

Parental precarious employment and the mental health of adolescents: a Swedish registry study

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Abstract

Objective: This study investigates the association between parental precarious employment (PE) and the mental health of their adolescent children, with a particular focus on how the association differs based on whether the mother or father is in PE.

Materials and Methods: This register-based study used the Swedish Work, Illness, and Labour-market Participation (SWIP) cohort. A sample of n=117,437 children aged 16 years at baseline (2005) were followed up until 2009 (the year they turned 20). A multidimensional construct of PE (SWE-ROPE 2.0) was used to classify parental employment as either “precarious”, “substandard” or “standard employment”. The outcome, adolescents’ mental disorders, was measured as a diagnosis of a mental disorder using ICD-10 codes or by prescribed psychotropic drugs using ATC codes. Crude and adjusted Cox regression models produced Hazard Ratios (HR) with 95 % confidence intervals (95% CI) to estimate the association between parental PE and adolescents’ mental health.

Results: Adolescents with parents in PE exhibited a higher risk of developing mental disorders. The association was more pronounced for paternal PE (HR 1.22 95% CI 1.10-1.35) compared to maternal PE (HR 1.11, 95% CI 1.00-1.21). These associations largely persisted after adjusting for important confounders, including parental mental health.

Conclusion: This study addresses a significant gap in the literature on parental PE and adolescents’ mental health. As PE is growing more common across countries, this study provides relevant insights into the intergenerational role that parental low-quality employment may have in terms of mental health within families.

Keywords: *Adolescent Health, Health Inequalities, Intergenerational Transmission, Longitudinal Studies, Mental Health, Precarious Employment, Register-based*

Introduction

Precarious employment (PE) is growing more common in many countries and can have several health damaging effects (1) resulting, for instance, from increased stress, financial hardship and hazardous working conditions. PE is associated with several adverse health effects and health risks for the worker (2-4), including mental health issues (5-7), suicide attempts and substance use disorders (8). PE specifically refers to the (poor) quality of employment, it is a multidimensional construct measured by the elements of income inadequacy, employment insecurity and a lack of rights and protections (9).

While it is known that PE can have negative effects on worker's health, an increasing body of evidence suggests that PE and related factors, such as hazardous- and poor psychosocial working conditions, can also harm the health and well-being of family members (1, 10). This implies that there may be an intergenerational transmission of adverse health consequences stemming from parental employment that can affect their children. With PE growing increasingly common in Sweden and elsewhere (11), it is important to advance the knowledge of the intergenerational effects that parental PE may have on children's health. Such studies are especially urgent for adolescents where research is particularly scarce (12, 13), and for mental health, which is a common and increasing problem among children this age in Sweden (14).

In 2023, 12% of young men and 21% of young women aged 18-24 were either diagnosed with a mental health disorder or were prescribed psychotropic drugs in Sweden (15). Many mental health outcomes, such as anxiety and depression are, to a large extent, socially determined (16) and, therefore, preventable. Thus, identifying key contributing factors can be helpful in efforts to improve the mental health of adolescents. Health in adolescence is often influenced by exposures in early childhood (17, 18), yet the significance of exposures later in childhood should not be neglected (18). While the school context and peers indeed have increasing influence on adolescents' health and wellbeing, family factors continue to be of importance (19). Thus, for adolescent mental health, certain socially determined and avoidable exposures during this period may be particularly harmful. Especially, since experiencing socioeconomic disadvantage is known to affect the mental health of both children and adolescents (20), parental PE should be considered to be a contributing factor.

The current evidence on how parental PE influences the health of adolescents is scarce, although related research indicates that it may be a contributing factor to poorer health. For example, maternal non-standard working schedules have been associated with adolescent obesity (25) and maternal job insecurity and parental non-standard working schedules have been found to adversely influence adolescent mental health and depressive symptoms (12, 26). These findings are also in line

with similar research focusing on younger children that have found that their health and wellbeing is linked to parental psychosocial working environment and employment quality (10, 21-24). However, these studies focus specifically on working conditions and do not incorporate a multidimensional assessment of parental PE. The few studies containing such a multidimensional assessment of PE, show that maternal PE is associated with adolescent obesity (27), whereas parental PE has been shown to reduce adolescents' happiness (28).

