Department for Education

Higher education and mental health: analyses of the LSYPE cohorts

Research report

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Gemma Lewis, Tayla McCloud and Claire Callender, University College London Division of Psychiatry and Institute of Education

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Executive summary

The mental health of young people is a growing policy concern in the UK (Wolpert et al., 2019). Depression and anxiety (common mental disorders) are the two most common mental health problems and they often occur together (Thapar et al., 2012). Rates of common mental disorder are rising among young people, particularly in girls and young women (McManus, 2018).

The number of young people entering higher education in the UK has increased substantially in recent decades (Bolton, 2019; Connell-Smith and Hubble, 2018). In England, 29% of 18 year olds and 12% of 19 year olds entered higher education during the 2018/19 academic year (Department for Education, 2020). Most students in higher education are between 17 and 25 years of age (HESA, 2019), the peak age of onset for common mental disorders.

There is mounting concern about the mental health of higher education students (Gunnell et al., 2018). There are several potential reasons why higher education might increase symptoms of common mental disorder including academic pressures, exam stress, financial strain and changes to social support systems that result from leaving home. Despite concerns about student mental health, it is unclear whether higher education students are at increased risk of common mental health problems compared with the rest of the general population.

Aims

The aim of our research project was to improve our understanding of common mental health problems in young people who attend higher education, compared with those who do not.

We investigated:

- whether there were differences in symptoms of common mental disorder between these groups;
- how these differences changed over time and what might drive them; and
- whether the mental health of higher education students compared with the general population has changed during the past decade.

We conducted analyses of two large nationally representative cohort studies: the Longitudinal Studies of Young People In England (LSYPE). Both studies started when young people were 13/14 years of age. LSYPE1, known to participants as

Next Steps, started in 2004 and LSYPE2, known to participants as Our Future, started in 2013.

Main findings

Our findings in LSYPE2 suggest that symptoms of common mental disorder were higher among 18/19 year olds who started higher education in 2018/19, compared with young people who did not attend higher education (see Chapter 3). This difference was observed during the first year of higher education.

In LSYPE1, we found no difference in symptoms of common mental disorder between young people who had and had not attended higher education (see Chapter 3). This difference was observed at age 25, after students had completed their undergraduate studies which they started when aged between 18 and 20 in 2009.

We also investigated differences in common mental disorders between young people who attended higher education and those who did not, while the young people were still in secondary school or further education (see Chapter 4). In LSYPE2, at age 14/15, young people who later attended higher education had fewer symptoms of common mental disorder than those who did not attend. However, common mental disorder symptoms were similar in the two groups at ages 16/17 and 17/18. In contrast, in LSYPE1, at age 16/17, young people who later attended higher education had more symptoms of common mental disorder than those who later did not attend. At other ages during secondary school, there was no difference.

It is unclear why there are differences between the two cohorts when young people are at school or further education, and this needs further investigation.

Risk factors for common mental disorder (alcohol use, social media, parental qualifications, locus of control, equating hard work with success) did not differ between young people who attended higher education and those who did not (see Chapter 4).

Conclusions and policy recommendations

Common mental disorders are often impairing and can adversely affect educational performance, social relationships and physical health, as well as increase the risk of suicide and self-harm (Mars et al., 2014; Thapar et al., 2012).

This is the first study in the UK that we are aware of, which has found higher levels of common mental disorder in young people who are attending higher education compared with those who are not. This finding was observed after controlling for

differences between young people who did and did not attend higher education. The study used contemporary data from young people who started higher education in 2018/19 and has potential implications for policy, public health, higher education, and mental health services and clinicians.

Although the effect size was small, it is likely to be of public health importance. Small effects can still be significant, especially when the risk factor is common (Rothman et al., 2013).

Our findings should be considered in light of several limitations (see Chapter 6). We cannot be certain that associations are causal due to the observational study design. The proportion of young people who entered higher education straight after secondary school or further education was higher in our study than in administrative data for this age group, which may affect our results. Comparisons between LSYPE1 and LSYPE2 were limited by the fact that, after the age of 16/17, symptoms of common mental disorder were not measured at the same time-points. This study did not investigate whether associations differed according to whether higher education students were full-time or part-time.

More research is needed to investigate mechanisms underlying the association between higher education attendance and levels of common mental disorder. For instance, further research could take place at different time-points within the academic year and across academic years and beyond, to examine how these differences might fluctuate.

One finding of note was that there did not appear to be any evidence of differences in common mental health disorders when comparing graduates aged 25 with those who had not attended Higher Education. Despite this, we believe further research could be usefully undertaken to more fully examine whether higher education leads to a relatively short-term increase in symptoms of common mental disorder, or whether there are longer-term effects. This, alongside other suggested additional research, is vital to inform the development of mental health interventions aimed at students and young people.

Specifically, our finding of higher levels of common mental disorder among students points to the importance of preventing and treating common mental disorders in higher education encouraging students to be aware of and seek treatment from available support services. Although demand for mental health services is high, these findings suggest the need for higher education providers to focus resources towards students in their first year of study.

Our finding in LSYPE1 (although not replicated in the more recent LSYPE2 study), that during secondary school, young people who later enter higher education may

already have more symptoms of common mental disorder than the general population similarly requires further investigation. These findings also have potential implications for policy and mental health services. They underscore the importance of preventing and managing common health problems in schools, which is high on the policy agenda.

Chapter 1 - introduction

Background

The mental health of young people is a growing policy concern in the UK (Wolpert et al., 2019). Depression and anxiety are the two most common mental health problems (referred to hereafter as common mental disorders), and they often occur together (Thapar et al., 2012). Rates of common mental disorder are rising among young people, particularly in girls and young women (Department for Education, 2016; Mcmanus et al., 2016; Pitchforth et al., 2019). In 2017, a study of the Millennium Cohort found that 16% of 17-year olds in the UK were experiencing high levels of common mental disorder (Patalay and Fitzsimons, 2021). The national survey of children and young people's mental health provides data on clinical diagnoses as well as symptoms. In the most recent survey in 2017, 5% of 11-19 year olds had major depression and 5% had generalized anxiety disorder (NHS Digital, 2018). There are stark gender differences in both of these mental health problems (Patalay and Fitzsimons, 2021). From around the age of 12/13, females are twice as likely to experience depression and anxiety than males. Half of all mental health problems begin by age 14 and three-quarters by age 24 (Kessler et al., 2005). Preventing these mental health problems during the first two decades of life is therefore important.

The number of young people entering higher education in the UK has increased substantially in recent decades (Bolton, 2019; Connell-Smith and Hubble, 2018). In England, 29% of 18 year olds and 12% of 19 year olds entered higher education during the 2018/19 academic year (Department for Education, 2020). Most students in higher education are between 17 and 25 years of age (HESA, 2019), the peak age of onset for common mental disorder.

A higher education degree can have many benefits including educational, social, and longer-term employment and financial gains. However, higher education might also pose risks to young people's mental health. Alongside the developmental transition to adulthood, young people entering higher education can experience academic pressures, social challenges, separation from their usual support networks, and financial problems (Duffy et al., 2019; McCloud and Bann, 2019; Royal College of Psychiatrists, 2011; Storrie et al., 2010; Thorley, 2017). Over the last 8 years, the proportion of higher education students reporting mental health conditions has increased by 3.2 percentage points. Data collected by the Higher Education Statistics Agency (HESA) shows that 3.9% of higher education students in England reported a mental health condition in 2018/19 (Office for Students, 2020).

Despite concerns about student mental health, it is unclear whether higher education students are at increased risk of common mental health problems compared with the rest of the general population. In the UK, only a few studies have compared symptoms of common mental disorder in higher education students and the rest of the population (Macaskill, 2013; McManus and Gunnell, 2020; Tabor et al., 2021). A cross-sectional study of 1197 undergraduates from one university in the North of England in 2012 found that 17.3% had symptoms of probable common mental disorder, similar to the UK general population. However, the comparison with the general population used the 2007 Adult Psychiatric Morbidity Survey, which had a different measure of common mental disorder. The age of the comparison group was also not reported.

Two more recent studies have been conducted. One used data on young people (16–24) from three cross-sectional Adult Psychiatric Morbidity Surveys (APMS; 2000, 2007, and 2014) (McManus and Gunnell, 2020). There was no evidence that the prevalence of common mental disorder, suicide attempts or non-suicidal self-harm differed between higher education students and the general population. However, APMS was not designed to access people in higher education accommodation so could have been biased toward students in their second and third year of study, older students or those living with their families. There were fewer than 122 higher education students at each time-point and student status was only asked of those not in paid work in the past week. Another study used data from 11,500 young people (44% of whom were higher education students) aged 17-24 from eight waves of the UK Household Longitudinal Study (UKHLS), collected between 2010 and 2019 (Tabor et al., 2021). Higher education students were classified as those who were attending a university or a higher or further education college or had a degree. A series of cross-sectional associations were compared at eight separate time-points. Across all time-points, higher education students had fewer symptoms of common mental disorder than the general population. However, this study adjusted for a limited range of confounders (sex, age, ethnicity, and highest parent educational qualification) and may have been under-powered to detect small effect sizes within and across time-points.

