Mental disorders and long-term labour market outcomes: nationwide cohort study of 2 055 720 individuals

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Objective: To examine the associations between an onset of serious mental disorders before the age of 25 with subsequent employment, income, and education outcomes.

Methods: Nationwide cohort study including individuals (n=2 055 720) living in Finland between 1963 and 1990, who were alive at the end of the year they turned 25. Mental disorder diagnosis between ages 15 and 25 was used as the exposure. The level of education, employment status, annual wage or self-employment earnings, and annual total income between ages 25 and 52 (measurement years 1988-2015) were used as the outcomes.

Results: All serious mental disorders were associated with increased risk of not being employed and not having any secondary or higher education between ages 25 and 52. The earnings for individuals with serious mental disorders were considerably low, and the annual median total income remained rather stable between ages 25 and 52 for most of the mental disorder groups.

Conclusions: Serious mental disorders are associated with low employment rates and poor educational outcomes, leading to a substantial loss of total earnings over the life course.

Keywords: mental disorders; income; education; employment

Significant Outcomes

- Serious mental disorders are associated with higher rates of not being employed and not having any secondary or higher education.
- Annual median earnings for the population without serious mental disorders increased from 15 000 € to 30 000€ between ages 25 and 52. On the contrary, annual median earnings were under 6000 € for most of the serious mental disorder groups.
- The median total income varied between 8000 € to 15 000 € for most serious mental disorder groups, indicating that income transfers compensate partly labour market losses due to serious mental disorders.

Limitations

- Only individuals who were treated in Finnish hospitals were examined in the current study and the severity of mental disorders was not measured. Individuals who did not seek treatment or who received treatment in primary care or in outpatient clinics were included in the comparison population.
- The findings are not applicable to individuals with less severe mental disorders.

Mental disorders are a leading cause of global disease burden. They lead to a loss of billions of dollars annually.[1] From the specific mental disorders, substance abuse, psychotic, depressive and anxiety disorders are among the largest contributors to loss of disability adjusted life-years.[2] The global cost of mental disorders is enormous—economic evaluations have indicated that the costs were approximately 2.5 trillion US dollars in 2010 and they are projected to increase to around 6 trillion US dollars in 2030.[3] Whereas direct costs—which refer to the costs associated with diagnosis and treatment—are considerable, indirect costs—referring to the "invisible" costs such as unemployment and income losses—are typically the largest components of the total economic burden caused by mental disorders.[3–7] For example, from the indirect costs associated with schizophrenia, unemployment amounted to around third of the total costs.[7,8]

Cross-sectional and longitudinal studies have shown that substance abuse disorders, schizophrenia and other psychosis, depression, and anxiety are each significantly associated with higher unemployment and lower income over time.[9–20] It also seems that these associations are stronger for serious mental disorders.[21,22] However, considerable variation in employment rates between different mental disorders has been reported. Whereas 10% to 20% of individuals with schizophrenia have been reported to be employed [23,24], the numbers have been around 60% among individuals with bipolar disorder [25] or a major depressive disorder.[4] In addition, studies that have examined the association between mental disorders with educational attainment have produced partially mixed findings. Whereas cross-sectional and longitudinal survey studies have found that most mental disorders are associated with poor educational attainment[26,27], a recent register-based study from the Netherlands founded that schizophrenia, but not depression or bipolar disorder, were associated with lower likelihood of obtaining secondary or higher education.[28] Taken together, it seems that mental disorders can lead to irregular work careers and permanently low income, thus increasing the total economic burden of mental disorders.[29,30]

However, large scale studies on the topic are still limited and, most studies have focused on the role of socioeconomic factors in developing mental disorders.[31–33] Moreover, most studies have not examined whether serious mental disorders lead to a permanently poor socioeconomic position and to what extent. This issue is of high policy importance as most mental disorders emerge before the age of 25,[34,35] increasing substantially the risk of poor economic outcomes over life course. Furthermore, most previous studies have mainly compared schizophrenia with mood disorders,[16,28] leaving out substance abuse and anxiety disorders.

Aims of the Study

We examined in a comprehensive national cohort study the association between serious mental disorders with subsequent employment, earnings, total income, and educational outcomes from a work life course perspective. To accomplish this, we combined national register-based information on mental disorders with comprehensive administrative register data on long-term labour market outcomes.

Methods

Study population

Our study population included the total working-age resident population living in Finland between 1988 and 2015, who were alive at the end of the year they turned 25. The individuals included in the current study were born between 1963 and 1990. The data were compiled through linking several registries: Finnish Longitudinal Employer-Employee Data (FLEED), the Hospital Discharge Register (HDR) of National Institute for Health and Welfare, and the Causes of Death Statistics of Statistics Finland. Individual-level register linkages were conducted using personal identity numbers, which have been assigned to all Finnish residents starting from the year 1969.

FLEED is an annual panel data recording the entire Finnish working age population. It is constructed from administrative registers of individuals including information on individuals' labour market status, salaries and other sources of income extracted from tax and other administrative registers, such as from government-run pension registers. FLEED also includes information on relevant individual characteristics and contains general demographic information. FLEED is available from 1988 onwards and for the current study we use the data over the period 1988–2015. HDR contains information on all hospital admissions in Finland, both public and private. Causes of Death Statistics include information on all dates and causes of deaths in Finland. Ethical approval for the study was received from the Research Ethics Committee of National Institute for Health and Welfare (decision #10/2016§751). Data were linked with the permissions of National Institute for Health and Welfare and Statistics Finland by the appropriate authorities.

Assessment of serious mental disorders

Mental disorder diagnoses have been recorded in HDR according to the ICD-9 with DSM-III-R criteria from 1986 to 1995 and according to the ICD-10 since 1996. We defined mental disorders using the following ICD-10 codes (and their corresponding ICD-9 codes): alcohol abuse (ICD-10: F10), other substance abuse (ICD-10: F11-19), schizophrenia (ICD-10: F20), other non-affective psychoses (ICD-10: F22-29), bipolar disorders (ICD-10: F30-31), depressive disorders (ICD-10: F32-33 and F34.1), other mood disorders (ICD-10: F38-39, F34.0, F34.8, and F34.9), and anxiety disorders (F40-48). All these mental disorders were labelled as serious mental disorders in the current study context where only inpatient data were available. Both primary and secondary diagnoses were used, and an individual could have more than one diagnosis. For sensitivity analyses, a hierarchy of the diagnoses using the following structure was constructed: schizophrenia, other non-affective psychoses, other substance abuse, alcohol abuse, bipolar disorders, depressive disorders, other mood disorders,

and anxiety disorders. In addition, for those individuals that had information of their biological parents (n=1 740 726), history of parental mental disorders, i.e., information whether either or both of the parents were treated for a mental disorder in a hospital, was obtained from the HDR. Parental mental disorders were defined as no mental disorder *vs* any mental disorder in either or both parents (ICD-10 codes: F10 to F48).

Labour market outcomes

All labour market outcomes were obtained from the FLEED. Annual employment status was measured as the employment status during the last week of each year. Individuals who were working either part-time or full-time in a legal employment contract, or self-employed were defined as employed. All others were classified as not employed. Annual earnings were measured as the average of annual wage and salary earnings and self-employed income for each year. Total income was measured as the total taxable income, which includes in addition to annual wage and salary earnings and self-employment income, income transfers (e.g., sick leave allowance), social security benefits (e.g., parental leave benefits), and capital income (capital gains and dividends). To allow for the comparability of earnings over the years, all income measures were deflated to the base year 2015 using the official consumer price index provided by Statistics Finland. Highest completed secondary or higher education was obtained from the Finnish registry for educational achievement, where it was recorded annually. Individuals who did not have any secondary or higher education and thus had no data in the education registry where categorized as having no secondary or higher education.

Statistical analyses

The associations of serious mental disorders with not being employed and not having any secondary or higher education were examined using analyses where mental disorder diagnoses between ages 15 and 25 (yes/no) was modelled as the exposure and employment or

education status between ages 25 and 52 as the outcomes. For these two outcomes, separate models were estimated for all eight different mental disorders and all ages between 25 and 52. All estimates were adjusted for sex, the year of birth and migrant status where a migrant was defined as anyone born outside of Finland (first generation) or born in Finland but with both parents born outside Finland. Additional analyses were conducted, where the associations were adjusted also for parental history of mental disorders. Instead of reporting odds ratios, a relative risk ratio (RR) was considered to be a more interpretable for the present study as the outcomes had a prevalence of more than 10%.[36] Hence, a modified Poisson regression was used in the analyses.[37,38] Possible sex differences in the associations were examined by including an interaction term between sex and a mental disorder diagnosis in separate analyses.

Median and mean earnings and total income levels for all ages between ages 25 and 52 were calculated for individuals who were diagnosed with a mental disorder between the age of 15 and 25. In a similar way, mean earnings and total income levels for all ages between ages 25 and 52, were also calculated for those individuals who were not diagnosed with any serious mental disorders. In addition, predicted mean earnings and total income were estimated using linear regression models. Mental disorder diagnoses between ages 15 and 25 (yes/no) were modelled as the exposure and earnings and total income between ages 25 and 52 as the outcomes. The separate models in which sex, the year of birth and migrant status were accounted for were estimated for all eight different mental disorders.

Lastly, the association between mental disorders with employment status and education was also examined using a hierarchy where diagnoses were ranked according to alleged severity, i.e., from the most (schizophrenia) to least (anxiety disorders) severe. Stata 15.1 (Stata Corp, College Station, TX) was used in all analyses.

Results

In total, 2 055 720 individuals (48.8% women) were included in the analyses. Descriptive statistics of the sample are shown in **Table 1** and the number of individuals in these diagnostic groups between ages of 25 and 52 are shown in **Appendix Table 1**. Due to very small number of individuals with other substance abuse diagnosis between ages 15 and 25, and complete follow-up data at the age of 52, results for these analyses are not shown.

The percentage of individuals who were not employed and who did not complete any secondary or higher education between ages 25 and 52 are shown **Figure 1**. Overall, the rate of not being in employment was highest among individuals with schizophrenia (range from 89% to 94%). Slightly lower rates were found for individuals diagnosed with other non-affective psychosis (range from 76% to 84%), with alcohol abuse (range from 60% to 70%), with other substance abuse (range from 63% to 82%), and with bipolar disorders (range from 60% to 75%). Among individuals diagnosed for depressive disorders 52% – 73% were not employed and respective rates for other mood disorders were 49% – 62% and anxiety disorders 41% – 59%. Whereas in the comparison population without any of these disorders the rate of not being employed rapidly declined over the follow-up period (i.e., 35% of the individuals were not employed at the age of 25, and 19% of the individuals were not employed at the age of 45), for most mental disorders the rate of not being employed increased over the follow-up period. Exception to this pattern was substance abuse other than alcohol and other mood disorders, where the rate of not being employed also declined over time.

In the comparison population without any mental disorders, 14% to 17% of individuals had not completed some secondary or higher education (**Figure 1**). From the different mental disorder groups, individuals with other substance abuse disorder had the highest rate of not completing any secondary or higher education (range from 45% to 70%). Among individuals with alcohol abuse the rate was between 40% and 52%; with schizophrenia between 43% and 54%; and with other non-affective psychosis between 30%

and 42%. Relatively similar rates were found for mood disorders and anxiety disorders. For all mental disorders, the rate of not having any secondary or higher education declined over the follow-up period.

The relative risks for mental disorder diagnosis between ages 15 and 25 and not being employed are shown **Figure 2**. Overall, schizophrenia was associated with the highest relative risk of not being employed between the ages of 25 and 52. At the age of 25, individuals with schizophrenia had 2.7-fold relative risk of not being employed; at the age of 45 it was over two times higher. A similar trend was also found for other non-affective psychoses. In comparison, alcohol abuse was associated with 2-fold relative risk and other substance abuse with 2.5-fold relative risks of not being employed at the age of 25. At the age of 45, however, these same relative risks were around 1.5 times higher, indicating that the relative risks increased over follow-up. Sex-specific associations indicated that men with alcohol abuse, other substance abuse, schizophrenia and other non-affective psychoses had higher relative risk of not being employed between ages 25 and 40 than women (all p-values <.01) (**Appendix Figure 1; Appendix Tables 2-3**). After that notable differences were not found (all p-values >.01).

All mood disorders and anxiety disorders were also associated with higher relative risks of not being employed between the ages of 25 and 52 (**Figure 2**). These relative risks were slightly higher for bipolar disorders than for depressive disorders, other mood disorders, or anxiety disorders. They also increased up to the age of 40, and then remained rather stable. Sex-specific associations suggested that after the age of 40 the relative risks of not being employed (p-values<.01) were slightly higher for women than for men diagnosed any mood or anxiety disorders (**Appendix Figure 2; Appendix Tables 4-5**).

In additional analyses the history of parental mental disorders was also included as covariate. These results are reported in **Appendix Tables 6**. The risk ratios for different mental disorder diagnoses of not being employed and not having any secondary or higher

education were only slightly diluted when the history of parental mental disorders was also adjusted.

Figure 3 shows the median earnings and total income levels for the individuals with different mental disorders diagnosed between the age of 15 and 25, and for comparison population. Over half of the individuals with alcohol abuse, other substance abuse, schizophrenia, other non-affective psychoses or bipolar disorders did not have any earnings or very little earnings between ages 25 and 52. For these groups, the median total income was under or little over 10 000 € between the ages 25 and 52. Whereas the median earnings for individuals with depressive disorders or other mood disorders were also very small, the median total income slightly increased over time. For the anxiety disorders group, the median earnings and total income increased before the age of 35 and decreased after that. These results are in line with the unadjusted mean earnings and total income shown **Appendix Figure 3**. However, the estimated mean earnings and total income, which are shown in **Appendix Figures 4-7**, suggest that the variation in earnings and total income increases considerably over time**.**

Figure 4 shows the relative risks for not having any secondary or higher education after the age of 25 for different mental disorder categories. At the age of 25, schizophrenia, other non-affective psychoses, alcohol abuse, and other substance abuse were associated between 2.60- to 4.35-fold relative risk of not having completed any secondary or higher education. For other non-affective psychoses, alcohol abuse, and especially for other substance abuse, the relative risks of not having completed any secondary or higher education decreased slightly over follow-up, whereas there was a modest increasing trend among individuals diagnosed with schizophrenia. All mood disorders and anxiety disorders were associated with around 2.5-fold relative risk of not having any secondary or higher education at the age of 25. This relative risk decreased slightly over follow-up among individuals with bipolar disorders. Sex-specific associations showed that the relative risk of not having any

secondary or higher education were slightly higher for most of the mental disorders among women (all p-values <.01) **(Appendix Figures 8-9; Appendix Tables 7-10**). The additional analyses, where the history of parental mental disorders was also included as covariate, suggested that the associations were minimally attenuated when the history of parental mental disorders was taken into account (**Appendix Tables 11)**.

Sensitivity analyses

The risk ratios for mental disorder diagnosis between ages 15 and 25 with not being employed and not having any secondary or higher education after the age of 25 using a hierarchy of mental disorder diagnoses are shown in **Appendix Figures 10** and **11**, respectively. Compared to the previously reported associations (**Figure 2**), the risk ratios for not being employed were slightly higher for schizophrenia and somewhat diluted for all other mental disorders. Similarly, the risk ratios for not having any secondary or higher education were slightly higher for schizophrenia and slightly lower or very similar for all other mental disorders.

Discussion

The present study examined the associations between serious mental disorders and subsequent employment, earnings, total income and educational outcomes from a work career perspective. We used comprehensive national register data from Finland. Our main finding was that all serious mental disorders were associated with higher rates of not being employed and not having any secondary or higher education, and thus leading to a substantial loss of total earnings and income.

In our analyses, especially schizophrenia, but also the other non-affective psychoses, alcohol abuse, other substance abuse and bipolar disorders were also associated

with considerably higher risk of not being employed and a significant loss of total earnings. Lastly, individuals with mood disorders earned less than half of the earnings the individuals without mental disorders. Our income related estimates, however, are conservative since individuals with mental disorders who were not hospitalized between ages 15 to 25 and whose disorder started after age 25 were included in the comparison group, thus lowering the estimates for the labour market losses associated with mental disorders. Moreover, the total income was considerable higher for all mental disorder groups – and especially in schizophrenia – compared to earned income, indicating that income transfers increased considerably the total income of individuals with mental disorders. Lastly, variation in the predicted income increased over time, indicating that some individuals do better than others.

It is well established that indirect costs, such as non-employment, constitute a large part of the total economic burden caused by mental disorders.[3–7] Most previous studies have also shown that most disorders are associated with lower rates of employment and low income,[9–20] but not necessarily with low education.[28] To our knowledge, the current study is one of the largest to examine the associations of serious mental disorders with subsequent economic outcomes and the first one to compare the associations between different mental disorders that is critical for policy decisions to allocate the health care resources to the treatment of these conditions. In addition to showing the associations between mental disorders with lower rates of employment, earnings, total income, and education, the results showed that the effect sizes of these associations — except for individuals diagnosed with drug related substance abuse disorder — increased over time, indicating that for individuals diagnosed with a serious mental disorder before the age of 25 the economic prospects are worse over the long run. Although this might not lower their quality of life, pensions in Finland and in other Nordic countries are tightly linked to earnings before the official retirement age, thus persons with mental disorders will suffer from a low income also after retiring. Moreover, although Finland has a universal health care and welfare system in which

coverage is intended to provide economic security during unemployment and to compensate the income losses during periods of illness, it is not known how well these policies help individuals to obtain work after an onset of mental disorders. Although our study did not address specific policies, our findings could be used to project how well policies in different countries for individuals with mental disorders work.