There are several plausible mechanisms, through which PE can negatively affect adolescent health. First, parental PE may influence poor health of adolescents through financial hardship, where material needs may be unmet and financial stress is increased (28). Secondly, parental psychosocial strain, such as feelings of vulnerability or fear of joblessness (28), stress (27) and poor parental mental health (29), can also contribute to poor adolescent health. Moreover, stressful conditions at parents' work and certain types of non-standard working schedules (e.g. working late at night or during the weekends), can negatively influence family connectedness as both the time- and the quality of time spent with adolescents may be reduced (30, 31). With reduced family connectedness, parents are less able to monitor behaviors, and to offer communication and support (31). This can increase the likelihood of developing adolescent problem behaviors (19, 30) such as sexual risk behaviors, substance misuse and truancy, which, in turn, are closely connected with adolescents' mental health (32).

However, while evidence indicate that parental PE may affect the mental health of their adolescent children, the impact may differ between types of families. For example, two-parent families working non-standard working schedules may also find themselves having more time to spend with their children (12), which could be beneficial for adolescents' mental health. Furthermore, the relationship between employment, children's health, and family connectedness can be influenced by the parent's gender, with outcomes for children varying depending on whether the exposure comes from the father or the mother (30, 31). These mixed relationships are likely due to unequal burden of childcare responsibilities (33) and the different role that employment status has for the well-being of men and women (34). Ultimately, such gendered differences in burdens and social roles of the parents, could influence the direction of the results for children's health.

Despite this background, there is still limited research on how parental PE, measured as a multidimensional construct to fully grasp its complexity, associates with adolescents' mental health over time, and how this relationship is influenced by the gender of the parent.

The aim of this study is to assess the association between parental PE and the risk of their adolescent children developing a mental health disorder, with a particular focus to explore to what extent this relation is modified by the gender of the parent.

Methods

Study population:

This register-based study uses data from the Swedish Work, Illness, and Labour-market Participation (SWIP) cohort. The SWIP cohort includes all individuals who were registered in Sweden and aged 16-65 in 2005. It is a closed cohort, meaning that no new participants are recruited at any later point in time. The SWIP cohort links information from multiple nationwide registries. It is anonymized and linked by Statistics Sweden. Here, sociodemographic and employment data comes from the Longitudinal Integration Database for Health Insurance and Labor Market Studies register (LISA); mental health disorder diagnoses, based on their ICD 10- and ICD 9-codes, were retrieved from the National Patient Registry; information on prescribed drugs comes from the Swedish Prescribed Drug Register; and linkage between children and parents is made possible through the multi-generation register.

The present study uses a subpopulation of 117,437 adolescents followed from 2006 to 2009 (i.e. until the year they turn 20 and exit adolescence), and at least one of their parents (adoptive or biological), whose sociodemographic information and employment conditions at baseline (2005) were assessed. Adolescents born in 1989, i.e. aged 16 years at baseline, with at least one eligible parent, were selected. In turn, eligible parents were aged 35-67 years (i.e. aged 19-51 the year when the child was born), and active in the labour market, at baseline. Exclusion criteria at baseline for the parents were: 1) missing information on the exposure (employment conditions), 2) being a student, 3) death, emigration or immigration, 4) having a yearly employer-based income of <100 SEK (to ensure labour market attachment), 5) being self-employed, to avoid misclassification to PE, 6) >90 days of unemployment, to avoid measuring the effect of unemployment on the outcome, 7) being on long-term sick leave (< 180 days), 8) being early retired and 9) being a pensioner. At least one parent had to fit the eligibility criteria. Exclusion criteria for the adolescents at baseline are: 1) any healthcare visit prior to 2006 due to mental health disorder, based on diagnosis (ICD 10: F00–F99; ICD 9: 291–319), including self-harm or suicide attempts (ICD 10: X60-X84; ICD 9: E95, E98), and/or 2) prescriptions of psychotropic drugs in 2005 (ATC-codes: N06A, N05B and N05C).

