The impact of mental health problems in adolescence on educational attainment

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Abstract

The aim of the study has been to examine the impact of diagnosed internalising and externalising behavioural problems on educational attainment. We used a fixed-effect model on rich individual longitudinal register data. The sample consisted of five full cohorts of adolescents (N=242,542). The analyses suggest that compared to their healthy peers, boys and girls with externalising problems have respectively 38 and 40 percentage points lower probability of completing upper secondary school. The comparable numbers for internalising problems are 29 percentage points for boys and 26 percentage points for girls. With regard to the likelihood of attending higher education, for those that completed secondary school, the results show a negative but much smaller impact of mental health disorders than the case was in the analysis of upper secondary school completion.

Keyword: mental health, education, drop out, adolecents

Introduction

There is growing concern about the mental health of young people. The rate of clinical diagnosis and treatment of adolescent psychiatric disorders, as well as the number of self-reported symptoms of mental health problems, have increased in recent decades (Bor et al. 2014, Collishaw 2015, Sletten and Bakken 2015). Worldwide, around 10%–20% of young people suffer from mental health disorders (WHO 2018). Mental health problems early in life are a serious issue with potentially severe consequences for the well-being of children and young people. Moreover, mental health problems in adolescence have been linked to poor educational outcomes (Esch et al. 2014) and adverse labour market outcomes (Veldman et al. 2015).

It is often fruitful to distinguish between externalising and internalising disorders (Achenbach 1978). Internalising disorders refer to problems of withdrawal, generating distress in the individual, and include disorders such as depression, anxiety and emotional disorders. Externalising disorders are mental disorders characterised by behaviours directed toward an individual's environment, and include disorders such as attention-deficit/hyperactivity disorder, conduct disorder and antisocial personality disorder. The onset of mental disorders usually occurs in childhood or adolescence (de Girolamo et al. 2012, Kessler et al. 2007). Longitudinal studies show that early onset rarely remits spontaneously and contributes to explain the burden of mental disorders in adulthood (de Graaf et al. 2012, Wittchen et al. 2011). Mental health problems vary across sociodemographic groups (Reiss et al. 2019). Furthermore, there are well-established gender differences in mental health problems (Van Droogenbroeck, Spruyt and Keppens 2018). Internalising problems affect girls to a greater extent than boys, while boys are more likely to be diagnosed with externalising disorders (Seedat et al. 2009). Furthermore, evidence from previous research suggests that educational outcomes may vary across mental disorders, with externalising behaviours appearing to have greater negative impacts on educational attainment than internalising problems (Currie and Stabile 2007).

Using longitudinal register data, this study examined the impact of mental health problems in adolescence on educational attainment for Norwegian youth. Norway serves as an interesting case for several reasons. First, the proportion of young people receiving health-related welfare benefits has increased substantially in recent decades, and the level is now the highest among the Organisation for Economic Co-operation and Development (OECD) countries (OECD 2018). The majority of these youths suffer from mental health disorders. Second, from an international perspective, Norway has relatively high non-completion rates in

upper secondary education, with one-in-five lacking an upper secondary degree at the age of 24 (Eurostat 2019). Third, Norway has very rich longitudinal register data containing information on diagnostic mental health problems linked to information on educational attainment. Empirical studies on the subject are often based on subjective measures of health provided by survey data and are hence subject to measurement error. Register data is less prone to sampling error and selection bias (Thygesen and Ersboll 2014). Moreover, previous research indicates that there is a lack of large-scale longitudinal studies examining the impact of mental health on educational attainment (Cornaglia, Crivellaro and McNally 2015). Our database covered the whole population in Norway aged 15 to 17 in the five years period from 2008 to 2012, and we followed them until the end of the year they turned 21 years old. This study, thus, provides new relevant knowledge on the relationship between diagnosed mental disorders and educational attainment among boys and girls, using high-quality register data.

Background and previous research

There are a number of mechanisms through which mental health problems can lead to adverse educational outcomes. Mental disorders in childhood can have a negative influence on the development of a child's cognitive abilities, which in turn affects school performance (Guo and Harris 2000). The relationship between mental health and educational attainment is complex, and it is hard to know whether mental health problems have a direct adverse effect on educational attainment or if some other confounding factor is responsible (Hale, Bevilacqua and Viner 2015).