Plausible mechanisms

There are several plausible explanations for the differences we found between mental disorders. Individuals who have early and frequent episodes of acute mental health problems are likely to need more time off from work or studies, which in turn is likely to result in their exit from the labour market and widen the income differential. Individuals with serious mental disorders, such as schizophrenia and bipolar disorders, have difficulties in mental operations that facilitate social interactions,[39] including emotion recognition and expression. These difficulties are likely to lead to problems in workplaces where expressing and responding to emotions is required. In addition, individuals with mental disorders are subject to stigmatization, studies showing that individuals with serious mental disorders experience discrimination in multiple domains of life.[40] Whereas stigmatization has been shown to lead to delayed access to care,[41,42] it could also lead to the loss of a job and difficulties in finding or even applying for a new one. Mental disorders have also been shown to reduce work performance,[43] which may substantially reduce earnings in the long run, especially at workplaces where earnings are based on performance evaluations and ratings at work. Whereas cognitive deficits are a central feature of psychotic disorders and especially schizophrenia,[44] they are less present—with the exception of chronic forms—in other mental disorders such as depression.[45] Although good general cognitive capacity has been associated with higher earnings and better career prospects,[46,47] these effects are rather modest, and there are also many jobs in which high cognitive capacity is not required, and thus individuals with

difficulties in cognitive performance can be employed to these jobs. Overall, schizophrenia has been considered more chronic and more disabling than many other disorders. The present results support this conclusion. Last, it must be noted that the association between mental disorders with employment and education is reciprocal and, likely, quite complex as unemployment and low education have been consistently associated with increased risk of mental disorders.[31–33]

Strengths and limitations

The use of register data has obvious strengths. All legal employment contracts in Finland are recorded in the data. Although we measured employment status only during the last week of each year, the annual earnings measure that we use covers all earnings and total income during each year, even from the shortest part-time and temporary contracts. This register-based information, linked to HDR, enabled us to examine the long-term association of serious mental disorders with employment and educational outcomes using nationally representative data.

This study has some important limitations. First, we used register data that were not originally designed for research purposes. Although the diagnostic validity of schizophrenia[48] and bipolar disorder I[49] diagnoses in the Finnish register data have been reported to be good, we did not have diagnostic validity information for other mental disorders. Second, we did not have data on the severity of mental disorders. As our data contained only individuals who were diagnosed with mental disorders in Finnish hospitals, individuals with more severe symptoms were included in the data. Individuals who did not seek treatment or who received treatment in primary care, in outpatient clinics or in voluntary/community sector were not included. Moreover, individuals from a high-income background could be more likely to use private care services, which are also available in Finland to a limited extent. Due to these reasons, current findings describe the labour market

outcomes for those individuals who have been ill-enough to have been hospitalized for mental disorders during their young adulthood. Thus, present results may not be applicable to individuals with less severe or well-managed serious mental disorders. Third, selective survival bias, i.e., selective attrition where individuals with more severe symptoms[50,51] and from worse socioeconomic backgrounds are more likely to die, could explain part of the findings. Fourth, due to differences in welfare and health care policies between countries, generalization of the current study results outside the Finnish setting might be limited.

Conclusions

The results of the present study using administrative register data from Finland suggest that individuals who have been hospitalized with substance abuse, psychosis, and mood or anxiety related mental disorders have an increased risk of not being employed and not having any secondary or higher education over the work-life course. As a consequence of this, serious mental disorders lead to substantial losses of earnings and total income.

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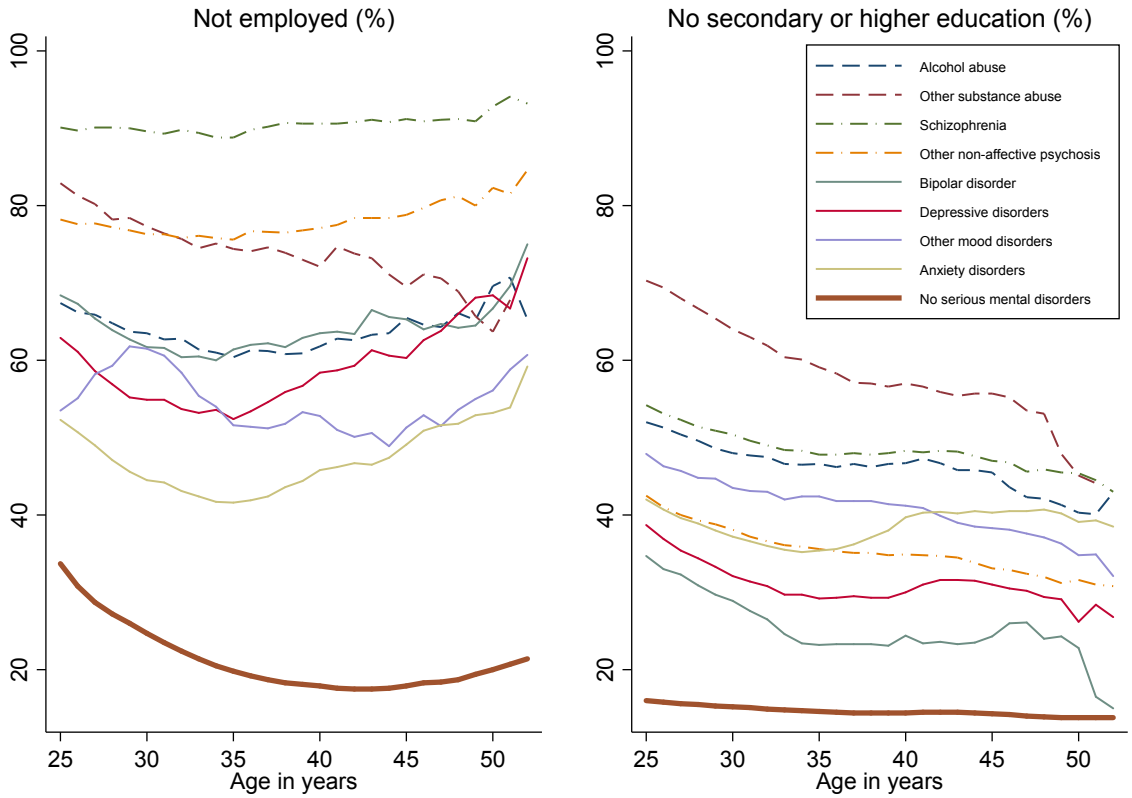


Figure 1. Percentage of individuals who were not employed or did not have secondary or higher education between ages 25 to 52 by mental disorder categories

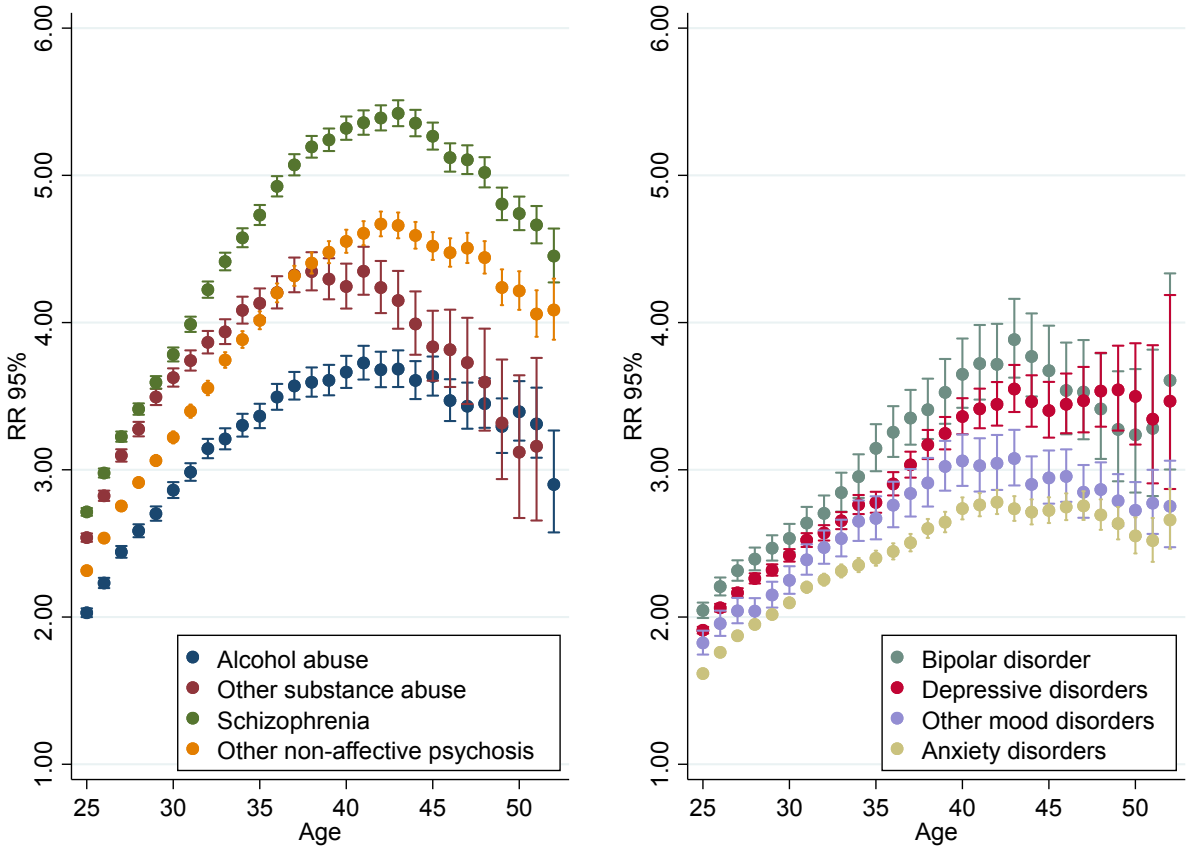


Figure 2. Associations of mental disorder diagnosis between ages 15 and 25 with not being employed over the work life course

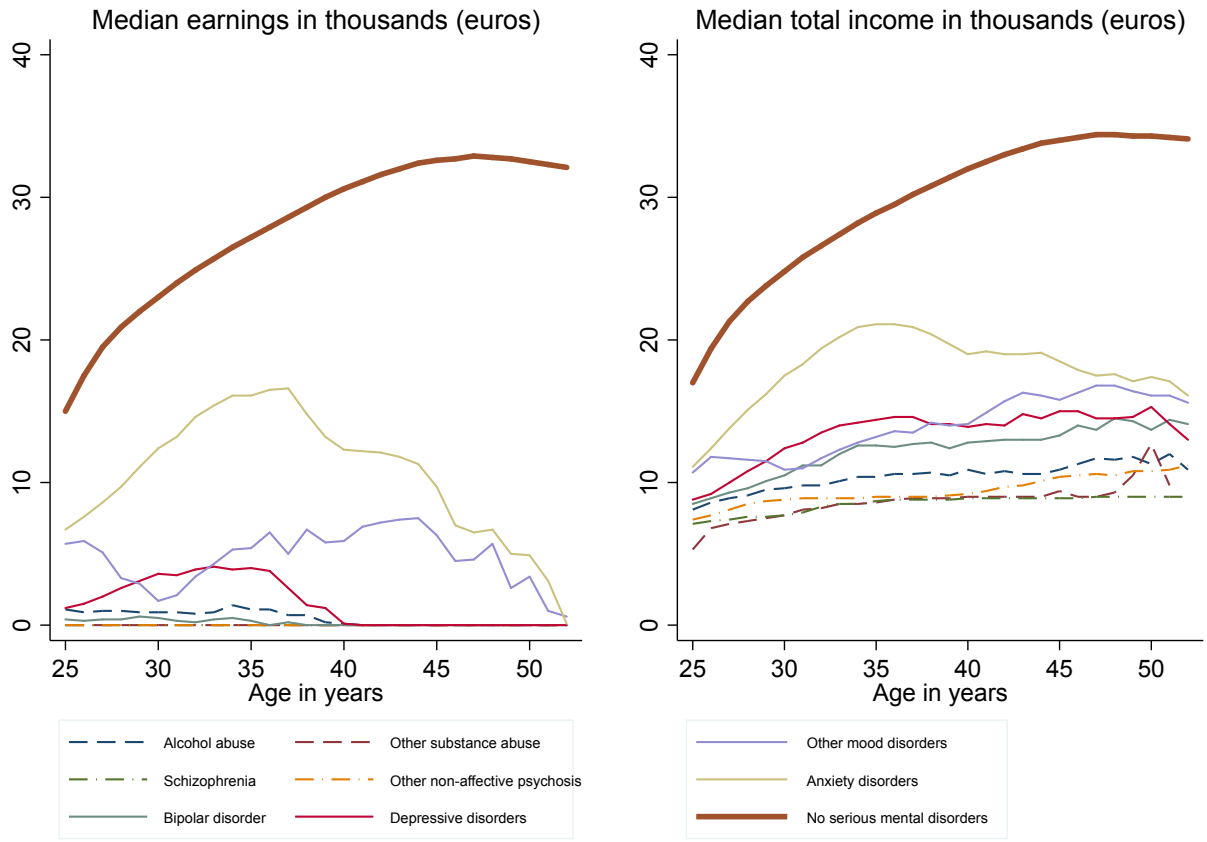


Figure 3. Median earnings and total income between the age of 25 and 52 for individuals with a mental disorder diagnosis between the ages of 15 and 25

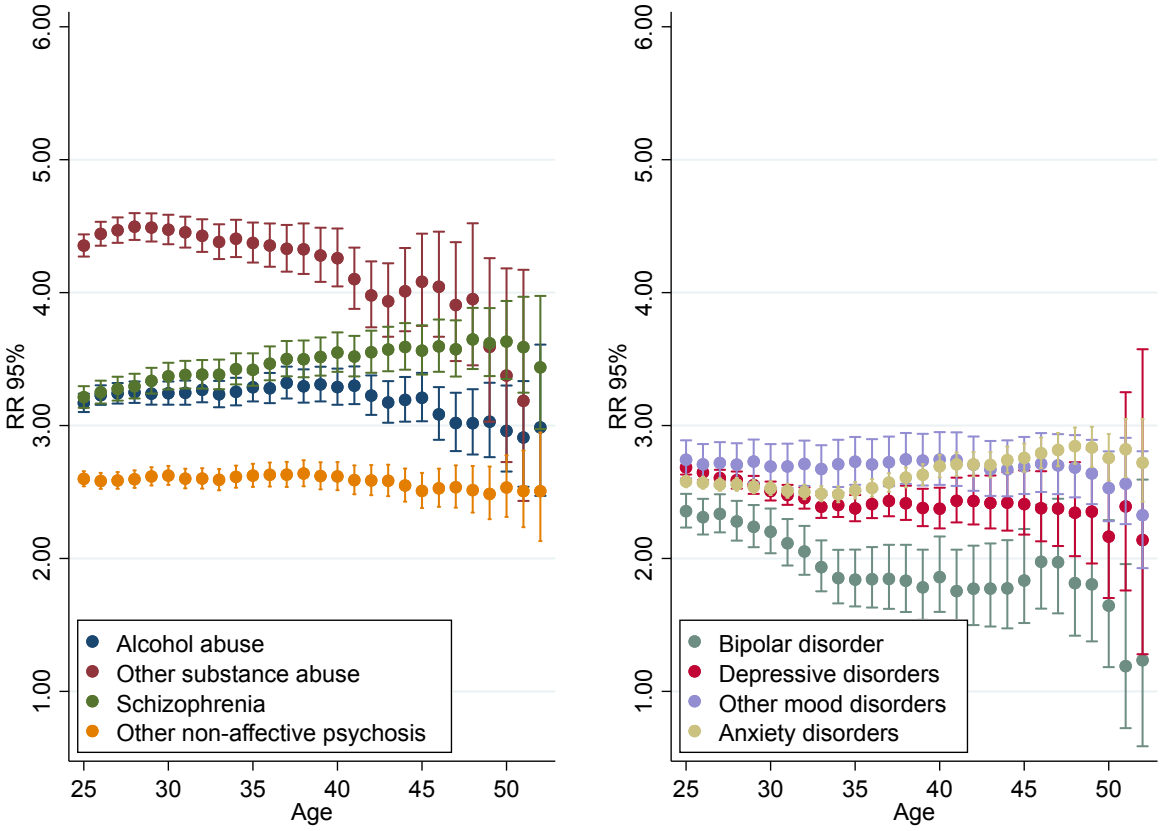


Figure 4. Associations of mental disorder diagnosis between ages 15 and 25 with no secondary or higher education between ages 25 and 52

Table 1. Descriptive statistics of the study population (n=2 055 720)

	N (% of the total number of individuals[1])	% women	% migrant	% with parental MD[2]	Mean age when diagnosed (sd)
Alcohol use disorder	9 057 (0.44%)	29.8%	2.9%	32.3%	20.9 (3.0)
Other substance abuse disorders	7 432 (0.36%)	31.2%	5.1%	32.4%	21.4 (2.5)
Schizophrenia	6 314 (0.31%)	35.9%	4.1%	28.5%	21.4 (2.6)
Other non-affective psychoses	12 604 (0.61%)	42.4%	4.5%	26.6%	21.0 (2.8)
Bipolar disorders	2 873 (0.14%)	60.8%	4.0%	29.3%	21.7 (2.6)
Depressive disorders	17 055 (0.83%)	58.0%	4.4%	26.9%	20.5 (2.9)
Other mood disorders	1 666 (0.08%)	36.6%	1.9%	24.3%	19.8 (2.2)
Anxiety disorders	21 232 (1.03%)	27.3%	3.6%	22.5%	20.3 (2.3)
No serious mental disorder	1 994 671 (97.03%)	49.1%	12.7%	12.0%	..