The incidence of common mental disorders is high during the mid-teens (12-16 years of age) (Joinson et al., 2017). It is therefore important to consider the trajectory of symptoms before and after exposure to higher education. Young people with common mental health problems may be less likely to attend university. However, it is also possible that young people who later attend higher education had more common mental health problems than their peers during the school years (for example due to academic pressures). Longitudinal investigations are needed to disentangle the direction of these associations. As far as we are aware, there are no longitudinal studies of common mental disorders in higher education students

compared with the general population in the UK. Worldwide, there has only been one longitudinal study in Australia, which found that higher education students had better mental health than the rest of the population during school and university (Cvetkovski et al., 2019). There has also been no investigation of the longer-term mental health outcomes of higher education students compared with the general population, once they have transitioned to adulthood. Our research project, commissioned by the DfE, addresses these gaps in the evidence.

Aims

The overall aim of this research is to improve our understanding of mental health among young people who attend higher education, compared with those who do not. The research investigates whether there are differences in symptoms of common mental disorder between these groups, how these differences change over time, and what might drive them. It also investigates whether the mental health of higher education students compared with the general population has changed during the past decade

The project aims to test the following hypotheses:

Hypothesis 1:

There are no differences in symptoms of common mental disorder between individuals in higher education and individuals who are not in higher education, when controlling for individual factors. Any observed differences will be due to differences in the composition of the higher education and non-higher education groups.

Hypothesis 2:

There are no differences in change in common mental health symptoms over time, between individuals who are in higher education and those who are not. Differences over time will be equivalent for the two groups.

Hypothesis 3:

There are no differences in predictive factors related to symptoms of common mental disorder between individuals in higher education and individuals who are not in higher education, for example scores on locus of control; scores on work ethic, use of social media, alcohol consumption and other relevant variables. Predictive factors for low mental health and well-being will be equivalent for the two groups.

Hypothesis 4:

There are no differences for young people who did and did not attend higher education between LSYPE1 and LSYPE2 on symptoms of common mental disorder.

Chapter 2 - methodology

Describing the cohorts

The aims of this project were tested using the two Longitudinal Studies of Young People in England (LSYPE1 and LSYPE2). Table 1 contains key information on each cohort, and the availability of data on higher education and mental health.

Sample and design

The methodology for LSYPE1 and LSYPE2 was as similar as possible, to enable cross cohort comparisons. The target population was young people aged 13/14 (year 9) in English state and independent schools and pupil referral units. LSYPE1 participants were born between 1 September 1989 and 31 August 1990. LSYPE2 participants were born between 1st September 1998 and 31st August 1999. LSYPE1 began in 2004 and LSYPE2 began nine years later, in 2013. Each cohort had a two-stage sampling process. Schools were the primary sampling unit, and deprived schools were over-sampled. Of 892 schools selected for LSYPE1, 647 (73%) participated. Within each school, 20 to 30 students were then selected, and ethnic minority groups were over-sampled. Approximately 21,000 young people were invited to LSYPE1 and 15,770 households were interviewed (74% response rate). Approximately 17,770 participants were invited to LSYPE2, with 13,100 households interviewed (72% response rate). Sampling procedures aimed to be nationally representative. Data were collected annually from young people and their parents/carers at home, between May and September (from 2004 to 2010 in LSYPE1 and 2013 to 2019 in LSYPE2). LSYPE2 data collection is ongoing but at the time of our study, data up to 2019 were available. An additional wave of data collection was conducted in LSYPE1 in 2015, when participants were 25 years of age.

Analyses of secondary data are always constrained by what data are available and when (Table 1). For cross-cohort comparisons of the association between higher education and mental health, one weakness of the LSYPE datasets is differences in the timing of key measures (Table 1). Whilst higher education status was assessed at wave 6 (ages 18/19) in both datasets, the timing of common mental disorder assessments varied (Table 1). Young people in LSYPE2 were 18 to 19 years of age in 2018/19, when many of them started higher education. Attendance at higher education began in September and mental health was measured between May and September of the following year. This relatively short follow-up is complemented by LSYPE1, which has followed young people up to the age of 25, although mental health was not measured at age 18/19.

Table 1: LSYPE data and measures

Data collection					Variable			
Wave	**Age**	**School year**	**Calendar year**		**Higher education**		**Common mental distress**	
			LSYPE1	**LSYPE2**	**LSYPE1**	**LSYPE2**	**LSYPE1**	**LSYPE2**
1	13/14	9	2004	2013	No	No	No	No
2	14/15	10	2005	2014	No	No	Yes	Yes
3	15/16	11	2006	2015	No	No	No	No
4	16/17	12	2007	2016	No	No	Yes	Yes
5	17/18	13	2008	2017	Yes[a]	Yes[a]	No	Yes
6	18/19	-	2009	2018	Yes[b]	Yes[b]	No	Yes
7	19/20	-	2010	2019	Yes	N/A[c]	No	N/A[d]
8[e]	25	-	2015	-	Yes	N/A[c]	Yes	N/A[d]

Footnotes and abbreviations

[a] Data on whether young people have applied, received offers or accepted a place, at which higher education institution and which course. Note that the young person has probably not yet attended higher education.

[b] Data on whether the young person is currently studying for a higher education degree.

[c] Wave 7 and 8 data from LSYPE2 not yet available.

[d] GHQ-12 = General Health Questionnaire.

[e] Wave 8 of LSYPE2 was completed in 2020 but data were not available at the time of our study.

Green highlight = LSYPE1 and LSYPE2 have the same data at the same age and are well-matched for comparative analyses across the cohorts.

Yellow highlight = variable is available but not matched according to time-point in LSYPE1 and LSYPE2.

Objectives

We conducted the following studies to address the aims and hypotheses of the project:

Hypothesis 1:

There are no differences in scores on common mental disorder between individuals in higher education and individuals who are not in higher education, when controlling for individual factors. Any observed differences will be due to differences in the composition of the higher education and non-higher education groups.

Study 1:

We conducted a study of symptoms of common mental disorder in higher education students compared with non-students, using wave 6 of LSYPE2 (students started higher education in September at age 18/19 and common mental disorder symptoms were assessed between May and September the following year).

Study 2:

We conducted a longer-term longitudinal study of symptoms of common mental disorder in higher education students compared with non-students, using LSYPE1. Higher education status was measured at age 18/19 in wave 6 and common mental disorder was assessed at age 25 in wave 8. This enabled an investigation of mental health among young people who attended higher education compared with those who did not, when they had reached early adulthood.

Hypothesis 2:

There are no differences in change in common mental health symptoms over time, between individuals who are in higher education and those who are not. Differences over time will be equivalent for the two groups.

Study 3:

We compared symptoms of common mental disorder in higher education students compared with non-students, at each time-point in each dataset. We did this by calculating a trajectory of common mental disorder symptoms in each group, using every available GHQ-12 measure (before and after young people did or did not attend higher education).

Hypothesis 3:

There are no differences in predictive factors related to common mental disorder between individuals in higher education and individuals who are not in higher education, for example scores on locus of control; scores on work ethic, use of social media, alcohol consumption and other relevant variables. Predictive factors for symptoms of common mental disorder will be equivalent for the two groups.

Study 4:

We investigated risk factors associated with symptoms of common mental disorder in young people. We compared these risk factors in the groups who did and did not attend higher education. These analyses were conducted in LSYPE2 (using mental health at age 18/19 as the outcome) and LSYPE1 (using mental health at age 25 as the outcome).

Hypothesis 4

There are no differences between higher education and non-higher education groups between LSYPE1 and LSYPE2 on measures of common mental disorder.

Studies 1-4:

Throughout the report, all results are compared across LSYPE1 and LSYPE2. The results of these cross-cohort comparisons were interpreted carefully due to differences in the timing of measures of common mental disorder in each cohort (Table 1).

Deriving the main variables

Below we explain how we derived the main variables for the analyses.

Attendance at higher education (exposure variable)

Higher education in England can be defined as studying for a degree provided by a university, higher education college, university college or private college (Qaa, 2018).

