

**The associations between adolescent psychiatric disorders and adulthood  
payment problems: A Norwegian register study of complete birth cohorts of  
1995-1997**

Aapo Hiilamo<sup>1,2</sup>, Maria Reinholdt Jensen<sup>3</sup>, Åsmund Hermansen<sup>3</sup>

1.\* Max Planck Institute for Demographic Research, Rostock, Germany

2. Max Planck – University of Helsinki Center for Social Inequalities in Population  
Health, Rostock, Germany and Helsinki, Finland, hiilamo@demogr.mpg.de

3. OsloMet – Oslo Metropolitan University, Faculty of Social Sciences, Department of  
Social Work, Child Welfare, and Social Policy, Oslo, Norway.

**This article has been accepted for publication in JECH following peer review,  
and the Version of Record can be accessed online at  
<https://doi.org/10.1136/jech-2024-222915>**

## **Background**

Psychiatric disorder diagnoses are linked to long-term socio-economic “shadows” into adulthood, but little is known about how these diagnoses are associated with adulthood payment problems in Norway, and whether these associations are moderated by parental and area characteristics.

## **Methods**

We combine Norwegian registry data with payment problem records from the public debt enforcement agency for the 1995-1997 birth cohorts (n=173,750). We ascertain behavioural, neurotic, mood, and substance use disorder diagnoses from specialised care at ages 13-17. Payment problems are defined as any records of mandatory deductions in wages or benefits up to age 23. Causal forests are used to explore the potential moderating role of socio-demographic variables.

## **Results**

Some 6% of the sample have payment problems, but the share is higher among men and among people with low childhood socio-economic status. After adjusting for background characteristics, behavioural problem diagnoses are linked to a 4.6 percentage point higher risk of payment problems (95% confidence intervals 4.1–5), mood disorder diagnoses to a 2.2 percentage point higher risk (1.5–2.9), neurotic disorder diagnoses to a 2.5 percentage point higher risk (2–3.1), and substance use disorder diagnoses to a 9.3 percentage point higher risk (7.6–10.9). The associations between substance use and behavioural diagnoses and payment problems are stronger for people with low childhood socio-economic status.

## **Conclusion**

The associations between adolescence substance and behavioural diagnoses and adulthood payment problems are particularly strong among people with low childhood socio-economic status. Reducing these associations is critical for preventing the accumulation of disadvantages.

What is already known on this topic

- Adolescent psychiatric diagnosis link to adulthood socio-economic outcome.

What this study adds

- Adolescence substance and behavioural diagnoses are associated with adulthood payment problems.
- These associations are particularly strong among people with low childhood socio-economic status.

How this study might affect research, practice or policy

- Preventive measures that address financial skills for young individuals with psychiatric diagnoses are important.

## Background

Psychiatric disorders are the key disease burdens in adolescence in Europe, with an estimated 17% of young people affected in 2019 (1). These disorders can cast long-term socio-economic “shadows” into adulthood (2,3). Behavioural, mood, and substance use disorders in adolescence are associated with subsequent lower income (4), social assistance use (5), and unemployment (6). While the mechanisms are complex, education is a key pathway (7–11).

What is less clear is how psychiatric disorders are linked to payment problems. As well as being markers of people’s past difficulties in fulfilling their financial commitments, payment problems can constrain people’s subsequent economic and social opportunities; reduce their credit rating; cause stigma; and make it difficult for them to enter into subsequent financial arrangements, such as securing a rental agreement (12). As payment problems reinforce a cycle of economic difficulties and mental disorders due to stress caused by debts (13), it is important to prevent such problems from arising. Debt problems have been linked to an increased risk of suicide (14) and critical mental health outcomes (13,14).

Few studies have investigated the association between mental health variables and subsequent payment problems (15–17). A limitation of the available studies investigating the financial consequences of adolescence psychiatric conditions is their lack of focus on how the consequences vary by family background. The risk of psychiatric disorders is higher in children with fewer parental economic resources (10). This association together with their well-established socio-economic consequences imply that psychiatric disorders act as mechanisms through which

socio-economic disadvantages are transmitted from one generation to another (18). However, no previous studies have explored how the associations between adolescent psychiatric disorders and payment problems vary by parental and other contextual factors.

In this study, we examine how adolescent behavioural, mood, neurotic, and substance use disorder diagnoses recorded in specialised care are linked to payment problems in early adulthood of the Norwegian birth cohorts of 1995-1997. Consumer debts, rents, and unpaid bills, rather than mortgages, are the main drivers of payment problems in this age group. In their formative years, these cohorts have simultaneously experienced the easy availability of online credit tools, online shopping options, social media influences on consumption habits, and increases in psychiatric diagnoses – all of which make them potentially vulnerable to payment problems. Despite the affluent welfare state and stable economic outlook, 8% of Norwegians report having unpaid bills, just below the EU-27 average of 9% (19). Formal debt advice is provided by the Norwegian Labour and Welfare Service (NAV). While debt settlements are offered as a solution to payment problems (20), these processes may be too bureaucratic for people with mental health issues (21). Unpaid debts are collected via the state and are subject to mandatory wage and benefit deductions (22).

## **Methods**

We use full population register data on the 1995-1997 birth cohorts in Norway. We use information from the basic population registry, employment register, income register, education register, Norwegian patient register, and debt enforcement agency register. These administrative registers are combined using pseudonomised national identity numbers. Persons are also linked to their parents and household using unique household and child-parent link variables. The study has received ethical approvals from the Norwegian Agency for Shared Services in Education and Research (NSD-686272) and Regional Committees for Medical and Health Research Ethics (REK-project 11880, case number 2019/643).

Our starting population are all individuals born in Norway from 1995 to 1997 (n=179,157). We first exclude the deceased (n=698) and then those who emigrated (i.e., they are not in the country n=3,649) by age 23. We then exclude individuals without control variables (n=1060). Our final sample consists of 173,750 individuals.