In the literature, mental health problems are commonly divided into internalising and externalising problems. With regard to externalising problems, consistent negative associations with educational outcomes have been found in several studies in the US (Breslau et al. 2011, Currie and Stabile 2006, McLeod and Kaiser 2004), Canada (Currie and Stabile 2006), New Zealand (Miech et al. 1999), the Netherlands (Veldman et al. 2014), Sweden (Jonsson et al. 2010), and Norway (Evensen et al, 2016). For internalising problems, the results are rather mixed (Melkevik et al. 2016). While some studies found an association between internalising problems and the rate of high school dropouts, failure to enter college, and NEET status (Brekke and Reisel 2015, Cornaglia, Crivellaro and McNally 2015, Fletcher 2008, Fletcher 2010, Kessler et al. 1995, McLeod and Fettes 2007), other studies report no such linkage (Breslau et al. 2011, Evensen et al. 2016, Miech et al. 1999). The differing findings might be due to methodological differences, as well as differences in the measurement and definition of mental

health problems. However, they could also reflect national differences. For instance, Breslau et al. (2011) found that after adjustment for co-occurring disorders (using diagnostic interviews), there was no significant association between internalising problems and failure to graduate on time. Similar results were found in a Norwegian study (Evensen et al. 2016) using linked survey-register data. Controlling for externalising disorders, there was no association between internalising problems and educational outcomes. In a longitudinal study conducted in New Zealand Miech et al. (1999) underline that different psychiatric diagnoses are differently related to social status. Moreover, their findings suggest that while anxiety and depression do not impair educational outcomes, conduct disorder and attention deficit disorder affect educational outcomes negatively, as well as future life opportunities. On the other hand, an American study analysing the effect of depressive symptoms on educational attainment found a negative effect, even after including externalising mental health problems in the model. However, the study did not include conduct disorders in the analysis (Fletcher, 2010).

Several authors have suggested that the association between internalising problems and disadvantaged educational outcomes could be attributed to differences in parental socioeconomic status (SES) and comorbid externalising problems (Melkevik et al. 2016). There is ample evidence that family background plays a key role in both children's mental health and future outcomes, including educational attainment and academic achievement (Vukojevic et al. 2017). Thus, studies analysing the association between mental health and educational outcomes should control for family socioeconomic characteristics (Esch et al. 2014).

Gender differences appear to matter for the association between mental health problems and educational outcomes. However, the literature does not provide a consistent picture (Esch et al. 2014). For the case of the US, Fletcher (2008) found that the negative relationship between depression and educational attainment applies to girls, but not boys. Ding et al. (2009) used genetic markers to examine the impact of depression in adolescence on academic performance and find the effects to be stronger for girls than for boys. Similar results were reported for Australia (Leach and Butterworth 2012) and the Netherlands (Veldman et al. 2014). Furthermore, Owens (2016) reported that early behaviour problems affect educational outcomes more for boys than for girls in the US.

Based on the research mentioned above, we hypothesised that externalising problems are more detrimental to educational attainment than internalising problems. Moreover, we expected the impact of externalising problems on educational attainment to be stronger among boys than among girls. Internalising problems, on the other hand, were expected to interrupt girls' educational outcomes more than those of boys.

The Norwegian context

The education system

Education in Norway is compulsory until age 16, when pupils finish lower secondary school. Public schools is the norm, and private schools are strongly subsidized. Compulsory school is divided into primary school (grades 1–7) and lower secondary school (grades 8–10). Both levels operate within a common governmental framework and a national programme of study. Schools are run by the local authorities; school districts follow residential street addresses, and children are allocated to the school where they live. There is no tracking by ability and no grade retention, meaning that pupils follow grades by their year of birth.

Upper secondary school (grades 11–13) is strongly encouraged, but it is not mandatory. The normal duration is three years in academic tracks and four in vocational tracks. About 25%–30% of students do not complete upper secondary school within the first five years. Those who drop out of school are mostly boys who are following the vocational track (Statistics Norway 2019a, Statistics Norway 2019b). All public education in Norway is free of charge, and students are entitled to grants and loans from the Norwegian State Educational Loan Fund with favourable repayment conditions.

Mental health services

Norway has a universal and highly developed health system providing publicly funded healthcare services to all people residing in Norway. According to the Health and Care Services Act (The Ministry of Health and Care Services 2011), municipalities are obliged to give the necessary health and care services to their inhabitants. The primary health service in Norway includes the regular general practitioner (GP) service, health centres, the school health service, and other mental health services such as the educational–psychological counselling service. GPs are often the first point of contact for children and adolescents with mental health problems, and many are treated and given follow-up care by their GP. However, the GP can refer children and adolescents with more severe mental health problems to the special health service for further treatment and follow-up care. The specialist healthcare service for children and young people under the age of 18 consists of child and adolescent psychiatric outpatient clinics, child and adolescent psychiatric wards, as well as family units and psychiatric youth teams (Sommer 2016). All treatment and contact with the specialist mental healthcare services are registered in the Norwegian Patient Registry (NPR).

Young people tend to be outpatients far more frequently than adults: while inpatient services account for 80% of expenditure on mental health for adults, they account for only 45% of expenditure on children and adolescents (Norwegian Ministry of Health and Care Services 2005). The guidelines of the Norwegian Ministry of Health recommend that the school health service in lower secondary school (LSS) should include roughly 1.5 positions per 550 pupils in lower secondary school, none of whom are required to have a specialised competence in mental health.[1] The recommendations are met regarding the nurses, but coverage is a lot lower when it comes to GPs and physiotherapists (Norwegian Directorate of Health 2010).