It was important to identify students who actually attended higher education (rather than, for example, those who accepted a place but did not attend). In both datasets, we defined higher education students as those studying for a:

1. Degree

2. Foundation Degree

3. Teacher Training (BEd or BA/BSc with QTS)

4. Diploma in Higher Education (DipHE)

5. Higher National Diploma (HND)

6. Higher National Certificate (HNC)

7. RSA or OCR Higher Diploma

8. Certificate of Higher Education

9. National Vocational Qualification (NVQ) at level 4 or 5.

The main aim of the project was to compare the mental health of individuals in higher education with those who were not. Our main analyses therefore used a binary exposure variable (classifying people as either in higher education or not).

There will be young people who took gap years and those who dropped out of higher education. These individuals may differ to other young people, which could affect differences between the two groups in terms of mental health. In LSYPE1, because our outcome was at age 25 (wave 8), we included all individuals who had started a higher education degree between the ages of 18/19 (wave 6) and 19/20 (wave 7). In LSYPE2, we just used the higher education variable at age 18/19 (wave 6), as there were no subsequent waves. In LSYPE1, we conducted a sensitivity analysis excluding the young people who started higher education at age 19/20 (wave 7; gap years), to see if this affected the results. Higher education attendance was reported irrespective of whether it was the young person's main activity, and we did not distinguish between students studying part-time or full-time.

Symptoms of common mental disorder (outcome variable)

The General Health Questionnaire-12 (GHQ-12) is a 12-item self-reported assessment of common mental disorders (depression and anxiety) (Bell et al., 2005). It has been extensively used as an alternative to longer, more time-consuming and expensive assessments. Factor analyses of the GHQ-12 show that it measures symptoms of depression, anxiety, and social dysfunction. The overall score reflects symptoms of common mental disorder (Gnambs and Staufenbiel, 2018; Politi et al., 1994). We therefore refer to the GHQ-12 as measuring symptoms of common mental disorder.

Common mental disorders are best defined as a continuum, ranging from no or few symptoms through to those that are mild, moderate or severe (Hankin et al., 2005).

Our main analyses used the GHQ-12 total score, which ranges from 0 to 36, higher scores indicating more severe symptoms. The advantage of this approach is that it uses the entire range of scores without imposing a relatively arbitrary cut-off point. Screening tools like the GHQ-12 were designed for the general population. Any cut-off score, although statistically valid, will over estimate the number of people with clinically significant symptoms relative to a clinical interview (Bell et al., 2005).

The GHQ-12 can also be used as a binary variable (0 or 1), with category one indicating symptoms that approximate a probable clinical diagnosis. The binary variable is calculated using a bimodal scoring of each GHQ-12 item (0, 0, 1, 1). A cut-off score of three identifies symptoms approximating a clinical diagnosis. This approach is commonly used and we report sensitivity analyses using this binary outcome. Advantages of this approach are that it identifies people with symptoms likely to be deemed clinical, and results are easy to interpret.

Potential confounders

Young people who attend higher education are likely to differ socially, demographically and individually to those who do not. If these differences are also associated with common mental disorders, they should be classed as potential confounders. Confounders are alternative explanations for an association between two variables that, when uncontrolled for, can distort (i.e. bias) estimates of the association. We selected potential confounders from the datasets, based on existing evidence and theoretical assumptions (VanderWeele, 2019). Our criteria for selecting potential confounders was that each variable should (1) differ between young people who attended higher education and those who did not (2) be associated with common mental disorder and (3) be unlikely to be part of the causal pathway from higher education to common mental disorder (i.e. a mediator) (VanderWeele, 2019). When testing a causal hypothesis about a risk factor and outcome, adjusting for mediators can cause bias to the effect estimate (VanderWeele, 2019). We present the association between higher education status and common mental disorder before (i.e. crude or unadjusted models) and after adjusting for potential confounders. This allowed us to inspect how the confounders affected the association. A reduction in the effect estimate (for higher education and common mental disorder) after adjusting for a confounder indicates positive confounding (Mehio-Sibai et al., 2005). An increase in the effect estimate after adjusting for confounders indicates negative confounding (Mehio-Sibai et al., 2005). In both instances, the association adjusted for confounders provides the more accurate estimate (Zammit et al., 2003).

In studies 1 and 2, our selection of confounders was informed by Table 2, which shows differences in the characteristics of higher education students and non-

students. Confounding variables were: sex, ethnicity, socioeconomic status, parents' highest educational qualification, family composition, antisocial behaviour, bullying, alcohol use, cannabis use, carer status, general quality of life, disability, and GHQ-12 scores at previous waves (see Table 3 footnote for more details).

In study 3, we adjusted for sex, ethnicity, socioeconomic status, parental education and family type because these variables preceded exposure and outcome at each time-point. We did not adjust for the other confounders used in studies 1 and 2, as they were measured after most of the GHQ-12 outcomes in the trajectories, which could have biased the effect estimates. For these reasons, the set of confoudners used in this study differs to those used in studies 1 and 2.

In study 4, we adjusted for the following confounders, which preceded the predictor variable and outcome: Sex, ethnicity, socioeconomic status, parents' highest qualification and family composition.

Predictive factors for symptoms of common mental disorder

For hypothesis three, we focused on variables likely to be risk factors for mental health problems in the youth population overall. We investigated whether associations between these risk factors and mental health problems differed in young people who attended higher education compared with those who did not. There is evidence, from LSYPE and beyond, that the following variables are associated with increased levels of common mental disorder (Department for Education, 2016; Patalay and Fitzsimons, 2016):

Locus of control and equating hard work with success: Young people completed eight self-report items, which assessed their attitudes to work and success. A previous factor analysis of these items in LSYPE2 found that they captured two constructs: equating hard work with success and locus of control. Equating hard work with success was measured by three statements referring to beliefs in the value of working hard at school and more generally in order to succeed. This was measured on a scale of 0-9; higher scores indicating that the young person more strongly equated hard work with success. The other three statements assessed locus of control, an aspect of personality related to the extent to which individuals believe they can control events affecting them. Locus of control was measured on a scale of 0-9; higher scores indicating higher locus of control. We selected these variables at wave two in LSYPE1 because wave 4 was only for the ethnic boost and wave 7 was after higher education; LSYPE2 was selected to match.

Social media: In LSYPE1, we used a continuous variable assessing the number of daily hours of social media use. Social media was only assessed at wave 8 in LSYPE1, so this analysis was cross-sectional and therefore susceptible to reverse

causation. Young people answered the question: on a normal weekday, how many hours do you spend visiting a social networking website such as Facebook, Bebo, MySpace, Hi5 or Twitter? We used a continuous score ranging from 0-24.

In LSYPE2, we used a categorical variable assessing the frequency with which young people used social media. For comparability to LSYPE1, we selected the latest time point when social media was assessed (wave 5). Social media was defined as any instant messenger services or social media sites or apps (for example, Facebook, Snapchat, Instagram, Twitter or Whatsapp). Young people were asked if they used any social media, and those who did were then asked how often they do so. There were six response options: regularly throughout the day (1), 2-3 times a day (2), once a day (3), every couple of days (4), once a week (5), and less often (6). Those who indicated option 1 were then asked how often throughout the day they use them, with the response options: multiple times an hour (7), once every hour (8), and every 2 to 3 hours (9). Those who indicated that they did not use any social media, and those who indicated options 3, 4, 5 and 6 were combined to create a “Less often or never” category. Those who indicated options 2, 7, 8 and 9 remained as separate categories respectively. Our final variable was therefore 5 categories: multiple times an hour, once every hour, every 2-3 hours, 2-3 times a day, and less often or never.

Alcohol consumption: In LSYPE1, we selected the measure of alcohol that was closest to when young people started higher education and LSYPE2 was then selected to match, for comparability. In LSYPE1, when young people said they had drunk alcohol in the last 12 months, they were asked about frequency of drinking. The first options they were given were most days, followed by once or twice a week, two or three times a month and so on. In the second cohort the order was reversed, with the possible implication that not drinking frequently was normative. This may lead to some inconsistency. We used a four category variable: never; once a month or less; 2-3 times a month; 2 or more times a week.

Parental education: We used a five category variable assessing highest educational qualification: below GCSE or no qualification, GCSE passes or equivalent; A/AS level passes or equivalent; higher education below degree level; degree or equivalent.

Statistical methods

We begin by describing the characteristics of the young people in each cohort. We also compare the characteristics of those who did and did not attend higher education, to identify potential confounders. We also inspected the characteristics of those who attended higher education across the two LSYPE cohorts, to see if this

had changed. We have not provided tests of statistical significance in this section, because these analyses are descriptive rather than tests of hypotheses. This also avoids potential issues caused by multiple testing.

Next, we used regression models to investigate the association between higher education status and symptoms of common mental disorder. Different analytical models were used depending on whether outcomes were continuous (linear regression) or binary (logistic regression).