## **Outcome**

We measure adulthood payment problems by having had at least one payment enforcement action by age 23. Norway has a public debt enforcement agency, which can impose mandatory payment actions if individuals are unable to meet their financial obligations after multiple payment reminders. Payment enforcement for private unpaid bills and debts requires a court order, while unpaid public bills can be directly deducted. Payment enforcement actions include wage or benefit deductions and asset deductions and freezing. These payment actions result in marks in the debt enforcement registry.

We have data from the debt enforcement agency on monthly mandatory debt collection records from 2008 to 2020. The enforcement actions are recorded regardless of whether the person had any income or assets to deduct from. We first calculate the cumulative sum of payment problem marks and then create a dichotomous outcome variable of having any record of payment problems before or in the calendar year the cohort members turn 23.

### **Exposure**

We ascertain psychiatric diagnoses from specialised health care records in the Norwegian Patient Registry. This registry includes all specialised care episodes at public and publicly financed private hospitals. We also include rehabilitation data. We measure diagnoses in the calendar years the cohort members turn ages 13-17. We look at both primary and any secondary diagnoses. From the two-digit ICD-10 codes recorded for specialised care, we distinguish four groups of diagnoses: behavioural (F9), mood (F3), neurotic (F4), and substance use (F1) disorders. These four diagnostic groups are selected based on prior research on the socio-economic consequences of psychiatric disorders (14). These groups are not mutually exclusive. We also repeat the analysis with a dichotomous variable of having any psychiatric disorder diagnosis (F).

### **Covariates**

All covariates are treated as both potential sources of confounding and potential moderators. These variables include parental and household socio-demographic



characteristics, and are measured in the calendar year the cohort members turn age 12 .

Sex and birth year are derived from the population registry. We derive the parents' highest educational levels from the calendar year of the cohort members' 12<sup>th</sup> birthday. We use nine categories of the Norwegian NUS classification from the education registry. Mother's and father's employment status are coded to employed vs. other. These data are taken from the employment registry. Household social assistance use, derived from the income registry, is coded as a dichotomous variable, taking a value of one when the household has received some income from social assistance. EU-scale equivalised household income is rounded to thousands of Norwegian krone for privacy concerns. Family type is coded to single-parent households vs. the rest. We also include a variable for identifying young mothers (under age 20 when the cohort member was born).

Municipality (and neighbourhood for larger cities) income level, unemployment, and share with low education are used to measure area-level deprivation. We additionally include a set of dummy variables for the 20 regional areas in Norway (first two digits of the municipality code).

### **Statistical analysis**

We provide the unadjusted prevalence of payment problems and risk ratios by the adolescent psychiatric diagnostic groups. We then fit a series of logistic models, estimated via maximum likelihood. We regress the odds of having payment problems on the selected diagnostic groups and covariates. We use separate models for each

diagnostic group. We use predicted values to calculate risk ratios and risk differences, and calculate the 95% confidence intervals using the delta method (23). We then use the Miettinen formula to calculate population attributable fractions (PAFs) (24), which measure the extent to which the prevalence of the outcome (payment problems) can be attributed to the exposure (adolescence psychiatric diagnoses). PAFs assume that the underlying adjusted risk ratio reflects a causal effect estimate.

We take an explorative, data-driven approach to investigating whether and how the association between psychiatric diagnoses and payment problems is moderated by background characteristics. We apply a non-parametric causal forest (CF) machine learning method (25) to estimate conditional treatment effects (CATEs), to assess evidence of potential heterogeneity in the association, and to identify the most important moderators. CF estimates CATE, that is, the average differences in the potential outcomes – risk of payment problems with and without psychiatric conditions of the same person – conditional on the covariates using multiple causal trees (for details see (25)). CF can handle complex moderating effects with non-linear relationships and unexpected moderators. For example, parental income may have differential moderating roles for males and females (26). While CF adjusts for measured background variables non-parametrically, the method relies on the unmeasured confounding assumption as traditional regression-based methods.

To ease the computational demands of this CF approach, we randomly match each person with a selected psychiatric diagnosis with 20 people without this diagnosis for

this analysis. Matching is made within the stratum of cohort, sex, and region, and selected using Stata's pseudorandom generator.

We grow 2000 trees and use all tuning parameters to estimate CATEs. As recommended, we assess the evidence of overall moderation using the rank-weighted average treatment effect, which measures whether the causal forest predictions can reliably identify subpopulations with differential effects based on their moderator value. As a metric for key moderators, we report variable importance, that is, the number of times each moderator variable is used to make a split in the data when maximising the differences in the estimated conditional effects. We plot predicated conditional treatment by sex and the most important moderators. Stata 18 and R version 4.2.3 are used in the analyses.

## Results

The analysed cohorts consist of 57,930 individuals born in 1995, 58,492 individuals born in 1996, and 57,328 individuals born in 1997 (Table 1). An adolescent psychiatric diagnosis is recorded for 23,681 persons. The share with any psychiatric disorder is especially high among those with lower household incomes (Supplementary Figure 1).

A total of 9767 (5.6%) persons have payment problems by age 23. Individuals with lower parental education and household income at age 12 have a higher prevalence of payment problems by age 23 (Supplementary Figure 2). Smaller shares of women (4.3%) than of men (6.9%) have payment problems.

Payment problems are common among people with any adolescent psychiatric diagnosis (Figure 1). The prevalence of payment problems is 14.3% among individuals with a behavioural disorder diagnosis (5% in the unaffected group), 8.4% among those with a mood disorder diagnosis (5.5%), 9.7% among those with a neurotic disorder diagnosis (5.4%), and 19.9% among those with a substance use diagnosis (5.5%).

