts later unemployment and early exit from the labor market, focus on the

beginning of working life is warranted (Eliason & Storrie, 2006).

Several potential parental and individual determinants of unemployment have been recognized. Parental socioeconomic position may be important when young workers are establishing their own social position (Caspi, Wright, Moffitt, & Silva, 1988). Own education, in turn, is a direct qualifier for many potential jobs. Moreover, dropping out of school is a crucial factor regarding labor market exclusion although the dropout rates in Finland are lower than in other Nordic countries (Bäckman, Jakobsen, Lorentzen, Österbacka, & Dahl, 2011). School dropout and early school leaving predict unemployment of the

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<https://doi.org/10.1016/j.ssmph.2019.100410>

Received 15 January 2019; Received in revised form 9 May 2019; Accepted 12 May 2019

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young adults (Albæk et al., 2015), as does low final school grades (Fröberg, Modin, Rosendahl, Tengström, & Hallqvist, 2015). Moreover, the impact of low education on unemployment is strong irrespective of the health status (van Zon, Reijneveld, Mendes de Leon, & Bültmann, 2017).

While unemployment can have adverse effects on mental health (Harkko, Virtanen, & Kouvonen, 2018; Milner et al., 2013; Norström, Virtanen, Hammarström, Gustafsson, & Janlert, 2014; Overland, 2016), health problems may also affect the risk of subsequent unemployment (van Rijn, Robroek, Brouwer, & Burdorf, 2014). This is often described as ‘health-related selection’ (Helgesson, Tinghog, Niederkrötenhaler, Saboonchi, & Mittendorf-Rutz, 2017).

A number of health-related risk markers in adolescence are linked to later unemployment. For example, mental health problems in adolescence can predict adverse work outcomes including less successful transition into paid employment (Veldman, Reijneveld, Verhulst, Ortiz, & Bültmann, 2017) and long-term unemployment (Clayborne, Varin, & Colman, 2019). Parental mental health problems, in turn, have been associated with an increased risk of mental health problems among offspring (Franic, Middeldorp, Dolan, Ligthart, & Boomsma, 2010). There is also evidence that loss of a parent, through divorce or death, may affect offspring's employment (Corak, 2001), as may teenage motherhood (Bradley, Cupples, & Irvine, 2002). In all, the associations between health-related factors and unemployment have scarcely been studied among young people although health problems contributing to adult life could be present already in childhood (Egan, Daly, & Delaney, 2015; Poulton, Moffitt, & Silva, 2015).

The above summarized relatively consistent contribution of different social and health-related factors to unemployment suggests that it is important to examine these factors in combination. Most studies have, however, only focused on identifying one or a few determinants at a time (Lander, Rasmussen, & Mortensen, 2012; Saigal et al., 2006). As these types of risks tend to operate in parallel, evidence of the cumulative contribution of different determinants provides an important additional perspective. Other limitations of previous studies include their small size (Fergusson, Horwood, & Woodward, 2001), with limited opportunities to include a wider set of also rarer social or health-related determinants, such as child protection interventions, criminal convictions (Bushway & Reuter, 1997), or extremely low birth weight (501–1000 g) (Saigal et al., 2006). The direct link between premature birth and unemployment has not, however, been established in prior studies (Moster, Lie, & Markestad, 2008). Nonetheless, these factors may increase the risk of unemployment, but they have seldom been examined, as large datasets are required to address their effects. Moreover, many studies have focused on health-related selection into unemployment during mid careers (Virtanen, Janlert, & Hammarström, 2013).

Finally, in addition to individual level social and health-related factors, also macro level and meso-level factors, such as overall high level of unemployment or high local level of unemployment as markers of disadvantage (Pickett & Pearl, 2001), could play a role, and amplify or dampen individual determinants (Barbieri, Cutuli, & Passaretta, 2016; Dubow, Boxer, & Huesmann, 2009; Scanlan & Bundy, 2009). Still, such macro level factors have often been examined separately of the individual determinants, or neglected. While effects of such contextual factors are likely weaker compared to individual level determinants (Pickett & Pearl, 2001), living in localities with high unemployment are linked to poorer employment outcomes (Murray et al., 2019). This highlights the importance of studying individual and contextual factors together. Finland is a Nordic welfare state, with equal access to high-quality education and health services for all (Hiilamo & Kangas, 2013). However, even in such welfare societies, health inequalities are persistent (Mackenbach, 2012), and there is a need to consider the context, when determinants of unemployment are studied.

Therefore, in the present study, we examined determinants of long-term unemployment in early adulthood, using a birth cohort with

nearly a 30-year follow-up from birth to early adulthood. Specifically, we examined whether accumulation of the key life course social and health-related determinants is associated with long-term unemployment among young men and women considering the municipal level unemployment rate. An additional aim was to examine contributions of each individual determinants to the risk of unemployment in general and specifically, to the risk of long-term unemployment.

## 2. Material and methods

The data were derived from the 1987 Finnish Birth Cohort (Paananen & Gissler, 2012) linking different administrative registers using unique identification numbers (Gissler & Haukka, 2004; Ristikari et al., 2016). The cohort comprises a complete census of all children, who were live born in Finland during 1987, after 22 weeks of gestational age, weighing at least 500 g, and registered in the Medical Birth Register (N = 59 476).

To examine who are at risk of unemployment, we excluded those who received disability allowance (middle or highest rate) as adults (n = 510), those who have been living outside Finland at least for a year between January 1987 and June 2015, (n = 1910), those who received a diagnosis of intellectual disability (ICD-9317–319 and F70–F79) during 1987–2015 (n = 258), people who died during 1987–2015 (n = 706) and people who were on disability pension (n = 680). We also excluded those who were more than 600 days outside the labor force between 2012 and 2015 (n = 8721) and were not eligible for unemployment benefits. The most common reason for being out of the labor force was studying (61%), parental allowance (46.7%), or sickness allowance (17%). It was possible to receive different kind of supports during the follow-up, thus the figures are not mutually exclusive. Finally, we excluded people with missing data on their residential municipality in 2012 (n = 170). Thus, the final study population comprised 46 521 people (78.2% of cohort), who were followed up from their birth in 1987 through 2015. Data formation is illustrated in Fig. 1.

Ethical approval for the study has been received from the Ethical Review Board of National Institute for Health and Welfare (§28/2009). Permissions to use and link all register data were granted by each register data holder.

### 2.1. Long-term unemployment

Long-term unemployment outcome was defined as unemployment lasting for over 12 consecutive months over the follow-up of three years between participants' 25th birthday and 28th birthday. Unemployment data were derived from the Finnish Centre for Pensions and Ministry of Economic Affairs and Employment of Finland. Overlapping periods were merged. As we examined sustained unemployment of one year or more as the main outcome, this removed the risk of including only a sum of shorter unemployment periods, e.g., during summer holidays. To confirm the results, we used ‘any unemployment’ as an outcome.

### 2.2. Determinants

#### 2.2.1. Own health-related and social determinants of unemployment

All health-related and social determinants of unemployment were used separately and in the cumulative indices. All own determinants were derived from the registers before the cohort members turned 25 years. Health-related determinants comprised any premature birth (< 37 weeks) and very premature birth (< 28 weeks) from the Medical Birth Register kept at the National Institute for health and Welfare, and mental disorders from the Care Register for Health Care also kept at the National Institute for health and Welfare. Mental disorders were based on diagnoses with 9th and 10th version of International Classification of Diseases and Related Health Problems ICD-9 codes 290–319, which comprise psychoses, neurotic disorders, personality disorders, and other

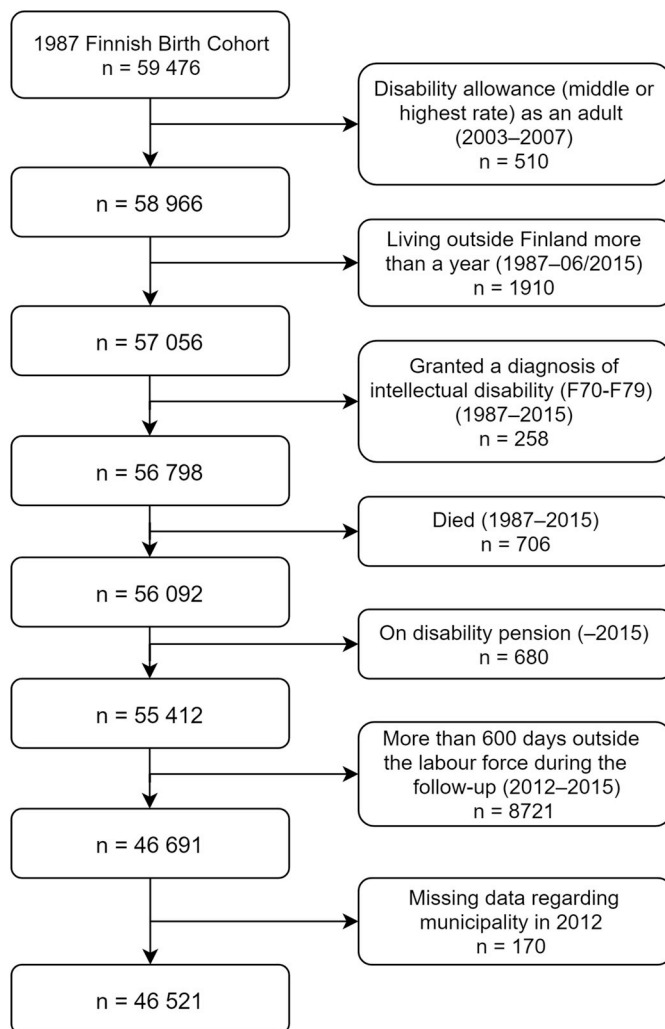


Fig. 1. Flowchart, numbers and (%) of the data formation and exclusions.

nonpsychotic mental disorders (World Health Organization, 1991) or ICD-10 codes F00–F99, which comprise all mental and behavioral disorders (World Health Organization, 2004) except for mental retardation (see above). Additionally, mental disorders included prescribed, reimbursed psychotropic medication (ATC-codes N05 or N06), i.e. psycholeptics and psychoanaleptics (WHO Collaborating Centre for Drug Statistics Methodology, 2019). These data were derived from the Benefits Register of Social Insurance Institution of Finland (Kela, Special reimbursable medicine). Mental disorders were indicated by having had psychiatric specialized outpatient visits. For girls, also teenage birth(s) and induced abortion(s) were included from the Register of Induced Abortions of the National Institute for Health and Welfare. These could be seen both as a social and health-related factors (Jalanko, Leppalahti, Heikinheimo, & Gissler, 2017; Patel & Sen, 2012).