Due to requiring eligibility of only one parent, a strategy was needed to, in the analyses, include those adolescents where the second parent was ineligible. For this reason, additional categories were created, consisting of two groups: 'others' and 'N/A'. The 'N/A' group comprises individuals who

either did not have a second parent, or whose second parent was not recorded in the LISA registry. The 'other' group consists of the ineligible parents in terms of being students, long-term unemployed, early retired, pensioners, those on long-term sick leave, the self-employed and the inactive.

[Figure 1. Flow chart – about here]

Exposure:

Parental PE was estimated based on the Swedish Register-based Operationalization of Precarious Employment 2.0 (SWE-ROPE) (35, 36). SWE-ROPE uses five items (contractual employment insecurity, contractual temporariness, multiple-job holding, income level and collective bargaining agreement coverage) (8) to capture the three dimensions of PE (36): employment insecurity, income inadequacy and a lack of rights and protections (9), as seen in Table 1. Item scores are summed, and the employment score of individuals can range from -9 to +2. PE is identified by scores <-3, standard employment (SE), is identified by scores ≥ 0 and the middle group consisting of scores from -3 to -1 represents those with substandard employment (SSE). SE was used as a reference group, to which parents in PE and SSE were compared.

]Table 1. SWE-ROPE scoring of items – about here]

Outcome:

The outcome of interest was adolescents' mental health disorders assessed as the first-time admission during follow-up with a mental disorder in either inpatient or specialized outpatient registries. The outcome contained the following disorders (ICD 10 codes in brackets): depression (F32–F33), anxiety (F41), stress-related disorders (F43), suicide attempt – intentional self-harm (X60–X84) and eating disorders (F50). The rationale for the selection of these diagnoses was to focus on both common mental health disorders (such as depression and anxiety disorders), as well as disorders with a high prevalence among adolescents that were highly interconnected to common mental disorders (such as self-harm or eating disorders). As an additional strategy to identify mental health disorders among adolescents who may not have been diagnosed in either inpatient or specialized outpatient care, the first incidence of treatment during follow-up with psychotropic drugs

was also assessed. These were identified by their ATC codes from the prescribed drug register and included antidepressants (N06A), anxiolytics (N05B) and hypnotics and sedatives (N05C). The outcome was assessed dichotomously as either having a mental health disorder (the incidence of diagnosis or prescribed drug) or not.

Covariates:

Covariates were measured in 2005. For the adolescents, these included family type (living in a household with two parents, single father or single mother), number of siblings, and parental and individual migrant background (born in Sweden to two Swedish parents, born in Sweden to one foreign parent, born in Sweden to two foreign parents and foreign-born). Parental covariates included parental employment, age and highest educational attainment among the parents (in the case of two parents). Parental history of a mental health diagnosis was also assessed in sensitivity analyses, with practically identical results. Given that it could be a mediator in the association between parental PE and adolescents' mental health, it was not included in the main analyses.

In this study, adolescents' own potential employment was not included as a covariate for a variety of reasons. Firstly, any potential job would be at the side of studying as close to all 16-year-olds in Sweden attended high school in 2005 (39). Furthermore, it is not possible to distinguish between those who work to earn some extra pocket money and those who work out of necessity, but both cases of adolescent employment are likely dependent on parental education and employment and should thus be understood as a mediator rather than a confounder. Finally, the operationalization of PE used in this study partly relies on assessing employment stability over two years, meaning that only those working two years prior to the age of 16 would be included, which makes it unfeasible given the data availability.

Data analysis:

First, baseline characteristics of the adolescents and their parents based on the selected covariates, were assessed and presented. Then, cox regression models were applied to estimate the hazard ratios (HR) with 95% confidence intervals (CI), for the outcome as dependent on parental employment as either PE; SSE or SE. Person-time is calculated from 1 January 2006, until the first incidence of the outcome of mental health disorders, until the year they turn 20 (2009), emigration or death, whichever one comes first. Model 1 was adjusted for the employment of the other parent (if there was more than one), and Model 2 was additionally adjusted for migrant status, number of siblings, family type, parents' age in 2005 and highest parental educational attainment. Sensitivity

analyses were conducted to test the robustness of the results. Here the results were stratified by the gender of the parent, stratified by the gender of the child, and parental history of mental health disorders was added as a covariate. All analyses have been conducted using STATA version 18.