[1]Individual could have more than one diagnosis and thus the total percentage is higher than 100
[2]Total number of individuals with information of both biological parents is 1 740 726

ONLINE SUPPLEMENT APPENDIX

Appendix Figure 1. Sex-specific associations between alcohol abuse, other substance abuse, schizophrenia, and other non-affective psychosis with not being employed over the work life course

Appendix Figure 2. Sex-specific associations between bipolar disorders, depressive disorders, other mood disorders, and anxiety disorders with not being employed over the work life course

Appendix Figure 3. Mean earnings and total income between the age of 25 and 52 for individuals with a mental disorder diagnosis between the ages of 15 and 25

Appendix Figure 4. Predicted total earnings for individuals with alcohol abuse, other substance abuse, schizophrenia, and other non-affective psychosis over the work life course

Appendix Figure 5. Predicted total earnings for individuals with bipolar disorders, depressive disorders, other mood disorders, and anxiety disorders over the work life course

Appendix Figure 6. Predicted total income for individuals with alcohol abuse, other substance abuse, schizophrenia, and other non-affective psychosis over the work life course

Appendix Figure 7. Predicted total income for individuals with bipolar disorders, depressive disorders, other mood disorders, and anxiety disorders over the work life course

Appendix Figure 8. Sex-specific associations between alcohol abuse, other substance abuse, schizophrenia, and other non-affective psychosis with not having completed any secondary or higher education over the work life course

Appendix Figure 9. Sex-specific associations between bipolar disorders, depressive disorders, other mood disorders, and anxiety disorders with not having completed any secondary or higher education over the work life course

Appendix Figure 10. Associations of mental disorder diagnosis (hierarchical model) between ages 15 and 25 with not being employed between ages 25 and 52

Appendix Figure 11. Associations of mental disorder diagnosis (hierarchical model) between ages 15 and 25 with no secondary or higher education between ages 25 and 52

Appendix Table 1. Number of individuals in the study population

Appendix Table 2. Sex-specific associations between alcohol abuse and other substance abuse with not being employed over the work life course.

Appendix Table 3. Sex-specific associations between schizophrenia and other non-affective psychosis with not being employed over the work life course

Appendix Table 4. Sex-specific associations between bipolar disorders and depressive disorders with not being employed over the work life course

Appendix Table 5. Sex-specific associations between other mood disorders and anxiety disorders with not being employed over the work life course

Appendix Table 6. The associations between mental disorders with not being employed at the age of 25, 30, 40, and 50

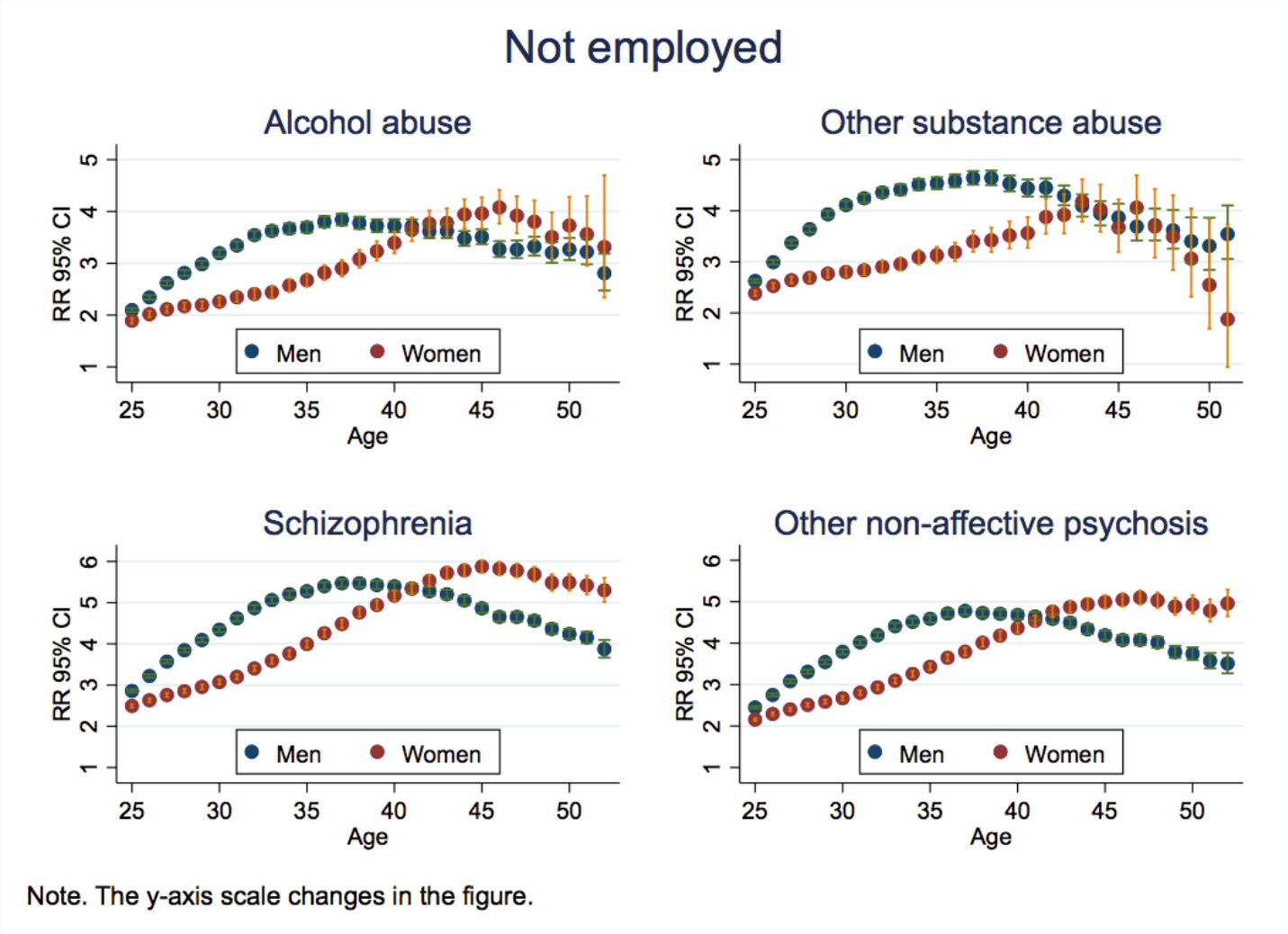
Appendix Table 7. Sex-specific associations between alcohol abuse and other substance abuse with not having any secondary or higher education over the work life course.

Appendix Table 8. Sex-specific associations between schizophrenia and other non-affective psychosis with not having any secondary or higher education over the work life course

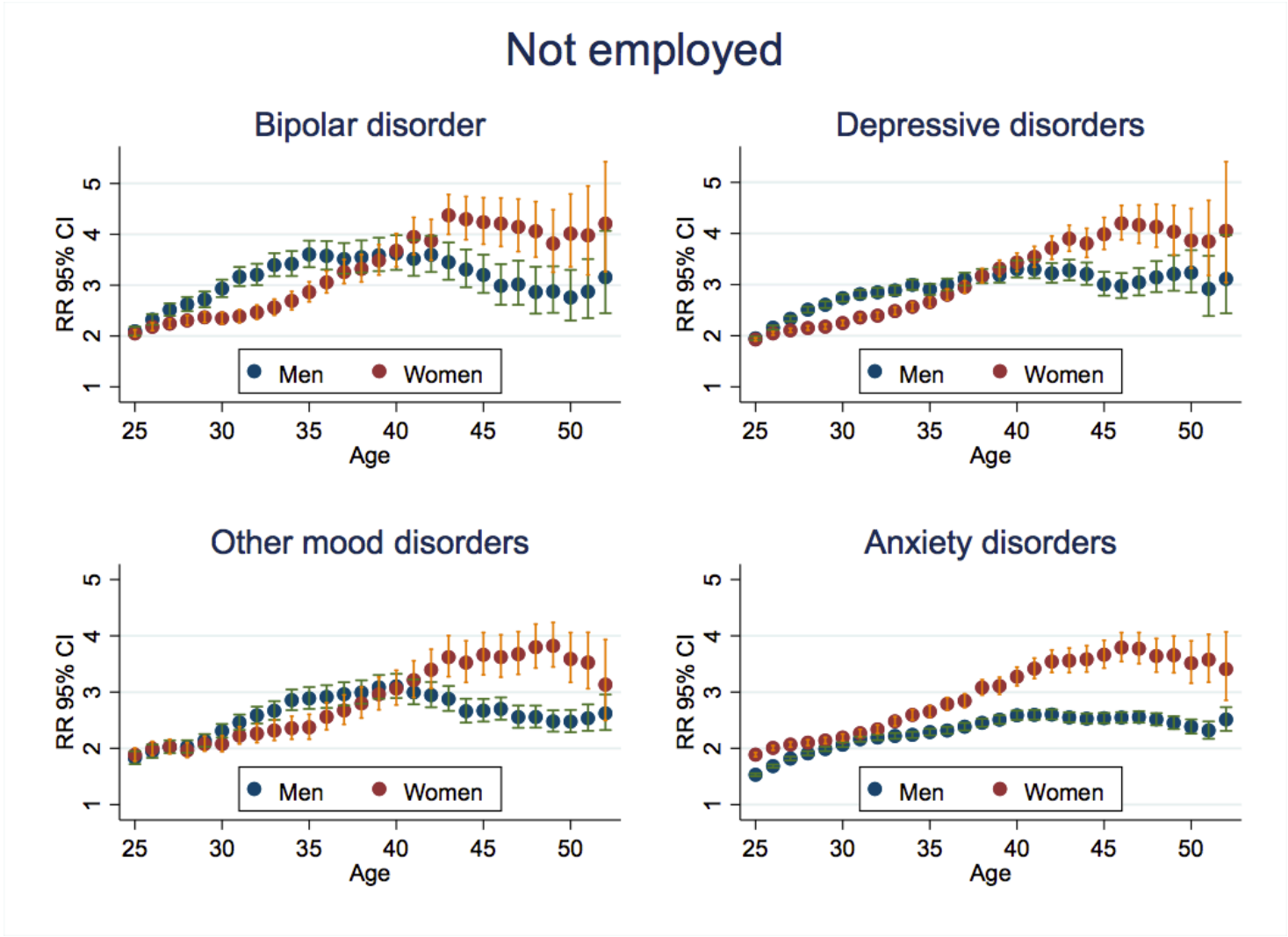
Appendix Table 9. Sex-specific associations between bipolar disorders and depressive disorders with not having any secondary or higher education over the work life course

Appendix Table 10. Sex-specific associations between other mood disorders and anxiety disorders with not having any secondary or higher education over the work life course

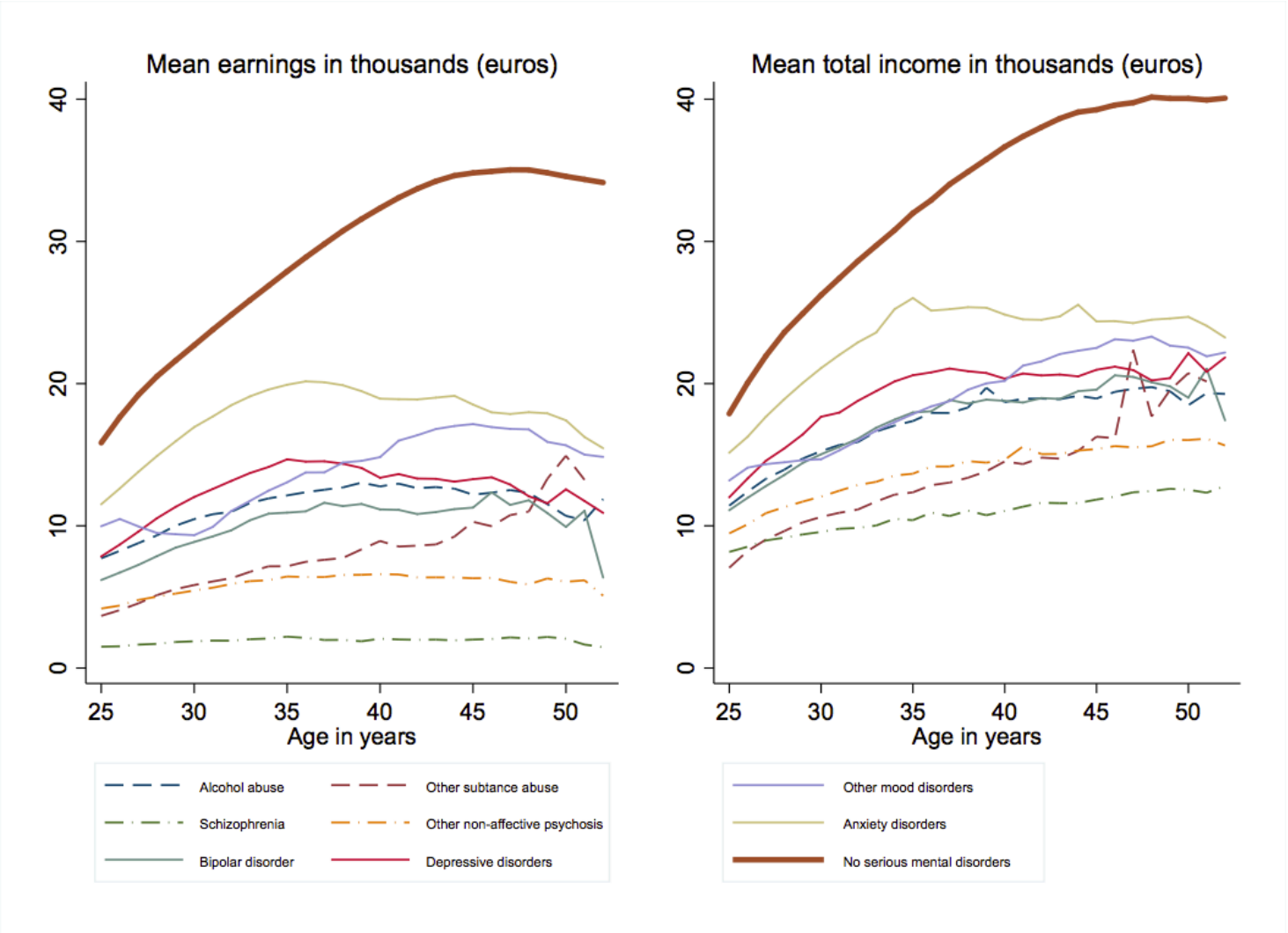
Appendix Table 11. The associations between mental disorders with no higher or secondary education at the age of 25, 30, 40, and 50



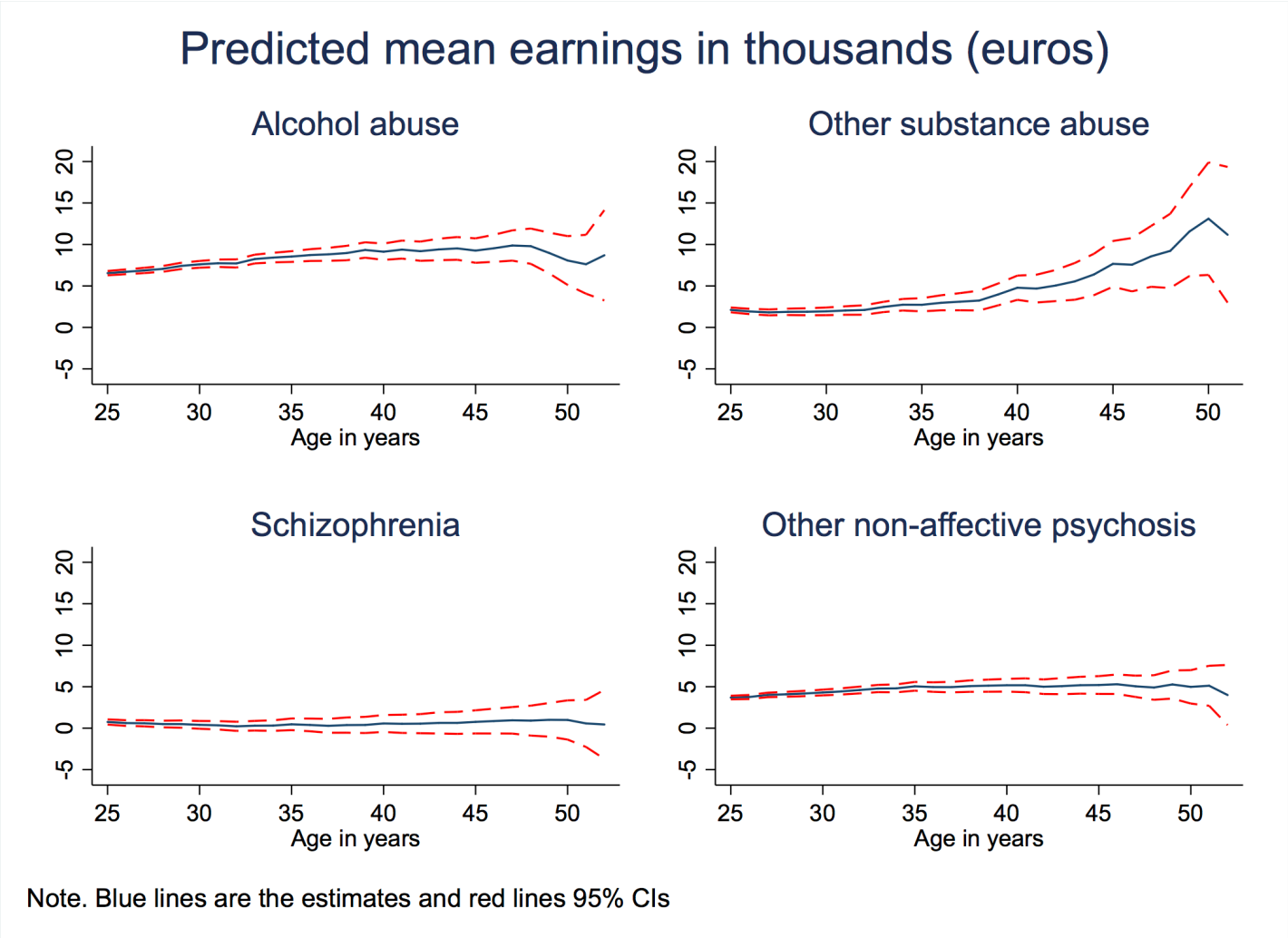
Appendix Figure 1. Sex-specific associations between alcohol abuse, other substance abuse, schizophrenia, and other non-affective psychosis with not being employed over the work life course