Studies 1 and 2:

In each dataset, our main analyses used a binary exposure variable (whether young people attended higher education or not) and a continuous outcome – GHQ-12 total scores. First, we tested univariable (unadjusted) associations between higher education status and GHQ-12 scores. Next, we incrementally added sets of potential confounding variables to the model and compared associations between higher education status and common mental disorder before and after adjusting for confounders.

We repeated these analyses using a binary outcome and logistic regression.

Study 3:

First, we present means (and standard deviations) for each GHQ-12 assessment, at each time-point, in each cohort. Next, we modelled changes in GHQ-12 scores over time using multilevel linear regression models with growth curves. We calculated a trajectory (change over time) of GHQ-12 scores in higher education students and compared this with the trajectory of scores in non-students. Multilevel regression models were designed for clustered data, and can be applied to longitudinal data, where observations over time are clustered within the individual. This approach uses all available GHQ-12 data, capitalising on the richness of the datasets. First, we ran a crude (unadjusted) model. Next, we tested for linear and non-linear effects of time, using linear and quadratic time variables respectively. If there was evidence of non-linearity, the quadratic time variable was left in the model. We then tested whether the association between higher education status and GHQ-12 scores differed by time, using interactions between higher education and linear and quadratic time variables. Where there was evidence of interaction, associations are presented differently by time-point. Finally, we ran the multilevel models after adjusting for confounders.

Study 4:

First, we explored descriptive statistics for each of the variables classed as predictors. Next, we used linear regression models, with GHQ-12 scores as the outcome (at age 18/19 in LSYPE2 and age 25 in LSYPE1). We used separate models for each predictor variable, before and after adjusting for confounders.

Next, we estimated each model separately in the groups who did and did not attend higher education.

We visually inspected effect estimates and confidence intervals for each variable across the higher education and non-higher education sub-groups. We did not rely on p values for this comparison because p values from sub-group analyses can be unreliable (Brookes et al., 2004). Next, we calculated an interaction term for each predictor by multiplying the higher education variable and the predictor variable. The interaction provides a formal test of whether the association between risk factor and outcome is different across the two groups. We ran each model in the entire sample including the interaction term. If there was statistical evidence for the interaction term, we interpreted this as evidence that the association between predictor and outcome was different in the group who attended higher education compared with the group who did not.

Inspecting difference across LSYPE1 and LSYPE2:

We inspected effect estimates and 95% confidence intervals from each analysis to determine evidence of any differences.

Sub-group analyses:

We repeated all of our analyses in groups defined by sex, socio-economic background and ethnicity. We investigated whether associations differed across sub-groups using interaction tests.

School clustering, sampling weights and missing data

In both LSYPE cohorts, schools were the primary sampling unit so young people were clustered within schools. Each dataset contains survey weights at each time-point, which re-weight the data to represent the target population, account for study design, and reduce the impact of attrition. These weights also account for the clustering of students within schools, as they contain an (anonymised) indicator of the school each young person was recruited from. We therefore applied survey weights to each regression analysis that we conducted.

Each analysis used a sample with complete data on all variables in that particular analysis (i.e. listwise deletion or complete cases analysis). Missing data could therefore bias our results. In our main analyses, we controlled for potential biases induced by missing data using the attrition weights built into the population weight. In line with LSYPE guidance, we selected weights from the same time-point as the outcome (https://ilsype.sdaltd.com/ilsype/workspaces/public/wiki/UserGuide/Weighting#2).

We also conducted sensitivity analyses using multiple imputation with chained equations (MICE) (Sterne et al., 2009). MICE uses different methodology to account for biases due to attrition, compared with attrition weights. Unlike attrition weights, MICE increases sample size, to reduce losses to statistical power due to attrition. It also controls for biases due to attrition. We used MICE for sensitivity analyses of the main associations in studies 1 and 2, to see if it altered the results. If result were altered, we planned to conduct all other analyses using MICE too. For each variable with missing data, MICE uses regression models to predict and replace missing values. Data are assumed to be missing at random i.e. missing values are associated with other variables in the dataset. To predict missing values, we used all variables in our analyses plus auxiliary variables including maternal general health and whether the young person had been truant from school or smoked. Multiple datasets are produced, to account for uncertainty in the prediction of missing values. We imputed 50 datasets and re-ran regression models, combining datasets using Rubin's rules (Sterne et al., 2009). We conducted two sets of multiple imputation analyses, to gradually increase the amount of missing data we were replacing. First, we replaced missing data in the outcome and confounders (increasing the sample size to 9586 in LSYPE1 and 6916 in LSYPE2). We ensured participants had at least one GHQ-12, to improve prediction of the outcome. Next, we replaced missing data in exposure, outcome and confounders (increasing the sample size to 15,770 in LSYPE1 and 13,100 in LSYPE2; i.e. the original cohorts). We applied the population weight from wave one to analyses using multiply imputed data, to account for the study design and increase representativeness of the target population.

Describing the cohorts

In LSYPE1, at wave 6 (age 18/19), 4773 (49%) young people attended higher education. This proportion was higher in the sample with complete data for study 1: 1994 (56%). In LSYPE2, at wave 6 (age 18/19), 3390 (49%) young people attended higher education. This proportion was slightly higher in the sample with complete data for study 1: 3104 (51%).

Characteristics of each LSYPE cohort overall, and according to whether or not the young people attended higher education, are shown in Table 2 (using unweighted percentages, for weighted percentages please see Appendix Table 1).

In both LSYPE cohorts, there were differences between higher education students and non-students on most variables (Table 2). We provide a summary of the main differences between young people who did and did not attend higher education below.

Compared to non-students, higher education students were more likely to be females and ethnic minorities. They were also more likely to come from two-parent homes, with parents who were more highly educated and from higher socioeconomic statuses. Higher education students were less likely than non-students to have consumed alcohol regularly, used cannabis, been bullied or have a history of antisocial behaviour. They were also less likely to have poor general health, a disability, or caring responsibilities.

Table 2: Demographic characteristics of young people overall and those who did and did not attend higher education (unweighted percentages).

Variable – N (%)	**LSYPE1**			**LSYPE2**		
	Attended higher education[a]	**Did not attend higher education[a]**	**Total**	**Attended higher education[a]**	**Did not attend higher education[a]**	**Total**
Sex[b]						
Female	1,530 (56.8%)	1,084 (50.7%)	2,614 (54.1%)	1,731 (55.8%)	1,509 (49.9%)	3,240 (52.9%)
Male	1,166 (43.2%)	1,052 (49.3%)	2,218 (45.9%)	1,373 (44.2%)	1,515 (50.1%)	2,888 (47.1%)
Ethnicity[c]						
White	1,830 (67.9%)	1,724 (80.7%)	3,554 (73.6%)	2,255 (72.7%)	2,497 (82.6%)	4,752 (77.6%)
Mixed	105 (3.9%)	102 (4.8%)	207 (4.3%)	135 (4.4%)	125 (4.1%)	260 (4.2%)
Indian	275 (10.2%)	57 (2.7%)	332 (6.9%)	103 (3.3%)	56 (1.9%)	159 (2.6%)
Pakistani	151 (5.6%)	95 (4.4%)	246 (5.1%)	136 (4.4%)	85 (2.8%)	221 (3.6%)
Bangladeshi	123 (4.6%)	65 (3.0%)	188 (3.9%)	112 (3.6%)	48 (1.6%)	160 (2.6%)
Black African	77 (2.9%)	20 (0.9%)	97 (2.0%)	170 (5.5%)	81 (2.7%)	251 (4.1%)

Black Caribbean	57 (2.1%)	46 (2.2%)	103 (2.1%)	80 (2.6%)	86 (2.8%)	166 (2.7%)
Other	78 (2.9%)	27 (1.3%)	105 (2.2%)	113 (3.6%)	46 (1.5%)	159 (2.6%)
Parents' Socioeconomic Status[d,e]						
Managerial and professional occupations	1,557 (57.8%)	783 (36.7%)	2,340 (48.4%)	1,694 (54.6%)	1,239 (41.0%)	2,933 (47.9%)
Intermediate occupations	456 (16.9%)	471 (22.1%)	927 (19.2%)	686 (22.1%)	728 (24.1%)	1,414 (23.1%)
Lower supervisory, routine occupations and not currently working	683 (25.3%)	882 (41.3%)	1,565 (32.4%)	724 (23.3%)	1,057 (35.0%)	1,781 (29.1%)
Parents' Highest Qualification[e, f]						
Degree or equivalent	815 (30.2%)	224 (10.5%)	1,039 (21.5%)	670 (21.6%)	335 (11.1%)	1,005 (16.4%)
Higher education below degree level	536 (19.9%)	319 (14.9%)	855 (17.7%)	440 (14.2%)	278 (9.2%)	718 (11.7%)