After adjusting for covariates, behavioural disorder diagnoses are associated with a 4.6 percentage point higher risk of payment problems (95% confidence intervals 4.1 – 5.1), mood disorder diagnoses are linked to a 2.2 percentage point higher risk (1.5 – 2.9), neurotic disorder diagnoses are associated with a 2.5 percentage point higher risk (2 – 3.1), and substance use disorder diagnoses are linked to a 9.3 percentage

point higher risk (7.6 – 10.9) (Table 2). PAF calculations indicate that some 11% of all payment problems can be attributed to adolescent psychiatric disorder diagnoses, with the largest PAF observed for behavioural disorder diagnoses (8%).

Causal forest indicates that the associations between behavioural disorder and substance use diagnoses and payment problems are moderated by area deprivation and parental socio-demographic characteristics. For the association between adolescent behavioural disorder diagnoses and payment problems, the most important moderators are father's employment, household income, and mother's age, all of which reflect family socio-economic status (Figure 2). The estimated effects are larger for those with low household incomes in the case of behavioural and substance use disorder diagnoses (Figure 3). Similar moderation is observed for both men and women. There is no strong evidence for meaningful variation in the association between mood disorder diagnoses and payment problems according to the rank-weighted average treatment effect measure.

## **Discussion**

In Europe, a substantial share of adolescents experience psychiatric disorders. At the same time, payment problems are estimated to affect some 10% of European adults, creating significant social and mental health burdens (27). Our study provides two novel findings regarding the association between the two phenomena.

The first is that psychiatric disorder diagnoses in adolescence are associated with an increased risk of payment problems later in life, but the associations vary according to diagnostic groups. These differences between diagnostic groups likely reflect the nature of the disorders within these groups. Substance use may lead to addictive or impulsive spending.

While we are unable to identify comparable studies from Norway, these findings are consistent with those of a recent Finnish study, which showed that substance-related and conduct and oppositional diagnoses had the strongest effects on credit records at age 30. Notably, the same study found that completion of upper secondary education significantly reduced the effects of mental health disorders on over-indebtedness at age 30 (16). Our findings also correspond to the observations reported in an earlier qualitative study of Norwegian adults, in which people attributed their payment problems to mental health issues (21).

Our second key, novel finding is that the associations between adolescents' behavioural and substance use diagnoses and payment problems are stronger for those with low socio-economic backgrounds or living in low-income areas.

Nevertheless, studies looking at other disadvantageous outcomes, such as non-

completion of secondary education (18,28) and entering a precarious school-to-work trajectory (26), reported similarly high parental socio-economic status “buffering”.

Further interpretation of these findings should be done with care while promoting destigmatisation (12). One potential interpretation is that the financial consequences of psychiatric diagnoses are embedded in social structures and parental resources. In other words, psychiatric disorders may not cause payment problems, but their association may be strengthened by other factors that increase vulnerability. A possible explanation for the moderating role of socio-economic background is that affluent parents use their economic, cultural, and social resources to counteract their children’s disadvantages, thereby preventing them from ending up in undesirable positions (29) – in this case, payment problems. Parents may help their children financially by paying their bills or covering their housing and consumption costs. Inherited skills may also be important. It is well-documented that financial literacy – that is, “the ability to make informed judgements and to take effective decisions regarding the use and management of money” (30)(p. 54) – is unevenly distributed across social backgrounds. Those with higher socio-economic backgrounds have higher financial literacy levels than those with lower socio-economic backgrounds (31), providing them with better prerequisites for making beneficial economic choices. This observation is supported in our additional analysis in this study (see Supplementary Figure 2), which shows that the prevalence of payment problems at age 23 is substantially higher for adolescents with low-educated, non-employed, and low-income parents. People with lower family socio-economic backgrounds have a higher prevalence of psychiatric diagnoses, and these diagnoses also have a stronger association with payment problems. This double disadvantage amplifies the

existing inequalities of payment problems. It seems that the levels of public support and financial education for those at risk of payment problems are inadequate, leading to inequalities in payment problems.

Furthermore, the results show that socio-economic conditions outside of the family, i.e., area deprivation level variables, moderate the associations. This may reflect the parents' direct socio-economic status (high-SES families live in more affluent areas), or the fact that low-income municipalities have fewer resources in general. Another possible explanation is that low-income municipalities tend to have more people with financial problems but fewer public and private resources. Low-income municipalities might find it challenging to ensure the quality of financial advisory services in social offices, an issue that has been a topic of debate in Norway for several years (30). Thus, people living in more high deprived areas may not get the help they need, and the consequences (e.g., payment problems) of psychiatric disorders can be worse for them than they are for people in less deprived municipalities. This suggests that more debt advice resources should be targeted to low-income municipalities.

Overall, the findings underscore the need for heightened awareness within the healthcare system regarding the potential impact of adolescent psychiatric disorders on later financial status. Our findings support the idea of cross-sector collaboration to ensure a holistic approach when dealing with vulnerable individuals facing multiple challenges. It also seems crucial to integrate preventive measures that address financial skills into services for young individuals with psychiatric disorders. This is particularly important for young people from low socio-economic backgrounds who appear to be at increased risk of payment problems.



## **Methodological considerations**

We have analysed nationwide cohort data from Norway, comprehensive register data, and unique data on payment problems using modern machine learning methods to uncover potentially unexpected moderators of this association. However, a limitation here is that we measure disorders using diagnoses recorded in specialised care. Lack of diagnosis does not imply the absence of the health condition, as some people may not seek help for their condition. There may be also other factors that affect the likelihood of being diagnosed, such as geographical availability of specialised care. These factors can also link to payment problems and this association may bias to our results. Moreover, we have access to the first two digits of the ICD-10 codes. It is possible that some of the observed moderation by parental background is due to some specific diagnoses. Moreover, our payment problem outcome is dichotomous and measures severe financial difficulties, while less severe financial difficulties are not accounted for. People may experience payment problems over longer time periods, but without experiencing payment enforcement action by refinancing their payments with new loans. We therefore underestimate the full scale of payment problems.