Social factors comprised poor school performance, early school leaving, timing of entry into paid employment, marital status, and criminal convictions. Poor school performance was based on the grade point average (GPA) in the certificate given after the compulsory comprehensive 9-year education (from the Finnish National Agency for Education). It ranged from 4 (failed) to 10 (the highest possible) (FinlandEducation.info, 2018) and was classified following previous procedures (Halonen et al., 2019): missing, 4.0–6.9 (poor performance), 7.0–7.4, 7.5–7.9, 8.0–8.4 and 8.5–10.0. For the cumulative index, those with a GPA below 7.5 scored 1, while those with a GPA  $\geq 7.5$  or missing scored 0. In Finland, the admittance into the upper secondary school is based on the GPA, making it an important

determinant of subsequent education (and later employment). The register data for GPA were from the year when participants turned 16 years and were expected to complete their compulsory education. Missing data could be due to several reasons: a participant had started school a year earlier and applied to secondary education or has not completed compulsory education or has not applied to secondary education. To address school dropout rate, we included a variable indicating, if the participant had not completed secondary level education based on the Statistics Finland's Register of Completed Education and Degrees. Timing of the first longer period from the Earning Register of the Finnish Centre of Pensions (6 month or more) of paid employment was classified into three age groups: under 19 years, 19–23 years and 24 years or older, to indicate early and later entry. For the index, the variable was dichotomized: those who did not have any period of paid employment before they turned 25 years scored 1, others 0. Marital status was derived from the Population Information System kept by Population Register Centre. It was also divided into three groups: married, not married, and divorced to consider the potential harmful effects of divorce for mental health and the risk of unemployment (Cherlin, Chase-Lansdale, & McRae, 1998; Covizzi, 2008). For the index, being divorced or single scored 1, and being married 0. Criminal conviction referred to any milder and severe registered convictions derived from the Criminal Records at the Legal Register Centre, by the end of the year 2012 (yes = 1, no = 0).

### 2.2.2. Parental health-related and social determinants of unemployment

Parental determinants were derived from the registers before the cohort members turned 16 years (Halonen et al., 2017). Health-related determinants on the parental level included mental disorders (either or both biological parents had a mental or a behavioral disorder (ICD-9 - 290-319 or ICD-10 F00-99, or they had visited a specialized psychiatric clinic). Additionally, we included any parental cancer (from the Care Register for Health Care) or death (from the Causes of Death Register of the Statistics Finland), and whether the participant's mother had had a teenage pregnancy (from the Medical Birth Register).

Family-level social factors included several different indicators. First, parental education was classified into four groups: compulsory education, upper-secondary level, lower academic, and higher academic level (from the Statistics Finland's Register of Completed Education and Degrees). For the index, all the lower groups scored 1, whereas those whose parents had a university degree scored 0. Second, poverty during childhood was defined as both biological parents' income level below 60% of the national median during any year between 1987 and 2003. Third, poverty when participant was 15 years was defined as both biological parents' income level below 60% of the national median in 2002. These poverty-related measures were from the Finnish Centre for Pensions' Earning Register. Fourth, family receiving social assistance referred to income benefits, for at least 6 months at a time, or altogether for 12 months during 2001–2005 (from the Register on Social Assistance at the National Institute for Health and Welfare). Fifth, long-term over-indebtedness was defined based on participant's mother's or father's unpaid debts/payment disruptions in 2010. The data were from the register data holder "Suomen Asiakastieto Oy". Sixth, we formed a variable describing whether any child protection interventions (foster care/placements as support measures in open care) had been applied when participants were younger than 13 years, or when 13 years or older. The data were from the Register on Child Welfare, kept by the National Institute for health and Welfare. Seventh, parent's marital status (married, not married, and divorced) was included (Population Information System kept by the Population Register Centre). For the index, parental marital status was classified as divorced or single (= 1) and being married (= 0).

### 2.3. Cumulative indices

To study whether the social and health-related factors cumulatively

increased the probability of long-term unemployment, we formed four cumulative indices using dichotomized determinants. Thus, each dichotomized determinant scored 0, if it was not present, and 1 otherwise. We formed four indices: 1) own health-related determinants (scores 0–5), 2) own social determinants (scores 0–6), 3) parental health-related determinants (scores 0–4), and 4) parental social determinants (scores 0–7). As very scored 1 in all of the included determinants for any of the indices, the extreme ends of the cumulative indices were merged into one category (for own health-related determinants, scores 2+, for own social determinants scores 4+, for parental health-related determinants scores 2+ and for parental social determinants scores 6+, were merged).

#### 2.4. Unemployment at the municipal level

To account for the contribution of the municipal unemployment rate to the predicted probabilities of unemployment, we used unemployment rates of the municipalities where the participants resided at the beginning of the follow-up in 2012. Residential municipality was derived from the Population Register Centre, and unemployment rate of each municipality from the Statistics Finland. Median level of unemployment in the country (10.7%) in 2012 was used as a cut-off point for low and high unemployment rate of the cohort participants' residential municipality.

#### 2.5. Statistical analyses

Key relations between cumulative indices and unemployment, as well as confounders and mediators, are displayed in the [Appendix Figure A1](#). Predicted probabilities of unemployment using the cumulative indices of own health-related determinants, own social determinants, parental health-related determinants, and parental social determinants, were derived from logistic regression models, where the outcome was long-term unemployment. More specifically, in our main analyses, we examined the probability of unemployment, stratified by the unemployment rate at the municipal level (moderator) and by gender. Goodness of fit of the cumulative models was tested using the Hosmer-Lemeshow's test. Based on the test, all models fit the data well.

In additional analyses using logistic regression, we studied the individual determinants separately using long-term and any unemployment as outcomes. This was done to confirm, if the determinants are similar to any and long-term unemployment, and to have a reference group comprised of only those with no unemployment. In these analyses, bivariate associations were examined first. Then, adjustments were made in blocks. First, own health-related determinants were mutually adjusted for. Second, own social determinants were mutually adjusted for. Third, parental health-related determinants were mutually adjusted for, and fourth, parental social determinants were mutually adjusted for. The idea in the block-wise adjustments was to confirm, if the individual effects of each of the determinants remain, when other determinants belonging to the same index are mutually adjusted for.

### 3. Results

During the follow-up, 40% of women ( $n = 8316$ ) had at least one episode of any unemployment, while 5% ( $n = 935$ ) experienced long-term unemployment ( $> 12$  months). The corresponding figures for men were 40% ( $n = 10\,266$ ) and 7% ( $n = 1845$ ), respectively. The most common own health-related determinant was presence of a mental disorder ([Table 1](#)), which was the case for 30% of the women and 22% of the men. The first longer period of employment had most often occurred between the ages 19–23 among both among men (55%) and women (56%). For parental social and health-related determinants ([Table 2](#)), mental disorders were the most prevalent of the examined health factors: 17% of the participants' parents had a mental disorder. Experience of relative poverty in childhood families was common; half

of the participants had experienced it before the age of 15 years. A majority had at least one own or parental social determinant, while own and parental health-related determinants were less common ([Table 3](#)).

Predictive probabilities of long-term unemployment in early adulthood increased with increasing number of determinants, i.e., the higher the score of the index, the higher the predicted probability of long-term unemployment ([Figs. 2–5](#)). Moreover, the figures display the predicted probabilities of long-term unemployment by high versus low levels of municipal level unemployment at the beginning of the follow-up. The risks were observed for low and high unemployment municipalities, but they were generally higher for those living in municipalities with unemployment rates higher than the country median level.

The patterns were similar for women and men although the probability of long-term unemployment among men appeared to be higher than among women. Only for own social determinants, women's predicted probabilities for long-term unemployment were higher than those of the men's when there were three or four social determinants.

In the additional analyses, we examined the individual determinants using long-term and any unemployment as outcomes ([Appendix tables A1 and A2](#)). In general, the determinants were largely similarly associated with unemployment among men and women. The strongest association was observed for poor school performance that was linearly associated with long-term unemployment. The odds of long-term for women with the lowest final GPA of 4.0–6.9 (vs. highest 8.5 to 10) was 6.65 (95% CI 5.21–8.55) after considering all other social determinants. The corresponding OR for men was 3.70 (95% CI 2.96–4.67). For marital status, the associations were somewhat mixed, but parents' divorce tended to increase the risk of unemployment.

Of the more rarely examined determinants, a very premature birth was associated with long-term unemployment among men in bivariate models (OR 1.79, 95% CI 1.04–2.90), but the association was not statistically confirmed after other social determinants were adjusted for (OR 1.71, 95% CI 0.94–2.95). Additionally, odds of unemployment appeared higher among those women and men whose child protection action occurred later (after the age of 13), than for those whose actions occurred earlier.