GCE, A Level or equivalent	445 (16.5%)	419 (19.6%)	864 (17.9%)	421 (13.6%)	345 (11.4%)	766 (12.5%)
GCSE grades A-C or equivalent	485 (18.0%)	646 (30.2%)	1,131 (23.4%)	1,126 (36.3%)	1,429 (47.3%)	2,555 (41.7%)
Below GCSE or no qualification	415 (15.4%)	528 (24.7%)	943 (19.5%)	447 (14.4%)	637 (21.1%)	1,084 (17.7%)
Family Composition[e]						
Married/cohabiting	2,252 (83.5%)	1,530 (71.6%)	3,782 (78.3%)	2,456 (79.1%)	2,169 (71.7%)	4,625 (75.5%)
Lone parent or no parents in the household	444 (16.5%)	606 (28.4%)	1,050 (21.7%)	648 (20.9%)	855 (28.3%)	1,503 (24.5%)
Antisocial Behaviour (in past 12 months)[g, h]	299 (11.1%)	465 (21.8%)	764 (15.8%)	170 (5.5%)	299 (9.9%)	469 (7.7%)
Experienced Bullying (in past 12 months)[h]	642 (23.8%)	645 (30.2%)	1,287 (26.6%)	839 (27.0%)	970 (32.1%)	1,809 (29.5%)
Frequency of Alcohol Use[i, j]						
Never	653 (24.2%)	380 (17.8%)	1,033 (21.4%)	1,094 (35.2%)	893 (29.3%)	1,987 (32.4%)

Once every couple of months or less	486 (18.0%)	379 (17.7%)	865 (17.9%)	1,189 (38.3%)	1,297 (42.9%)	2,486 (40.6%)
1-3 times a month	893 (33.1%)	636 (29.8%)	1,529 (31.6%)	718 (23.1%)	682 (22.6%)	1,400 (22.9%)
Once a week or more	664 (24.6%)	741 (34.7%)	1,405 (29.1%)	103 (3.3%)	152 (5.0%)	255 (4.2%)
Cannabis Use[j] (ever)	673 (25.0%)	785 (36.8%)	1,458 (30.2%)	554 (17.9%)	771 (25.5%)	1,325 (21.6%)
General Quality of Health[j]						
Very good	1,488 (55.2%)	1,031 (48.3%)	2,519 (52.1%)	1,363 (43.9%)	1,127 (37.3%)	2,490 (40.6%)
Fairly good	1,064 (39.5%)	928 (43.4%)	1,992 (41.2%)	1,543 (49.7%)	1,560 (51.6%)	3,103 (50.6%)
Not very good or not good at all	144 (5.3%)	177 (8.3%)	321 (6.6%)	198 (6.4%)	337 (11.1%)	535 (8.7%)
Disability Status[j]	163 (6.0%)	177 (8.3%)	340 (7.0%)	286 (9.2%)	412 (13.6%)	698 (11.4%)
Carer Status[k]	203 (7.5%)	165 (7.7%)	368 (7.6%)	125 (4.0%)	180 (6.0%)	305 (5.0%)

a. Indicates whether young person was attending university at wave 6 or 7 (age 18/19 or 19/20) in LSYPE1, or at wave 6 (age 18/19) in LSYPE2.
b. Measured at wave 6 (age 18/19) in LSYPE1 and wave 1 (age 13/14) in LSYPE2.
c. Measured at wave 4 (age 16/17) in LSYPE1 and wave 1 (age 13/14) in LSYPE2 (missing data supplemented with wave 2 data).
d. Parents' socioeconomic status is based on the socioeconomic status of whichever parent (mother or father) has the highest employment category.
e. Measured at wave 4 (age 16/17) in LSYPE1 and wave 1 (age 13/14) in LSYPE2.

f. In LSYPE1, indicates the highest qualification held by the main or second parent. In LSYPE2, indicates the highest qualification held by the mother or father.
g. In LSYPE1, antisocial behaviour includes taking part in any of the following: vandalising public property; shoplifting; graffitiing on walls; fighting or public disturbance. In LSYPE2, the following: damaging anything in a public place on purpose that does not belong to them; shoplifting; graffitiing anywhere; hitting or attacking someone on purpose with or without using an object or weapon.
h. Measured at wave 3 (age 15/16) in LSYPE1 and LSYPE2.
i. Categories differed slightly from stated at LSYPE2, as follows: Never; Once a month or less; 2-3 times a month; 2 or more times a week.
j. Measured at wave 4 (age 16/17) in LSYPE1 and LSYPE2.
k. In LSYPE1, indicates whether young person has been a carer at wave 4 (age 16/17) or wave 5 (age 17/18). In LSYPE2, indicates whether young person has been a carer at wave 4 (age 16/17) only.

Notes:
1. Data from Analysis 1 complete case sample - N = 4,832 for LSYPE1 and N = 6,128 for LSYPE2.
2. Data are unweighted.

Chapter 3 - Differences in symptoms of common mental disorder between young people who did and did not attend higher education

Introduction

In this chapter we present the results from studies 1 and 2. Both studies tested the hypothesis that there would be no differences in symptoms of common mental disorder between young people who attended higher education and those who did not, when controlling for individual factors.

Study 1

We conducted a study of symptoms of common mental disorder in higher education students compared with non-students, using wave 6 of LSYPE2 (students started higher education in September at age 18/19 and common mental disorder symptoms were assessed between May and September the following year).

Study 2:

We conducted a longer-term longitudinal study of symptoms of common mental disorder in higher education students compared with non-students, using LSYPE1. Higher education status was measured at age 18/19 in wave 6 and common mental disorder was assessed at age 25 in wave 8. This enabled an investigation of mental health among young people who attended higher education compared with those who did not, when they had reached early adulthood.

Analysis:

The main analyses for each study used linear regression models. Results from these models are presented in Table 3, before and after adjusting for confounders. As the exposure variable was binary, the effect size can be interpreted as the difference in mean GHQ-12 scores between those who did not attend higher education (the reference or base category) and those who did. This is also described as an unstandardised regression coefficient. Negative mean differences indicate that the mean GHQ-12 score was lower in those who attended higher education compared with those who did not. Positive mean differences indicate that the mean GHQ-12 score was higher in those who attended higher education compared with those who did not. GHQ-12 scores had a possible range of 0-36, which is useful information when interpreting the size of the mean differences. We interpret the size of the effect (the mean difference) separately from the strength of the statistical evidence (the

confidence interval and p value). We interpret p values as a continuum of the strength of evidence rather than as a binary construct (Greenland et al., 2016).

We present models before and after adjusting for potential confounders.

In LSYPE2, with the outcome at age 18/19, there was evidence of an association between higher education and mental health. In the unadjusted model (model 1, column 2, Table 3), GHQ-12 scores were 0.43 (95% confidence interval 0.07 to 0.79, p=0.020) of a point higher in young people who attended higher education compared with those who had not. Evidence of this association attenuated after adjusting for sex, ethnicity and sociodemographic confounders (e.g. model 3, column 2, Table 3: 0.19, 95% confidence interval -0.16 to 0.55, p=0.29;), indicating positive confounding However, strong evidence of the association returned after further adjusting for antisocial behaviour, bullying, alcohol, cannabis use and carer, health and disability status (e.g. model 6, column 2, Table 3: 0.60, 95% CI 0.26 to 0.95, p<.001), indicating negative confounding. Evidence of the association remained after we further adjusted for GHQ-12 scores at wave 5 (model 7, column 2, Table 3: 0.36, 95% CI 0.05 to 0.68, p=.02). This suggests that the difference observed at wave 6 was not attributable to any differences in GHQ-12 scores before higher education.

In LSYPE1, GHQ-12 scores were 0.46 (96% confidence interval -0.88 to -0.05, p = .030) of a point lower in young people who had attended higher education compared with those who had not at age 25 (model 1, column 1, Table 3). However, evidence of this association disappeared after adjusting for sociodemographic factors (-0.31, 95% confidence interval -0.73 to 0.12, p=0.153, model 3, column 2, Table 3). In the final adjusted model, there remained no evidence of a difference in symptoms of common mental disorder between the two groups (-0.25, 95% confidence interval -0.66 to 0.16, p = 0.229, model 7, column 1, Table 3).

To illustrate the pattern of confounding in detail, associations between higher education and symptoms of common mental disorder are shown in Appendix Table 2, individually adjusted for each confounder

GHQ-12 scores according to sex, ethnicity and socioeconomic status are shown in Appendix Table 3. There was no evidence in either cohort that the association between higher education status and common mental disorder differed according to sex, socioeconomic background or ethnic background. See Table 4 for the p values from interaction terms testing these differences.

In both cohorts, the pattern of our findings was similar when we used the binary common mental disorder outcome variable (Table 5). The findings from LSYPE1 were unaltered when we classified higher education status using data from wave 6 only (thereby excluding those who took gap years right after school; Table 6).