There are clearly unmeasured confounding explaining both psychiatric diagnoses and payment problems. Child welfare service involvement and gambling problems may be potential confounders not considered here. Given that our unadjusted associations were larger than adjusted estimates, we suspect that, due to unmeasured confounding, our estimates represent the upper bound of true causal effects. Nevertheless, unmeasured confounders would have to have major effects on

both our exposure and our outcome to explain away the results. Moreover, these associations, even if not interpreted causally, provide meaningful information about people at risk of payment problems and inequalities in those risks.

## **Conclusion**

Adolescents' psychiatric disorder diagnoses, particularly those related to substance abuse, are linked to an increased risk of payment problems. These associations are stronger among people with low socio-economic backgrounds, thus contributing to the clustering of disadvantages. Reducing the associations between psychiatric disorders and payment problems among those with fewer family resources is critical to preventing the accumulation of multiple disadvantages early in the life course.

### Contributorship statement

AHi and AHe initiated and conceptualised the study. AHi analysed and MJ analysed the data. All authors participated in the writing of the manuscript. All authors agreed the submission. AH is the quarantor of the study.

### Competing interests

Authors declare no competing interests.

### Funding

This research was funded by Research Council of Norway (302884)

### Data sharing statement

Authors have no permission to share the data.

### Ethics statement

The study has received ethical approvals from the Norwegian Agency for Shared Services in Education and Research (NSD-686272) and Regional Committees for Medical and Health Research Ethics (REK-project 11880, case number 2019/643).

## References

1. Castelpietra G, Knudsen AKS, Agardh EE, Armocida B, Beghi M, Iburg KM, et al. The burden of mental disorders, substance use disorders and self-harm among young people in Europe, 1990–2019: Findings from the Global Burden of Disease Study 2019. *The Lancet Regional Health – Europe* [Internet]. 2022 May 1 [cited 2024 May 6];16. Available from: [https://www.thelancet.com/journals/lanepc/article/PIIS2666-7762\(22\)00034-5/fulltext](https://www.thelancet.com/journals/lanepc/article/PIIS2666-7762(22)00034-5/fulltext)
2. Goodman A, Joyce R, Smith JP. The long shadow cast by childhood physical and mental problems on adult life. *Proceedings of the National Academy of Sciences*. 2011 Apr 12;108(15):6032–7.
3. Copeland WE, Wolke D, Shanahan L, Costello EJ. Adult Functional Outcomes of Common Childhood Psychiatric Problems: A Prospective, Longitudinal Study. *JAMA Psychiatry*. 2015 Sep 1;72(9):892–9.
4. Philipson A, Alaie I, Ssegonja R, Imberg H, Copeland W, Möller M, et al. Adolescent depression and subsequent earnings across early to middle adulthood: a 25-year longitudinal cohort study. *Epidemiology and Psychiatric Sciences*. 2020 Jan;29:e123.
5. Haula T, Vaalavuo M. Mental health problems in youth and later receipt of social assistance: do parental resources matter? *Journal of Youth Studies*. 2022 Aug 9;25(7):877–96.
6. Mousteri V, Daly M, Delaney L, Tynelius P, Rasmussen F. Adolescent mental health and unemployment over the lifespan: Population evidence from Sweden. *Social Science & Medicine*. 2019 Feb 1;222:305–14.
7. Dalsgaard S, McGrath J, Østergaard SD, Wray NR, Pedersen CB, Mortensen PB, et al. Association of Mental Disorder in Childhood and Adolescence With Subsequent Educational Achievement. *JAMA Psychiatry*. 2020 Aug 1;77(8):797–805.
8. Wickersham A, Sugg HVR, Epstein S, Stewart R, Ford T, Downs J. Systematic Review and Meta-analysis: The Association Between Child and Adolescent Depression and Later Educational Attainment. *Journal of the American Academy of Child & Adolescent Psychiatry*. 2021 Jan 1;60(1):105–18.
9. Gorman E, Bowden N, Kokaua J, McNeill B, Schluter PJ. A national multiple baseline cohort study of mental health conditions in early adolescence and subsequent educational outcomes in New Zealand. *Sci Rep*. 2023 Jul 7;13(1):11025.
10. Nordmo M, Kinge JM, Reme BA, Flatø M, Surén P, Wörn J, et al. The educational burden of disease: a cohort study. *The Lancet Public Health*. 2022 Jun 1;7(6):e549–56.
11. Mikkonen J, Moustgaard H, Remes H, Martikainen P. The Population Impact of Childhood Health Conditions on Dropout from Upper-Secondary Education. *The Journal of Pediatrics*. 2018 May 1;196:283-290.e4.