Data, sample, and variables

Our sample consisted of all youths in Norway who were aged 15 to 17 years during the period 2008–2012. For these youths, we have access to several individual registers for the period 2008–2016. The registers are administered and merged by Statistics Norway. Importantly, a unique encrypted ID number makes it possible to link this data to the Norwegian Patient Registry (NPR) to obtain mental health information on these youths. The NPR is an administrative database of records reported by all government-owned hospitals and outpatient clinics and by all private health clinics that receive governmental reimbursement. The register contains individual information about all treatments received from the specialist healthcare service. The reporting of encrypted national ID numbers in the NPR began in 2008, allowing us to link it to other national registers. The diagnostic codes in the NPR follow the World Health Organization's International Classification of Diseases, version 10 (ICD-10). The Regional Committee for Medical Research Ethics in Norway approved the current study (2016/1434). For ethical reasons, we do not publish results on small diagnostic groups. Moreover, to ensure that individuals are unidentifiable the data is not linked to variables such as place of residency and detailed country of origin.

Dependent variables

We constructed two dummy variables to capture the association between mental health and educational attainment. The first dependent variable indicated whether the youth had completed upper secondary education at age 21 (yes=1, no=0). The second variable measured whether the youth had continued on to further education, which was coded 1 if he/she was

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[1] The 1.5 position should be composed of 0.2 GP, 0.38 physiotherapist and 1 full time nurse.

registered in higher education at age 21 and 0 otherwise[2]. This second outcome was conditional on having completed an academic track in upper secondary school, as this is a prerequisite for most tertiary educations. Due to data availability, the outcomes were observed for the cohorts born in 1993–1996.

Mental disorders

An individual was said to have a mental health disorder if he or she was registered as having had one or more consultations with the specialist mental health care services from the time he/she turned 15 until he/she turned 18. We distinguished between two different types of mental disorders: internalising and externalising disorders. Internalising disorders include depressive disorders, mood disorders (excluding bipolar) anxiety disorders, obsessive–compulsive and related disorders, trauma and stressor-related disorders, as well as eating disorders (ICD-10: F32-F34, F38-F43, F48, F50, F93-F94). Externalising disorders include hyperkinetic disorders (ADHD) and conduct disorders (ICD-10: F90-F91). The remaining consultations, which mainly include unspecified mental disorders, as well as disorders related to mental retardation and developmental disorders (ICD-10: F70-F89) are disregarded in the analyses.[3,4]

Covariates

Country of birth was measured by three dummy variables (Norway, Western countries and non-Western countries).[5] *Grade point average (GPA)* was measured in the 10th grade as an average of credits/marks reflecting performance in class, tests, and national exams in all 11 main school subjects undertaken in lower secondary school. *Socioeconomic status* (SES) was measured by parental education and income. *Parental education* was divided into three levels: compulsory school or less, upper secondary school, and bachelor's/master's level and above. Missing

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[2] The majority of the students (70 %) enrol in higher education for the first time before they turn 22 years old (Statistics Norway, 2020).

[3] That is, in the category 'Other' two-thirds of the consultations are registered as 'no diagnosis given'/'no illness found', or the information is missing. The remaining diagnoses in 'Other' are mostly disabilities delaying normal progression.

[4] Ideally, we would like to control for comorbidity. However, few youths were registered as having multiple diagnoses in NPR during our observation period. Fewer than 10% of those with a registered ICD-10 code in our sample were registered as having a bi-diagnosis, of whom the majority were registered with a diagnosis in the same disorder-group as the main diagnosis.

[5] Western countries include the Nordic countries; Western Europe; the EU member states in Eastern Europe; North America and Oceania. Non-Western countries include those in Africa; Asia; Eastern Europe (excluding EU member states), South- and Middle-America.

educational information was included as a separate category. *Parental income* was measured as both parents' combined mean incomes during the years that the youth was 7–17 years of age, including salary, income from self-employment, and some state support benefits, such as unemployment benefits, sickness benefits, and maternity benefits. Parental income was measured in Basic Amounts.[6] *Timing of parental divorce* was divided into three: no divorce, parental divorce before turning 13, and divorce after turning 13 years old. In addition, we controlled for family size and birth order (=1 if firstborn, 0 otherwise). All analyses controlled for birth cohort. We also included contextual school variables from lower secondary school, such as the number of students. Not least, we included a set of covariates intended to capture peer effects at lower secondary school. Peers' mental health was captured by the *share of pupils with mental health problems at lower secondary school*, measured by three dummy variables depending on diagnosis (share of pupils with externalising problems, share of pupils with internalising problems, and share with other mental health problems). Peers' family background was captured by the average income of parents in the same cohort and school. To capture school quality, we included cohort- and school-specific GPA. All peer variables were constructed excluding the values for the individual under analysis.