Differences in the demographic characteristics and common mental disorder symptoms of young people with and without missing data are shown in Appendix Tables 4 and 5. Here, young people with missing data are those who did not provide data on higher education (because they had dropped out by that wave or did not complete the higher education questions). Generally, young people with missing data were more likely to be from families with lower education and were more likely to have general health, behavioural and substance use problems. However, they had fewer symptoms of common mental disorder.

In analyses which used multiple imputation to replace missing data (and applied weights for the target population), findings from studies 1 and 2 were unaltered when compared with those in Table 3 (Appendix Tables 6 and 7).

Summary of findings

In LSYPE2, there was evidence that higher education students had more symptoms of common mental disorder than non-students. This difference was observed during the first year of higher education, when young people were 18/19 years of age. In LSYPE1, we found no evidence of a difference in symptoms of common mental disorder at age 25, after young people had or had not attended higher education between the ages of 18 and 20.

Common mental disorder was assessed at different ages in the two cohorts. It could be that attending higher education has a short-term effect on symptoms of common mental disorder (at age 18/19) but, by the age of 25, this has disappeared. However, it is also possible that differences occurring between the two cohorts explain the findings, since LSYPE2 was conducted 9 years after LSYPE1.

Table 3: Mean difference in symptoms of common mental disorder between young people who did and did not attend higher education.

Model	Mean Difference (95% Confidence Interval), *p* value	
	LSYPE1	**LSYPE2**
Did not attend higher education	*Reference category (base)*	*Reference category (base)*
Model 1[a]	-0.46 (-0.88 to -0.05), p = .030	0.43 (0.07 to 0.79), p = .020
Model 2[b]	-0.51 (-0.93 to -0.09), p = .018	0.28 (-0.07 to 0.63), p = .116
Model 3[c]	-0.31 (-0.73 to 0.12), p = .153	0.19 (-0.16 to 0.55), p = .290
Model 4[d]	-0.14 (-0.55 to 0.28), p = .521	0.32 (-0.03 to 0.67), p = .074
Model 5[e]	-0.08 (-0.50 to 0.34), p = .722	0.39 (0.04 to 0.74), p = .028
Model 6[f]	0.02 (-0.40 to 0.44), p = .921	0.60 (0.26 to 0.94), p = .001
Model 7[g]	-0.25 (-0.66 to 0.16), p = .229	0.36 (0.05 to 0.68), p = .024

a. Unadjusted model.
b. Adjusted for sex and ethnicity.
c. Model 2 plus parents' socioeconomic status, parents' highest qualification and family composition.
d. Model 3 plus antisocial behaviour and experienced bullying.
e. Model 4 plus alcohol use and cannabis use.
f. Model 5 plus carer status, general quality of health and disability status.
g. Model 6 plus GHQ-12 scores at previous wave - for LSYPE1, this is wave 5 (age 17/18), for LSYPE2, this is wave 4 (age 16/17).

Notes:
1. Data from Analysis 1 complete case sample - N = 4,832 for LSYPE1 and N = 6,128 for LSYPE2.
2. Analyses weighted using weight from main outcome wave – wave 8 (age 25) for LSYPE1 and wave 6 (age 18/19) for LSYPE2.

Table 4: p values for interactions between higher education and demographics, from the final adjusted regression model.

Variable	Interaction term p value	
	LSYPE1	LSYPE2
Sex	0.420	0.312
Ethnicity	0.594	0.332
Parents' Socioeconomic Status	0.174	0.467

Notes:
1. Data from Analysis 1 complete case sample - N = 4,832 for LSYPE1 and N = 6,128 for LSYPE2.
2. Analyses weighted using weight from main outcome wave – wave 8 (age 25) for LSYPE1 and wave 6 (age 18/19) for LSYPE2.

Table 5: Sensitivity analysis with common mental disorder outcome as a binary variable.

Model	Odds Ratio (95% Confidence Interval), *p* value	
	LSYPE1	**LSYPE2**
Did not attend higher education	*Reference category (base)*	*Reference category (base)*
Model 1[a]	0.95 (0.82 to 1.11), p = .509	1.17 (1.03 to 1.32), p = .013
Model 2[b]	0.93 (0.80 to 1.08), p = .323	1.11 (0.98 to 1.26), p = .105
Model 3[c]	1.00 (0.85 to 1.17), p = .959	1.08 (0.95 to 1.22), p = .247
Model 4[d]	1.06 (0.90 to 1.25), p = .492	1.13 (0.99 to 1.28), p = .064
Model 5[e]	1.08 (0.92 to 1.28), p = .358	1.15 (1.02 to 1.31), p = .027
Model 6[f]	1.11 (0.94 to 1.31), p = .222	1.22 (1.08 to 1.39), p = .002
Model 7[g]	1.03 (0.87 to 1.22), p = .743	1.17 (1.02 to 1.34), p = .024

a. Unadjusted model.
b. Adjusted for sex and ethnicity.
c. Model 2 plus parents' socioeconomic status, parents' highest qualification and family composition.
d. Model 3 plus antisocial behaviour and experienced bullying.
e. Model 4 plus alcohol use and cannabis use.
f. Model 5 plus carer status, general quality of health and disability status.
g. Model 6 plus GHQ-12 scores at previous wave - for LSYPE1, this is wave 5 (age 17/18), for LSYPE2, this is wave 4 (age 16/17).

Notes:
1. Data from Analysis 1 complete case sample - N = 4,832 for LSYPE1 and N = 6,128 for LSYPE2.
2. Analyses weighted using weight from main outcome wave – wave 8 (age 25) for LSYPE1 and wave 6 (age 18/19) for LSYPE2.

3. GHQ scores made binary by coding each item 0 or 1 - a score of 1 or 2 would be coded 0 and a score of 3 or 4 would be coded 1. The score across the 12 items is then totalled. Finally, any participant with a total score above 2 would be coded as 1, and scores of 2 and below would be coded as 0.

Table 6: Sensitivity analysis with higher education exposure coded using only data from wave 6 (age 18/19).

Model	Mean Difference (95% Confidence Interval), *p* value
	LSYPE1
Did not attend higher education	*Reference category (base)*
Model 1[a]	-0.44 (-0.84 to -0.03), p = .033
Model 2[b]	-0.49 (-0.89 to -0.09), p = .017
Model 3[c]	-0.30 (-0.70 to 0.09), p = .131
Model 4[d]	-0.16 (-0.56 to 0.24), p = .444
Model 5[e]	-0.08 (-0.48 to 0.33), p = .710
Model 6[f]	0.04 (-0.36 to 0.44), p = .836
Model 7[g]	-0.14 (-0.54 to 0.25), p = .480

a. Unadjusted model.
b. Adjusted for sex and ethnicity.
c. Model 2 plus parents' socioeconomic status, parents' highest qualification and family composition.
d. Model 3 plus antisocial behaviour and experienced bullying.
e. Model 4 plus alcohol use and cannabis use.
f. Model 5 plus carer status, general quality of health and disability status.
g. Model 6 plus GHQ-12 scores at previous wave - for LSYPE1, this is wave 5 (age 17/18).

Notes:

1. Categorises higher education variable using only data from wave 6 (age 18/19), comparable with the data available in LSYPE2.
2. Uses alternate Analysis 1 complete case sample – those with complete data on main outcome, all confounders and exposure (now only coded using data from wave 6). N = 4,824.
3. Analyses weighted using weight from main outcome wave – wave 8 (age 25) for LSYPE1.

Chapter 4: Changes in symptoms of common mental disorder over time, among young people who did and did not attend higher education

Introduction

In this chapter, we present the results from study 3. This study tested the hypothesis that there would be no differences in change in common mental disorder symptoms over time, between individuals who attended higher education and those who did not. Differences over time will be equivalent for the two groups.

Study 3:

We compared symptoms of common mental disorder in higher education students and non-students, at each time-point in each dataset. We did this by calculating a trajectory of common mental disorder symptoms in each group, using every available GHQ-12 measure (before and after students did or did not attend higher education).

Findings

Means and standard deviations for each GHQ-12 assessment at each time-point in each cohort are shown in Table 7, for the sample overall and according to higher education status (estimates are unweighted; please see Appendix Table 8 for weighted estimates).

In the multilevel models, there was strong evidence that associations between higher education status and common mental disorder deviated from linearity and differed by time-point (p values for the interactions for these analyses are shown in Appendix Table 9). Associations are therefore presented separately by time-point from now on.