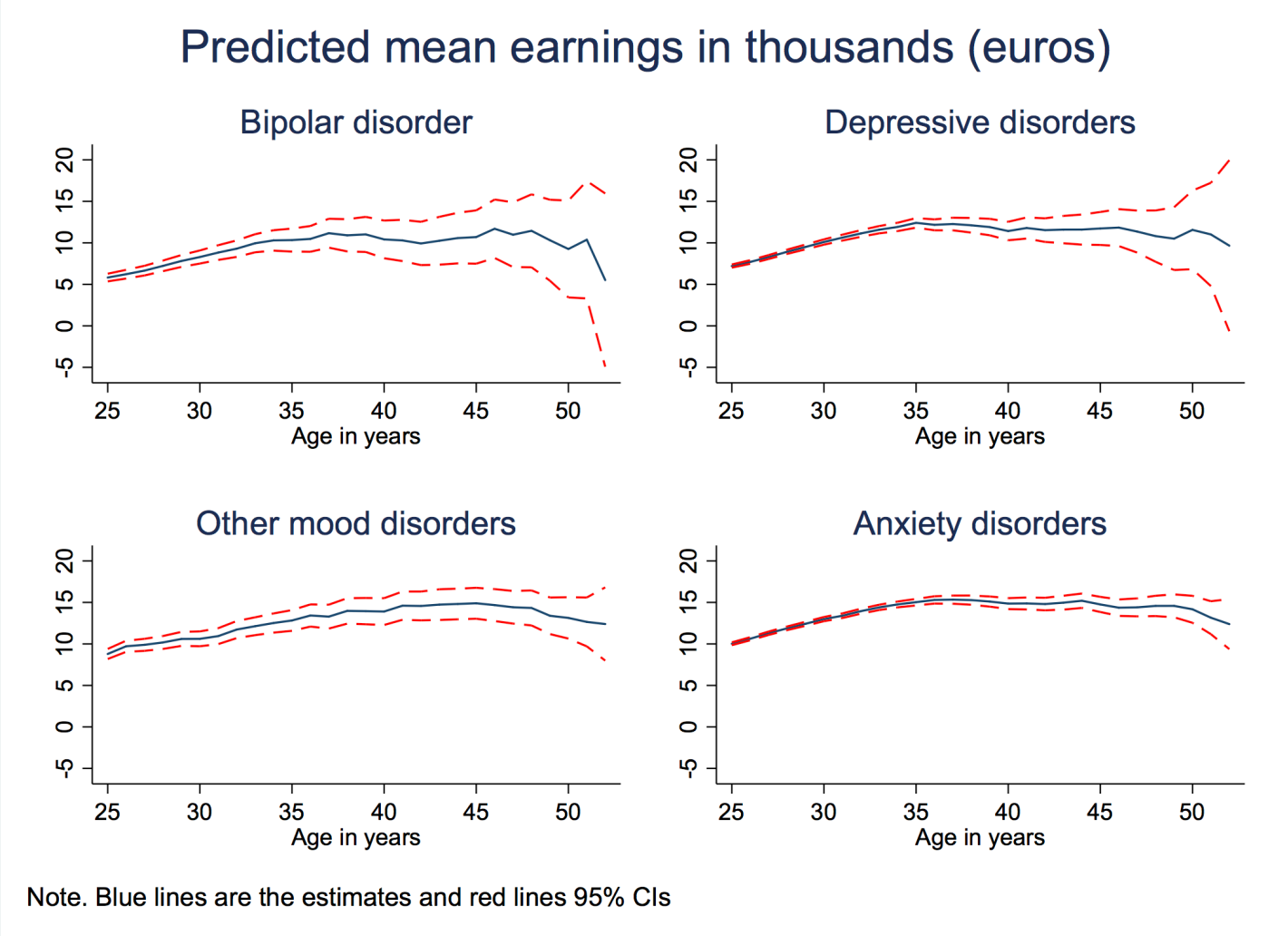
Appendix Figure 2. Sex-specific associations between bipolar disorders, depressive disorders, other mood disorders, and anxiety disorders with not being employed over the work life course



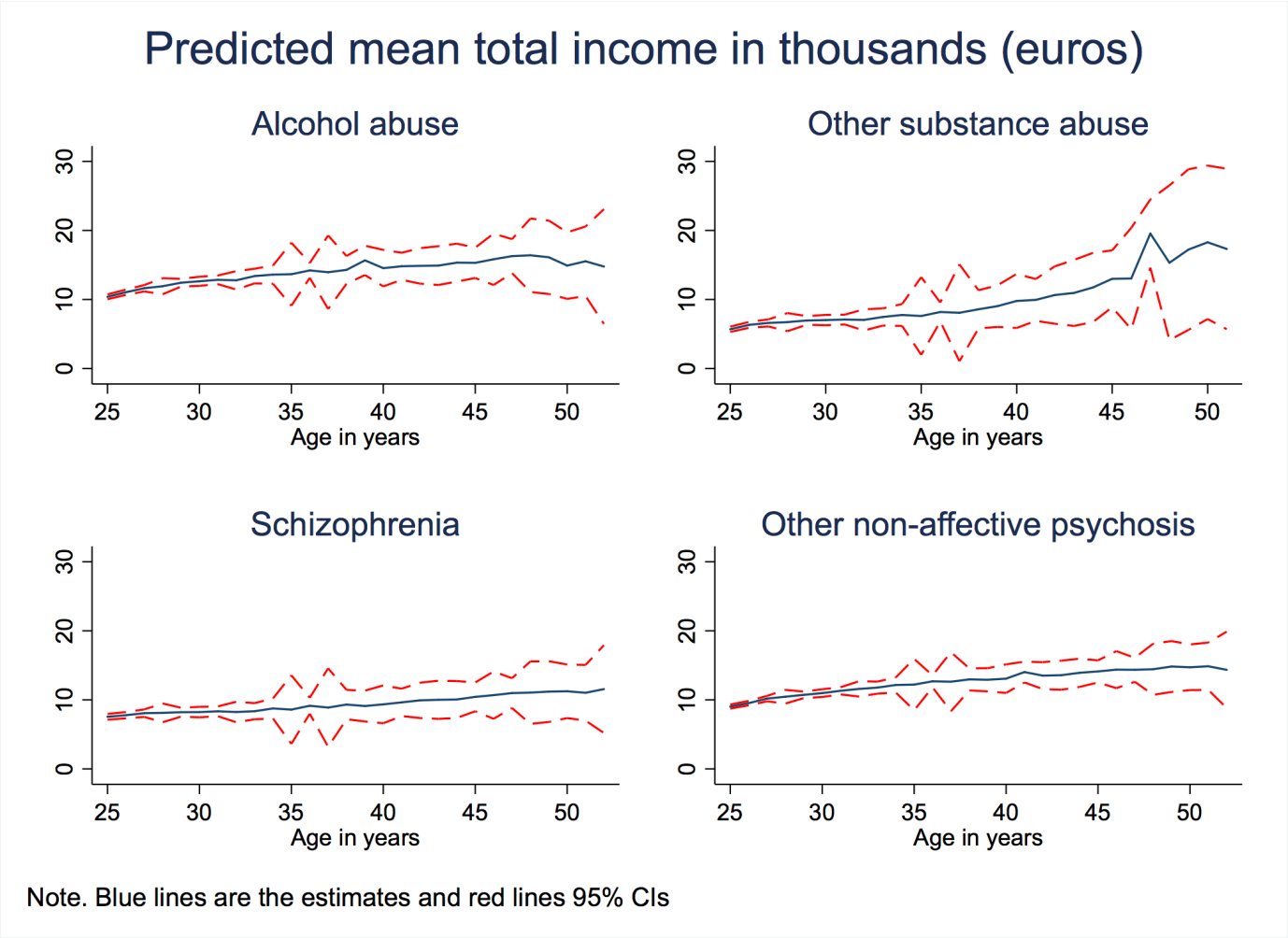
Appendix Figure 3. Mean earnings and total income between the age of 25 and 52 for individuals with a mental disorder diagnosis between the ages of 15 and 25



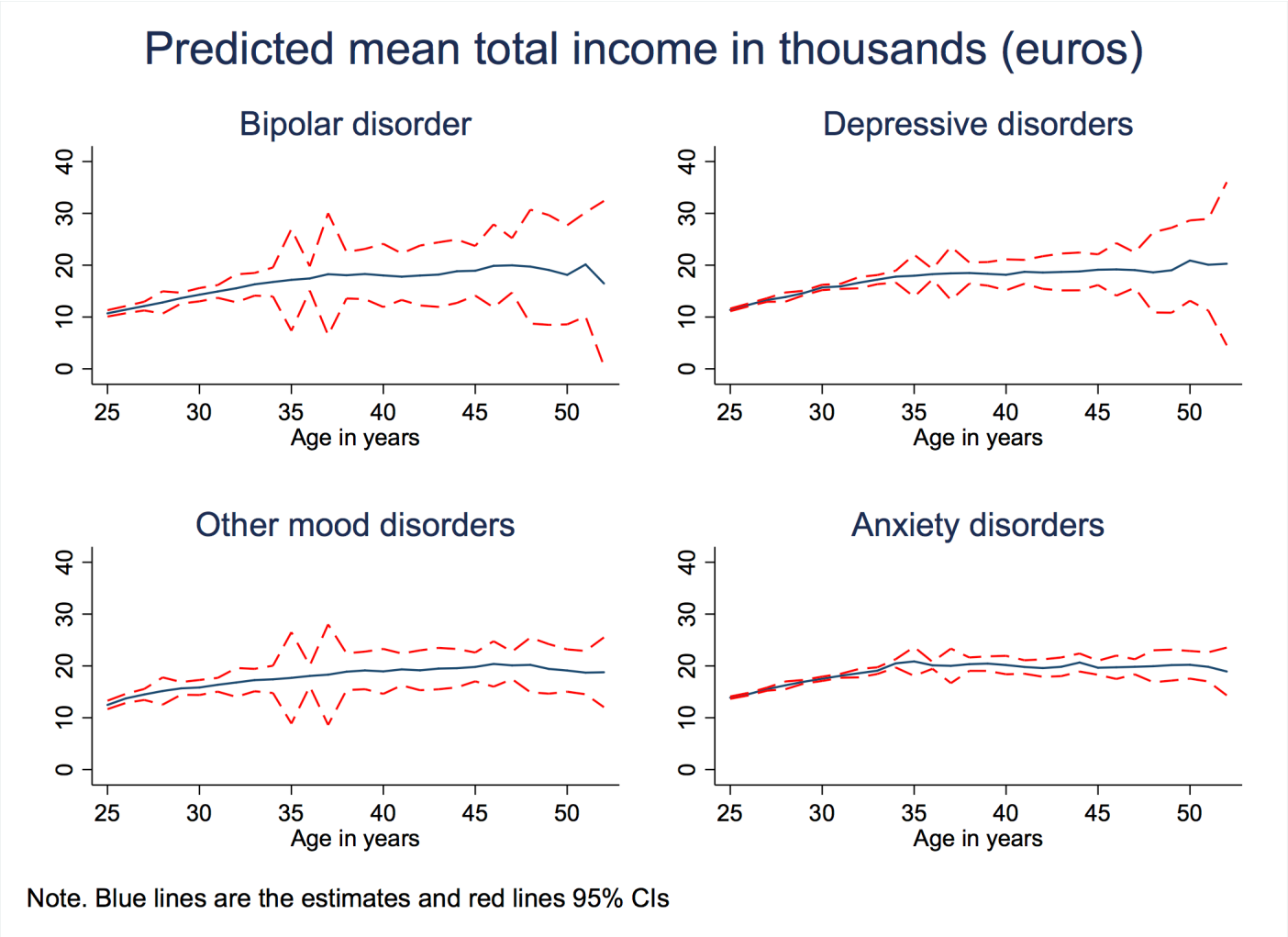
Appendix Figure 4. Predicted total earnings for individuals with alcohol abuse, other substance abuse, schizophrenia, and other non-affective psychosis over the work life course



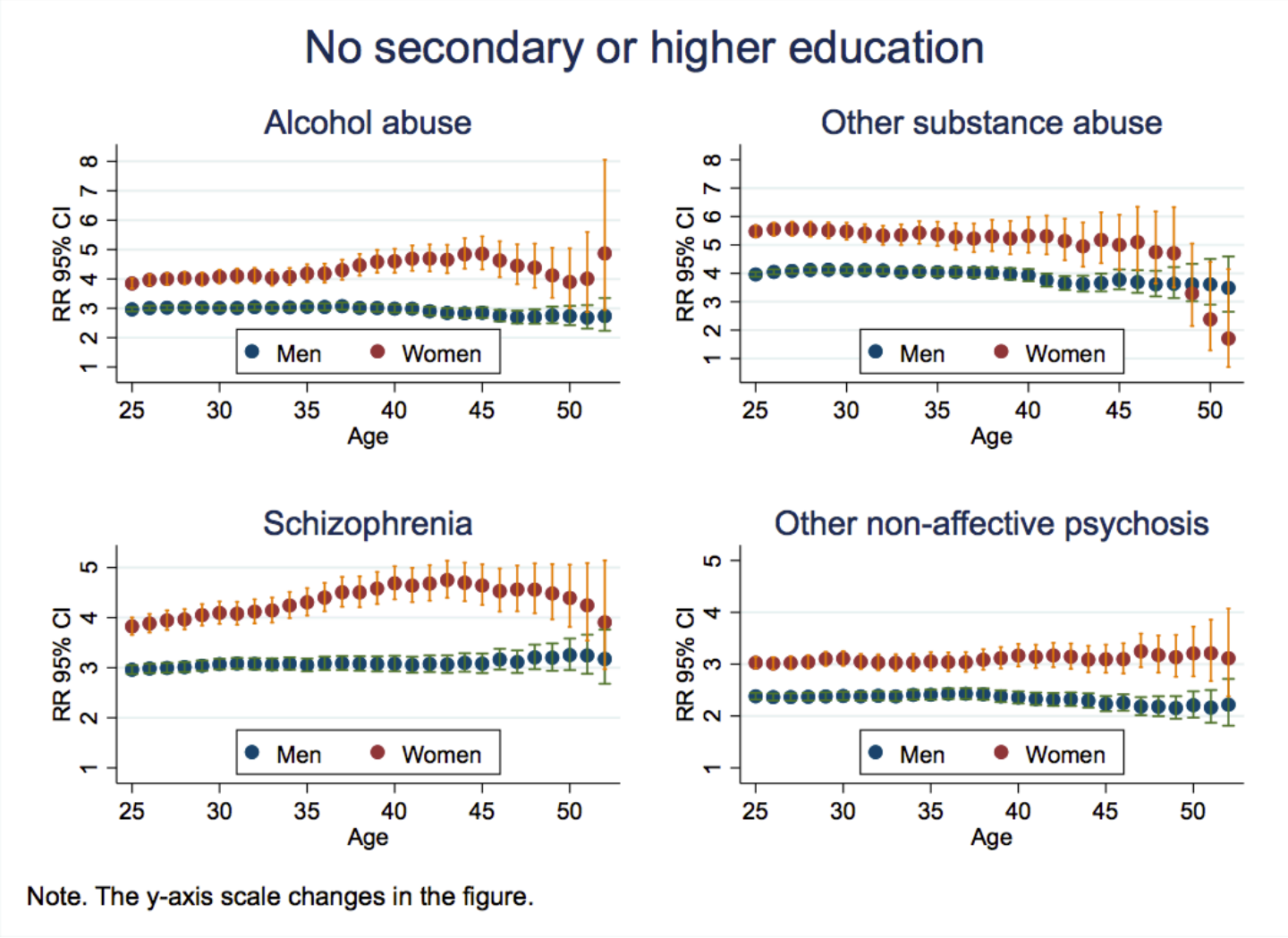
Appendix Figure 5. Predicted total earnings for individuals with bipolar disorders, depressive disorders, other mood disorders, and anxiety disorders over the work life course



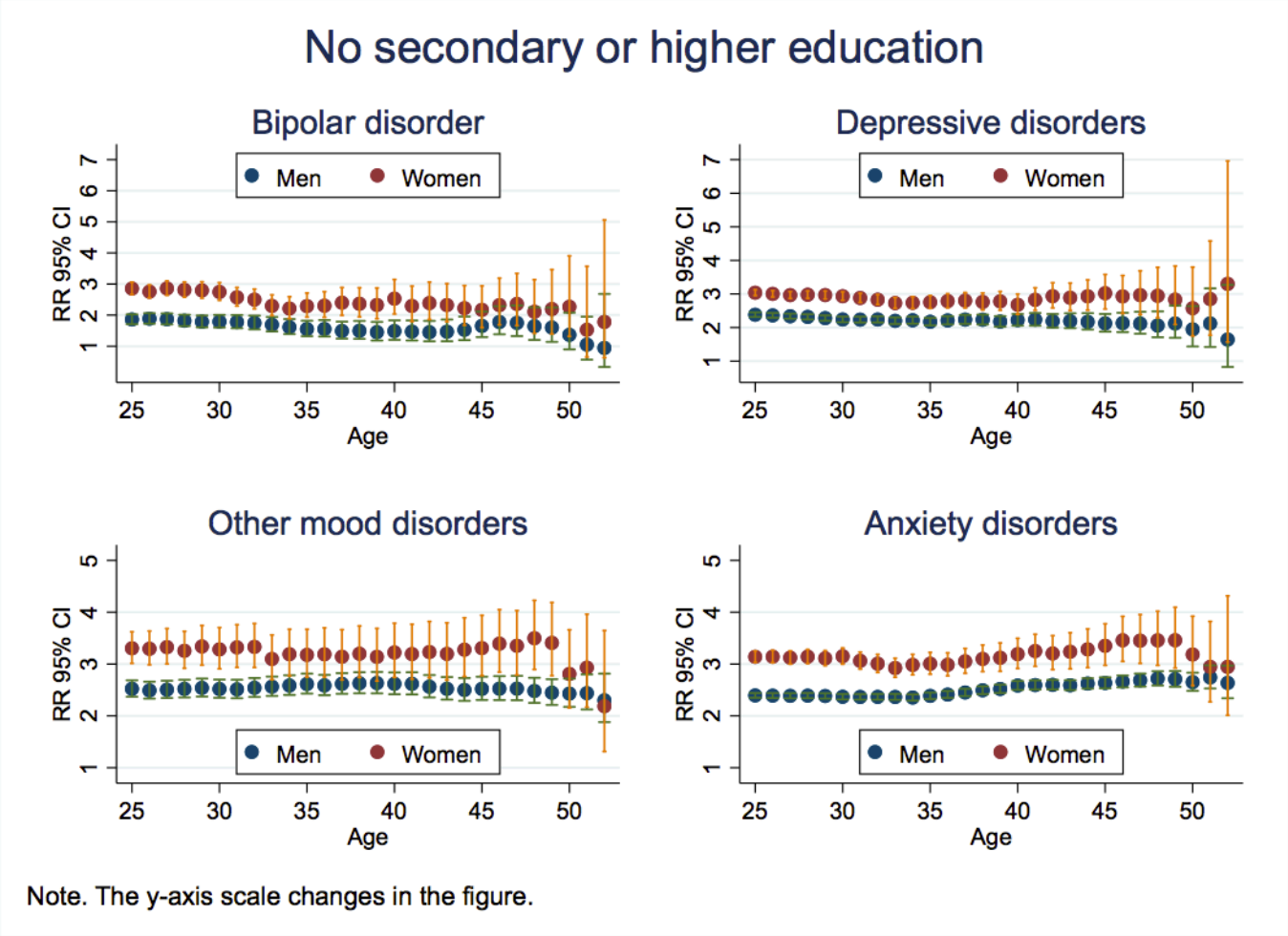
Appendix Figure 6. Predicted total income for individuals with alcohol abuse, other substance abuse, schizophrenia, and other non-affective psychosis over the work life course