Estimation strategy

We used a school fixed-effect model to examine the impact of diagnosed internalising and externalising behaviour problems on educational attainment. Educational attainment was measured in two ways: as the probability of completing upper secondary school by age 21 and as that of being enrolled in tertiary education at age 21. Our access to a full youth cohort as well as detailed individual, family, and school characteristics linked to medical records on specialised mental healthcare usage permitted us to investigate variations by type of diagnosis at a vulnerable age. All analyses were made separately for boys and girls. We investigated a potential mediator for the impact of mental health problems, namely grade point average (GPA) in lower secondary school. Our main goal was to investigate the impact of mental health problems on educational attainment. We relied on a rich set of variables to achieve this end, but we cannot assert that the correlation is actually causal. Reverse causality and omitted variables are potential problems. The association between mental health and educational attainment might be spurious if unobserved confounders are at play affecting both variables,

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[6] In 2016, 1 BA = 92,576 NOK (approx. EUR 9,066).

which, when overlooked, will mistakenly drive us to believe that mental health has an impact on prospects it does not have.

We approached the identification problems in several ways. We measured mental health and cognitive skills several years prior to when we measured our outcome variables, reducing the risk of reverse causality. Importantly, our rich longitudinal data permitted us to control for a broad array of time-varying and time-invariant covariates to deal with potentially confounding factors. In addition, we used the method developed by Oster (2019) to evaluate robustness to omitted variables bias and to provide upper and lower bounds for the impact of mental health on educational attainment.

Our basic fixed-effect model can be written as:

$$(1) \; Y_{isc} = \beta_0 + \beta_1 H_i + \beta_2 X_i + \beta_2 S_c + \sum_{c=1993}^{1997} \tau_c + \vartheta_s + \mu_{isc}$$

where Y_{isc} measures the outcome for individual i in school s and cohort c (year of birth). H is a categorical variable capturing the individual's mental health diagnosis from the special health care services and is our key explanatory variable. X is a vector of individual and parental characteristics. S is a vector of time-varying lower secondary school (LSS) characteristics; τ and v are cohort and upper secondary school (USS) fixed effects, and μ is an observation-specific error term. Standard errors were adjusted for by clustering at the USS level to take into account eventual within-school correlations.

We controlled for USS characteristics that were stable over time by including school fixed effects.[7] This is important. First, youths apply freely to USS and are accepted based on GPA scores from LSS. This means that, in contrast with the situation with regard to LSS, differences in school quality at the upper secondary level may be substantial, particularly in urban areas. Moreover, USS fixed effects also capture the school culture when it comes to mental health and the capacity of the school to create an environment where youths can turn to someone for help if in need of counselling. Time-varying school characteristics can be of concern, e.g. outside awareness of health issues at a school may make it less attractive over time, changing the quality of the school and, hence, students' outcomes. Since our analysis follows four cohorts of teenagers, we consider the time span too short to be of concern. We

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[7] Our fixed-effects approach implies that we only include youths who actually make the transition to USS. It is likely that youths with the most severe mental illnesses are overrepresented among those who drop out after compulsory school. In that case, our sample is positively selected, excluding the sickest youths. However, only 0.8% of the youths in our sample did not start upper secondary education during our observation window, of whom 30% were registered with a mental diagnosis. This suggests that the potential bias introduced by our fixed-effects approach was not very large.

captured the school environment at LSS by controlling for the presence of peers with mental health problems (the share of students with externalising and internalising diagnoses) in the 10th grade, peers' GPA scores, and parental income. Finally, we included individual-level GPA in the model to investigate the potential mediating role of GPA in the relationship between mental health and educational attainment. Our assumption was that, conditional on this rich set of controls, β_1 would identify the impact of mental health on later educational and labour market performance.

Results

Main results

Table 1 shows the prevalence of diagnosed mental disorders, as measured in our sample. Overall, there were 242,542 youth aged 15–17 during the period 2008–2012, of whom 13% had at least one consultation in the specialist mental health care services one or more times at ages 15–17 and were diagnosed as having a mental health disorder. Among these, 40% had an internalising disorder, while 17% had a disorder classified as an externalising disorder.[8] The mean number of consultations was 38, and the youths were registered in the NPR for an average of 10 months.

We observed substantial gender differences regarding mental health status. While 11% of the boys were diagnosed with a mental health disorder, the corresponding share among girls was 15%. Internalising disorders were much more common among girls than boys, while boys were more likely to be diagnosed with an externalising disorder. Our data also shows that girls consult specialists more frequently and stayed longer in the specialist health system compared to boys.

Table 1 here

Table 2 shows how the outcomes varied with the type of mental health disorder and gender. Overall, girls seem to have achieved higher educational attainment than boys, irrespective of diagnosis. Youth with mental health problems, however, did poorly; over half of the youths with mental health problems had not completed upper secondary school by the age of 21. This share was higher for boys than for girls and rose to two-thirds when it came to externalising disorders. Noticeably, roughly 60%–70% of boys who completed an academic track continued

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[8] The remaining 43% had a disorder classified as 'other' (of whom approximately two-thirds had an unspecified diagnosis).

on to higher education, irrespective of whether they had mental health problems. For girls, the differences were larger, with 82% of the whole sample and 59% of girls with externalising problems continuing in higher education.