12. Birkeland MB, Vogt KC. Youth Debt in a Life-Course Context: Young People's Ways into and out of Debt in Norway. *Nordisk välfärdsvetenskap | Nordic Welfare Research*. 2024 Jul;9(3):238–51.
13. Richardson T, Elliott P, Roberts R. The relationship between personal unsecured debt and mental and physical health: A systematic review and meta-analysis. *Clinical Psychology Review*. 2013 Dec 1;33(8):1148–62.
14. Rojas Y. Status of Debtor Registration at an Enforcement Authority and Risk of Nonfatal Suicide Attempt. *Crisis*. 2023 May;44(3):209–15.
15. Richardson T, Elliott P, Roberts R, Jansen M. A Longitudinal Study of Financial Difficulties and Mental Health in a National Sample of British Undergraduate Students. *Community Ment Health J*. 2017 Apr 1;53(3):344–52.
16. Hiilamo A, Keski-Säntti M, Pirkola S, Lallukka T, Kääriälä A. Psychiatric and neurodevelopmental diagnoses in adolescence and adulthood over-indebtedness among Finns born in 1987. *European Journal of Public Health*. 2022 Dec 1;32(6):858–63.
17. Bakkeli NZ, Drange I. Relationship between payment problems and health: A nation-wide register study in Norway. *Sociology of Health & Illness* [Internet]. 2024 [cited 2024 Apr 18];n/a(n/a). Available from: <https://onlinelibrary.wiley.com/doi/abs/10.1111/1467-9566.13755>
18. Mikkonen J, Remes H, Moustgaard H, Martikainen P. Evaluating the Role of Parental Education and Adolescent Health Problems in Educational Attainment. *Demography*. 2020 Dec;57(6):2245–67.
19. EU-SILC. EU statistics on income and living conditions (EU-SILC) methodology - economic strain [Internet]. 2024 [cited 2024 Jul 5]. Available from: [https://ec.europa.eu/eurostat/statistics-explained/index.php?title=EU\\_statistics\\_on\\_income\\_and\\_living\\_conditions\\_\(EU-SILC\)\\_methodology\\_-\\_economic\\_strain](https://ec.europa.eu/eurostat/statistics-explained/index.php?title=EU_statistics_on_income_and_living_conditions_(EU-SILC)_methodology_-_economic_strain)
20. Ministry of Children E and SI. Government.no. regjeringen.no; 2021 [cited 2024 Jul 4]. Debt settlement. Available from: <https://www.regjeringen.no/en/topics/consumers/debt-settlement/id670299/>
21. Kempson E, Poppe C. The low self-efficacy trap: why people with vulnerabilities experience prolonged periods with payment problems. *Front Behav Econ* [Internet]. 2024 Apr 26 [cited 2024 Jul 1];3. Available from: <https://www.frontiersin.org/journals/behavioral-economics/articles/10.3389/frbhe.2024.1368877/full>
22. Poppe C, Lavik R, Borgeraas E. The dangers of borrowing in the age of financialization. *Acta Sociologica*. 2016 Feb 1;59(1):19–33.
23. Cummings P. Estimating Adjusted Risk Ratios for Matched and Unmatched Data: An Update. *The Stata Journal*. 2011 Jul 1;11(2):290–8.

24. Miettinen OS. Proportion of disease caused or prevented by a given exposure, trait or intervention. *Am J Epidemiol*. 1974 May;99(5):325–32.
25. Athey S, Tibshirani J, Wager S. Generalized Random Forests. *The Annals of Statistics*. 2019;47(2):1148–78.
26. Jensen MR, Hermansen Å. Adolescence Mental Health Disorders and Precarious School-to- Work Trajectories: The Role of Family Background and Gender. *YOUNG*. 2023 Sep 1;31(4):315–38.
27. Angel S. The Effect of Over-Indebtedness on Health: Comparative Analyses for Europe. *Kyklos*. 2016;69(2):208–27.
28. Jensen MR, van der Wel KA, Bråthen M. Adolescent Mental Health Disorders and Upper Secondary School Completion – The Role of Family Resources. *Scandinavian Journal of Educational Research*. 2023 Jan 2;67(1):83–96.
29. Bernardi F. Compensatory Advantage as a Mechanism of Educational Inequality: A Regression Discontinuity Based on Month of Birth. *Sociol Educ*. 2014 Apr 1;87(2):74–88.
30. Tufte PA. Økonomisk rådgivningskompetanse i Nav – en nøkkeltjeneste i spenn mellom skjønnsutøvelse og tillit. In: *Penger til besvær - Privatøkonomiske utfordringer og økonomisk rådgivning i kredittsamfunnet*. Oslo: Universitetsforlaget; 2022. p. 188–206.
31. Lusardi A. Financial Literacy Skills for the 21st Century: Evidence from PISA. *Journal of Consumer Affairs*. 2015;49(3):639–59.

Table 1. Characteristics of the study population by psychiatric diagnosis.

	All (n)	All (col %)	No F diagnoses (col %)	Any F diagnoses (col %)
observations	173750	173750	150069	23681
Male	89734	51.6	52.1	48.7
Women	84016	48.4	47.9	51.3
Birth year 1995	57930	33.3	33.6	31.8
Birth year 1996	58492	33.7	33.7	33.4
Birth year 1997	57328	33	32.7	34.7
Father: No education and pre-school education (NUS 1)	2940	1.7	1.6	2.6
Father: Primary education (NUS 2)	523	.3	.3	.3
Father: Lower secondary education (NUS 3)	34279	19.7	18.6	26.9
Father: Upper secondary, basic (NUS 4)	14879	8.6	8.4	9.4
Father: Upper secondary, final year (NUS 5)	60693	34.9	35.2	33.1
Father: Post-secondary not higher education (NUS 6)	9373	5.4	5.5	5
Father: First stage of higher education, undergraduate level (NUS 7)	34790	20	20.6	16.1
Father: First stage of higher education, graduate level (NUS 8)	14478	8.3	8.7	6.1
Father: Second stage of higher education (postgraduate education) (NUS 9)	1795	1	1.1	.7
Mother: No education and pre-school education (NUS 1)	1124	.6	.7	.6
Mother: Primary education (NUS 2)	759	.4	.5	.2
Mother: Lower secondary education (NUS 3)	33937	19.5	18.4	27
Mother: Upper secondary, basic (NUS 4)	16888	9.7	9.6	10.2
Mother: Upper secondary, final year (NUS 5)	50961	29.3	29.4	28.7
Mother: Post-secondary not higher education (NUS 6)	4613	2.7	2.7	2.5
Mother: First stage of higher education, undergraduate level (NUS 7)	55324	31.8	32.7	26.3
Mother: First stage of higher education, graduate level (NUS 8)	9305	5.4	5.6	4.1

Mother: Second stage of higher education (postgraduate education) (NUS 9)	839	.5	.5	.3
Father employed	152573	87.8	88.9	81
Mother employed	146176	84.1	85.5	75.6
Single adult hh	41521	23.9	21.9	36.6
Social assistance	6417	3.7	3.2	7
Father age	.	31.8	31.9	31.3
Mother age	.	29	29.1	28.3
Hh income	.	29.7	30.1	27.5
Area income	.	29.8	29.8	29.7
Area unemployment	.	1.6	1.6	1.6
Area low education	.	24.5	24.5	24.7
Outcome: payment problems	9767	5.6	4.8	10.9



Table 2. Adjusted associations between psychiatric diagnoses at ages 13+17 and payment problems at age of 23. Population attributable Fraction (PAF) calculated with Miettinen formula. Risk differences and risk ratios are derived from adjusted logistic regression models. Parental and area confounders are adjusted for.