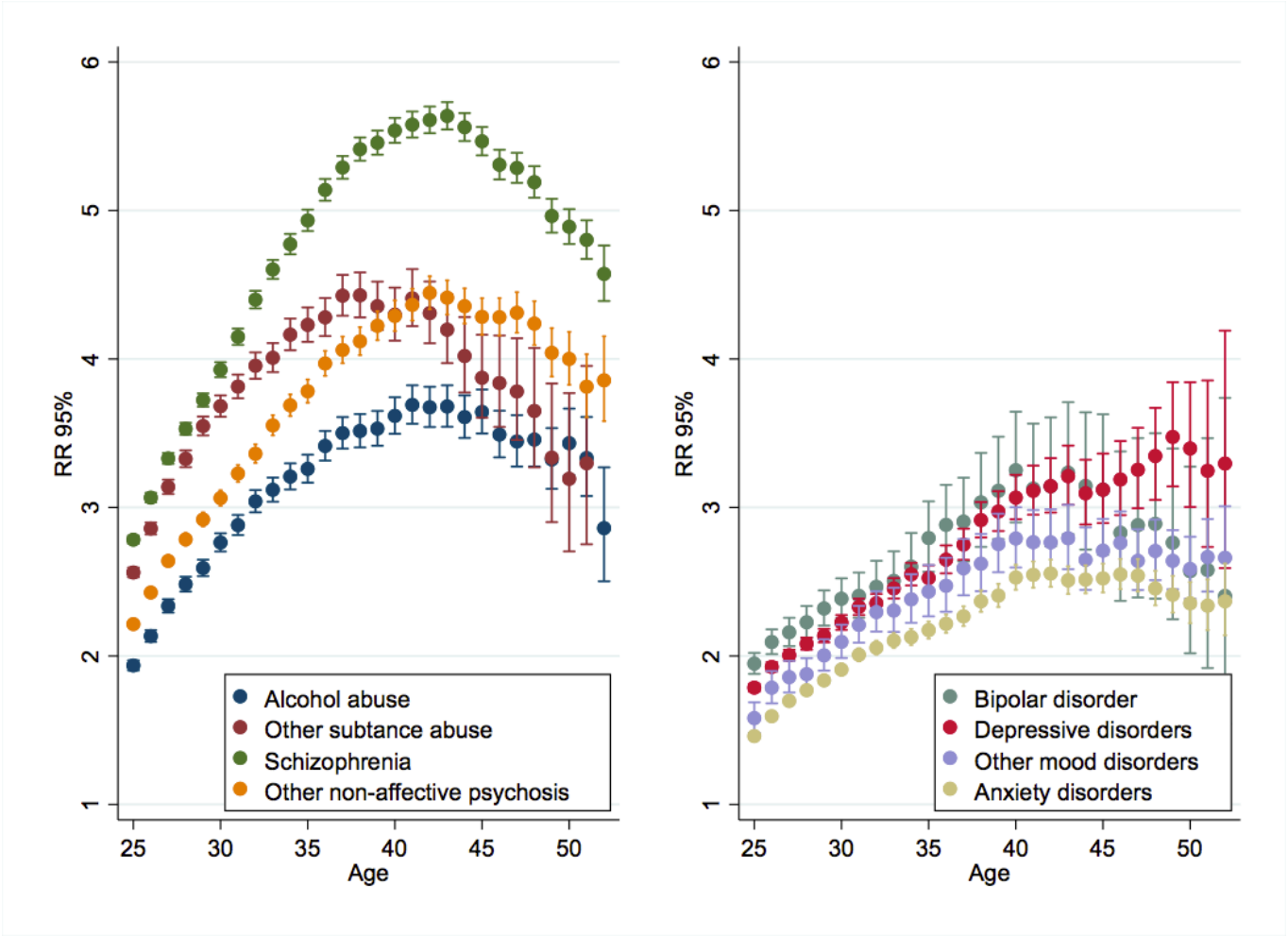
Appendix Figure 7. Predicted total income for individuals with bipolar disorders, depressive disorders, other mood disorders, and anxiety disorders over the work life course



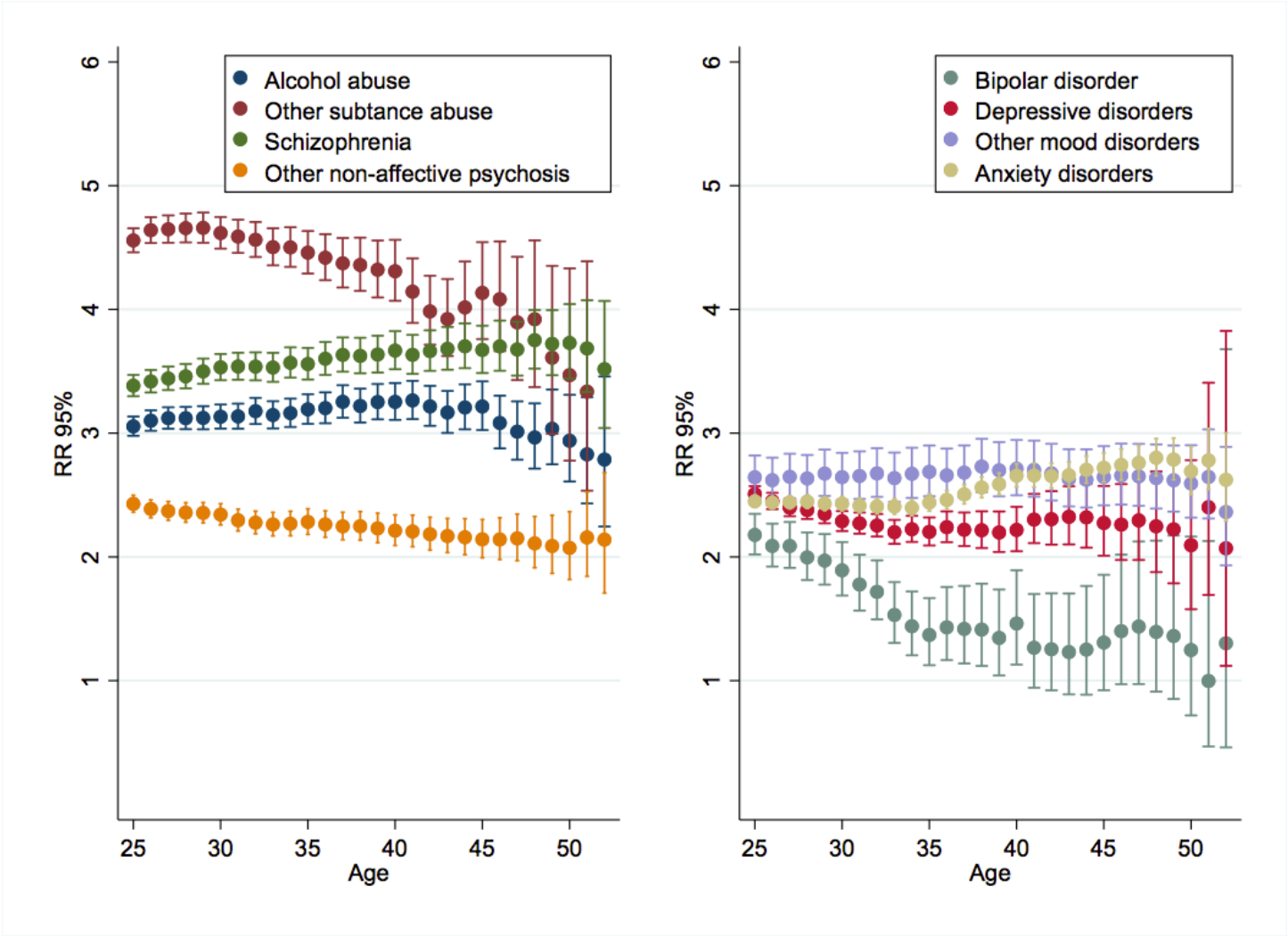
Appendix Figure 8. Sex-specific associations between mental alcohol abuse, other substance abuse, schizophrenia, and other non-affective psychosis with not having completed any secondary or higher education over the work life course



Appendix Figure 9. Sex-specific associations between bipolar disorders, depressive disorders, other mood disorders, and anxiety disorders with not having completed any secondary or higher education over the work life course.



Appendix Figure 10. Associations of mental disorder diagnosis (hierarchical model) between ages 15 and 25 with not being employed between ages 25 and 52.



Appendix Figure 11. Associations of mental disorder diagnosis (hierarchical model) between ages 15 and 25 with no secondary or higher education between ages 25 and 52

Appendix Table 1. Number of individuals in the study population

Age	Alcohol abuse	Other substance abuse	Schizophrenia	Other non-affective psychosis	Bipolar disorders	Depressive disorders	Other mood disorders	Anxiety disorders	No serious mental disorders	Total sample size
25	8984	7358	6291	12513	2847	16909	1646	21009	1824368	1962410
26	8509	6894	6078	11860	2622	15660	1600	20280	1764950	1895876
27	8075	6510	5860	11226	2427	14526	1553	19620	1706033	1830456
28	7650	6093	5628	10636	2245	13412	1512	18926	1645343	1763292
29	7250	5693	5399	10074	2034	12296	1467	18311	1586907	1698598
30	6841	5320	5185	9545	1829	11224	1433	17684	1526408	1632033
31	6375	4897	4963	9035	1627	10100	1400	16927	1463392	1562422
32	5890	4432	4718	8509	1436	8921	1355	16028	1397873	1489784
33	5465	3958	4461	7964	1275	7840	1311	14944	1330875	1415586
34	5043	3510	4179	7479	1123	6758	1274	13692	1263919	1341217
35	4659	3067	3930	6984	1006	5870	1249	12513	1199300	1269860
36	4274	2613	3674	6510	894	4974	1207	11251	1135150	1198774
37	3899	2248	3420	6033	797	4179	1175	10003	1071044	1128166
38	3542	1882	3167	5611	712	3452	1143	8687	1006679	1057419
39	3227	1606	2921	5164	623	2825	1113	7474	941310	986237
40	2920	1331	2728	4781	550	2293	1088	6505	874805	914781
41	2611	1094	2536	4416	496	1897	1062	5915	809040	845149
42	2333	893	2353	4050	462	1557	1045	5470	746061	778844
43	2089	719	2155	3707	424	1301	1032	5062	688544	718336
44	1858	560	1971	3365	375	1059	1022	4649	628697	655591
45	1599	456	1778	2997	337	880	1003	4183	566620	590597
46	1343	346	1586	2581	289	724	969	3669	502442	523282
47	1088	269	1412	2182	238	566	940	3109	436912	454649
48	871	196	1204	1790	204	412	885	2614	366508	381291

49	669	140	976	1393	169	282	829	2128	294163	306092
50	484	91	747	1031	123	187	676	1588	221524	230443
51	314	59	490	675	79	102	456	1005	148759	154518
52	147	..[1]	251	331	40	41	224	480	74676	

[1]Cell size was too small to be reported

Appendix Table 2. Sex-specific associations between alcohol abuse and other substance abuse with not being employed over the work life course.

Age	Alcohol abuse	Sex	Alcohol abuse x sex	Other substance abuse	Sex	Other substance abuse x sex
	RR (95% CI)	RR (95% CI)	RR (95% CI)	RR (95% CI)	RR (95% CI)	RR (95% CI)
25	2.10 (2.07-2.14)	1.12 (1.11-1.12)	0.89 (0.86-0.92)	2.64 (2.60-2.67)	1.12 (1.11-1.12)	0.89 (0.87-0.91)
26	2.35 (2.30-2.39)	1.18 (1.17-1.18)	0.85 (0.82-0.88)	3.00 (2.96-3.04)	1.18 (1.17-1.18)	0.83 (0.81-0.85)
27	2.62 (2.57-2.67)	1.24 (1.23-1.24)	0.80 (0.77-0.83)	3.37 (3.32-3.42)	1.24 (1.23-1.24)	0.77 (0.75-0.80)
28	2.81 (2.76-2.87)	1.29 (1.28-1.29)	0.77 (0.74-0.79)	3.64 (3.58-3.70)	1.29 (1.28-1.29)	0.73 (0.71-0.75)
29	2.99 (2.92-3.05)	1.33 (1.32-1.34)	0.73 (0.70-0.76)	3.95 (3.88-4.02)	1.33 (1.32-1.34)	0.69 (0.67-0.71)
30	3.20 (3.13-3.27)	1.37 (1.36-1.38)	0.70 (0.67-0.73)	4.16 (4.09-4.24)	1.37 (1.36-1.38)	0.66 (0.63-0.68)
31	3.35 (3.27-3.43)	1.39 (1.39-1.40)	0.69 (0.66-0.72)	4.34 (4.25-4.42)	1.39 (1.39-1.40)	0.64 (0.61-0.66)
32	3.55 (3.47-3.64)	1.39 (1.39-1.40)	0.67 (0.64-0.70)	4.48 (4.38-4.57)	1.39 (1.38-1.40)	0.63 (0.60-0.66)
33	3.64 (3.55-3.73)	1.38 (1.37-1.39)	0.66 (0.63-0.70)	4.54 (4.44-4.65)	1.38 (1.37-1.39)	0.63 (0.60-0.66)
34	3.69 (3.60-3.79)	1.36 (1.35-1.37)	0.69 (0.65-0.72)	4.67 (4.56-4.78)	1.36 (1.35-1.37)	0.64 (0.61-0.68)
35	3.73 (3.62-3.83)	1.32 (1.31-1.33)	0.71 (0.67-0.75)	4.69 (4.57-4.82)	1.31 (1.31-1.32)	0.65 (0.61-0.69)
36	3.83 (3.73-3.95)	1.27 (1.26-1.28)	0.72 (0.68-0.77)	4.74 (4.61-4.87)	1.27 (1.26-1.28)	0.66 (0.62-0.70)
37	3.88 (3.77-4.00)	1.22 (1.21-1.23)	0.74 (0.69-0.78)	4.80 (4.66-4.94)	1.22 (1.21-1.23)	0.69 (0.65-0.74)
38	3.83 (3.71-3.95)	1.16 (1.16-1.17)	0.79 (0.74-0.85)	4.79 (4.65-4.95)	1.16 (1.15-1.17)	0.70 (0.65-0.75)
39	3.78 (3.65-3.90)	1.12 (1.11-1.13)	0.84 (0.79-0.90)	4.67 (4.51-4.83)	1.11 (1.10-1.12)	0.73 (0.68-0.80)
40	3.78 (3.66-3.91)	1.08 (1.07-1.08)	0.88 (0.82-0.95)	4.57 (4.40-4.75)	1.07 (1.06-1.08)	0.76 (0.70-0.83)
41	3.77 (3.64-3.91)	1.02 (1.01-1.03)	0.95 (0.89-1.02)	4.57 (4.39-4.76)	1.02 (1.01-1.03)	0.83 (0.75-0.91)
42	3.67 (3.54-3.81)	0.98 (0.97-0.99)	1.01 (0.93-1.09)	4.39 (4.20-4.60)	0.97 (0.96-0.98)	0.87 (0.78-0.97)
43	3.68 (3.54-3.82)	0.94 (0.93-0.95)	1.01 (0.93-1.09)	4.17 (3.96-4.41)	0.94 (0.93-0.95)	0.98 (0.88-1.09)
44	3.53 (3.38-3.67)	0.90 (0.89-0.91)	1.10 (1.01-1.19)	4.01 (3.78-4.26)	0.90 (0.89-0.91)	0.98 (0.86-1.12)
45	3.56 (3.41-3.71)	0.86 (0.85-0.87)	1.09 (1.00-1.19)	3.92 (3.67-4.20)	0.86 (0.85-0.87)	0.92 (0.79-1.08)
46	3.31 (3.16-3.47)	0.84 (0.83-0.85)	1.21 (1.10-1.33)	3.74 (3.46-4.04)	0.83 (0.82-0.84)	1.07 (0.91-1.26)
47	3.31 (3.14-3.48)	0.83 (0.82-0.84)	1.17 (1.05-1.29)	3.76 (3.46-4.09)	0.83 (0.82-0.84)	0.97 (0.80-1.18)
48	3.36 (3.18-3.55)	0.82 (0.80-0.83)	1.11 (0.99-1.25)	3.66 (3.29-4.06)	0.81 (0.80-0.82)	0.95 (0.75-1.19)
49	3.24 (3.05-3.45)	0.80 (0.79-0.81)	1.07 (0.93-1.23)	3.44 (3.03-3.92)	0.80 (0.79-0.81)	0.89 (0.66-1.20)
50	3.32 (3.11-3.55)	0.79 (0.78-0.80)	1.10 (0.95-1.28)	3.37 (2.89-3.93)	0.79 (0.78-0.80)	0.75 (0.49-1.16)
51	3.27 (3.03-3.53)	0.79 (0.77-0.80)	1.07 (0.88-1.31)	3.59 (3.10-4.16)	0.78 (0.77-0.80)	0.52 (0.26-1.04)
52	2.85 (2.51-3.24)	0.78 (0.76-0.80)	1.14 (0.79-1.65)	3.37 (2.67-4.26)	0.78 (0.76-0.80)	0.46 (0.13-1.63)

Note. Values are risk ratios and 95% confidence intervals. The associations between alcohol abuse and other substance abuse with employment at specific ages have been examined in separate models.