Table 2 here

Table A1 in the Appendix shows summary statistics of the main background variables included in the estimations by gender and mental health status. We found only minor gender differences, reflecting the fact that our sample consisted of full cohorts of youth. The exception was GPA, where girls tended to have higher scores than boys. Girls also chose an academic track in USS to a larger degree than boys. The differences were larger when we compared across mental health status. Immigrants were under-represented among youth with a mental health disorder. This may reflect the fact that immigrants utilise specialist health care services to a lesser extent than ethnic Norwegians, rather than their having better mental health (Abebe, Lien and Elstad 2017). Youths with mental health problems also come from slightly more disadvantaged families, in terms of parents' education and income, and more often have divorced parents. They have lower GPAs. It is noteworthy that youths with mental health problems are more likely to choose a vocational track in upper secondary school.

Table 3 here

We ran a number of regressions, separately for boys and girls.[9] In Table 3, we investigated the probability of completing upper secondary school, measured at age 21. In the first model (column 1), we included mental health-related variables and country of birth. The second model (column 2) added groups of control variables in a stepwise manner to get an understanding of the different aspects of youth life being correlated with both mental health and school completion. In addition it included parental income and level of education, whether the

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[9] The classification into externalising and internalising disorders may seem a bit crude. As stated in section 4, externalizing disorders consist of two diagnostic groups (Hyperkinetic disorder (F90), Conduct disorders (F91)), while internalizing disorders include the diagnostic groups depressive disorders (F32-F34, F38-F39), anxiety (F40-F43, F48), eating disorders (F50) and emotional disorders (F93-F94). A simple tabulation shows that anxiety is the largest diagnostic group within internalising disorders for both boys and girls (around 50 percent), followed by depressive disorders. As for externalising disorders, over 90 percent have a hyperkinetic disorder. We have run the model for both outcomes separately for internalising and externalising disorders, controlling for diagnostic group. Results (available upon request) show very small differences across disorder group for internalising disorders, with the exception of eating disorders for girls. For externalising disorders, conduct problems seem to be more detrimental for completing upper secondary school than hyperkinetic disorders.

parents got divorced before or the year the teenager turned 13, family size and birth order. The third model (column 3) added the number of students at LSS, as well as peer variables in LSS: mean parents' income, mean cohort and school specific GPA, and the share with mental health problems (by diagnosis). The last model (column 4) added individual GPA from LSS. Moreover, all models included cohort and USS fixed effects, with standard errors clustered at the USS level.

The results from column (1) in Table 3 show that mental health disorders were negatively associated with the likelihood of completing USS. Moreover, the results suggested that externalising disorders have a stronger impact than internalising disorders, both for boys and girls. The estimates remained remarkably stable when we gradually included family- and LSS-related characteristics, as shown in columns (2) and (3). However, the estimates changed substantially when including individual GPA from LSS in the full set of controls (column 4). In fact, GPA was the single variable that reduced the impact of mental health disorders the most. Adjusting for GPA, we also observed that the difference between internalising and externalising problems became smaller.[10] This supports the role of individual GPA as a mediator, since externalising problems are often associated with concentration problems, and lack of concentration has a strong impact on school performance.

Since individual GPA seemed to absorb much of the impact of mental health problems, in the following, we refer to model 3 as our preferred model. To get an indication of the size of the estimates, we calculate the impact as a percentage using the information on the share that completed USS by age 21 in Table 2, and the estimates in column (3) in Table 3. The results show that externalising behavioural problems were associated with a reduction in school completion (by age 21) of roughly 54% for girls and 53% for boys. The comparable numbers for internalising problems were 42% for boys and 33% for girls.

Table 4 here

Table 4 shows estimates for the impact of mental health on the probability of attending tertiary education at age 21 for a sub-sample of youth who chose and successfully completed an academic track in upper secondary school. We found that mental health disorders were negatively associated with continuing with tertiary education. However, compared to USS

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[10] For boys, the mental health coefficients for externalizing and internalizing disorders in model 4 (with GPA) do not survive a Wald-test of equality of coefficients, while for girls the mental health coefficients are statistically different from each other in all specifications.

completion, the association was a lot less accentuated. As in the previous analyses (Table 3), the gender differences in predicted estimates were small regarding internalising problems: Model 3 (column 3) predicted that the impact of internalising problems on continuing in tertiary education was 8% for both genders. When it came to externalising problems, it reduced the probability of entering higher education by 14% for girls and 10% for boys. Again, we observed that individual GPA reduced the impact of mental disorders on educational outcomes (column 4). Interestingly, after adjusting for GPA, externalising disorders had no significant impact on boys, while externalising disorders were the most detrimental for girls.