### 4. Discussion

#### 4.1. Main findings

We examined parental and individual's own social and health-related factors in childhood and adolescence as determinants of long-term unemployment during early adulthood. Our main finding was that the accumulation of parental and own social and health-related disadvantage relatively similarly increased the probability of early long-term unemployment in a dose-response manner. Furthermore, as a novelty, we examined the individual-level risk factors in the context of municipal level unemployment rates. The observed associations were similar irrespective of the residential unemployment rate, although the risk of long-term unemployment tended to be greater in municipalities with high unemployment rate than in those with low unemployment rate. The patterns were also largely similar for women and men, although there were some differences in the strength of the associations.

#### 4.2. Interpretation

This study is the first to examine cumulative indices comprised of a wide set of both the parents' and the offspring's social and health-related determinants and their contribution to long-term unemployment in early adulthood. As an additional novelty aspect, we examined, if these relationships varied across municipal level unemployment.

Our results are in accordance with a Danish study examining parental socioeconomic factors and neighborhood disadvantage as determinants of long-term unemployment during early adulthood ([Lander et al., 2012](#)), confirming the significance of social inequalities in the



**Table 1**  
Distributions (%) own social and health-related determinants of long-term early unemployment among men and women in the Finnish Birth Cohort 1987

	Men	Women	(Total)
	% (n)	% (n)	% (n)
<b>Own health and social determinants</b>	55.6 (25 857)	44.4 (20 664)	100 (46 521)
<i>1) Health-related determinants</i>			
Premature birth	5.1 (1311)	4.4 (908)	4.8 (2219)
Very premature birth	0.5 (141)	0.5 (96)	0.5 (237)
Any mental disorder	21.5 (5559)	29.7 (6128)	25.1 (11 687)
Disability allowance when under 16	14.6 (3775)	11.0 (2277)	13.0 (6052)
Teenage birth		3.5 (724)	3.5 (724)
Teenage abortion		6.5 (1344)	6.5 (1344)
<i>2) Social determinants</i>			
Grade point average (GPA, the last year of compulsory education, 4–10)			
Missing	2.0 (510)	2.2 (446)	2.1 (956)
4.0–6.9	30.5 (7885)	11.6 (2399)	22.1 (10 285)
7.0–7.4	18.7 (4841)	13.0 (2684)	16.2 (7524)
7.5–7.9	18.5 (4782)	17.0 (3512)	17.8 (8293)
8.0–8.4	16.0 (4142)	20.1 (4167)	17.8 (8302)
8.5–10.0	14.3 (3697)	36.1 (7472)	24.0 (11 161)
Early school leaving (no completed second degree education)	13.6 (3528)	8.0 (1646)	11.1 (5174)
First period of paid employment, ≥6 months			
< 19 years	29.5 (7632)	30.7 (6350)	30.1 (13 982)
19–23 years	54.9 (14 203)	56.0 (11 572)	55.4 (25 775)
≥24 years	10.2 (2628)	9.7 (2006)	10.0 (4634)
No employment	5.4 (1394)	3.6 (736)	4.6 (2130)
Marital status			
Married	7.3 (1879)	8.7 (1803)	7.9 (3682)
Not married	91.7 (23 699)	88.9 (18 373)	90.4 (42 072)
Divorced	1.1 (279)	2.4 (488)	1.6 (767)
Criminal conviction	18.2 (4708)	3.9 (808)	11.9 (5516)
Municipal unemployment rate in 2012			
Low (< 10.7%)	46.6 (12 047)	49.4 (10 199)	47.8 (22 246)
High (≥ 10.7%)	53.4 (13 810)	50.6 (10 456)	52.2 (24 275)
Long-term unemployed before the follow-up (before the age of 25)	2.9 (753)	1.4 (287)	2.2 (1040)

risk of long-term unemployment. Our results are further confirming those of the earlier studies, where the focus has been on single determinants such as education (Dubow et al., 2009), or on poor mental and physical health (Kaspersen et al., 2016). This study also extends previous evidence by showing the cumulative effects of various determinants from different life-course stages, and showing the importance of some rarely examined social determinants.

One could have assumed that the unemployment rate in the residential municipality more strongly contributes to the probability of the individual-level unemployment than we observed. An earlier study found that the association between socioeconomic factors, health and unemployment are more pronounced when the unemployment level increases, e.g. during economic recession (Bartley & Owen, 1996). It is possible that the variance in the unemployment rates between studies differ, partly explaining the conflicting results. In our data, high unemployment was dichotomized from 10.7% and categorization using different cut-offs might have resulted in larger differences by municipal unemployment rate. As unemployment fluctuates between years, it might have some effects on the results. Moreover, after the global economic crises, youth unemployment – especially long-term unemployment – increased in Finland steadily towards the end of the follow-up period in 2015. This might have affected the incidence of long-term unemployment in this cohort, but also the probabilities the unemployment. Thus, in times when unemployment rate is high, it could be assumed that it disproportionately affected people with social disadvantage and poorer health. However, also many of those with relatively good functioning could also have become unemployment during such a period. In other words, while there is health selection into unemployment, it could be even stronger in times of economic downturn and high unemployment. Nonetheless, the current results indicate that those in a socially more advantaged position have a lower risk of unemployment, even if the level of unemployment in the living area is

high. As this is a total birth cohort, some other macro level factors or periodic effects are of lower importance, since all are of same age and the data are from the same period and collected with similar methods for each participant.

Of individual determinants, poor school performance had a surprisingly strong association with unemployment highlighting the need to address learning difficulties during the compulsory school education. Despite a clear association also for early school leaving, it may be challenging to find effective means to intervene. For example, reforms to increase duration of mandatory education do not necessarily lead to better outcomes (Courtin et al., 2019).

Regarding the rarely examined determinants we observed some tendency for an increased risk of long-term unemployment in relation to very low birth weight, although the risk was statistically confirmed only among men. In an earlier study, people with very low birth weight had equal opportunities to be employed as compared to their normal birth weight counterparts, after excluding those with disabilities (Saigal et al., 2006).

When studying the associations between social and health-related factors and unemployment, reverse causality and selection may play a role. According to previous studies, poor health is associated with the risk of subsequent unemployment (Harkko et al., 2018; Kaspersen et al., 2016; Milner, Page, & LaMontagne, 2014). Our results are in line with this, but also extend the previous knowledge by considering several health factors among parents and young adults before they entered the labor market.

In all, this study introduces a highly-needed comprehensive picture of early determinants of long-term unemployment indicating that the higher the number of determinants of disadvantage, the higher the likelihood of long-term unemployment in early adulthood. Of the individual determinants, parental and own mental disorders and poor own school performance were the strongest predictors. Indeed, the most

**Table 2**

Distributions (%) of parental social and health-related determinants of long-term early unemployment among men and women in the Finnish Birth Cohort 1987

	Men	Women	(Total)
	% (n) 55.6 (25 857)	% (n) 44.4 (20 664)	% (n) 100 (46 521)
<b>Parental health and social determinants</b>			
<i>Health-related determinants</i>			
Teenaged mother	3.1 (793)	2.8 (571)	2.9 (1364)
Any mental disorder	16.3 (4206)	17.8 (3682)	17.0 (7888)
Any cancer	4.8 (1246)	5.5 (1142)	5.1 (2388)
Death	3.8 (987)	4.0 (817)	3.9 (1804)
<i>Social determinants</i>			
Parental education			
Compulsory education	7.5 (1936)	7.0 (1441)	7.3 (3377)
Upper-secondary level	44.2 (11 431)	43.0 (8892)	43.7 (20 323)
Lower academic level	24.7 (6374)	25.3 (5227)	24.9 (11 601)
Higher academic level	23.7 (6116)	24.7 (5104)	24.1 (11 220)
Poverty in the family in childhood	49.4 (12 766)	48.8 (10 094)	49.1 (22 860)
Poverty in the family when 15 years	17.7 (4581)	17.2 (3545)	17.5 (8126)
Over-indebtedness	3.4 (884)	3.1 (646)	3.3 (1530)
Social assistance (income)	35.9 (9289)	34.7 (7164)	35.4 (16 453)
Child protection intervention			
< 13 years	1.5 (400)	1.3 (263)	1.4 (663)
≥ 13 years	0.9 (233)	1.3 (272)	1.1 (505)
Marital status			
Biological parents married	65.8 (17 012)	64.9 (13 409)	65.4 (30 421)
Not married	11.9 (3086)	12.5 (2584)	12.2 (5670)
Divorced	22.3 (5759)	22.6 (4671)	22.4 (10 430)

**Table 3**

Distributions of the cumulative indices.