Results

Baseline characteristics

Table 2 shows the baseline characteristics of the adolescents and their parents. Most adolescents were born in Sweden to Swedish-born parents (76.86%) and lived in two-parent households (70.31%). Most of the parents were aged 40-49 at baseline (63.71% by mothers and 55.89% by fathers), meaning they were between the ages of 24-33 the year the child was born. The highest educational attainment of the parents was most frequently reported as middle educational attainment (48.98%). In terms of parental employment, SE was the most common employment type among both mothers (39.60%) and fathers (47.84%). PE constituted the smallest group (3.75% among mothers and 2.89% among fathers). The sample of parents in PE in this study is lower than for the general population (11), which was expected since precariousness often leads to a postponement of family formation (40).

[TABLE 2 about here]

Associations between parental PE and adolescent mental health disorders

During the follow-up period, there were 13,095 incident cases of mental disorders, affecting 11.2% of our sample of adolescents. Mental disorders were significantly more common among adolescents with parents in PE (father: 12.7%, mother: 11.4%) compared to adolescents with parents in SE (father: 10.1%, mother: 10.0 %) (Table 3).

Table 3 shows the association between parental PE and adolescent mental health disorders as compared to adolescents with parents in SE. Model 1 shows that adolescents with either a mother (HR 1.11, 95% CI 1.00-1.21) or a father in PE (HR 1.22 95% CI 1.11-1.35) had a statistically significantly increased risk of developing mental health disorders. After adjusting for all covariates, the risk among adolescents to develop mental health disorders slightly increased as associated with maternal PE (HR

1.12, 95% CI 1.02-1.22) and reduced slightly for the association with paternal PE (HR 1.17, 95% CI 1.06-1.29). Overall, the results indicated that especially fathers' PE was associated with an increased risk of developing mental health disorders for adolescents.

As seen in model 2, while adolescents to fathers in SSE also had a slight increased risk of developing mental health disorders compared to those with fathers in SE (HR 1.06, 95% CI 1.00-1.12), this association was not found for those with mothers in SSE (HR 1.01, 95% CI 0.96-1.06). Finally, it should be noted that the confidence intervals were close to one, and that the differences between mothers' and fathers in PE were small.

[TABLE 3 about here]

Sensitivity analyses

Several sensitivity analyses were conducted to test the robustness of the results. First, the results were stratified by the gender of the parent (Supplementary Table 1). The results for the association between parental PE and adolescents' mental health remained similar although slightly attenuated for both mothers (HR 1.13, 95% CI 1.03-1.24) and fathers (HR 1.20, 95% CI 1.09-1.32). Then, parental history of mental health disorders was added as a covariate (Supplementary Table 2). Again, the overall results for PE remained the same although this time slightly reduced (mothers: HR 1.11, 96% CI 1.01-1.22; fathers: HR 1.16, 95% CI 1.05-1.28). Finally, the results were stratified by the gender of the adolescent. Here, the effect of parental PE was somewhat stronger for boys than for girls and the only significant result was for fathers PE increasing the risk for boys to develop mental health disorders (Supplementary Table 3). However, after investigating this further, a model with interaction terms (model not shown) between parental PE and the gender of the child, showed that these differences were not statistically significant. The stratified results may thus be due to a loss of power as the sample was significantly reduced.

Discussion

To our knowledge, this is the first longitudinal study using high-quality registry data to investigate how parental PE, measured as a multidimensional construct, associates with the risk of mental health disorders of their children in late adolescence. The results suggest that being an adolescent to a parent in PE, slightly increases the risk of developing mental health disorders, primarily among adolescents whose fathers are precariously employed. Overall, these results remained robust after

having conducted several sensitivity analyses. Thus, this study is an important contribution to the evidence concerning the intergenerational transmission of disadvantages in mental health stemming from PE.