In unadjusted models in LSYPE1, at 14/15 and 16/17 years of age, young people who would later attend higher education had higher mean GHQ-12 scores than those who did not (model 1, columns 1 and 2, Table 8). However, by age 25, this difference was no longer apparent, and mean GHQ-12 scores were similar in the two groups (model 2, columns 1 and 2, Table 8). Note that this estimate at age 25 differs slightly to the result from study 2 (Chapter 3) because the sample sizes for the two analyses differ. However, the confidence intervals largely overlap indicating no substantial difference between these estimates across Chapters. In adjusted models, only the difference at age 16/17 remained, with evidence that GHQ-12 scores were 0.60 (95% confidence interval 0.30 to 0.90) of a point higher in those who attended higher education compared with those who did not (model 2, column 2, Table 8).

In unadjusted models in LSYPE2, GHQ-12 scores at 14/15 years of age, were lower in those who would later attend higher education compared with those who did not (model 1, column 1, Table 9). By subsequent ages, this difference had reversed, and GHQ-12 scores were higher in higher education students compared with non-students (model 1, columns 3, 4, 5, Table 9). After adjusting for confounders, evidence that GHQ-12 scores were lower in higher education students than non-students remained at age 14/15 (model 2, column 2, Table 9). However, at subsequent ages, evidence of any difference disappeared (model 2, columns 3, 4, 5, Table 9.

The adjusted associations between higher education status and symptoms of common mental disorder are presented graphically in Figures 1 (for LSYPE1) and 2 (for LSYPE2). The x-axis shows the time-point and the y-axis shows the mean GHQ-12 score according to higher education group. Coefficients are from adjusted models and error bars indicate 95% confidence intervals.

Table 7: Mean (SD) symptoms of common mental disorder at each wave, in the sample overall and those who did and did not attend higher education.

Wave	Mean (95% confidence interval); standard deviation							
	LSYPE1				LSYPE2			
	Attended higher education	Did not attend higher education	Total	N	Attended higher education	Did not attend higher education	Total	N
Wave 2 (age 14/15)	10.09 (9.92 to 10.27); 5.36	9.65 (9.45 to 9.85); 5.88	9.89 (9.76 to 10.02); 5.61	7,078	10.31 (10.08 to 10.54); 6.69	10.74 (10.48 to 11.01); 6.07	10.52 (10.34 to 10.69); 6.38	5,045
Wave 4 (age 16/17)	10.85 (10.68 to 11.03); 5.81	9.77 (9.59 to 9.95); 5.92	10.32 (10.19 to 10.44); 5.89	8,493	12.01 (11.80 to 12.22); 6.12	11.70 (11.48 to 11.92); 6.52	11.85 (11.70 to 12.01); 6.33	6,732
Wave 5 (age 17/18)					12.49 (12.28 to 12.70); 6.15	11.99 (11.77 to 12.21); 6.69	12.24 (12.08 to 12.39); 6.43	6,753
Wave 6 (age 18/19)					12.07 (11.85 to 12.29); 6.41	11.73 (11.50 to 11.96); 6.84	11.90 (11.74 to 12.06); 6.63	6,743
Wave 8 (age 25)	11.51 (11.31 to 11.71); 5.64	11.81 (11.56 to 12.06); 6.42	11.65 (11.49 to 11.80); 6.00	5,611				

Notes:
1. Data from Analysis 2 eligible sample.

2. Data are unweighted.
3. Red cells indicate time points where data was not available for that dataset.

Table 8: Mean difference in symptoms of common mental disorder between young people who did and did not attend higher education at each time-point in LSYPE1.

	Mean Difference (95% Confidence Interval)		
Model	**Wave 2 (age 14/15)** **N = 7,078**	**Wave 4 (age 16/17)** **N = 8,493**	**Wave 8 (age 25)** **N = 5,611**
Did not attend higher education	*Reference category (base)*	*Reference category (base)*	*Reference category (base)*
Model 1[a]	0.55 (0.25 to 0.85)	1.11 (0.82 to 1.40)	-0.34 (-0.75 to 0.07)
Model 2[b]	0.08 (-0.23 to 0.39)	0.60 (0.30 to 0.90)	-0.21 (-0.64 to 0.23)

a. Model 1 is unadjusted.
b. Model 2 is adjusted for sex, ethnicity, parents' socioeconomic status, parents' highest qualification and family composition.

Notes:
1. Data from Analysis 2 eligible sample.
2. Each analysis is weighted using the weight from that wave.

Table 9: Mean difference in symptoms of common mental disorder between young people who did and did not attend higher education at each time-point in LSYPE2.

	Mean Difference (95% Confidence Interval)			
Model	**Wave 2 (age 14/15)** **N = 5,045**	**Wave 4 (age 16/17)** **N = 6,732**	**Wave 5 (age 17/18)** **N = 6,753**	**Wave 6 (age 18/19)** **N = 6,743**
Did not attend higher education	*Reference category (base)*	*Reference category (base)*	*Reference category (base)*	*Reference category (base)*
Model 1	-0.38 (-0.74 to -0.01)	0.41 (0.09 to 0.72)	0.52 (0.20 to 0.85)	0.42 (0.07 to 0.77)
Model 2	-0.74 (-1.09 to -0.39)	-0.06 (-0.38 to 0.25)	0.08 (-0.25 to 0.40)	0.16 (-0.18 to 0.50)

a. Model 1 is unadjusted.
b. Model 2 is adjusted for sex, ethnicity, parents' socioeconomic status, parents' highest qualification and family composition.

Notes:
1. Data from Analysis 2 eligible sample.
2. Each analysis is weighted using the weight from that wave.

Figure 1: Change in symptoms of common mental disorder over time in young people who attended higher education compared with those who did not in LSYPE1.