	Men	Women	Total
	% (n) 55.6 (2 5857)	% (n) 44.4 (20 664)	% (n) 100 (46 521)
<b>Own health and social determinants</b>			
<i>1) Health-related determinants</i>			
0	66.0 (17 066)	56.8 (11 745)	61.9 (28 811)
1	27.2 (7030)	32.7 (6765)	29.7 (13 795)
2 or more	6.8 (1761)	10.4 (2154)	8.4 (3915)
<i>2) Social determinants</i>			
0	4.4 (1139)	6.7 (1380)	5.4 (2519)
1	52.1 (13 465)	74.3 (15 356)	62.0 (28 821)
2	25.9 (6701)	13.3 (2749)	20.3 (9450)
3	11.9 (3086)	4.3 (884)	8.5 (3970)
4 or more	5.7 (1466)	1.4 (295)	3.8 (1761)
<b>Parental health and social determinants</b>			
<i>3) Health-related determinants</i>			
0	76.0 (19 646)	74.2 (15 337)	75.2 (34 983)
1	20.4 (5273)	21.9 (4527)	21.1 (9800)
2 or more	3.6 (938)	3.9 (800)	3.7 (1738)
<i>4) Social determinants</i>			
0	11.6 (3009)	12.3 (2534)	11.9 (5543)
1	26.8 (6932)	27.3 (5631)	27.0 (12 563)
2	21.4 (5538)	20.8 (4301)	21.1 (9839)
3	20.9 (5392)	20.4 (4224)	20.7 (9616)
4	11.6 (3000)	11.8 (2438)	11.7 (5438)
5	5.6 (1445)	5.5 (1135)	5.5 (2580)
6 or more	2.1 (541)	1.9 (401)	2.0 (942)

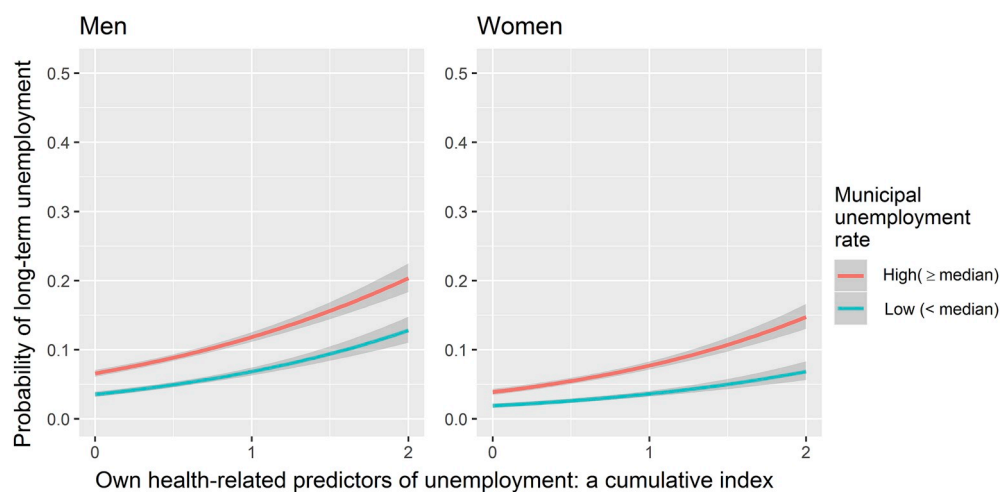
consistent predictor was the GPA, although in Finland, all have equal access to free education. Furthermore, the compulsory education of 9 years is almost entirely completed in public schools, while private schools are rare. Finland further has a high-quality health care system that is available for everyone, which could affect both prevalence of and prognosis of different health-related determinants. It is possible that in another, less affluent or less egalitarian context, the probability of unemployment could be even higher, should the social or health-related disadvantage accumulate. Effects of the differing contexts have also been shown among young people not in education, employment of training (NEET) (Holte, Swart, & Hiilamo, 2019).

Information on the strongest predictors should be applied in the efforts to prevent long-term unemployment among young adults and its adverse consequences, and to promote health and work participation of young people from the beginning of their working life. Tackling the determinants of unemployment already in childhood is important also regarding the prevention of more permanent exit from labor market. However, in addition to the studied determinants, further research could also focus on protective factors, and programs aiming to enhance employment during early adulthood should consider the complexity of factors affecting unemployment. That is, further studies could benefit from including different combinations of factors that may increase and decrease the likelihood of employment and its stability among young adults.

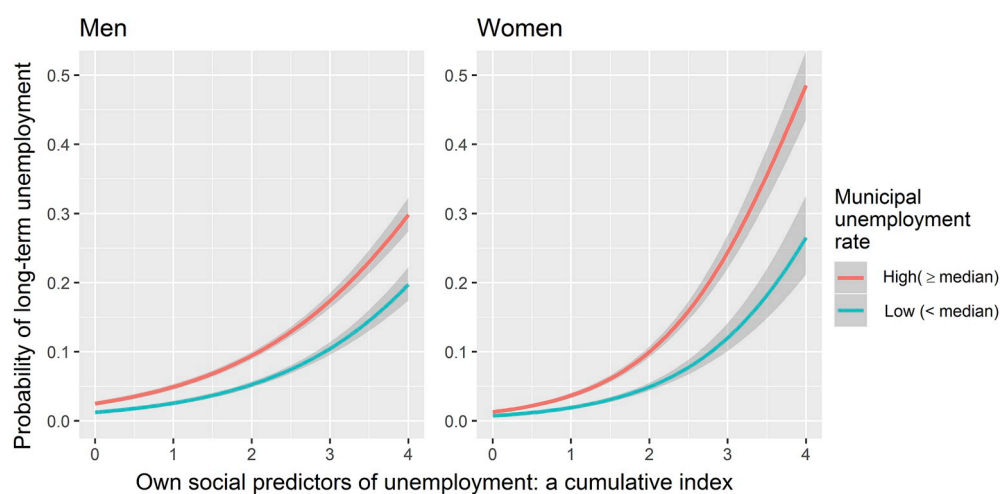
#### 4.3. Limitations and strengths

Some methodological limitations and strengths of the study are of note. A limitation of this study is the lack of individual-level survey data to consider potential mediators or confounders that are not available from registers. For example, health behaviors such as smoking and alcohol consumption might be linked to unemployment, and labor market attachment (Halonen et al., 2018; Leino-Arjas, Liira, Mutanen, Malmivaara, & Matikainen, 1999; Virtanen et al., 2013). However, they likely are on the causal pathway between the studied determinants and outcomes (Appendix Fig A1), so their role could be better addressed in other studies. Furthermore, we only could study those who had data in the registers and had lived continuously in Finland. However, the overall loss to follow-up was small and the routinely collected administrative register data are practically both complete and accurate (Kieseppä, Partonen, Kaprio, & Lönnqvist, 2000; Lampi et al., 2010). As immigrants were not included, only those born in Finland, their determinants of unemployment could be different.

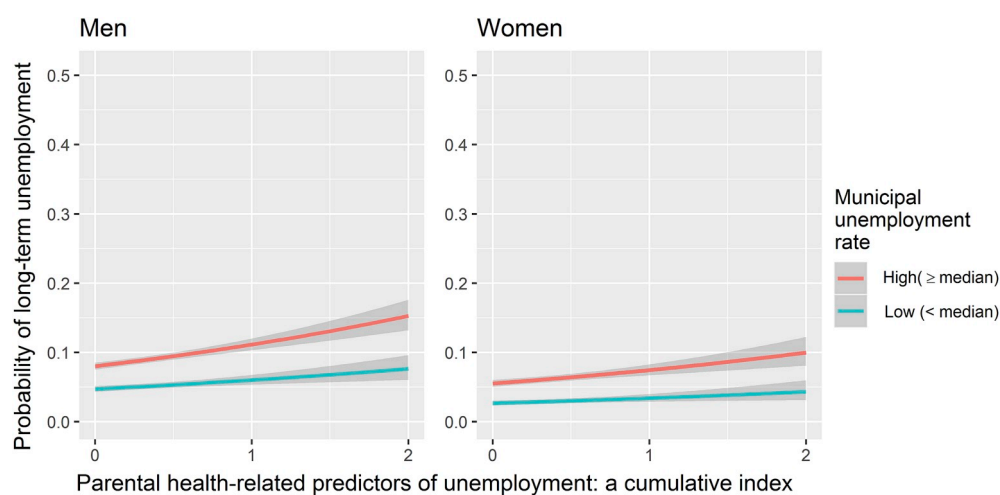
To further confirm, if there is selection into being non-eligible, we additionally examined the distributions of key predictors among the excluded participants (Appendix table A3). As the distributions among those excluded from the study were similar to the included ones, such selection bias is unlikely to have distorted our findings. One may also consider some further selection effects, since those with gaining high education may be protected by the fact that they are having the high education. More importantly, they may not be at risk of long-term unemployment at all, if they are still studying and not part of the labor force. Thus, in our study, those with the longest education might have either had a much shorter follow-up, or be out of the study population entirely, due to our exclusion criteria. One could additionally assume that a lower proportion of those with a high education explains the strong effect of GPA on the results, and those with the lowest education very seldom access tertiary education. However, we did several sensitivity analyses to confirm our findings, and all the main results remained. Thus, we excluded those who were studying, on maternity leave, on sick leave, or otherwise not at risk for unemployment more than 300 days and more than 1000 days during the three-year follow-up (in addition to current exclusion of those not at risk for more than 600 days). We also stratified the analyses by the level of completed own education by the end of the follow-up (high and low). Due to lower numbers, all the cumulative indices could not be examined in stratified



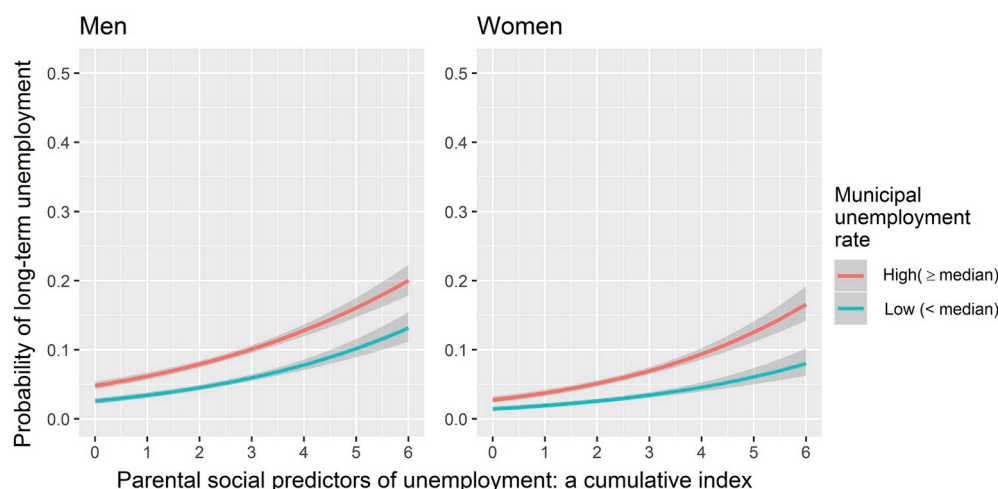
**Fig. 2.** Cumulative index of own health-related predictors of unemployment among men and women by municipal unemployment rate (low vs. high): predictive probabilities (y-axis) with their 95% confidence intervals in the Finnish Birth Cohort 1987.