	Adjusted risk difference	Adjusted risk ratio	Population attributable fraction
Any psychiatric diagnosis (F)	.035 (.032 - .039)	1.7 (1.6 - 1.8)	11
Behavioral F9	.046 (.041 - .051)	1.9 (1.8 - 2)	8
Neurotic F4	.025 (.02 - .031)	1.5 (1.4 - 1.6)	3
Mood F3	.022 (.015 - .029)	1.4 (1.3 - 1.5)	1
Substance abuse F1	.093 (.076 - .109)	2.7 (2.4 - 3)	2

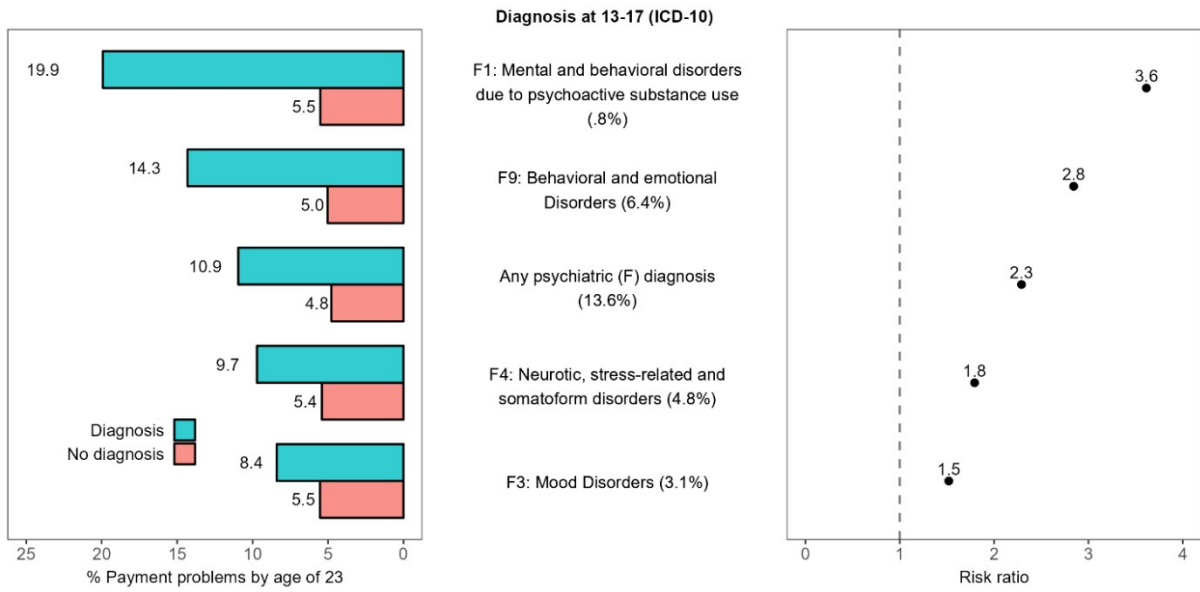


Figure 1. Prevalence of payment problems by adolescent psychiatric disorders at ages 13-17.

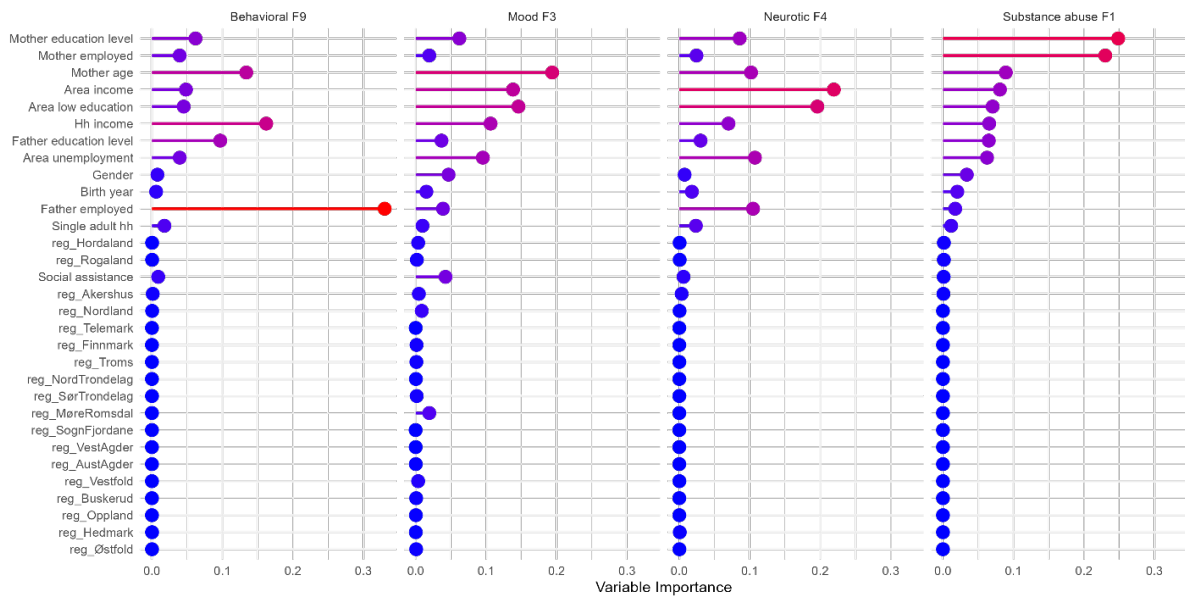


Figure 2. The most important moderators for the association between psychiatric diagnoses and payment problems according to variable importance metric from Causal Forest models. Higher value indicates that variable was used more often to split the data to maximize treatment effect differences.