The first objective of this study was to assess how parental PE associates with the mental health of adolescents, and the main results showed that parental PE associates with an increased risk for adolescents to develop mental health disorders. This finding is in line with similar studies, that, although often based on smaller sample sizes, have also found that parental PE, and associated exposures, such as non-standard working schedules, seems to impact the health and wellbeing of adolescents negatively (12, 25-28). The results could be attributed to increased parental financial strain, work-family conflict, reduced family connectedness, parental psychosocial strain, or parental mental health disorders that could spillover and harm the health and wellbeing of children (28, 31). While future research is needed to test these pathways, the study results support the argument that while, for example, the school environment and peers have a growing influence on adolescents, family factors are of continued importance also for adolescents (19), here in terms of mental health and parental employment quality.

The second objective of this study was to explore how this association varies if the father or mother is in PE. While differences were small, the results suggested that adolescents with fathers in PE had the highest risk of developing mental health disorders. The current evidence is mixed regarding how the health and wellbeing of children differ based on the employment quality of mothers and fathers. There is more evidence for harmful effects of maternal employment due to a lack of studies specifically on fathers' employment (22, 26, 27, 41). Among studies that consider employment and work for both parents, mother's exposure to low job quality (10) and father's work-related factors (21, 24) have each been found to be especially associated with the health and wellbeing of children. It is therefore crucial to apply a contextual understanding of the gendered impact of employment on children's health, and potential explanations for the findings of this study are discussed below from a gendered perspective

The finding that the risk for developing mental health disorders among adolescents was somewhat higher for those with fathers' in PE, could be explained by social role theory, which suggests that various employment situations are experienced differently by men and women due to the interplay between normative gender roles and employment. For example, men's wellbeing (such as life satisfaction or happiness) is reduced to a greater extent in the case of unemployment than it is for women (34) allegedly due to the unmet normative expectation of the male family breadwinner. Parental wellbeing influences their relationship with their children and the family connectedness,

and with reduced family connectedness, the risk for adverse mental health among adolescents increases (30), making it a plausible explanation for our results. Women's wellbeing, on the other hand, may not suffer equally from unemployment or PE as their social value is more commonly ascribed to them through their role as a mother or wife (42), a role they may perform even better when not working standard full-time jobs.

However, it is also likely that compared to men in PE, women in PE make greater efforts to find time to fulfil their role as caregivers and to contribute to greater family connectedness, despite facing challenges due to their employment (21) and regardless of how this affects their own wellbeing. Thus, the fact that adolescents with fathers in PE have a higher risk of developing mental health disorders, may suggest that, in Sweden, the traditional role of men as the family breadwinner persists, and that fathers in PE then may suffer psychosocially when this role is unfulfilled, which can spillover and influence adolescents. For mothers, however, social role theory may not explain the findings as well, since compared to adolescents with mothers in SE, adolescents with mothers in PE still had an increased risk of mental health disorders.

In turn, a strictly financial pathway can also offer support to the results of this study. Women in Sweden generally earn less compared to men (43). Thus, fathers in PE could have a stronger influence on the mental health of adolescents because having a father in PE compared to a father in SE, could mean a greater absolute financial reduction for the household compared to having a mother in PE versus SE. If women generally earn less, the absolute wage gap between women in various employment categories may not differ as much as it may do for men, which could also explain why we found only paternal SSE and not maternal SSE, to increase the risk of adolescents developing mental health disorders. While the financial pathway of a parent in PE can influence adolescent mental health, this influence is not necessarily determined solely by the parent's gender. The overall household income is also likely a crucial factor in shaping adolescent mental health.

Finally, the results of this study remained robust even after conducting several sensitivity analyses. For example, in this study, parental mental health diagnoses were examined as a potential confounding factor between parental PE and adolescent mental health, but it did not affect the main results. Regarding the gender of the adolescent, it initially seemed that the mental health of boys with fathers in PE were at greater risk compared to girls with parents in PE. However, after further investigations, these results were not significant. While these results are too inconclusive to add any evidence to this topic, it does, as has been suggested by others (44), potentially implicate that the gendered interaction of both parents and children may be of relevance for the link between parental PE and children's health. This should be investigated in more detail in future research on this topic.