**Fig. 3.** Cumulative index of own social predictors of unemployment among men and women by municipal unemployment rate (low vs. high): predictive probabilities (y-axis) with their 95% confidence intervals in the Finnish Birth Cohort 1987.



**Fig. 4.** Cumulative index of parental health-related predictors of unemployment among men and women among municipal unemployment rate (low vs. high): predictive probabilities (y-axis) with their 95% confidence intervals in the Finnish Birth Cohort 1987.



**Fig. 5.** Cumulative index of parental social predictors of unemployment among men and women by municipal unemployment rate (low vs. high): predictive probabilities (y-axis) with their 95% confidence intervals in the Finnish Birth Cohort 1987.

analyses, but the tested indices showed similar results. Some differences were found only in the strengths of the estimates (further data not shown). Furthermore, poor school performance ( $GPA < 7.0$ ) was very similarly associated with long-term unemployment both among those with low (secondary) education (OR 3.54 [2.78–4.58]) and high (academic) education (OR 2.17 [1.06–3.96]). The corresponding odds ratios for GPAs 7.0–7.4 were 2.61 [2.04–3.40] for those with low education and 3.45 [2.44–4.80] for those with high education. Although our follow-up from birth was overall nearly 30 years, it was still relatively short with respect to work participation and the risk of unemployment after completed education.

One may also assume that timing of entry could contribute to the risk, and timing of the unemployment follow-up. We thus conducted sensitivity analyses studying each of our indices from the age of 19–25 (data not shown), as this could also be a typical period of first entry into the labor market. The prevalence of long-term unemployment for this group was 7.3% for men and 4.4% for women. All the results remained similar, except the probabilities were at a somewhat lower level, as compared to the current analyses. In Finland, many people typically study long and late, and thus 25 years was considered as a more meaningful start for the follow-up, to avoid excluding too many people, who were not at risk at that younger age due to their incomplete and continuous education, receiving other allowances for their studies.

Strengths of the study include the opportunity to simultaneously focus on various social and health-related determinants, both concerning the participants and their parents, with shared genetics. Furthermore, the data with register linkages from multiple sources were rich, and the data comprised several rarer determinants that can seldom be examined (Paananen & Gissler, 2012; Ristikari et al., 2016). Additionally, we were able to include an entire birth cohort, representative of the entire country. Thus, period effects are less likely to distort the results. However, the findings are generalizable to the same age cohorts only, and probably not to countries with different welfare state types. Finally, a special advantage was the availability of data about the unemployment rate at the municipal level, enabling to study the contribution of the cumulative indices to the probability long-term unemployment distinguishing between municipalities with high and low unemployment.

#### 4.4. Conclusions

To conclude, both parental and own social and health-related factors were important determinants of subsequent long-term

unemployment during early working life. Particularly women and men with poor school performance were a high-risk group for long-term unemployment, highlighting the need to better support the families and, for example, provide environments that enhance learning among children and adolescents. When the level of the municipal unemployment is high, the effects of social and health-related disadvantage could be emphasized, while those with fewer adversities had a lower risk of unemployment even in areas of high unemployment.

#### Funding

The study was funded through the Alli Paasikivi Foundation, the Jenny and Antti Wihuri Foundation, the Emil Aaltonen Foundation, the National Institute for Health and Welfare, Finland and the Academy of Finland. TL and JIH were supported by the Academy of Finland [grant numbers 287488, 294096, and #319200], MK, TR, MG and MM were supported by the grant 288960 and consortium funding for the PSYCOHORTS.

#### Declarations of interest

None.

#### Data statement

The data that support the findings of this study are not publicly available due to data protections laws and regulations.

#### Ethical statement

Ethical approval for the study has been received from the Ethical Review Board of National Institute for Health and Welfare (§28/2009). Permissions to use and link all register data were granted by each register data holder.

#### Author contributions

The manuscript has been received, reviewed and approved by all authors, the requirements for authorship have been met, and each author believes that the manuscript represents valid work. TL drafted the first version of the manuscript. MK conducted the analyses. All authors critically revised and commented the draft.



## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ssmph.2019.100410>.

## Appendices

### Appendix table A1

Determinants of long-term unemployment among women (n = 20 664) and men (n = 25 857)

	Men				Women			
	All determinants examined in separate models		All determinants adjusted in blocks		All determinants examined in separate models		All determinants adjusted in blocks	
	Long-term unemployment		Long-term unemployment		Long-term unemployment		Long-term unemployment	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
<b>Own health and social determinants</b>								
<i>1) Health-related determinants</i>								
Premature birth	1.02	[0.82, 1.25]	0.93	[0.73, 1.17]	1.16	[0.85, 1.55]	1.13	[0.80, 1.54]
Very premature birth	<b>1.79</b>	[1.04, 2.90]	1.71	[0.94, 2.95]	1.41	[0.55, 2.96]	1.31	[0.49, 3.00]
Any mental disorder	<b>3.22</b>	[2.92, 3.55]	<b>3.15</b>	[2.86, 3.48]	<b>2.74</b>	[2.40, 3.13]	<b>2.47</b>	[2.16, 2.83]
Disability allowance when under 16	<b>1.47</b>	[1.3, 1.66]	<b>1.16</b>	[1.02, 1.31]	<b>1.46</b>	[1.21, 1.75]	<b>1.28</b>	[1.06, 1.54]
Teenage birth	-	-	-	-	<b>3.62</b>	[2.88, 4.50]	<b>2.68</b>	[2.11, 3.36]
Teenage abortion	-	-	-	-	<b>2.68</b>	[2.21, 3.23]	<b>2.08</b>	[1.70, 2.53]
<i>2) Social determinants</i>								
School performance (grade point average, the last year of compulsory education, 4–10, ref = 8.5 or higher)								
Missing	<b>2.82</b>	[1.88, 4.14]	<b>1.87</b>	[1.21, 2.83]	<b>3.26</b>	[1.95, 5.19]	<b>1.75</b>	[1.01, 2.88]
4.0–6.9	<b>4.53</b>	[3.67, 5.64]	<b>3.70</b>	[2.96, 4.67]	<b>10.83</b>	[8.69, 13.62]	<b>6.65</b>	[5.21, 8.55]
7.0–7.4	<b>3.26</b>	[2.61, 4.11]	<b>3.17</b>	[2.52, 4.04]	<b>5.29</b>	[4.16, 6.76]	<b>4.33</b>	[3.36, 5.59]
7.5–7.9	<b>2.29</b>	[1.82, 2.91]	<b>2.34</b>	[1.85, 2.99]	<b>3.42</b>	[2.68, 4.39]	<b>3.22</b>	[2.50, 4.15]
8.0–8.4	<b>1.74</b>	[1.36, 2.25]	<b>1.82</b>	[1.42, 2.36]	<b>2.24</b>	[1.73, 2.91]	<b>2.27</b>	[1.74, 2.96]
Early school leaving (no completed second degree education)	<b>2.59</b>	[2.32, 2.89]	<b>1.45</b>	[1.27, 1.65]	<b>5.10</b>	[4.37, 5.93]	<b>1.75</b>	[1.44, 2.11]
First period of paid employment 6 months or longer (ref = 19–23 years)								
< 19 years	<b>0.63</b>	[0.55, 0.72]	<b>0.65</b>	[0.57, 0.75]	<b>0.81</b>	[0.67, 0.97]	<b>0.82</b>	[0.68, 0.99]
≥ 24 years	<b>1.70</b>	[1.46, 1.96]	<b>1.91</b>	[1.64, 2.23]	<b>2.23</b>	[1.82, 2.71]	<b>2.15</b>	[1.74, 2.63]
No employment	<b>7.70</b>	[6.75, 8.79]	<b>6.67</b>	[5.78, 7.70]	<b>13.1</b>	[10.87, 15.77]	<b>8.25</b>	[6.69, 10.18]
Marital status (ref = married)								
not married	<b>2.63</b>	[2.02, 3.48]	<b>2.09</b>	[1.59, 2.79]	0.82	[0.66, 1.03]	0.98	[0.78, 1.25]
divorced	<b>2.51</b>	[1.45, 4.19]	1.70	[0.96, 2.90]	<b>1.56</b>	[1.05, 2.28]	1.08	[0.69, 1.64]
Criminal conviction	<b>2.14</b>	[1.92, 2.37]	<b>1.47</b>	[1.30, 1.66]	<b>3.76</b>	[3.04, 4.63]	<b>1.39</b>	[1.08, 1.77]
Municipal unemployment rate 2012 (ref = low)								
high (≥ 10.7%)	<b>1.84</b>	[1.66, 2.03]	<b>1.58</b>	[1.42, 1.76]	<b>2.20</b>	[1.91, 2.53]	<b>1.77</b>	[1.52, 2.06]
Long-term unemployed before the age of 25	<b>7.37</b>	[6.28, 8.64]	<b>4.04</b>	[3.38, 4.81]	<b>8.50</b>	[6.46, 11.07]	<b>3.37</b>	[2.47, 4.56]
<b>Parental health and social determinants</b>								
<i>3) Health-related determinants</i>								
Teenaged mother	<b>1.91</b>	[1.53, 2.35]	<b>1.82</b>	[1.45, 2.24]	<b>2.13</b>	[1.57, 2.83]	<b>2.04</b>	[1.50, 2.72]
Any mental disorder	<b>1.59</b>	[1.41, 1.78]	<b>1.55</b>	[1.38, 1.73]	<b>1.50</b>	[1.28, 1.75]	<b>1.47</b>	[1.26, 1.71]
Any cancer	0.94	[0.74, 1.17]	0.88	[0.70, 1.11]	0.82	[0.59, 1.10]	0.78	[0.56, 1.06]
Death	<b>1.34</b>	[1.07, 1.66]	1.27	[1.00, 1.58]	1.27	[0.93, 1.71]	1.21	[0.88, 1.64]
<i>4) Social determinants</i>								
Parental education (ref = Higher academic level)								
Compulsory education	<b>2.47</b>	[2.04, 2.98]	<b>1.55</b>	[1.26, 1.90]	<b>3.72</b>	[2.83, 4.88]	<b>2.25</b>	[1.68, 3.00]
Upper-secondary level	<b>2.06</b>	[1.79, 2.37]	<b>1.59</b>	[1.38, 1.84]	<b>2.85</b>	[2.32, 3.53]	<b>2.17</b>	[1.75, 2.70]
Lower academic level	<b>1.39</b>	[1.19, 1.63]	<b>1.26</b>	[1.07, 1.48]	<b>1.72</b>	[1.36, 2.19]	<b>1.54</b>	[1.22, 1.97]
Poverty in the family in childhood	<b>1.33</b>	[1.21, 1.47]	0.93	[0.83, 1.04]	<b>1.52</b>	[1.33, 1.73]	1.04	[0.89, 1.22]
Poverty in the family when 15 years	<b>1.48</b>	[1.32, 1.65]	<b>1.16</b>	[1.02, 1.33]	<b>1.53</b>	[1.31, 1.78]	1.06	[0.89, 1.27]
Over-indebtedness	<b>2.50</b>	[2.06, 3.01]	<b>1.41</b>	[1.14, 1.71]	<b>2.28</b>	[1.72, 2.97]	1.14	[0.85, 1.51]
Social assistance (income)	<b>2.17</b>	[1.97, 2.39]	<b>1.59</b>	[1.42, 1.78]	<b>2.45</b>	[2.14, 2.79]	<b>1.65</b>	[1.40, 1.94]
Child protection action								
< 13 years	<b>2.85</b>	[2.17, 3.68]	<b>1.45</b>	[1.09, 1.91]	<b>4.09</b>	[2.86, 5.70]	<b>2.06</b>	[1.42, 2.94]
≥ 13 years	<b>4.12</b>	[3.00, 5.56]	<b>2.54</b>	[1.84, 3.46]	<b>5.01</b>	[3.61, 6.81]	<b>3.15</b>	[2.25, 4.33]
Marital status (ref = biological parents married)								
Not married	<b>2.37</b>	[2.09, 2.69]	<b>1.58</b>	[1.38, 1.82]	<b>2.30</b>	[1.94, 2.73]	<b>1.34</b>	[1.10, 1.62]
Divorced	<b>1.66</b>	[1.48, 1.86]	<b>1.23</b>	[1.08, 1.39]	<b>1.74</b>	[1.49, 2.03]	1.18	[0.99, 1.40]