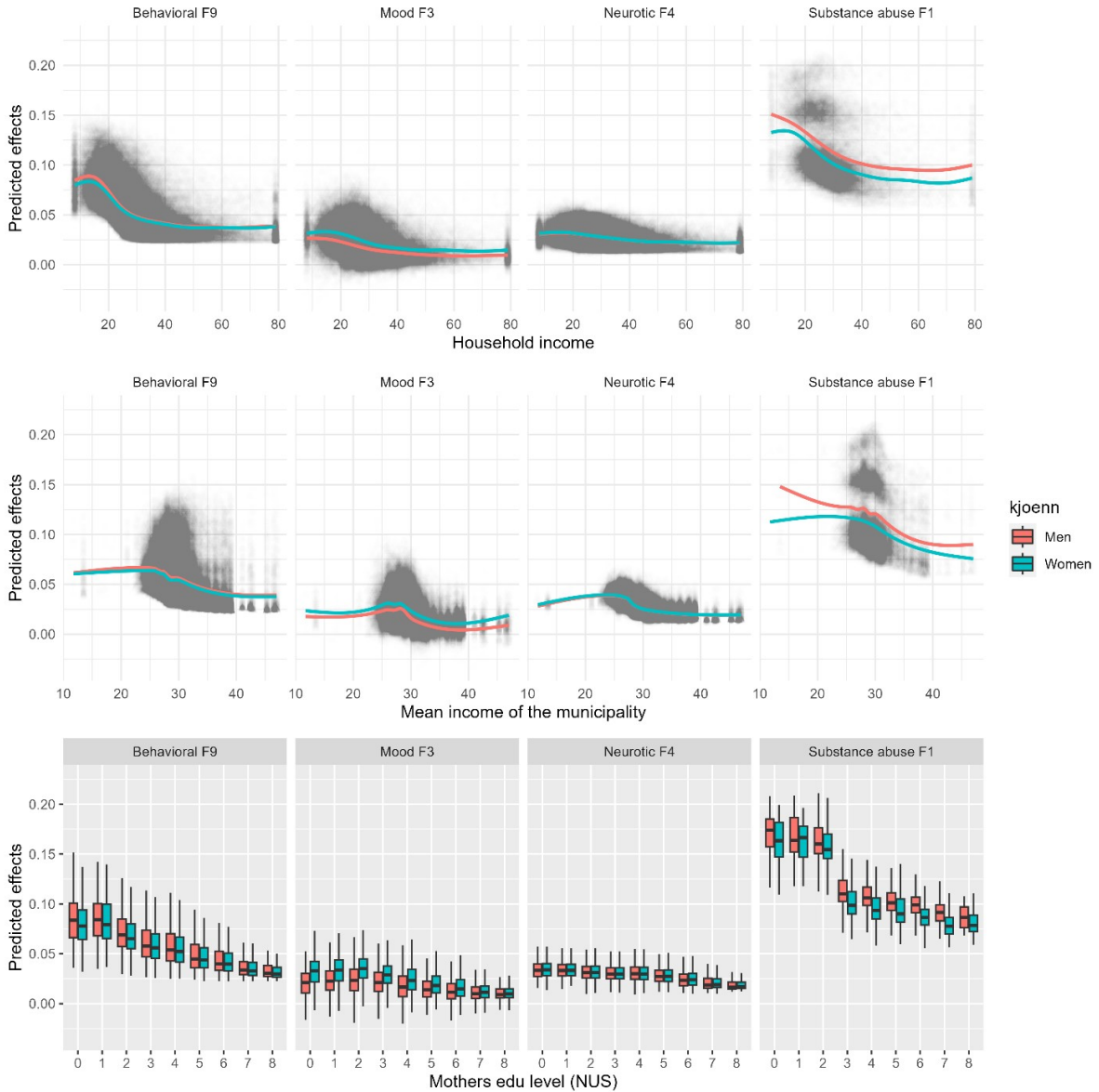
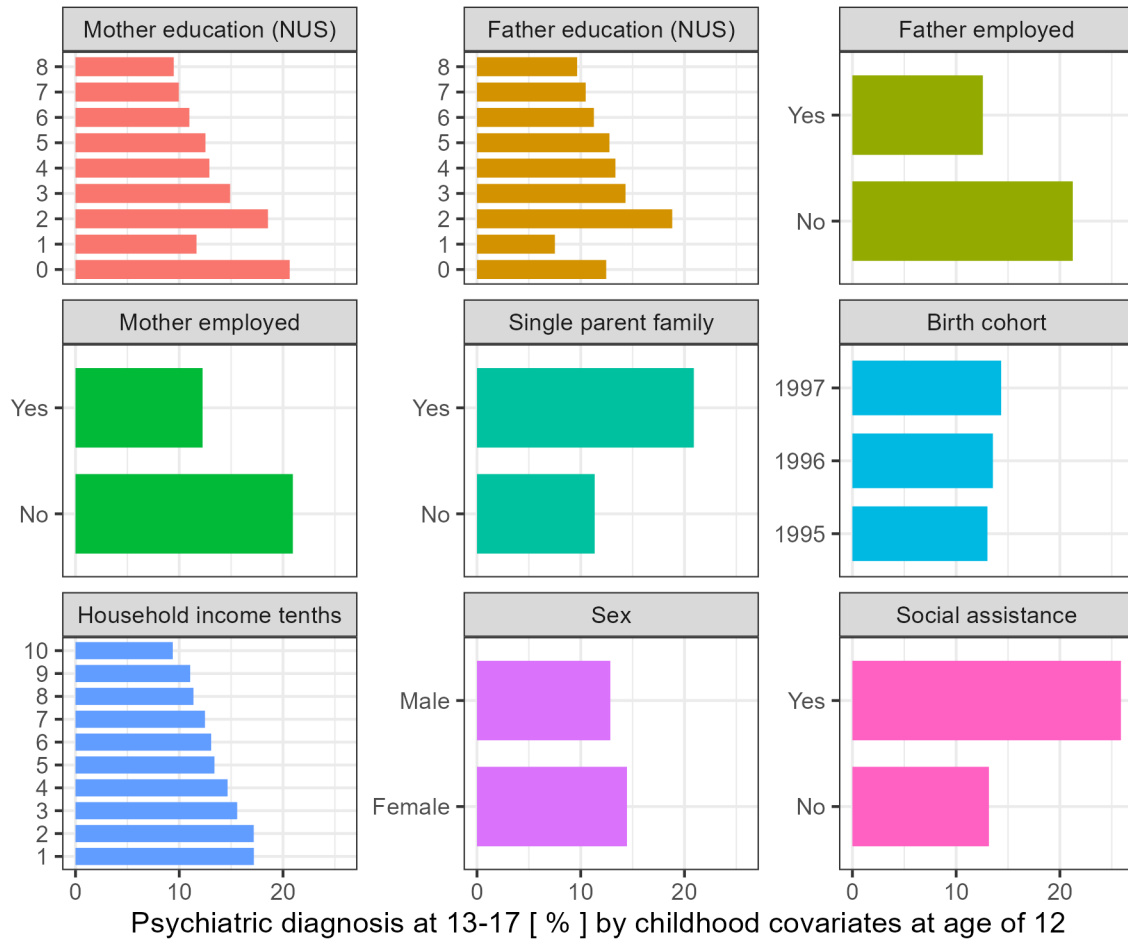
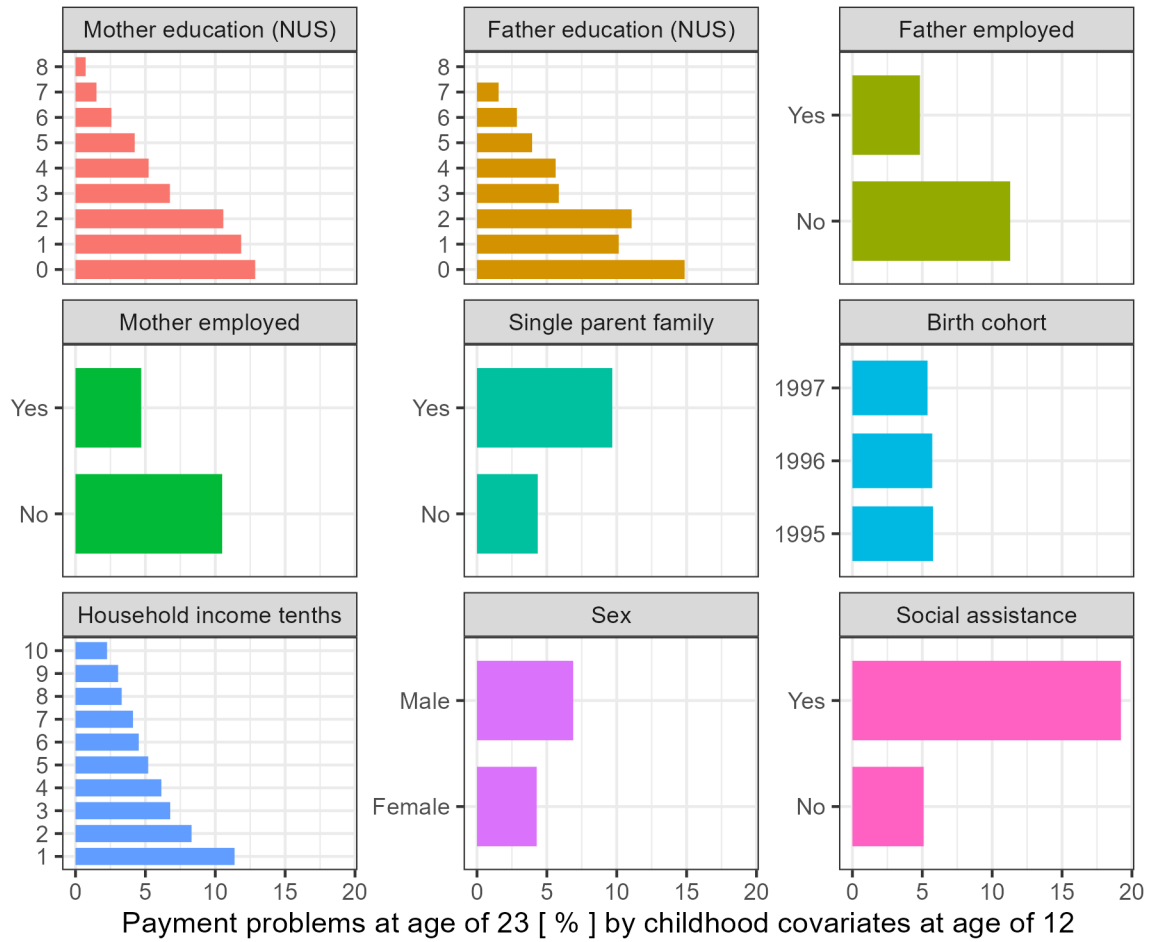


Figure 3. The distribution of the predicted conditional treatment effects (CATEs) and key moderators. CATEs are from the Causal Forest models, estimated separately for each outcome. The Figure shows also fitted LOWESS line for the predicted effects. Randomness has been added to x-axis variables to improve the readability.



Supplementary Figure 1. Prevalence of any psychiatric diagnoses at ages 13-17 by covariates at age of 12.



Supplementary figure 2. The prevalence of payment problems at age of 23 by childhood covariates at age of 12.