Appendix Table 3. Sex-specific associations between schizophrenia and other non-affective psychosis with not being employed over the work life course

Age	Schizophrenia	Sex	Schizophrenia x sex interaction	Other non-affective psychosis	Sex	Other non-affective psychosis x sex interaction
	RR (95% CI)	RR (95% CI)	RR (95% CI)	RR (95% CI)	RR (95% CI)	RR (95% CI)
25	2.85 (2.82-2.89)	1.12 (1.11-1.12)	0.87 (0.86-0.89)	2.46 (2.43-2.49)	1.12 (1.11-1.12)	0.87 (0.85-0.89)
26	3.22 (3.18-3.26)	1.18 (1.17-1.18)	0.82 (0.80-0.83)	2.76 (2.73-2.80)	1.18 (1.17-1.18)	0.82 (0.81-0.84)
27	3.57 (3.53-3.62)	1.24 (1.23-1.24)	0.77 (0.75-0.79)	3.09 (3.05-3.14)	1.24 (1.23-1.24)	0.77 (0.76-0.79)
28	3.85 (3.80-3.91)	1.29 (1.28-1.29)	0.73 (0.72-0.75)	3.32 (3.27-3.37)	1.29 (1.28-1.29)	0.75 (0.74-0.77)
29	4.11 (4.06-4.17)	1.33 (1.32-1.33)	0.71 (0.70-0.73)	3.55 (3.50-3.61)	1.33 (1.32-1.34)	0.72 (0.71-0.74)
30	4.37 (4.31-4.44)	1.37 (1.36-1.37)	0.70 (0.68-0.72)	3.80 (3.74-3.86)	1.37 (1.36-1.38)	0.70 (0.68-0.72)
31	4.65 (4.59-4.72)	1.39 (1.38-1.40)	0.69 (0.67-0.70)	4.04 (3.97-4.10)	1.39 (1.39-1.40)	0.69 (0.67-0.71)
32	4.91 (4.84-4.98)	1.39 (1.38-1.40)	0.69 (0.67-0.71)	4.22 (4.15-4.29)	1.39 (1.39-1.40)	0.69 (0.67-0.71)
33	5.10 (5.02-5.19)	1.38 (1.37-1.39)	0.70 (0.68-0.72)	4.43 (4.35-4.51)	1.38 (1.37-1.39)	0.70 (0.68-0.72)
34	5.25 (5.16-5.33)	1.36 (1.35-1.36)	0.72 (0.70-0.74)	4.54 (4.46-4.63)	1.36 (1.35-1.37)	0.71 (0.69-0.74)
35	5.33 (5.23-5.42)	1.31 (1.31-1.32)	0.75 (0.73-0.77)	4.62 (4.53-4.71)	1.32 (1.31-1.32)	0.74 (0.72-0.76)
36	5.45 (5.36-5.55)	1.27 (1.26-1.28)	0.78 (0.76-0.80)	4.75 (4.66-4.85)	1.27 (1.26-1.28)	0.76 (0.74-0.79)
37	5.53 (5.43-5.62)	1.22 (1.21-1.23)	0.81 (0.79-0.83)	4.82 (4.72-4.92)	1.22 (1.21-1.23)	0.78 (0.76-0.81)
38	5.53 (5.43-5.63)	1.16 (1.15-1.17)	0.86 (0.83-0.88)	4.78 (4.68-4.88)	1.16 (1.15-1.17)	0.83 (0.81-0.86)
39	5.47 (5.37-5.58)	1.11 (1.10-1.12)	0.90 (0.87-0.93)	4.76 (4.66-4.87)	1.11 (1.11-1.12)	0.87 (0.84-0.90)
40	5.45 (5.34-5.56)	1.07 (1.06-1.08)	0.94 (0.92-0.97)	4.75 (4.64-4.85)	1.07 (1.06-1.08)	0.91 (0.88-0.94)
41	5.39 (5.29-5.50)	1.02 (1.01-1.03)	0.98 (0.95-1.02)	4.70 (4.60-4.81)	1.02 (1.01-1.03)	0.95 (0.92-0.99)
42	5.33 (5.22-5.44)	0.97 (0.96-0.98)	1.03 (1.00-1.06)	4.65 (4.54-4.76)	0.97 (0.96-0.98)	1.01 (0.97-1.05)
43	5.26 (5.15-5.38)	0.94 (0.93-0.95)	1.07 (1.04-1.11)	4.56 (4.45-4.67)	0.94 (0.93-0.95)	1.05 (1.01-1.09)
44	5.11 (5.00-5.23)	0.90 (0.89-0.91)	1.12 (1.08-1.15)	4.39 (4.28-4.51)	0.90 (0.89-0.91)	1.11 (1.06-1.15)
45	4.93 (4.82-5.04)	0.86 (0.85-0.87)	1.17 (1.13-1.21)	4.24 (4.12-4.36)	0.86 (0.85-0.86)	1.16 (1.11-1.21)
46	4.72 (4.61-4.84)	0.83 (0.82-0.84)	1.21 (1.17-1.26)	4.12 (4.01-4.25)	0.83 (0.82-0.84)	1.20 (1.15-1.26)
47	4.72 (4.60-4.84)	0.83 (0.82-0.84)	1.20 (1.16-1.25)	4.13 (4.00-4.26)	0.82 (0.81-0.83)	1.22 (1.16-1.27)
48	4.62 (4.51-4.75)	0.81 (0.80-0.82)	1.21 (1.16-1.26)	4.06 (3.93-4.20)	0.81 (0.80-0.82)	1.22 (1.16-1.28)
49	4.42 (4.30-4.55)	0.80 (0.79-0.81)	1.22 (1.17-1.28)	3.83 (3.69-3.98)	0.80 (0.78-0.81)	1.26 (1.19-1.33)
50	4.31 (4.18-4.44)	0.79 (0.77-0.80)	1.25 (1.20-1.31)	3.80 (3.65-3.96)	0.79 (0.77-0.80)	1.27 (1.20-1.35)

51	4.22 (4.08-4.36)	0.78 (0.77-0.80)	1.26 (1.20-1.33)	3.62 (3.44-3.82)	0.78 (0.76-0.8)	1.30 (1.20-1.40)
52	3.93 (3.72-4.16)	0.78 (0.76-0.80)	1.33 (1.23-1.43)	3.57 (3.32-3.83)	0.77 (0.75-0.8)	1.36 (1.24-1.50)

Note. Values are risk ratios and 95% confidence intervals. The associations between schizophrenia and other non-affective psychosis with employment at specific ages have been examined in separate models.

Appendix Table 4. Sex-specific associations between bipolar disorders and depressive disorders with not being employed over the work life course

Age	Bipolar disorders RR (95% CI)	Sex RR (95% CI)	Bipolar disorders x sex RR (95% CI)	Depressive disorders RR (95% CI)	Sex RR (95% CI)	Depressive disorders x sex RR (95% CI)
25	2.13 (2.05-2.22)	1.11 (1.11-1.12)	0.93 (0.89-0.98)	1.97 (1.94-2.01)	1.11 (1.11-1.12)	0.95 (0.93-0.97)
26	2.36 (2.26-2.47)	1.17 (1.17-1.18)	0.90 (0.85-0.95)	2.18 (2.14-2.22)	1.17 (1.17-1.18)	0.91 (0.89-0.94)
27	2.56 (2.44-2.69)	1.23 (1.22-1.23)	0.85 (0.80-0.90)	2.35 (2.30-2.40)	1.23 (1.22-1.23)	0.87 (0.85-0.90)
28	2.68 (2.54-2.82)	1.28 (1.27-1.28)	0.84 (0.78-0.90)	2.53 (2.47-2.59)	1.28 (1.27-1.28)	0.83 (0.80-0.85)
29	2.78 (2.62-2.94)	1.32 (1.31-1.32)	0.83 (0.77-0.89)	2.64 (2.57-2.70)	1.32 (1.31-1.33)	0.80 (0.78-0.83)
30	3.00 (2.83-3.18)	1.36 (1.35-1.36)	0.76 (0.70-0.82)	2.79 (2.72-2.87)	1.36 (1.35-1.37)	0.78 (0.75-0.81)
31	3.24 (3.05-3.44)	1.38 (1.37-1.39)	0.72 (0.66-0.78)	2.90 (2.82-2.98)	1.38 (1.38-1.39)	0.78 (0.75-0.81)
32	3.27 (3.06-3.49)	1.38 (1.37-1.39)	0.73 (0.67-0.80)	2.95 (2.86-3.04)	1.38 (1.37-1.39)	0.78 (0.75-0.81)
33	3.46 (3.24-3.70)	1.37 (1.36-1.38)	0.72 (0.66-0.79)	3.00 (2.90-3.09)	1.37 (1.36-1.38)	0.80 (0.77-0.84)
34	3.48 (3.24-3.74)	1.34 (1.33-1.35)	0.76 (0.68-0.83)	3.12 (3.02-3.22)	1.35 (1.34-1.36)	0.79 (0.76-0.83)
35	3.66 (3.40-3.94)	1.30 (1.29-1.31)	0.77 (0.69-0.85)	3.02 (2.92-3.14)	1.31 (1.30-1.32)	0.85 (0.81-0.89)
36	3.62 (3.35-3.92)	1.26 (1.25-1.27)	0.83 (0.75-0.92)	3.11 (3.00-3.24)	1.26 (1.25-1.27)	0.87 (0.82-0.92)
37	3.56 (3.27-3.88)	1.21 (1.20-1.22)	0.90 (0.80-1.01)	3.22 (3.09-3.35)	1.21 (1.20-1.22)	0.89 (0.84-0.94)
38	3.59 (3.28-3.93)	1.15 (1.14-1.16)	0.91 (0.81-1.03)	3.27 (3.12-3.41)	1.15 (1.15-1.16)	0.94 (0.88-1.00)
39	3.63 (3.31-3.98)	1.11 (1.10-1.12)	0.95 (0.84-1.07)	3.27 (3.12-3.43)	1.11 (1.10-1.12)	0.98 (0.92-1.05)
40	3.67 (3.34-4.03)	1.07 (1.06-1.08)	0.99 (0.87-1.13)	3.38 (3.21-3.55)	1.07 (1.06-1.08)	0.99 (0.92-1.06)
41	3.55 (3.21-3.92)	1.01 (1.00-1.02)	1.10 (0.96-1.26)	3.38 (3.20-3.57)	1.01 (1.00-1.02)	1.02 (0.94-1.10)
42	3.63 (3.28-4.01)	0.97 (0.96-0.98)	1.05 (0.91-1.21)	3.30 (3.11-3.50)	0.97 (0.96-0.98)	1.10 (1.01-1.20)
43	3.49 (3.14-3.88)	0.94 (0.93-0.94)	1.23 (1.07-1.41)	3.35 (3.15-3.56)	0.94 (0.93-0.94)	1.14 (1.04-1.24)
44	3.35 (2.99-3.75)	0.89 (0.89-0.90)	1.27 (1.09-1.47)	3.27 (3.05-3.50)	0.90 (0.89-0.90)	1.14 (1.03-1.26)
45	3.23 (2.87-3.64)	0.86 (0.85-0.86)	1.30 (1.11-1.52)	3.05 (2.82-3.30)	0.86 (0.85-0.86)	1.28 (1.15-1.43)
46	3.02 (2.64-3.45)	0.83 (0.82-0.84)	1.38 (1.16-1.64)	3.01 (2.77-3.27)	0.83 (0.82-0.84)	1.37 (1.22-1.54)
47	3.04 (2.63-3.51)	0.83 (0.82-0.84)	1.35 (1.12-1.63)	3.09 (2.83-3.37)	0.83 (0.82-0.84)	1.32 (1.17-1.50)
48	2.89 (2.46-3.39)	0.81 (0.80-0.82)	1.40 (1.14-1.72)	3.18 (2.89-3.50)	0.81 (0.80-0.82)	1.28 (1.11-1.47)
49	2.90 (2.47-3.40)	0.80 (0.79-0.81)	1.31 (1.05-1.64)	3.24 (2.91-3.61)	0.80 (0.79-0.81)	1.23 (1.04-1.44)
50	2.77 (2.31-3.32)	0.79 (0.77-0.80)	1.44 (1.12-1.85)	3.28 (2.89-3.72)	0.79 (0.77-0.80)	1.16 (0.95-1.41)
51	2.88 (2.35-3.53)	0.78 (0.77-0.80)	1.37 (1.02-1.83)	2.96 (2.42-3.62)	0.78 (0.77-0.80)	1.28 (0.97-1.68)
52	3.21 (2.49-4.13)	0.78 (0.76-0.80)	1.29 (0.90-1.84)	3.16 (2.48-4.03)	0.78 (0.76-0.80)	1.26 (0.86-1.83)

Note. Values are risk ratios and 95% confidence intervals. The associations between bipolar disorders and depressive disorders with employment at specific ages have been examined in separate models.

Appendix Table 5. Sex-specific associations between other mood disorders and anxiety disorders with not being employed over the work life course

Age	Other mood disorders RR (95% CI)	Sex RR (95% CI)	Other mood disorders x sex RR (95% CI)	Anxiety disorders RR (95% CI)	Sex RR (95% CI)	Anxiety disorders x sex RR (95% CI)
25	1.79 (1.68-1.91)	1.11 (1.11-1.12)	1.04 (0.96-1.14)	1.52 (1.49-1.54)	1.12 (1.11-1.12)	1.22 (1.19-1.25)
26	1.95 (1.84-2.07)	1.17 (1.17-1.18)	1.01 (0.92-1.10)	1.67 (1.64-1.70)	1.18 (1.17-1.18)	1.18 (1.14-1.21)
27	2.09 (1.97-2.21)	1.23 (1.22-1.23)	0.95 (0.87-1.03)	1.81 (1.78-1.84)	1.24 (1.23-1.24)	1.12 (1.09-1.15)
28	2.13 (2.02-2.25)	1.28 (1.27-1.29)	0.89 (0.82-0.97)	1.90 (1.87-1.94)	1.29 (1.28-1.30)	1.08 (1.05-1.12)
29	2.23 (2.12-2.35)	1.32 (1.31-1.32)	0.90 (0.83-0.98)	1.99 (1.95-2.02)	1.33 (1.32-1.34)	1.06 (1.02-1.09)
30	2.39 (2.27-2.51)	1.36 (1.35-1.36)	0.85 (0.78-0.93)	2.08 (2.04-2.12)	1.37 (1.36-1.38)	1.03 (1.00-1.07)
31	2.51 (2.37-2.65)	1.38 (1.37-1.39)	0.88 (0.80-0.96)	2.20 (2.15-2.24)	1.40 (1.39-1.41)	1.01 (0.97-1.05)
32	2.61 (2.47-2.77)	1.38 (1.37-1.39)	0.86 (0.78-0.94)	2.24 (2.19-2.29)	1.40 (1.39-1.41)	1.02 (0.98-1.06)
33	2.67 (2.51-2.84)	1.37 (1.36-1.38)	0.87 (0.78-0.96)	2.27 (2.22-2.33)	1.39 (1.38-1.40)	1.07 (1.03-1.11)
34	2.81 (2.64-3.00)	1.35 (1.34-1.35)	0.85 (0.76-0.94)	2.29 (2.24-2.35)	1.36 (1.35-1.37)	1.11 (1.06-1.16)
35	2.82 (2.64-3.02)	1.30 (1.30-1.31)	0.85 (0.76-0.95)	2.34 (2.28-2.40)	1.32 (1.31-1.33)	1.11 (1.06-1.16)
36	2.85 (2.66-3.05)	1.26 (1.25-1.27)	0.91 (0.81-1.03)	2.36 (2.30-2.43)	1.28 (1.27-1.29)	1.16 (1.11-1.22)
37	2.90 (2.71-3.11)	1.21 (1.20-1.22)	0.94 (0.83-1.05)	2.43 (2.36-2.49)	1.22 (1.21-1.23)	1.15 (1.10-1.22)
38	2.94 (2.75-3.16)	1.16 (1.15-1.16)	0.96 (0.86-1.09)	2.49 (2.42-2.56)	1.17 (1.16-1.18)	1.22 (1.16-1.29)
39	3.03 (2.83-3.24)	1.11 (1.10-1.12)	0.99 (0.88-1.12)	2.54 (2.46-2.62)	1.12 (1.11-1.13)	1.21 (1.14-1.28)
40	3.04 (2.84-3.26)	1.07 (1.06-1.08)	1.02 (0.90-1.15)	2.61 (2.53-2.70)	1.08 (1.07-1.09)	1.24 (1.17-1.31)
41	2.93 (2.72-3.16)	1.01 (1.00-1.02)	1.11 (0.98-1.26)	2.62 (2.53-2.70)	1.02 (1.01-1.03)	1.29 (1.21-1.37)
42	2.89 (2.68-3.12)	0.97 (0.96-0.98)	1.18 (1.04-1.34)	2.63 (2.54-2.72)	0.98 (0.97-0.99)	1.33 (1.25-1.42)
43	2.86 (2.65-3.09)	0.94 (0.93-0.95)	1.27 (1.12-1.44)	2.58 (2.50-2.68)	0.95 (0.94-0.96)	1.36 (1.27-1.46)
44	2.67 (2.47-2.89)	0.90 (0.89-0.91)	1.31 (1.15-1.49)	2.56 (2.48-2.66)	0.91 (0.90-0.92)	1.38 (1.28-1.49)
45	2.71 (2.51-2.92)	0.86 (0.85-0.87)	1.33 (1.17-1.51)	2.57 (2.48-2.67)	0.87 (0.86-0.88)	1.40 (1.30-1.51)
46	2.74 (2.55-2.95)	0.83 (0.82-0.84)	1.30 (1.14-1.47)	2.58 (2.49-2.68)	0.84 (0.83-0.85)	1.45 (1.34-1.56)
47	2.59 (2.40-2.80)	0.83 (0.82-0.84)	1.40 (1.23-1.59)	2.59 (2.49-2.70)	0.84 (0.83-0.85)	1.43 (1.32-1.56)
48	2.59 (2.40-2.80)	0.81 (0.80-0.82)	1.44 (1.27-1.64)	2.55 (2.44-2.66)	0.82 (0.81-0.83)	1.41 (1.29-1.55)
49	2.51 (2.33-2.71)	0.80 (0.79-0.81)	1.50 (1.31-1.70)	2.48 (2.37-2.60)	0.81 (0.79-0.82)	1.45 (1.31-1.60)
50	2.52 (2.32-2.72)	0.79 (0.78-0.80)	1.40 (1.21-1.62)	2.42 (2.29-2.55)	0.80 (0.78-0.81)	1.42 (1.26-1.60)
51	2.57 (2.34-2.82)	0.78 (0.77-0.80)	1.35 (1.14-1.60)	2.35 (2.20-2.51)	0.79 (0.77-0.80)	1.49 (1.30-1.71)
52	2.66 (2.36-3.00)	0.78 (0.76-0.80)	1.16 (0.90-1.50)	2.55 (2.34-2.77)	0.79 (0.76-0.81)	1.31 (1.08-1.59)

Note. Values are risk ratios and 95% confidence intervals. The associations between other mood disorders and anxiety disorders with employment at specific ages have been examined in separate models.