Strengths and limitations

A strength of the study is the use of high-quality register-based data. Firstly, this allows for more objective measures of both the exposure and the outcome, which are otherwise often self-reported. Secondly, this register-based study allows for a relatively large sample size and a longitudinal approach, both of which are scarce in existing research on this topic. Moreover, similar studies often focus exclusively on children living in either sole-parent households (12), in two-parent households (10, 45), or they focus on the exposure measured only by the mother (25, 27, 29). This current study, however, includes children with one or two parents and considers both paternal and maternal employment, which allows an investigation of a greater diversity in family formations. Finally, SWE-ROPE allows for considering PE as a multidimensional construct rather than looking only at a single dimension.

Some limitations of this study stem from data restrictions. First, the SWIP cohort includes only those aged 16 and above in 2005. While adolescence traditionally includes the ages 10-19 (46), the data used here restricted the scope of children to those in their later adolescence, starting from the age of 16. While this hindered a more comprehensive study including all ages, late adolescence is currently the most overlooked age group in similar research, illustrating the relevance to focus on this group. Furthermore, the fact that no new recruitments are made to the SWIP cohort, means that 2005 was the most recent year that these 16-year-old children could be included. In Sweden around 2005, both PE (11) and adolescent mental health diagnoses (47) were more rare than they are today. As the current study still found a relationship between the two, an even stronger association could be expected when using more recent data, highlighting the importance of these findings. Second, history of mental health diagnoses prior to follow-up used in sensitivity analysis (in the case of parents) and as exclusion criteria (in the case of adolescents) was assessed strictly through inpatient data. Due to register constraints, we were unable to include information from the specialized outpatient care register, which reached complete coverage in 2003, or prescribed drug registry, which started in 2005. Last, due to data limitations of the SWIP cohort, our focus on adolescents meant that PE could only be measured at baseline (2005), preventing an assessment of employment trajectories. Further research should incorporate a longitudinal assessment of PE.

Conclusion

This study found an association between parental PE and the mental health of their adolescent children. Specifically, adolescents with a parent in PE, particularly a father, were slightly more likely to experience mental health disorders. These findings support the assumption that there is an intergenerational transmission of disadvantage linked to lower employment quality among parents.

As PE becomes increasingly common, this study emphasizes the urgent need for policies and regulations addressing PE and its harmful impact, given its detrimental effects not only on the health of workers but also on their adolescent children's mental well-being.