## Appendix table A2

Determinants of any unemployment among women (n = 20 664) and men (n = 25 857)

	Men				Women			
	All determinants examined in separate models		All determinants adjusted in blocks		All determinants examined in separate models		All determinants adjusted in blocks	
	Ever unemployed		Ever unemployed		Ever unemployed		Ever unemployed	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
<b>Own health and social determinants</b>								
<i>1) Health-related determinants</i>								
Premature birth	1.01	[0.90, 1.13]	0.98	[0.86, 1.10]	0.96	[0.84, 1.11]	0.93	[0.80, 1.07]
Very premature	1.34	[0.96, 1.86]	1.29	[0.90, 1.84]	1.26	[0.84, 1.88]	1.35	[0.88, 2.07]
Mental disorders	2.23	[2.10, 2.36]	2.21	[2.08, 2.35]	1.71	[1.61, 1.81]	1.63	[1.53, 1.73]
Disability allowance when under 16	1.22	[1.14, 1.31]	1.05	[0.98, 1.13]	1.30	[1.19, 1.42]	1.22	[1.11, 1.33]
Teenage birth	-	-	-	-	2.48	[2.13, 2.89]	2.18	[1.87, 2.55]
Teenage abortion	-	-	-	-	1.52	[1.36, 1.70]	1.33	[1.19, 1.49]
<i>2) Social determinants</i>								
School performance (grade point average, the last year of compulsory education, 4–10, ref = 8.5 or higher)								
Missing**	1.48	[1.21, 1.80]	1.30	[1.05, 1.60]	0.98	[0.80, 1.20]	0.82	[0.66, 1.02]
4.0–6.9	2.77	[2.54, 3.01]	2.43	[2.21, 2.67]	2.73	[2.49, 3.01]	2.08	[1.88, 2.31]
7.0–7.4	2.02	[1.85, 2.22]	2.02	[1.83, 2.23]	1.64	[1.50, 1.79]	1.47	[1.34, 1.62]
7.5–7.9	1.69	[1.54, 1.86]	1.73	[1.57, 1.90]	1.31	[1.21, 1.42]	1.26	[1.16, 1.38]
8.0–8.4	1.31	[1.19, 1.45]	1.36	[1.23, 1.51]	1.13	[1.04, 1.22]	1.13	[1.05, 1.23]
Early school leaving (no second degree diploma)	2.08	[1.93, 2.23]	1.48	[1.36, 1.61]	2.63	[2.37, 2.92]	1.77	[1.57, 1.99]
First period of paid employment 6 months or longer (ref = 19–23 years)								
< 19 years	0.73	[0.69, 0.78]	0.73	[0.69, 0.78]	0.78	[0.73, 0.84]	0.80	[0.75, 0.85]
≥ 24 years	1.70	[1.57, 1.85]	1.97	[1.80, 2.15]	2.08	[1.89, 2.29]	2.03	[1.84, 2.24]
No employment	3.28	[2.92, 3.69]	2.89	[2.55, 3.27]	3.96	[3.37, 4.68]	2.86	[2.40, 3.40]
Marital status (ref = biological parents married)								
Not married	1.49	[1.35, 1.65]	1.31	[1.18, 1.46]	0.91	[0.82, 1.00]	0.97	[0.88, 1.08]
Divorced	2.02	[1.56, 2.60]	1.52	[1.16, 1.99]	1.43	[1.17, 1.75]	1.24	[1.00, 1.53]
Criminal conviction	1.99	[1.87, 2.13]	1.56	[1.45, 1.68]	2.12	[1.84, 2.44]	1.36	[1.17, 1.59]
Municipal unemployment rate 2012 (ref = low)								
High (≥ 10.7%)	1.86	[1.77, 19.5]	1.75	[1.66, 1.85]	1.83	[1.73, 1.94]	1.69	[1.60, 1.80]
Long-term unemployed before the age of 25	7.47	[6.21, 9.06]	4.60	[3.80, 5.61]	7.22	[5.36, 9.91]	4.33	[3.19, 6.00]
<b>Parental health and social determinants</b>								
<i>3) Health-related determinants</i>								
Teenaged mother	1.63	[1.41, 1.87]	1.58	[1.37, 1.82]	1.44	[1.22, 1.71]	1.42	[1.20, 1.67]
Any mental disorder	1.35	[1.26, 1.44]	1.33	[1.24, 1.42]	1.23	[1.15, 1.33]	1.22	[1.13, 1.31]
Any cancer	0.94	[0.83, 1.05]	0.90	[0.80, 1.01]	0.98	[0.87, 1.11]	0.95	[0.84, 1.08]
Death	1.23	[1.08, 1.40]	1.20	[1.05, 1.37]	1.20	[1.04, 1.38]	1.16	[1.00, 1.34]
<i>4) Social determinants</i>								
Parental education (ref = Higher academic level)								
Compulsory education	1.91	[1.72, 2.12]	1.46	[1.31, 1.63]	1.66	[1.48, 1.87]	1.30	[1.15, 1.47]
Upper-secondary level	1.66	[1.56, 1.78]	1.44	[1.34, 1.54]	1.52	[1.41, 1.63]	1.32	[1.23, 1.42]
Lower academic level	1.32	[1.23, 1.42]	1.24	[1.16, 1.34]	1.18	[1.08, 1.27]	1.11	[1.02, 1.21]
Poverty in the family in childhood	1.25	[1.19, 1.31]	1.04	[0.98, 1.10]	1.27	[1.20, 1.34]	1.07	[1.00, 1.14]
Poverty in the family when 15 years	1.17	[1.10, 1.25]	0.94	[0.87, 1.01]	1.28	[1.19, 1.37]	1.07	[0.98, 1.16]
Over-indebtedness	2.03	[1.77, 2.32]	1.33	[1.15, 1.53]	1.52	[1.30, 1.78]	1.04	[0.88, 1.22]
Social assistance (income)	1.74	[1.65, 1.83]	1.40	[1.32, 1.49]	1.59	[1.50, 1.68]	1.34	[1.25, 1.43]
Child protection action								
< 13 years	2.49	[2.04, 3.06]	1.59	[1.29, 1.97]	2.08	[1.63, 2.67]	1.40	[1.09, 1.81]
≥ 13 years	4.12	[3.10, 5.54]	2.97	[2.23, 4.01]	2.70	[2.11, 3.47]	2.10	[1.63, 2.71]
Marital status (ref = married)								
Not married	1.64	[1.51, 1.77]	1.20	[1.11, 1.31]	1.44	[1.32, 1.57]	1.10	[1.00, 1.21]
Divorced	1.47	[1.38, 1.56]	1.18	[1.10, 1.26]	1.33	[1.24, 1.42]	1.10	[1.02, 1.19]