Appendix Table 6. The associations between mental disorders with not being employed at the age of 25, 30, 40 and 50

	Not employed at the age of 25					
	Model 1 (n=1884853)		Model 2 (n=1884853)		Model 3 (n=1727296)	
	RR	95% CI	RR	95% CI	RR	95% CI
Alcohol use disorder	1.96	1.93-1.99	2.03	2.00-2.06	1.96	1.93-2.00
Other substance abuse disorders	2.41	2.38-2.43	2.54	2.51-2.57	2.53	2.50-2.56
Other non-affective psychoses	2.62	2.60-2.64	2.71	2.69-2.74	2.72	2.69-2.75
Schizophrenia	2.28	2.26-2.30	2.32	2.29-2.34	2.33	2.30-2.35
Bipolar disorders	1.98	1.93-2.03	2.04	1.99-2.10	2.04	1.98-2.09
Depressive disorders	1.83	1.81-1.85	1.91	1.89-1.93	1.91	1.89-1.94
Other mood disorders	1.55	1.48-1.62	1.82	1.75-1.91	1.82	1.73-1.91
Anxiety disorders	1.52	1.50-1.54	1.62	1.60-1.64	1.60	1.58-1.63
	Not employed at the age of 30					
	Model 1 (n=1572972)		Model 2 (n=1572972)		Model 3 (n=1420298)	
	RR	95% CI	RR	95% CI	RR	95% CI
Alcohol use disorder	2.49	2.44-2.54	2.86	2.81-2.92	2.72	2.66-2.78
Other substance abuse disorders	3.03	2.98-3.07	3.63	3.56-3.69	3.58	3.52-3.65
Other non-affective psychoses	3.52	3.49-3.55	3.78	3.74-3.83	3.81	3.76-3.86
Schizophrenia	3.01	2.97-3.04	3.22	3.18-3.26	3.25	3.21-3.29
Bipolar disorders	2.41	2.32-2.49	2.53	2.44-2.63	2.48	2.39-2.58
Depressive disorders	2.15	2.12-2.19	2.42	2.38-2.46	2.40	2.36-2.44
Other mood disorders	2.40	2.30-2.50	2.25	2.16-2.34	2.20	2.10-2.30
Anxiety disorders	1.75	1.72-1.78	2.10	2.06-2.13	2.09	2.05-2.12
	Not employed at the age of 40					
	Model 1 (n=892585)		Model 2 (n=892585)		Model 3 (n=801032)	
	RR	95% CI	RR	95% CI	RR	95% CI
Alcohol use disorder	3.33	3.24-3.43	3.66	3.56-3.77	3.45	3.34-3.56

Other substance abuse disorders	3.88	3.75-4.01	4.25	4.10-4.40	4.01	3.86-4.17
Other non-affective psychoses	4.91	4.85-4.97	5.32	5.24-5.40	5.28	5.20-5.36
Schizophrenia	4.20	4.13-4.27	4.55	4.47-4.63	4.55	4.47-4.63
Bipolar disorders	3.40	3.19-3.62	3.65	3.42-3.89	3.60	3.36-3.85
Depressive disorders	3.14	3.04-3.25	3.36	3.24-3.49	3.33	3.21-3.46
Other mood disorders	2.84	2.68-3.00	3.06	2.89-3.24	2.95	2.77-3.15
Anxiety disorders	2.48	2.41-2.55	2.74	2.66-2.81	2.70	2.63-2.78
	Not employed at the age of 50					
	Model 1 (n=225516)		Model 2 (n=225516)		Model 3 (n=202683)	
	RR	95% CI	RR	95% CI	RR	95% CI
Alcohol use disorder	3.36	3.17-3.57	3.39	3.20-3.60	3.26	3.07-3.47
Other substance abuse disorders	3.06	2.62-3.58	3.12	2.67-3.64	3.06	2.60-3.61
Other non-affective psychoses	4.51	4.41-4.61	4.74	4.63-4.86	4.63	4.51-4.76
Schizophrenia	4.00	3.89-4.12	4.22	4.09-4.35	4.11	3.98-4.25
Bipolar disorders	3.21	2.83-3.63	3.24	2.85-3.68	3.10	2.68-3.59
Depressive disorders	3.29	2.99-3.63	3.50	3.17-3.86	3.32	3.00-3.68
Other mood disorders	2.71	2.53-2.89	2.72	2.55-2.92	2.65	2.46-2.85
Anxiety disorders	2.58	2.47-2.71	2.55	2.43-2.68	2.49	2.37-2.62

Note. All mental disorders were analyzed separately
Model 1: unadjusted
Model 2: adjusted for sex, the year of birth, and migrant status
Model 3: additional adjustment for the history of parental mental disorders

Appendix Table 7. Sex-specific associations between alcohol abuse and other substance abuse with not having any secondary or higher education over the work life course.

Age	Alcohol abuse RR (95% CI)	Sex RR (95% CI)	Alcohol abuse x sex RR (95% CI)	Other substance abuse RR (95% CI)	Sex RR (95% CI)	Other substance abuse x sex RR (95% CI)
25	3.00 (2.93-3.08)	0.71 (0.70-0.71)	1.25 (1.19-1.31)	4.03 (3.94-4.12)	0.71 (0.70-0.71)	1.32 (1.27-1.38)
26	3.05 (2.97-3.13)	0.70 (0.69-0.70)	1.26 (1.19-1.32)	4.14 (4.04-4.24)	0.70 (0.69-0.70)	1.30 (1.25-1.36)
27	3.07 (2.99-3.16)	0.69 (0.68-0.69)	1.25 (1.19-1.32)	4.19 (4.09-4.29)	0.69 (0.68-0.69)	1.28 (1.22-1.34)
28	3.08 (3.00-3.17)	0.68 (0.68-0.69)	1.25 (1.18-1.33)	4.24 (4.13-4.35)	0.68 (0.68-0.69)	1.26 (1.19-1.32)
29	3.09 (3.00-3.18)	0.67 (0.67-0.68)	1.24 (1.16-1.31)	4.26 (4.15-4.37)	0.67 (0.67-0.68)	1.23 (1.17-1.30)
30	3.08 (2.98-3.17)	0.67 (0.66-0.67)	1.26 (1.18-1.34)	4.26 (4.14-4.38)	0.67 (0.66-0.67)	1.22 (1.15-1.29)
31	3.08 (2.98-3.18)	0.66 (0.65-0.66)	1.27 (1.19-1.35)	4.26 (4.14-4.39)	0.66 (0.65-0.66)	1.20 (1.13-1.28)
32	3.11 (3.01-3.22)	0.65 (0.65-0.66)	1.25 (1.17-1.34)	4.26 (4.13-4.39)	0.65 (0.65-0.66)	1.18 (1.11-1.27)
33	3.09 (2.98-3.20)	0.65 (0.64-0.65)	1.24 (1.15-1.34)	4.20 (4.06-4.34)	0.65 (0.64-0.65)	1.21 (1.12-1.29)
34	3.11 (3.00-3.22)	0.64 (0.64-0.65)	1.25 (1.16-1.35)	4.22 (4.07-4.37)	0.64 (0.64-0.65)	1.21 (1.12-1.31)
35	3.13 (3.01-3.24)	0.64 (0.63-0.64)	1.27 (1.17-1.38)	4.20 (4.04-4.36)	0.64 (0.63-0.64)	1.21 (1.11-1.31)
36	3.12 (3.00-3.24)	0.63 (0.62-0.64)	1.28 (1.17-1.39)	4.20 (4.03-4.38)	0.63 (0.62-0.64)	1.19 (1.08-1.30)
37	3.15 (3.02-3.28)	0.63 (0.62-0.63)	1.30 (1.19-1.42)	4.18 (4.00-4.37)	0.63 (0.62-0.63)	1.18 (1.07-1.31)
38	3.09 (2.96-3.22)	0.62 (0.62-0.63)	1.38 (1.26-1.51)	4.16 (3.96-4.37)	0.62 (0.62-0.63)	1.21 (1.08-1.35)
39	3.08 (2.95-3.22)	0.62 (0.61-0.63)	1.41 (1.29-1.55)	4.12 (3.91-4.34)	0.62 (0.61-0.62)	1.20 (1.07-1.36)
40	3.06 (2.92-3.21)	0.61 (0.61-0.62)	1.43 (1.30-1.58)	4.07 (3.85-4.31)	0.61 (0.61-0.62)	1.24 (1.09-1.40)
41	3.06 (2.92-3.21)	0.61 (0.60-0.61)	1.45 (1.31-1.61)	3.89 (3.65-4.14)	0.61 (0.60-0.61)	1.29 (1.12-1.48)
42	2.98 (2.83-3.13)	0.60 (0.60-0.61)	1.50 (1.34-1.67)	3.77 (3.52-4.04)	0.60 (0.60-0.61)	1.28 (1.10-1.50)
43	2.92 (2.76-3.08)	0.60 (0.60-0.61)	1.52 (1.35-1.71)	3.74 (3.46-4.04)	0.60 (0.59-0.61)	1.26 (1.06-1.49)
44	2.90 (2.73-3.08)	0.60 (0.59-0.61)	1.59 (1.41-1.79)	3.77 (3.46-4.11)	0.60 (0.59-0.61)	1.31 (1.08-1.58)
45	2.92 (2.74-3.11)	0.60 (0.59-0.61)	1.58 (1.39-1.80)	3.88 (3.54-4.26)	0.60 (0.59-0.60)	1.23 (1.00-1.51)
46	2.81 (2.61-3.02)	0.60 (0.59-0.60)	1.57 (1.35-1.82)	3.79 (3.40-4.23)	0.60 (0.59-0.60)	1.29 (1.02-1.64)
47	2.76 (2.55-3.00)	0.59 (0.58-0.60)	1.53 (1.29-1.81)	3.71 (3.27-4.21)	0.59 (0.58-0.60)	1.23 (0.93-1.63)
48	2.78 (2.53-3.04)	0.59 (0.58-0.59)	1.50 (1.24-1.82)	3.74 (3.22-4.34)	0.58 (0.58-0.59)	1.22 (0.89-1.68)
49	2.83 (2.56-3.14)	0.59 (0.58-0.60)	1.39 (1.11-1.74)	3.72 (3.11-4.46)	0.59 (0.58-0.60)	0.87 (0.55-1.37)
50	2.82 (2.50-3.18)	0.59 (0.58-0.60)	1.31 (0.98-1.74)	3.72 (2.98-4.65)	0.59 (0.58-0.60)	0.62 (0.32-1.20)
51	2.76 (2.38-3.21)	0.59 (0.57-0.60)	1.37 (0.95-1.98)	3.60 (2.73-4.74)	0.59 (0.57-0.60)	0.47 (0.18-1.23)

52	2.82 (2.30-3.45)	0.58 (0.56-0.60)	1.64 (0.95-2.81)	4.45 (3.27-6.04)	0.58 (0.56-0.60)	0.58 (0.23-1.48)

Appendix Table 8. Sex-specific associations between schizophrenia and other non-affective psychosis with not having any secondary or higher education over the work life course

Age	Schizophrenia	Sex	Schizophrenia x sex	Other non-affective psychosis	Sex	Other non-affective psychosis x sex
	RR (95% CI)	RR (95% CI)	RR (95% CI)	RR (95% CI)	RR (95% CI)	RR (95% CI)
25	2.98 (2.89-3.08)	0.71 (0.70-0.71)	1.27 (1.20-1.34)	2.40 (2.33-2.46)	0.70 (0.70-0.71)	1.25 (1.19-1.31)
26	3.02 (2.92-3.11)	0.70 (0.69-0.70)	1.27 (1.20-1.34)	2.39 (2.32-2.46)	0.69 (0.69-0.70)	1.24 (1.19-1.30)
27	3.03 (2.94-3.14)	0.69 (0.68-0.69)	1.28 (1.21-1.36)	2.39 (2.32-2.47)	0.68 (0.68-0.69)	1.24 (1.18-1.30)
28	3.06 (2.96-3.16)	0.68 (0.67-0.68)	1.27 (1.20-1.35)	2.40 (2.33-2.48)	0.68 (0.67-0.68)	1.24 (1.17-1.30)
29	3.09 (2.99-3.20)	0.67 (0.67-0.67)	1.28 (1.20-1.36)	2.42 (2.34-2.50)	0.67 (0.66-0.67)	1.25 (1.18-1.32)
30	3.13 (3.02-3.24)	0.66 (0.66-0.67)	1.28 (1.20-1.36)	2.43 (2.35-2.51)	0.66 (0.66-0.67)	1.24 (1.17-1.31)
31	3.15 (3.03-3.27)	0.66 (0.65-0.66)	1.26 (1.18-1.35)	2.43 (2.34-2.51)	0.66 (0.65-0.66)	1.22 (1.15-1.29)
32	3.14 (3.03-3.26)	0.65 (0.64-0.65)	1.28 (1.19-1.37)	2.44 (2.35-2.53)	0.65 (0.64-0.65)	1.20 (1.13-1.28)
33	3.13 (3.01-3.26)	0.64 (0.64-0.65)	1.29 (1.20-1.38)	2.43 (2.34-2.52)	0.64 (0.64-0.65)	1.21 (1.13-1.29)
34	3.15 (3.02-3.28)	0.64 (0.63-0.64)	1.31 (1.22-1.41)	2.46 (2.37-2.56)	0.64 (0.63-0.64)	1.19 (1.11-1.27)
35	3.12 (2.99-3.26)	0.63 (0.63-0.64)	1.34 (1.24-1.44)	2.46 (2.37-2.57)	0.63 (0.63-0.64)	1.20 (1.12-1.28)
36	3.15 (3.01-3.29)	0.63 (0.62-0.63)	1.35 (1.25-1.46)	2.48 (2.38-2.59)	0.63 (0.62-0.63)	1.18 (1.10-1.27)
37	3.16 (3.02-3.31)	0.62 (0.62-0.63)	1.38 (1.28-1.50)	2.49 (2.38-2.60)	0.62 (0.62-0.63)	1.18 (1.10-1.27)
38	3.15 (3.00-3.30)	0.62 (0.61-0.63)	1.38 (1.28-1.50)	2.48 (2.37-2.59)	0.62 (0.61-0.63)	1.20 (1.11-1.30)
39	3.14 (2.98-3.30)	0.62 (0.61-0.62)	1.41 (1.30-1.53)	2.43 (2.32-2.55)	0.62 (0.61-0.62)	1.23 (1.14-1.34)
40	3.14 (2.99-3.31)	0.61 (0.60-0.62)	1.44 (1.32-1.56)	2.41 (2.29-2.53)	0.61 (0.60-0.62)	1.26 (1.16-1.37)
41	3.12 (2.96-3.29)	0.60 (0.60-0.61)	1.43 (1.31-1.56)	2.38 (2.26-2.51)	0.60 (0.60-0.61)	1.27 (1.16-1.38)
42	3.15 (2.98-3.32)	0.60 (0.59-0.61)	1.43 (1.30-1.56)	2.37 (2.25-2.50)	0.60 (0.59-0.61)	1.28 (1.17-1.40)
43	3.13 (2.96-3.32)	0.60 (0.59-0.61)	1.45 (1.32-1.60)	2.37 (2.24-2.51)	0.60 (0.59-0.61)	1.27 (1.16-1.40)
44	3.17 (2.99-3.37)	0.60 (0.59-0.61)	1.42 (1.28-1.57)	2.35 (2.21-2.49)	0.60 (0.59-0.61)	1.26 (1.14-1.40)
45	3.15 (2.96-3.36)	0.60 (0.59-0.60)	1.41 (1.27-1.57)	2.28 (2.14-2.44)	0.60 (0.59-0.60)	1.30 (1.17-1.45)
46	3.24 (3.03-3.46)	0.59 (0.59-0.60)	1.34 (1.20-1.50)	2.30 (2.15-2.47)	0.59 (0.59-0.60)	1.29 (1.15-1.45)
47	3.20 (2.97-3.44)	0.59 (0.58-0.60)	1.36 (1.21-1.54)	2.24 (2.07-2.42)	0.59 (0.58-0.60)	1.39 (1.22-1.58)
48	3.29 (3.05-3.56)	0.58 (0.57-0.59)	1.33 (1.16-1.51)	2.24 (2.05-2.44)	0.58 (0.57-0.59)	1.36 (1.18-1.57)
49	3.29 (3.02-3.58)	0.59 (0.58-0.60)	1.31 (1.13-1.52)	2.21 (2.00-2.45)	0.59 (0.58-0.60)	1.36 (1.16-1.60)
50	3.35 (3.03-3.69)	0.59 (0.57-0.60)	1.26 (1.06-1.49)	2.27 (2.02-2.55)	0.59 (0.57-0.60)	1.35 (1.12-1.62)
51	3.35 (2.97-3.77)	0.58 (0.57-0.60)	1.21 (0.98-1.50)	2.23 (1.92-2.58)	0.58 (0.57-0.60)	1.37 (1.09-1.73)