Selection on unobservables

To assess the importance of omitted variable bias, we applied the procedure developed by Oster (2019). This method uses information about coefficient stability and changes in R-squared when adding covariates to estimate the bias arising from selection on unobservables. The underlying assumption is that the selection on unobserved variables is proportional to the observed selection captured by our covariates. Table 5 shows the results from the Oster procedure, estimating the overall impact of mental health on USS completion by age 21, merging the different types of mental health disorders into one single indicator, and pooling boys and girls. The first row shows the overall estimate based on Model 3, our preferred model (the controlled regression, in Oster's terms).

Table 5 here

The bias-adjusted estimate arising from the Oster procedure is shown in the second row of Table 5. This estimate may be interpreted as an upper bound on the overall effect, with the estimate from the controlled regression as a lower bound. The bias-adjustment makes the estimate less negative with respect to model 3, suggesting that we are not underestimating the impact of mental health on school performance. However, it is still negative and qualitatively leads to the same conclusion. This means that Oster's procedure predicts the overall impact to be between -0.26 and -0.30, which corresponds to a reduction in percentage terms between 19% and 22%. The last row shows the degree of selection on unobservables relative to observables that would be necessary to wipe out the effect of mental health. The results suggest that the unobservables must be almost four times as important as the observables to produce a zero-treatment effect. As we have access to a rich set of control variables, this suggests that our results are quite robust to omitted variable bias.

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Discussion and conclusion

This paper examined the impact of internalising and externalising mental health problems in adolescence on educational outcomes independently for boys and girls. Descriptive statistics indicated a clear gender difference in mental health problems. Internalising disorders were much more common among girls than boys, while boys were more likely to be diagnosed with an externalising disorders. Girls also had more frequent consultations and were registered in the specialist mental health care services for a longer period than boys. These results corroborate previous research showing significant gender differences in the diagnosis of mental disorders and health care use (Seedat et al. 2009, Sletten and Bakken 2015, Van Droogenbroeck, Spruyt and Keppens 2018).

In this paper, we hypothesised that externalising problems are more detrimental to educational attainment than internalising problems. In support of this hypothesis, the results in this study show that externalising problems seem to be more impeding for educational outcomes than internalising problems, and thus support previous findings (Currie and Stabile 2007, Esch et al. 2014). The results suggest that externalising behavioural problems were associated with a reduction in USS completion (by age 21) of roughly 54% for girls and 53% for boys. The comparable numbers for internalising problems are 42% for boys and 33% for girls. The stronger effect of externalised problems may be due to youths with externalising problems having coexisting conditions such as learning difficulties and problems with attention (Morgan and Lilienfeld 2000), which again may result in academic difficulties (Hinshaw 1992).

Furthermore, the results indicate that the impact of mental health disorders on school completion holds after adjusting for a rich set of family background and school characteristics. There is little evidence of selection in our data, supported by the results from the Oster procedure. However, the effect becomes much smaller after adjusting for GPA for both girls and boys. These results are in line with previous research (Sagatun et al. 2014) showing that a substantial proportion of the total effect of mental health problems on school completion is mediated by grades in LSS.

With regard to attending higher education, the results show a negative but much smaller impact of mental health disorders than we saw in the analysis of USS completion. This is clearly related to the fact that this is a positively selected sample consisting of those following and successfully completing the academic track. The predicted negative impact of internalising problems in this selected group is in the order of 8% for both boys and girls. Externalising problems, on the other hand, affect boys and girls differently. While girls with externalising

problems have a 14% lower probability of continuing on to further education, the comparable number for boys is 10%.

In this study, we also hypothesised that the impact of externalising problems on educational attainment was stronger for boys than girls, while we expected the opposite to be the case for internalising problems. The findings in this article gave no support to this hypothesis. Overall, the gender differences in our study were found to be relatively small, although there was a tendency for the effect of mental disorders on educational outcomes to be more damaging to boys than to girls. However, previous research that examined the question of gender differences in the association between mental disorders and educational outcomes did not provide a consistent picture (Esch et al. 2014). One possible explanation for the apparent inconsistency may be that girls, particularly those who are high achieving with high expectations of themselves, do not reach out to specialists for help and support, such that their problems go unregistered. Under-reporting of internalizing problems is more likely than under-reporting of externalizing problems due to the nature of the disorder. Externalizing problems are more easily detected because the symptoms are more readily observed, and action can be taken accordingly. If this were the case, and assuming that anxiety and depression leads to worse school outcomes, such pattern would imply that our results underestimate the negative association between internalizing disorders and educational performance. Notably, with an increasing share of boys diagnosed with internalizing disorders, the share of boys also being underdiagnosed is likely to be higher too. More research is necessary to better understand gender differences with regard to mental health and educational outcomes.