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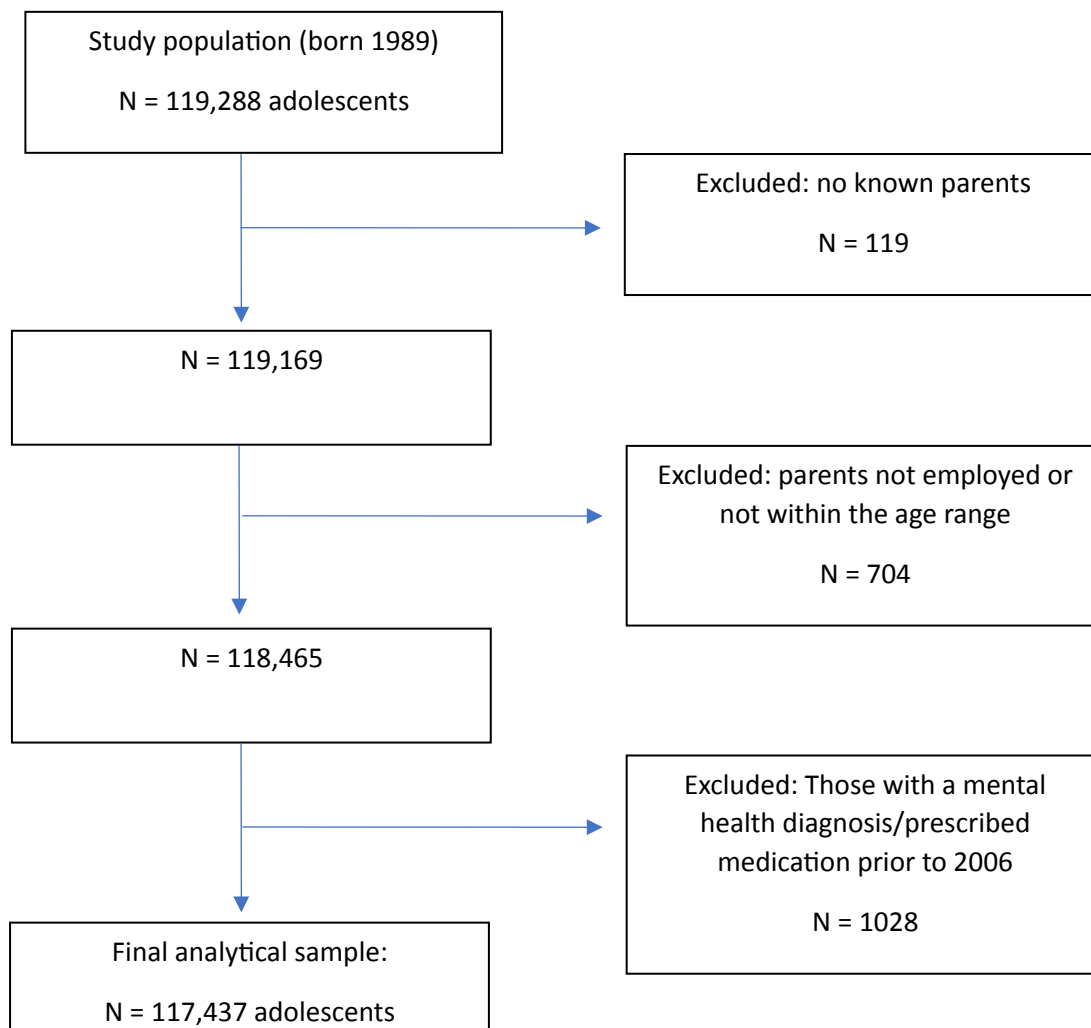


Figure 1. Flow chart of analytical sample

Table 1. SWE-ROPE scoring of items

Item	Score				
	-2	-1	0	1	2
Contractual employment insecurity		Agency employed	Directly employed		
Temporariness	Unstable employment		Stable employment		
Multiple-job holding	Multiple jobs (>2 jobs) and multiple sectors (>1 sector)	Multiple jobs (>2 jobs)	No multiple jobs (1 job)		
Income level (% of median)	<60	60-80	81-120	121-200	>200
Coverage under collective bargaining agreement (% likelihood)	<70	70-90	91-100		

Table 2. Characteristics of the study sample at the 2005 baseline (N=117,437)

Characteristics of adolescents	N	%
Sex of child		
Male	60 537	51.55
Female	56 900	48.45
Migrant background		
Foreign born	9027	7.69
Born in Sweden, two foreign parents	6977	5.94
Born in Sweden, one foreign parent	11 175	9.52
Born in Sweden, Swedish parents	90 258	76.86
Family type		
Lives with two parents	82 566	70.31
Lives with single mother	27 735	23.62
Lives with single father	7136	6.08
Number of siblings		
0	20 895	17.79
1	53 619	45.66
2	30 265	25.77
≥3	12 628	10.75
Characteristics of parents		
Mothers' age		
35-39	19 383	16.51
40-49	74 824	63.71
50-59	18 914	16.11
60-67	238	0.20
N/A	4078	3.47
Fathers' age		
35-39	7760	6.61
40-49	65 639	55.89
50-59	30 961	26.36
60-67	2940	2.50
N/A	10 137	8.63

Highest parental education

Low	8085	6.88
Middle	57 524	48.98
High	51 346	43.72

Mothers' employment

SE	46 509	39.60
SSE	28 231	24.04
PE	4399	3.75
Other	34 213	29.13
N/A	4085	3.48

Fathers' employment

SE	56 185	47.84
SSE	13 430	11.44
PE	3396	2.89
Other	34 284	29.19
N/A	10 142	8.64

Mothers' history of mental health disorders

No	109 320	93.09
Yes	4032	3.43
N/A	4085	3.48

Fathers' history of mental health disorders

No	104 466	88.95
Yes	2829	2.41
N/A	10 142	8.64

Missing: 30 (0.03%) missing in number of siblings; 482 (0.41%) missing in highest parental education.