52	3.27 (2.76-3.88)	0.58 (0.56-0.60)	1.15 (0.84-1.58)	2.29 (1.87-2.80)	0.58 (0.56-0.60)	1.29 (0.92-1.80)

Appendix Table 9. Sex-specific associations between bipolar disorders and depressive disorders with not having any secondary or higher education over the work life course

Age	Bipolar disorders RR (95% CI)	Sex RR (95% CI)	Bipolar disorders x sex RR (95% CI)	Depressive disorders RR (95% CI)	Sex RR (95% CI)	Depressive disorders x sex RR (95% CI)
25	1.88 (1.73-2.05)	0.70 (0.70-0.71)	1.49 (1.33-1.66)	2.44 (2.37-2.51)	0.70 (0.69-0.70)	1.21 (1.16-1.26)
26	1.92 (1.75-2.10)	0.69 (0.69-0.70)	1.40 (1.25-1.58)	2.42 (2.35-2.50)	0.69 (0.68-0.69)	1.19 (1.14-1.25)
27	1.91 (1.73-2.10)	0.68 (0.68-0.69)	1.45 (1.28-1.64)	2.41 (2.33-2.49)	0.68 (0.68-0.68)	1.18 (1.12-1.23)
28	1.86 (1.68-2.06)	0.68 (0.67-0.68)	1.45 (1.27-1.66)	2.40 (2.31-2.48)	0.67 (0.67-0.68)	1.18 (1.12-1.24)
29	1.83 (1.64-2.04)	0.67 (0.66-0.67)	1.46 (1.26-1.68)	2.36 (2.28-2.45)	0.67 (0.66-0.67)	1.18 (1.12-1.24)
30	1.84 (1.64-2.06)	0.66 (0.66-0.67)	1.42 (1.22-1.65)	2.33 (2.24-2.42)	0.66 (0.65-0.66)	1.18 (1.11-1.25)
31	1.82 (1.62-2.06)	0.66 (0.65-0.66)	1.34 (1.14-1.58)	2.33 (2.24-2.43)	0.65 (0.65-0.66)	1.15 (1.08-1.22)
32	1.79 (1.58-2.04)	0.65 (0.64-0.65)	1.32 (1.10-1.57)	2.34 (2.24-2.44)	0.65 (0.64-0.65)	1.12 (1.05-1.20)
33	1.74 (1.52-2.00)	0.64 (0.64-0.65)	1.25 (1.03-1.52)	2.30 (2.19-2.40)	0.64 (0.64-0.65)	1.11 (1.03-1.19)
34	1.66 (1.43-1.93)	0.64 (0.63-0.64)	1.27 (1.02-1.57)	2.31 (2.20-2.43)	0.64 (0.63-0.64)	1.10 (1.02-1.20)
35	1.59 (1.36-1.87)	0.63 (0.63-0.64)	1.37 (1.09-1.72)	2.27 (2.15-2.39)	0.63 (0.63-0.64)	1.13 (1.04-1.24)
36	1.59 (1.34-1.89)	0.63 (0.62-0.63)	1.38 (1.08-1.77)	2.30 (2.18-2.44)	0.63 (0.62-0.63)	1.13 (1.03-1.24)
37	1.52 (1.27-1.83)	0.62 (0.62-0.63)	1.51 (1.16-1.95)	2.33 (2.19-2.47)	0.62 (0.62-0.63)	1.13 (1.02-1.25)
38	1.53 (1.26-1.85)	0.62 (0.61-0.63)	1.49 (1.13-1.96)	2.32 (2.17-2.47)	0.62 (0.61-0.63)	1.12 (1.01-1.26)
39	1.48 (1.20-1.82)	0.62 (0.61-0.62)	1.52 (1.13-2.04)	2.25 (2.09-2.42)	0.62 (0.61-0.62)	1.17 (1.03-1.32)
40	1.51 (1.23-1.87)	0.61 (0.61-0.62)	1.61 (1.19-2.17)	2.29 (2.12-2.48)	0.61 (0.61-0.62)	1.11 (0.97-1.27)
41	1.50 (1.20-1.86)	0.61 (0.60-0.61)	1.47 (1.06-2.04)	2.31 (2.12-2.52)	0.61 (0.60-0.61)	1.15 (1.00-1.33)
42	1.48 (1.18-1.85)	0.60 (0.60-0.61)	1.55 (1.11-2.17)	2.26 (2.06-2.49)	0.60 (0.60-0.61)	1.22 (1.04-1.43)
43	1.50 (1.18-1.90)	0.60 (0.59-0.61)	1.49 (1.05-2.11)	2.26 (2.04-2.50)	0.60 (0.59-0.61)	1.21 (1.02-1.44)
44	1.55 (1.21-1.99)	0.60 (0.59-0.61)	1.38 (0.95-2.00)	2.23 (1.99-2.50)	0.60 (0.59-0.61)	1.25 (1.04-1.51)
45	1.68 (1.31-2.15)	0.60 (0.59-0.60)	1.25 (0.85-1.84)	2.19 (1.93-2.48)	0.60 (0.59-0.60)	1.31 (1.07-1.62)
46	1.81 (1.41-2.33)	0.59 (0.59-0.60)	1.25 (0.83-1.86)	2.19 (1.92-2.51)	0.59 (0.59-0.60)	1.27 (1.01-1.60)
47	1.78 (1.34-2.35)	0.59 (0.58-0.60)	1.30 (0.83-2.01)	2.18 (1.87-2.55)	0.59 (0.58-0.60)	1.28 (0.98-1.68)
48	1.66 (1.21-2.28)	0.58 (0.57-0.59)	1.24 (0.75-2.05)	2.13 (1.77-2.56)	0.58 (0.57-0.59)	1.31 (0.96-1.79)
49	1.62 (1.15-2.28)	0.59 (0.58-0.60)	1.33 (0.76-2.33)	2.18 (1.74-2.72)	0.59 (0.58-0.60)	1.24 (0.85-1.80)
50	1.38 (0.91-2.10)	0.59 (0.57-0.60)	1.61 (0.82-3.16)	2.01 (1.48-2.72)	0.59 (0.57-0.60)	1.22 (0.74-1.99)
51	1.06 (0.57-1.96)	0.58 (0.57-0.60)	1.40 (0.50-3.96)	2.19 (1.47-3.27)	0.58 (0.57-0.60)	1.23 (0.66-2.29)

52	0.97 (0.34-2.76)	0.58 (0.56-0.60)	1.73 (0.40-7.58)	1.69 (0.85-3.37)	0.58 (0.56-0.60)	1.85 (0.67-5.09)

Appendix Table 10. Sex-specific associations between other mood disorders and anxiety disorders with not having any secondary or higher education over the work life course

Age	Other mood disorders RR (95% CI)	Sex RR (95% CI)	Other mood disorders x sex RR (95% CI)	Anxiety disorders RR (95% CI)	Sex RR (95% CI)	Anxiety disorders x sex RR (95% CI)
25	2.51 (2.36-2.68)	0.70 (0.70-0.71)	1.32 (1.18-1.47)	2.44 (2.39-2.49)	0.71 (0.71-0.72)	1.26 (1.21-1.31)
26	2.49 (2.33-2.66)	0.69 (0.69-0.70)	1.32 (1.18-1.48)	2.44 (2.39-2.49)	0.70 (0.70-0.71)	1.26 (1.20-1.31)
27	2.50 (2.34-2.67)	0.68 (0.68-0.69)	1.32 (1.17-1.49)	2.44 (2.39-2.49)	0.69 (0.69-0.70)	1.24 (1.18-1.30)
28	2.52 (2.35-2.70)	0.68 (0.67-0.68)	1.28 (1.13-1.46)	2.45 (2.40-2.50)	0.69 (0.68-0.69)	1.24 (1.18-1.30)
29	2.54 (2.37-2.72)	0.67 (0.66-0.67)	1.30 (1.14-1.49)	2.45 (2.40-2.50)	0.68 (0.67-0.68)	1.22 (1.16-1.28)
30	2.51 (2.34-2.70)	0.66 (0.66-0.67)	1.29 (1.13-1.48)	2.44 (2.38-2.49)	0.67 (0.67-0.68)	1.23 (1.17-1.30)
31	2.51 (2.34-2.69)	0.66 (0.65-0.66)	1.31 (1.14-1.51)	2.44 (2.38-2.49)	0.66 (0.66-0.67)	1.20 (1.13-1.27)
32	2.54 (2.36-2.73)	0.65 (0.64-0.65)	1.30 (1.13-1.50)	2.44 (2.38-2.50)	0.66 (0.65-0.66)	1.17 (1.10-1.24)
33	2.56 (2.38-2.75)	0.64 (0.64-0.65)	1.20 (1.03-1.40)	2.44 (2.38-2.50)	0.65 (0.65-0.66)	1.14 (1.07-1.22)
34	2.58 (2.40-2.78)	0.64 (0.63-0.64)	1.23 (1.05-1.43)	2.43 (2.37-2.49)	0.65 (0.64-0.65)	1.17 (1.09-1.25)
35	2.61 (2.43-2.81)	0.63 (0.63-0.64)	1.21 (1.03-1.42)	2.46 (2.40-2.53)	0.64 (0.64-0.65)	1.17 (1.08-1.25)
36	2.58 (2.40-2.79)	0.63 (0.62-0.63)	1.23 (1.04-1.44)	2.48 (2.42-2.55)	0.64 (0.63-0.64)	1.15 (1.06-1.24)
37	2.62 (2.43-2.83)	0.62 (0.62-0.63)	1.19 (1.00-1.41)	2.52 (2.45-2.59)	0.63 (0.63-0.64)	1.16 (1.07-1.26)
38	2.64 (2.44-2.85)	0.62 (0.62-0.63)	1.20 (1.01-1.42)	2.56 (2.48-2.64)	0.63 (0.62-0.63)	1.16 (1.07-1.27)
39	2.64 (2.44-2.86)	0.62 (0.61-0.62)	1.17 (0.98-1.40)	2.58 (2.50-2.66)	0.62 (0.62-0.63)	1.16 (1.06-1.28)
40	2.64 (2.43-2.86)	0.61 (0.61-0.62)	1.20 (1.01-1.44)	2.64 (2.55-2.73)	0.62 (0.61-0.63)	1.16 (1.06-1.28)
41	2.64 (2.43-2.86)	0.61 (0.60-0.61)	1.19 (0.99-1.43)	2.65 (2.56-2.74)	0.61 (0.61-0.62)	1.18 (1.06-1.30)
42	2.59 (2.38-2.82)	0.60 (0.60-0.61)	1.22 (1.01-1.46)	2.66 (2.57-2.76)	0.61 (0.60-0.62)	1.16 (1.04-1.29)
43	2.56 (2.35-2.79)	0.60 (0.59-0.61)	1.21 (1.00-1.47)	2.65 (2.56-2.75)	0.61 (0.60-0.61)	1.17 (1.05-1.31)
44	2.54 (2.33-2.78)	0.60 (0.59-0.61)	1.25 (1.03-1.51)	2.69 (2.59-2.79)	0.61 (0.60-0.61)	1.18 (1.05-1.32)
45	2.57 (2.35-2.81)	0.60 (0.59-0.61)	1.24 (1.02-1.51)	2.70 (2.59-2.81)	0.60 (0.60-0.61)	1.19 (1.05-1.35)
46	2.58 (2.35-2.82)	0.60 (0.59-0.60)	1.27 (1.04-1.54)	2.73 (2.61-2.85)	0.60 (0.59-0.61)	1.22 (1.07-1.39)
47	2.58 (2.35-2.83)	0.59 (0.58-0.60)	1.24 (1.01-1.53)	2.76 (2.63-2.89)	0.60 (0.59-0.61)	1.20 (1.04-1.38)
48	2.53 (2.30-2.79)	0.59 (0.58-0.59)	1.32 (1.07-1.63)	2.79 (2.65-2.93)	0.59 (0.58-0.60)	1.19 (1.01-1.39)
49	2.51 (2.27-2.78)	0.59 (0.58-0.60)	1.30 (1.03-1.63)	2.78 (2.63-2.94)	0.60 (0.59-0.61)	1.19 (1.00-1.42)
50	2.50 (2.23-2.80)	0.59 (0.58-0.60)	1.07 (0.80-1.43)	2.73 (2.55-2.91)	0.59 (0.58-0.61)	1.11 (0.90-1.38)
51	2.51 (2.19-2.88)	0.59 (0.57-0.60)	1.11 (0.80-1.55)	2.83 (2.61-3.06)	0.59 (0.58-0.61)	0.99 (0.75-1.30)

52	2.37 (1.94-2.90)	0.58 (0.56-0.60)	0.89 (0.51-1.54)	2.71 (2.41-3.06)	0.58 (0.56-0.61)	1.03 (0.69-1.53)

Appendix Table 11. The associations between mental disorders with no higher or secondary education at the age of 25, 30, 40 and 50

	No higher or secondary education at the age of 25					
	Model 1 (n=1884853)		Model 2 (n=1884853)		Model 3 (n=1727296)	
	RR	95% CI	RR	95% CI	RR	95% CI
Alcohol use disorder	3.11	3.05-3.17	3.17	3.1-3.24	2.97	2.90-3.04
Other substance abuse disorders	4.22	4.15-4.28	4.35	4.27-4.44	4.37	4.29-4.45
Other non-affective psychoses	3.23	3.16-3.31	3.21	3.13-3.30	3.21	3.13-3.29
Schizophrenia	2.54	2.49-2.60	2.60	2.54-2.66	2.61	2.55-2.67
Bipolar disorders	2.06	1.96-2.17	2.36	2.23-2.49	2.40	2.27-2.53
Depressive disorders	2.32	2.27-2.36	2.69	2.63-2.74	2.73	2.68-2.79
Other mood disorders	2.84	2.70-2.99	2.74	2.60-2.89	2.68	2.52-2.84
Anxiety disorders	2.53	2.49-2.57	2.58	2.54-2.62	2.58	2.53-2.63
	No higher or secondary education at the age of 30					
	Model 1 (n=1572972)		Model 2 (n=1572972)		Model 3 (n=1420298)	
	RR	95% CI	RR	95% CI	RR	95% CI
Alcohol use disorder	3.05	2.97-3.13	3.24	3.16-3.33	3.06	2.98-3.15
Other substance abuse disorders	4.07	3.99-4.16	4.47	4.36-4.59	4.58	4.48-4.69
Other non-affective psychoses	3.19	3.11-3.28	3.37	3.27-3.47	3.37	3.27-3.47
Schizophrenia	2.42	2.36-2.48	2.62	2.55-2.70	2.63	2.56-2.70
Bipolar disorders	1.82	1.69-1.96	2.20	2.04-2.38	2.24	2.07-2.42
Depressive disorders	2.04	1.98-2.09	2.51	2.44-2.58	2.61	2.53-2.68
Other mood disorders	2.75	2.59-2.91	2.69	2.53-2.86	2.59	2.42-2.77
Anxiety disorders	2.38	2.34-2.43	2.53	2.48-2.58	2.56	2.50-2.61
	No higher or secondary education at the age of 40					
	Model 1 (n=892585)		Model 2 (n=892585)		Model 3 (n=801032)	
	RR	95% CI	RR	95% CI	RR	95% CI
Alcohol use disorder	3.16	3.03-3.28	3.29	3.16-3.43	3.15	3.01-3.29

Other substance abuse disorders	3.84	3.66-4.02	4.26	4.05-4.48	4.18	3.97-4.4
Other non-affective psychoses	3.26	3.14-3.39	3.55	3.40-3.70	3.50	3.35-3.65
Schizophrenia	2.36	2.27-2.45	2.62	2.51-2.73	2.59	2.48-2.70
Bipolar disorders	1.63	1.41-1.89	1.86	1.60-2.17	1.83	1.56-2.14
Depressive disorders	2.01	1.89-2.14	2.37	2.23-2.53	2.40	2.25-2.57
Other mood disorders	2.77	2.58-2.97	2.74	2.55-2.95	2.61	2.42-2.83
Anxiety disorders	2.69	2.61-2.77	2.69	2.61-2.78	2.65	2.57-2.74
	No higher or secondary education at the age of 50					
	Model 1 (n=225516)		Model 2 (n=225516)		Model 3 (n=202683)	
	RR	95% CI	RR	95% CI	RR	95% CI
Alcohol use disorder	2.85	2.56-3.18	2.96	2.65-3.30	2.79	2.49-3.13
Other substance abuse disorders	3.18	2.53-3.99	3.38	2.73-4.18	3.35	2.67-4.22
Other non-affective psychoses	3.22	2.98-3.49	3.63	3.35-3.94	3.58	3.30-3.90
Schizophrenia	2.24	2.05-2.45	2.53	2.31-2.78	2.46	2.24-2.71
Bipolar disorders	1.61	1.16-2.22	1.64	1.18-2.29	1.59	1.10-2.29
Depressive disorders	1.85	1.45-2.35	2.16	1.70-2.75	1.99	1.55-2.57
Other mood disorders	2.46	2.22-2.73	2.53	2.28-2.81	2.44	2.18-2.72
Anxiety disorders	2.79	2.62-2.97	2.76	2.59-2.94	2.64	2.47-2.83

Note. All mental disorders are analyzed separately
Model 1: unadjusted
Model 2: adjusted for sex, the year of birth and migrant status
Model 3: additional adjustment for the history of parental mental disorders