The present study has several strengths, including large sample size, rich longitudinal register data, a wide range of sociodemographic information and an objective measure of mental health. However, the study also has some limitations. First, a relevant question is how well diagnosed disorders in the specialist mental healthcare service work as a predictor of teenagers' mental health problems. Our data were likely to provide an incomplete census of youth with mental health problems. Since our sample was restricted to adolescents who have received treatment in the specialist health service, we may not capture less severe conditions. Particularly regarding internalizing problems, we might capture the tip of the iceberg, as suggested in the previous paragraph. There is also evidence that youth from lower socio-economic background and/or immigrant background are less likely to report mental health problems (Abebe, Lien and Elstad 2017). This is confirmed in our data. On the other hand, it has also being hypothesised that the increase in mental health problems may be due to over-reporting of mental health problems among some groups in recent years (Twenge et al. 2019). Our data shows that most

youth have multiple consultations, reducing the likelihood of this being a serious problem compared to studies based on self-reported mental health.

Second, the timing of the measurement of mental health is also a limitation that deserves mention. Mental health in our study was measured when the youths were between 15 and 17 years of age. Depression and anxiety, the most frequently occurring internalising disorders in our sample, are typically diagnosed when people are over 15 years old. Many externalising disorders, such as hyperkinetic disorder, manifest early in life when people are between 5 and 14 years old. As children with hyperkinetic disorder are often monitored by the primary healthcare service after diagnosis, the actual proportion with the diagnosis may have been higher than what we observed in our data (Institute of Public Health 2019). Third, we lacked information on comorbidity in our sample. It is widely acknowledged that individuals treated for mental disorders are at increased risk of developing other mental disorders (Melkevik et al. 2016). Thus, in our sample, some young people may have comorbid conditions that we do not capture.

In the context of these limitations, the findings in our study highlight the fact that mental health disorders in adolescence are important for educational outcomes. Youths with externalising disorders seem particularly vulnerable. Our results point to the need for schools and families to help young people with mental health problems learn strategies so that they can successfully navigate through the education system. Early interventions seem to be an essential means of achieving this goal. Moreover, following these cohorts into young adulthood would give valuable insight into how they fare in the labour market and their prospects of family formation.

Disclosure statement

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Funding

Acknowledgements

Table 1. Descriptive statistics of mental health in adolescence for youth in the sample, by gender. Means and standard deviations.

	All		Boys		Girls	
	mean	sd	mean	sd	mean	sd
Mental health disorder	0.129	0.336	0.108	0.311	0.151	0.358
N	242542		123477		119065	
Conditional on having a mental health disorder Disorder group:						
-Internalising	0.402	0.490	0.263	0.441	0.505	0.500
-Externalising	0.167	0.373	0.245	0.430	0.110	0.312
Nb months with consultations	9.87	8.02	8.80	7.45	10.66	8.33
Nb consultations	37.65	62.22	30.21	47.23	43.17	70.83
N	31393		13366		18027	

Note: 'Mental health disorder' is defined as being registered in the Norwegian Patient Register with at least one consultation with the psychiatric specialist health care services during the ages 15–17. The mental health disorders are measured as dummy variables equal to 1 if registered with a disorder/the specific diagnostic group, 0 otherwise, and the percentage share can be retrieved by multiplying the means with 100.

Table 2. Descriptive statistics. Means and standard deviations. Educational attainment at age 21, by gender and mental health status.

	Whole sample		Internalising		Externalising	
	mean	sd	mean	sd	mean	sd
Completed upper secondary school						
Boys	0.689	0.463	0.397	0.489	0.276	0.447
N	124666		3622		3553	
Girls	0.773	0.418	0.528	0.499	0.344	0.475
N	119938		9216		2238	
In higher education, conditional on having completed an academic track in upper secondary school						
Boys	0.744	0.436	0.621	0.485	0.568	0.496
N	48899		729		236	
Girls	0.816	0.387	0.715	0.452	0.587	0.493
N	66765		3057		327	

Note: Outcomes were observed for the cohorts born in 1993–1996. The outcome 'In higher education at age 21' was conditional on having completed an academic track in USS at age 21. The percentage share can be retrieved by multiplying the means with 100.

Table 3. The impact of mental health disorders on the probability of having completed USS by age 21, by gender. Cohorts born 1993–1996.

	(1) Individual	(2) +family	(3) +low sec. sch	(4) +GPA
	Boys			
Internalising	-0.312***	-0.289***	-0.287***	-0.173***
	(0.00879)	(0.00839)	(0.00835)	(0.00803)
Externalising	-0.410***	-0.380***	-0.375***	-0.179***
	(0.00858)	(0.00807)	(0.00810)	(0.00781)
Observations	123105	123105	123105	123105
R^2	0.139	0.170	0.175	0.303
	Girls			
Internalising	-0.272***	-0.258***	-0.256***	-0.173***
	(0.00636)	(0.00600)	(0.00599)	(0.00512)
Externalising	-0.428***	-0.403***	-0.399***	-0.210***
	(0.0129)	(0.0120)	(0.0118)	(0.0106)
Observations	118808	118808	118808	118808
R^2	0.152	0.180	0.185	0.317

Note: All models include cohort and USS fixed effects. The reference group is "no mental health disorder", and all models control for "other" mental health disorders in addition to the disorder groups "internalising" and externalising". Standard errors in parentheses.
* $p < .05$, ** $p < .01$, *** $p < .001$. Robust standard errors are clustered at the school level. Model 1 includes country of birth and mental health problems.