## Appendix table A3

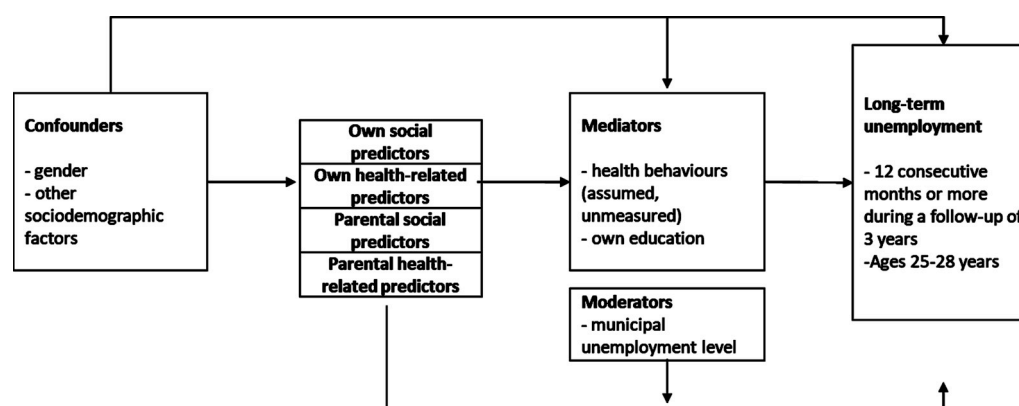
Distributions of the key health-related and social determinants of unemployment for the excluded participants

	Men	Women	Overall	Included
	n (%)	n (%)	n (%)	n (%)
n	4581	8374	12955	46 521
Teenaged mother	163 (3.6)	337 (4.0)	500 (3.9)	1364 (2.9)
Any mental disorder	887 (19.4)	1690 (20.2)	2577 (19.9)	7888 (17.0)
Any cancer	224 (4.9)	477 (5.7)	701 (5.4)	2388 (5.1)
Death	204 (4.5)	331 (4.0)	535 (4.1)	1804 (3.9)
Parental education (%)				
Compulsory education	413 (9.0)	768 (9.2)	1181 (9.1)	3377 (7.3)
Upper-secondary level	1676 (36.6)	3568 (42.6)	5244 (40.5)	20 323 (43.7)

(continued on next page)

Appendix table A3 (continued)

	Men	Women	Overall	Included
	n (%)	n (%)	n (%)	n (%)
Lower academic level	987 (21.5)	1901 (22.7)	2888 (22.3)	11 601 (24.9)
Higher academic level	1505 (32.9)	2137 (25.5)	3642 (28.1)	11 220 (24.1)
Poverty in the family in childhood	2433 (53.1)	4614 (55.1)	7047 (54.4)	22 860 (49.1)
Poverty in the family when 15 years	1033 (22.5)	1847 (22.1)	2880 (22.2)	8126 (17.5)
Over-indebtedness	216 (4.7)	395 (4.7)	611 (4.7)	1530 (3.3)
Social assistance (income)	1839 (40.1)	3510 (41.9)	5349 (41.3)	16 453 (35.4)
Child protection action before 16 years (%)				
< 13 years	160 (3.5)	181 (2.2)	341 (2.6)	663 (1.4)
≥ 13 years	141 (3.1)	245 (2.9)	386 (3.0)	505 (1.1)
Biological parents' marital status (%)				
Not married	674 (14.7)	1108 (13.2)	1782 (13.8)	670 (12.2)
Divorced	1094 (23.9)	2056 (24.6)	3150 (24.3)	10 430 (22.4)
Married	2813 (61.4)	5210 (62.2)	8023 (61.9)	30 421 (65.4)



**Appendix Fig. A1.** A simplified causal graph displaying the assumed associations and pathways between parental and own social and health-related predictors and long-term early unemployment: The Finnish Birth Cohort 1987 (N = 46 521)

## References

- Albaek, K., Asplund, R., Barth, E., Lindahl, L., von Simson, K., & Vanhala, P. (2015). *Youth unemployment and inactivity: A comparison of school-to-work transitions and labour market outcomes in four nordic countries*. Copenhagen: Nordic Council of Ministers: TemaNord (No. 548).
- Bäckman, O., Jakobsen, V., Lorentzen, T., Österbacka, E., & Dahl, E. (2011). *Dropping out in scandinavia: Social exclusion and labour market attachment among upper secondary school dropouts in Denmark, Finland, Norway and Sweden*. Institute for futures studies. Working Paper 2011:8.
- Barbieri, P., Cutuli, G., & Passaretta, G. (2016). *Institutions and the school-to-work transition: Disentangling the role of the macro-institutional context*. <https://doi.org/10.1093/ser/mww019>.
- Bartley, M., & Owen, C. (1996). Relation between socioeconomic status, employment, and health during economic change, 1973-93. *BMJ*, 313(7055), 445-449.
- Blossfeld, H., Buchholz, S., Bukodi, E., & Kurz, K. (Eds.). (2009). *Young workers, globalization and the labor market: Comparing early working life in eleven countries*. Cheltenham, UK; Northampton, MA, USA: Edward Elgar Pub.
- Bradley, T., Cupples, M., & Irvine, H. (2002). A case control study of a deprivation triangle: Teenage motherhood, poor educational achievement and unemployment. *International Journal of Adolescent Medicine and Health*, 14(2), 117-123.
- Bushway, S. D., & Reuter, P. (1997). Labor markets and crime risk factors (chapter six). In L. W. Sherman, D. Gottfredson, D. MacKenzie, P. Reuter, J. Eck, & S. Bushway (Eds.). *Preventing crime: What works, what doesn't, what's promising* (pp. 1-49). College Park: University of Maryland.
- Caspi, A., Wright, B. R. E., Moffitt, T. E., & Silva, P. A. (1988). Early failure in the labor market: Childhood and adolescent predictors of unemployment in the transition to adulthood. *American Sociological Review*, 63(3), 424-451.
- Cherlin, A. J., Chase-Lansdale, P. J., & McRae, C. (1998). Effects of parental divorce on mental health throughout the life course. *American Sociological Review*, 63(2), 239-249.
- Clayborne, Z. M., Varin, M., & Colman, I. (2019). Systematic review and meta-analysis: Adolescent depression and long-term psychosocial outcomes. *Journal of the American Academy of Child & Adolescent Psychiatry*, 58(1), 72-79 S0890-8567(18)31906-3].
- Corak, M. (2001). Death and divorce: The Long-Term consequences of parental loss on adolescents. *Journal of Labor Economics*, 19(3), 682-715. <https://doi.org/10.1086/322078>.
- Courtin, E., Nafilyan, V., Avendano, M., Meneton, P., Berkman, L. F., Goldberg, M., ... Dowd, J. B. (2019). Longer schooling but not better off? A quasi-experimental study of the effect of compulsory schooling on biomarkers in France. *Social Science & Medicine*, 220, 379-386 S0277-9536(18)30667-1.
- Covizzi, I. (2008). Does union dissolution lead to unemployment? A longitudinal study of health and risk of unemployment for women and men undergoing separation. *European Sociological Review*, 24(3), 347-361. <https://doi.org/10.1093/esr/jcn006>.
- Dubow, E. F., Boxer, P., & Huesmann, L. R. (2009). Long-term effects of parents' education on children's educational and occupational success: Mediation by family interactions, child aggression, and teenage aspirations. *Merrill-Palmer Quarterly*, 55(3), 224-249. <https://doi.org/10.1353/mpq.0.0030>.
- Egan, M., Daly, M., & Delaney, L. (2015). Childhood psychological distress and youth unemployment: Evidence from two British cohort studies. *Social Science & Medicine*, 124, 11-17. <https://doi.org/10.1016/j.socscimed.2014.11.023>.
- Eliason, M., & Storrie, D. (2006). Lasting or latent scars? Swedish evidence on the long-term effects of job displacement. *Journal of Labor Economics*, 24(4), 831-856.
- Eurofound (2016). *Exploring the diversity of NEETs*. Luxembourg: publications office of the European Union.
- Fergusson, D. M., Horwood, L. J., Woodward, L. J., & S027795360003440 (2001). Unemployment and psychosocial adjustment in young adults: Causation or selection? *Social Science & Medicine*, 53(3), 305-320.
- FinlandEducationinfo (2018). *Grading, language of instruction and academic year in Finland*. Retrieved from <http://www.finlandeducation.info/Education-System/Grading-System-Language-of-Instruction-and-Academic-Year-in-Finland.html>.
- Francis, S., Middeldorp, C. M., Dolan, C. V., Lighthart, L., & Boomsma, D. I. (2010). Childhood and adolescent anxiety and depression: Beyond heritability. *Journal of the American Academy of Child & Adolescent Psychiatry*, 49(8), 820-829. <https://doi.org/10.1016/j.jaac.2010.05.013>.
- Fröberg, F., Modin, B., Rosendahl, I. K., Tengström, A., & Hallqvist, J. (2015). The association between compulsory school achievement and problem gambling among Swedish young people. *Journal of Adolescent Health*, 56(4), 420-428. <https://doi.org/10.1016/j.jadohealth.2014.12.007>.
- Gissler, M., & Haukka, J. (2004). Finnish health and social welfare registers in epidemiological research. *Norsk Epidemiologi*, 14(1), 113-120.
- Halonen, J. I., Kivimäki, M., Vahtera, J., Pentti, J., Virtanen, M., Ervasti, J., ... Lallukka, T. (2017). Childhood adversity, adult socioeconomic status and risk of work disability:

- A prospective cohort study. *Occupational and Environmental Medicine*, 74(9), 659–666. <https://doi.org/10.1136/oemed-2017-104319>.
- Halonen, J. I., Merikukka, M., Gissler, M., Kerkelä, M., Virtanen, M., Ristikari, T., et al. (2019). Pathways from parental mental disorders to offspring's work disability due to depressive or anxiety disorders in early adulthood—the 1987 Finnish birth cohort. *Depression and Anxiety*, 36(4), 305–312. <https://doi.org/10.1002/da.22847>.
- Halonen, J. I., Virtanen, M., Ala-Mursula, L., Miettinen, J., Vaaramo, E., Karppinen, J., et al. (2018). Socioeconomic and health-related childhood and adolescence predictors of entry into paid employment. *The European Journal of Public Health*. <https://doi.org/10.1093/eurpub/cky221>.
- Harkko, J., Virtanen, M., & Kouvonen, A. (2018). Unemployment and work disability due to common mental disorders among young adults: Selection or causation? *The European Journal of Public Health*, 28(5), 791–797. <https://doi.org/10.1093/eurpub/cky024>.
- Helgesson, M., Tinghog, P., Niederkrotenthaler, T., Saboonchi, F., & Mittendorfer-Rutz, E. (2017). Labour-market marginalisation after mental disorders among young natives and immigrants living in Sweden. *BMC Public Health*, 17(1), <https://doi.org/10.1186/s12889-017-4504-4> 593-017-4504-4.
- Hiilamo, H., & Kangas, O. (2013). *Recipe for better life: Experiences from the Nordic countries*. Helsinki: Crisis management initiative.
- Holte, B., Swart, I., & Hiilamo, H. (2019). (2018) the NEET concept in comparative youth research: The Nordic countries and South Africa, journal of youth studies. *Journal of Youth Studies*, 22(2), 256–272. <https://doi.org/10.1080/13676261.2018.1496406>.
- Jalanko, E., Leppälähti, S., Heikinheimo, O., & Gissler, M. (2017). Increased risk of premature death following teenage abortion and childbirth—a longitudinal cohort study. *The European Journal of Public Health*, 27(5), 845–849. <https://doi.org/10.1093/eurpub/ckx065>.
- Kaspersen, S. L., Pape, K., Vie, G. A., Ose, S. O., Krokstad, S., Gunnell, D., et al. (2016). Health and unemployment: 14 years of follow-up on job loss in the Norwegian HUNT study. *The European Journal of Public Health*, 26(2), 312–317. <https://doi.org/10.1093/eurpub/ckv224>.
- Kieseppä, T., Partonen, T., Kaprio, J., & Lönnqvist, J. (2000). Accuracy of register- and record-based bipolar I disorder diagnoses in Finland; a study of twins. *Acta Neuropsychiatrica*, 12(3), 106–109. <https://doi.org/10.1017/S0924270800035535>.
- Lampi, K. M., Sourander, A., Gissler, M., Niemelä, S., Rehnström, K., Pulkkinen, E., et al. (2010). Brief report: Validity of Finnish registry-based diagnoses of autism with the ADI-R. *Acta Paediatrica*, 99(9), 1425–1428. <https://doi.org/10.1111/j.1651-2227.2010.01835.x>.
- Lander, F., Rasmussen, K., & Mortensen, J. T. (2012). Social inequalities in childhood are predictors of unemployment in early adulthood. *Danish Medical Journal*, 59(3), A4394 A4394 [pii].
- Leino-Arjas, P., Liira, J., Mutanen, P., Malmivaara, A., & Matikainen, E. (1999). Predictors and consequences of unemployment among construction workers: Prospective cohort study. *BMJ*, 319(7210), 600–605.
- Mackenbach, J. P. (2012). The persistence of health inequalities in modern welfare states: The explanation of a paradox. *Social Science & Medicine*, 75(4), 761–769. <https://doi.org/10.1016/j.socscimed.2012.02.031> 1982.
- Milner, A., Page, A., & LaMontagne, A. D. (2013). Long-term unemployment and suicide: A systematic review and meta-analysis. *PLoS One*, 8(1), e51333. <https://doi.org/10.1371/journal.pone.0051333>.
- Milner, A., Page, A., & LaMontagne, A. D. (2014). Cause and effect in studies on unemployment, mental health and suicide: A meta-analytic and conceptual review. *Psychological Medicine*, 44(5), 909–917. <https://doi.org/10.1017/S0033291713001621>.
- Moster, D., Lie, R. T., & Markestad, T. (2008). Long-term medical and social consequences of preterm birth. *New England Journal of Medicine*, 359(3), 262–273. <https://doi.org/10.1056/NEJMoa0706475>.
- Murray, E. T., Zaninotto, P., Fleischmann, M., Stafford, M., Carr, E., Shelton, N., et al. (2019). Linking local labour market conditions across the life course to retirement age: Pathways of health, employment status, occupational class and educational achievement, using 60 years of the 1946 British birth cohort. *Social Science & Medicine*, 226, 113–122 S0277-9536(19)30111-X.
- Norström, F., Virtanen, P., Hammarström, A., Gustafsson, P. E., & Janlert, U. (2014). How does unemployment affect self-assessed health? A systematic review focusing on subgroup effects. *BMC Public Health*, 14, 1310–2458. <https://doi.org/10.1186/1471-2458-14-1310> 14-1310.
- Overland, S. (2016). Unemployment and mental health. *Occupational and Environmental Medicine*, 73(11), 717–718. <https://doi.org/10.1136/oemed-2016-103831>.
- Paananen, R., & Gissler, M. (2012). Cohort profile: The 1987 Finnish birth cohort. *International Journal of Epidemiology*, 41(4), 941–945. <https://doi.org/10.1093/ije/dyr035>.
- Patel, P. H., & Sen, B. (2012). Teen motherhood and long-term health consequences. *Maternal and Child Health Journal*, 16(5), 1063–1071. <https://doi.org/10.1007/s10995-011-0829-2>.
- Pickett, K. E., & Pearl, M. (2001). Multilevel analyses of neighbourhood socioeconomic context and health outcomes: A critical review. *Journal of Epidemiology & Community Health*, 55(2), 111–122.
- Poulton, R., Moffitt, T. E., & Silva, P. A. (2015). The Dunedin multidisciplinary health and development study: Overview of the first 40 years, with an eye to the future. *Social Psychiatry and Psychiatric Epidemiology*, 50(5), 679–693. <https://doi.org/10.1007/s00127-015-1048-8>.
- van Rijn, R. M., Robroek, S. J., Brouwer, S., & Burdorf, A. (2014). Influence of poor health on exit from paid employment: A systematic review. *Occupational and Environmental Medicine*, 71(4), 295–301. <https://doi.org/10.1136/oemed-2013-101591>.
- Ristikari, T., Törmäkangas, L., Lappi, A., Haapakorva, P., Kiilakoski, T., Merikukka, M., et al. (2016). *Suomi nuorten kasvuympäristönä (Finland as a growth environment for young people). 25-year follow up of those born in Finland in 1987. (No. Report 9/2016. National Institute for Health and Welfare (THL) and the Finnish Youth Research Network.*
- Saigal, S., Stoskopf, B., Streiner, D., Boyle, M., Pinelli, J., Paneth, N., et al. (2006). Transition of extremely low-birth-weight infants from adolescence to young adulthood: Comparison with normal birth-weight controls. *Jama*, 295(6), 667–675 295/6/667 [pii].
- Scanlan, J. N., & Bundy, A. C. (2009). Is the health of young unemployed Australians worse in times of low unemployment? *Australian & New Zealand Journal of Public Health*, 33(1), 79–82. <https://doi.org/10.1111/j.1753-6405.2009.00343.x>.
- Veldman, K., Reijneveld, S. A., Verhulst, F. C., Ortiz, J. A., & Bultmann, U. (2017). A life course perspective on mental health problems, employment, and work outcomes. *Scandinavian Journal of Work, Environment & Health*, 43(4), 316–325. <https://doi.org/10.5271/sjweh.3651>.
- Virtanen, P., Janlert, U., & Hammarström, A. (2013). Health status and health behaviour as predictors of the occurrence of unemployment and prolonged unemployment. *Public Health*, 127(1), 46–52. <https://doi.org/10.1016/j.puhe.2012.10.016>.
- WHO Collaborating Centre for Drug Statistics Methodology (2019). Guidelines for ATC classification and DDD assignment. Oslo: WHO collaborating Centre for Drug Statistics 2019.
- World Health Organization (1991). *International classification of diseases, ninth revision, clinical modification (ICD-9-CM)*. Geneva: World Health Organization.
- World Health Organization (2004). *International statistical classification of diseases and health related problems (2nd ed.)*. The ICD-10 volume 1 Geneva: World Health Organization tenth revision ed.
- van Zon, S. K. R., Reijneveld, S. A., Mendes de Leon, C. F., & Bultmann, U. (2017). The impact of low education and poor health on unemployment varies by work life stage. *International Journal of Public Health*, 62(9), 997–1006. <https://doi.org/10.1007/s00038-017-0972-7>.