The categories Other and N/A refer to ineligible second parents who had to be included for methodological reasons. See the methods section for a more detailed explanation

Table 3. Crude and adjusted hazard ratios (HRs) with 95% confidence intervals (CIs) for the association between parental PE (2005) and adolescent mental health disorders (2006-2009)

Exposed (n)/Case	Model 1 ^a	Model 2 ^b
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	(%)	HR	95% CI	HR	95% CI
Mothers' employment					
SE (ref)	46 509/10.02	1.00		1.00	
SSE	28 231/10.18	1.01	0.96-1.05	1.01	0.96-1.06
PE	4399/11.39	1.11*	1.00-1.21	1.12*	1.02-1.22
Fathers' employment					
SE (ref)	56 185/10.07	1.00		1.00	
SSE	13 430/11.14	1.09**	1.03-1.15	1.06*	1.00-1.12
PE	3396/12.72	1.22**	1.11-1.35	1.17**	1.06-1.29

^a Model 1 adjusts for the employment of the other parent

^b Model 2 adjusts for the employment of the other parent, migrant background, number of siblings, mothers- and fathers' age in 2005, highest parental education and family type

** $p < 0.01$, * $p < 0.05$

Supplementary material

Supplementary Table 1. Adjusted hazard ratios (HRs) with 95% confidence intervals (CIs) for the association between parental PE (2005) and adolescent mental health disorders (2006-2009). Stratified by mothers and fathers

	Mothers ^a		Fathers ^b	
	HR	95% CI	HR	95% CI
SE (ref)	1.00		1.00	
SSE	1.02	0.97-1.07	1.08*	1.01-1.14
PE	1.13**	1.03-1.24	1.20**	1.09-1.32

^aAdjusted for migrant background, number of siblings, mothers age in 2005, highest maternal education and family type

^bAdjusted for migrant background, number of siblings, fathers age in 2005, highest paternal education and family type

** $p < 0.01$, * $p < 0.05$

Supplementary Table 2. Adjusted hazard ratios (HRs) with 95% confidence intervals (CIs) for the interaction effect between parental PE (2005) and adolescent mental health disorders (2006-2009). Additionally adjusted for by the history of parental severe mental health issues.

	HR	95% CI
Mothers' employment		
SE (ref)	1.00	
SSE	1.01	0.96-1.06
PE	1.11*	1.01-1.22
Fathers' employment		
SE (ref)	1.00	
SSE	1.06	1.00-1.12
PE	1.16**	1.05-1.28

Adjusted for the employment of the other parent, migrant background, number of siblings, mothers- and fathers' age in 2005, highest parental education, family type and parental history of severe mental health issues

** $p < 0.01$, * $p < 0.05$

Supplementary Table 3. Adjusted hazard ratios (HRs) with 95% confidence intervals (CIs) for the association

between parental PE (2005) and adolescent mental health disorders (2006-2009). Stratified by the gender of the child

	Exposed (n)/ Case (%)	Boys		Exposed (n)/ Case (%)	Girls	
		HR	95% CI		HR	95% CI
Mothers' employment						
SE (ref)	23 904/7.04	1.00		11 605/13.18	1.00	
SSE	14 546/7.48	1.06	0.98-1.15	13 685/13.05	0.98	0.92-1.04
PE	2289/8.39	1.15	0.99-1.34	2110/14.64	1.10	0.97-1.24
Fathers' employment						
SE (ref)	29 006/7.03	1.00		27 179/13.32	1.00	
SSE	6904/7.85	1.07	0.97-1.18	6526/14.62	1.05	0.98-1.13
PE	1728/9.61	1.24**	1.06-1.45	1668/15.95	1.12	0.99-1.27

Adjusted for the employment of the other parent, migrant background, number of siblings, mothers- and fathers' age in 2005, highest parental education and family type

** $p < 0.01$, * $p < 0.05$