Table 4. The impact of mental health disorders on the probability of attending tertiary education at age 21, conditional on having completed an academic track in USS, by gender. Cohorts born 1993–1996.

	(1) Individual	(2) +family	(3) +LSS	(4) +GPA
	Boys			
Internalising	-0.112***	-0.104***	-0.105***	-0.0732***
	(0.0183)	(0.0180)	(0.0180)	(0.0182)
Externalising	-0.129***	-0.129***	-0.131***	-0.0474
	(0.0314)	(0.0313)	(0.0314)	(0.0308)
Observations	48824	48824	48824	48824
R^2	0.044	0.053	0.054	0.098
	Girls			
Internalising	-0.0956***	-0.0928***	-0.0927***	-0.0735***
	(0.00813)	(0.00810)	(0.00812)	(0.00806)
Externalising	-0.175***	-0.172***	-0.172***	-0.106***
	(0.0267)	(0.0264)	(0.0264)	(0.0258)
N	66686	66686	66686	66686
R^2	0.045	0.053	0.053	0.088

Note: as in Table 3.

Table 5. The impact of mental health on completion of upper secondary school. Test of selection on unobservables using Oster (2019).

Controlled regression (model 3)	$\beta = -0.302$; $R^2 = 0.180$
Bias-adjustment	$\beta = -0.261$; $R_{max} = 0.235$; $\delta = 1$
Value of proportional selection	$\delta = 3.948$; $R_{max} = 0.235$; $\beta = 0$

Note: Rmax is defined as the R-squared from a hypothetical regression of the outcome on the full set of observed and unobserved variables. As recommended by Oster, $R_{max} = 1.3 * R^2$ from the controlled regression. δ characterises the proportional degree of selection and is set to 1.

Appendix

Table A1. Descriptive statistics. Youth with and without mental health problems, by gender

| | No mental health disorder | | | | Mental health disorder | | | |
| | Boys | | Girls | | Boys | | Girls | |
	mean	sd	mean	sd	mean	sd	mean	sd
Individual characteristics:								
Country of birth:								
-Norway	0.900	0.300	0.900	0.301	0.927	0.260	0.935	0.246
-Western country	0.018	0.132	0.018	0.131	0.015	0.121	0.013	0.114
-Non-western country	0.082	0.275	0.083	0.276	0.058	0.234	0.051	0.221
Grade point average (GPA)	38.001	9.613	42.155	9.272	27.624	13.389	34.291	13.041
Family characteristics:								
Parental education:								
-Compulsory	0.087	0.282	0.086	0.281	0.144	0.351	0.133	0.340
-Upper secondary	0.429	0.495	0.427	0.495	0.466	0.499	0.471	0.499
-University	0.477	0.499	0.480	0.500	0.385	0.487	0.389	0.488
-Unknown education	0.006	0.079	0.007	0.081	0.005	0.074	0.006	0.078
Parents' income (BA)	12.956	12.395	13.053	20.375	10.982	7.606	11.247	9.442
Parental divorce:								
-Before the age of 13	0.163	0.370	0.162	0.369	0.269	0.443	0.266	0.442
-After the age of 13	0.210	0.407	0.210	0.407	0.336	0.472	0.338	0.473
Firstborn	0.413	0.492	0.416	0.493	0.445	0.497	0.428	0.495
Family size	2.781	1.151	2.769	1.158	2.787	1.209	2.730	1.148
LSS characteristics:								
Nb students	95.342	46.904	95.462	46.923	90.595	48.058	91.232	47.657
Mean GPA	38.525	3.524	38.644	3.396	37.753	4.942	38.154	3.982
Mean parental income (1000 NOK)	967.2	240.8	969.6	244.6	944.3	226.2	944.6	221.7
Peers with mental health disorders:								
-Externalising disorders	0.017	0.020	0.016	0.019	0.021	0.032	0.019	0.027
-Internalising disorders	0.025	0.023	0.025	0.023	0.028	0.032	0.028	0.030
-Other disorders	0.049	0.035	0.048	0.034	0.057	0.052	0.055	0.045
USS characteristics:								
Study programme:								
-Vocational track	0.488	0.500	0.327	0.469	0.730	0.444	0.578	0.494
-Academic track	0.512	0.500	0.673	0.469	0.270	0.444	0.422	0.494
Observations	110943		101634		13723		18304	