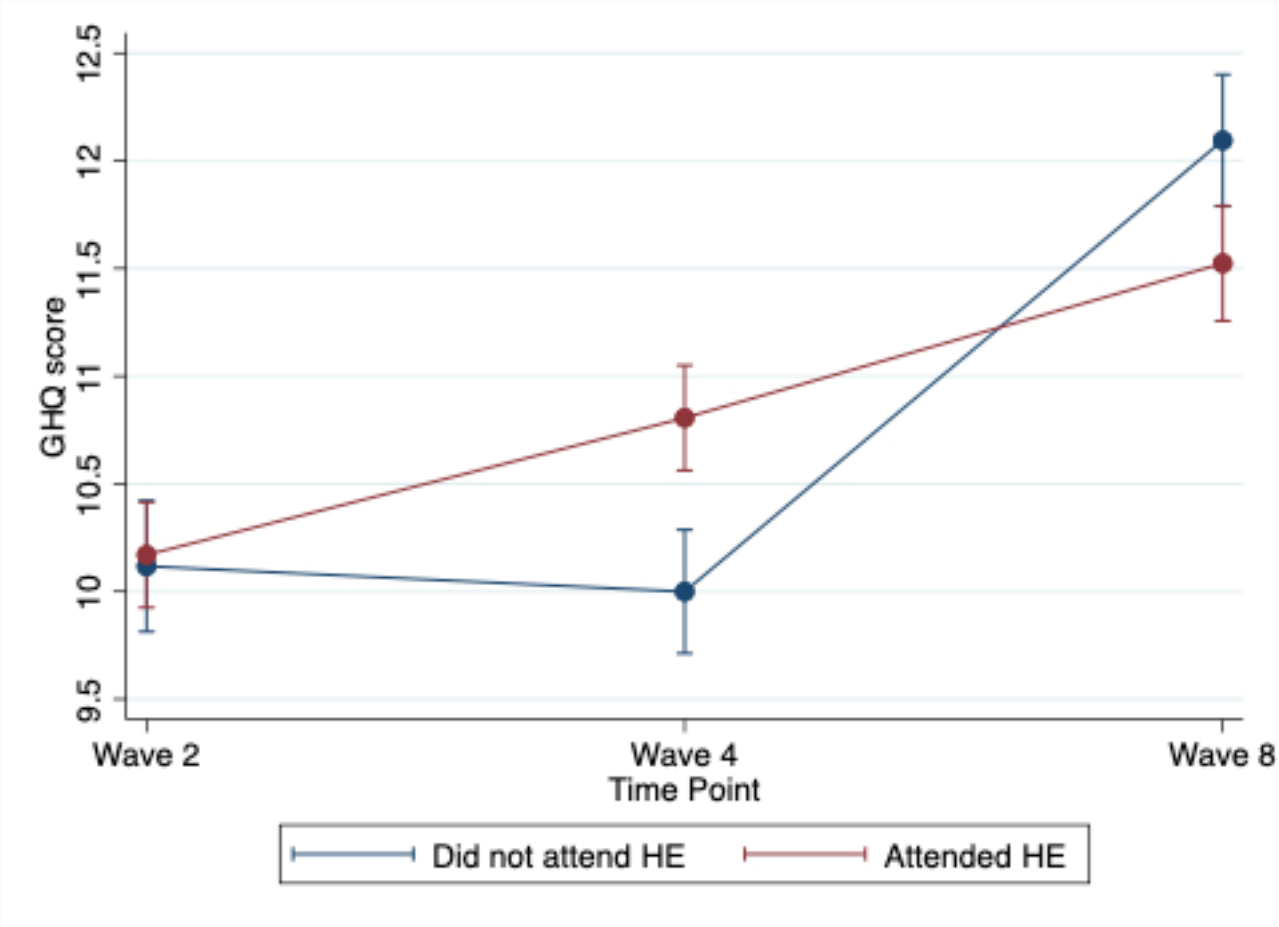
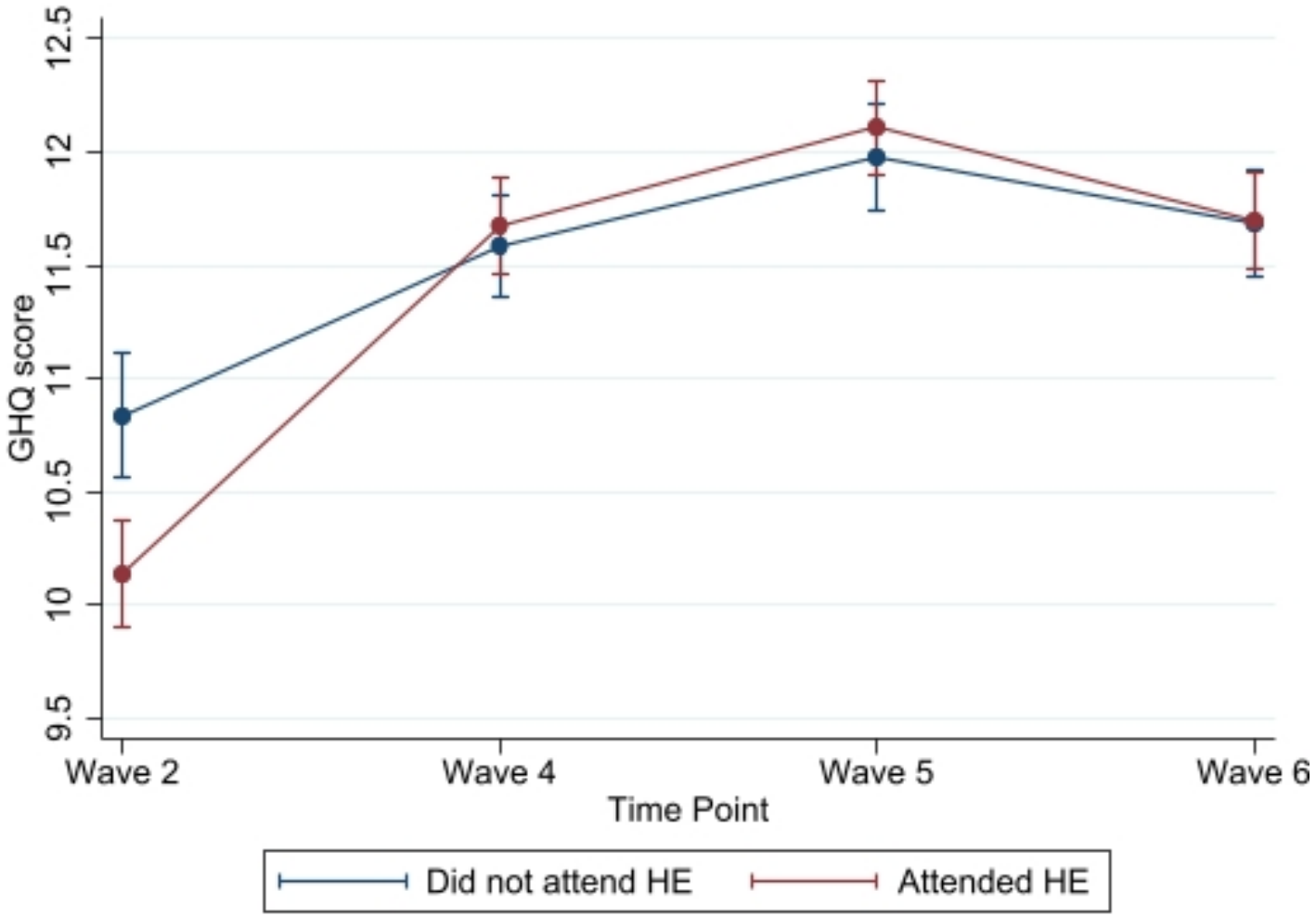


Figure 2: Change in symptoms of common mental disorder over time in young people who attended higher education compared with those who did not in LSYPE2.



Summary of findings

In this study, we explored symptoms of common mental disorder over time, in young people who attended higher education (at age 18/19) compared with those who did not. Our main focus was differences between these two groups during secondary school or further education, as differences during and after higher education were explored in detail in Chapter 3. In LSYPE2, we found that symptoms of common mental disorder were similar in the higher education compared with non-higher education groups at ages 16/17 and 17/18. However, at age 14/15, there was evidence that symptoms of common mental disorder were lower in young people who would later attend higher education compared with those who would not. In LSYPE1, at age 14/15, there was no evidence of any difference. However, at age 16/17, symptoms of common mental disorder were higher in young people who would later attend higher education compared with those who would not.

It is unclear why there are differences between the two cohorts when young people are at school, and this needs further investigation.

Our primary investigation of whether symptoms of common mental disorder differed during or after higher education was reported in Chapter 3 (i.e. at ages 18/19 in LSYPE1 and age 25 in LSYPE1). We included data from ages 18/19 and 25 in this chapter, for completeness of the trajectories. In this Chapter, we see no evidence of a difference between the two groups at age 18/19 in LSYPE2 (in contrast to the result in Chapter 3). This is because the multilevel models in this chapter do not include the variables which resulted in a strong pattern of negative confounding in Chapter 3 (bullying, antisocial behaviour, cannabis use and general health). We did not adjust for these variables in this chapter because, many of them were measured after the earlier GHQ-12 scores in our trajectory. Including them could therefore have biased the earlier effect estimates. The most accurate estimates of differences at ages 18/19 (LSYPE2) and 25 (LSYPE1) are therefore those from Chapter 3.

Any differences in GHQ-12 scores that occurred between the two groups before higher education started are unlikely to explain our findings in chapter 3. This is because we adjusted for pre-higher education GHQ-12 scores in our analyses.

Chapter 5: Predictors of symptoms of common mental disorder in young people who did and did not attend higher education

Introduction

In this chapter, we present the findings from study 4. In this study, we tested the hypothesis that there would be no differences in predictive factors related to symptoms of common mental disorder between young people in higher education and those who were not, for example in scores on locus of control; scores on work ethic, use of social media, and alcohol consumption.

Study 4:

We conducted analyses of risk factors associated with symptoms of common mental disorder in young people. We compared these risk factors in the groups who did and did not attend higher education. These analyses were conducted in LSYPE2 (using mental health at age 18/19 as the outcome) and LSYPE1 (using mental health at age 25 as the outcome).

The predictor variables we examined in each dataset were:

- Locus of control
- Equates hard work with success
- Social media use
- Parent's highest educational qualifications
- Frequency of alcohol use

Findings

First, we examined descriptive data for each potential predictor variable, in the sample overall, and according to higher education group (Table 10). Estimates in Table 10 are unweighted (for weighted estimates please see Appendix Table 10) In each cohort, young people who attended higher education scored higher on locus of control and equating hard work with success and they used slightly less social media. They had more highly educated parents and used alcohol less frequently.

We tested the association between each of the variables classed as predictors and symptoms of common mental disorder using linear regressions, first in the total sample and then in the sub-groups who did and did not attend higher education. We ran a separate model for each predictor, before and after adjusting for the same set of confounders used in studies one and two (longitudinal investigations of the association between higher education status and symptoms of common mental disorder).

In each cohort, there was no evidence that the association between any predictor and symptoms of common mental disorder differed across the groups (Table 11).

Our findings are shown in Table 12 for LYSPE1 and Table 13 for LSYPE2. In the samples overall, there was evidence that higher symptoms of common mental disorder were associated with: lower scores on locus of control, lower scores on equating hard work with success, more social media use, lower parental education and higher alcohol most days. After adjusting for confounders, evidence of these association remained for locus of control, equating hard work with success, alcohol use (LSYPE2 only) and social media use (LSYPE1 only) (Tables 12 and 13).

Table 10: Descriptive statistics for variables classed as predictors, in young people who did and did not attend higher education.

Variable	LSYPE1			LSYPE2		
	Attended higher education	Did not attend higher education	Total	Attended higher education	Did not attend higher education	Total
Locus of control – M (SD)[a]	6.30 (1.46)	5.62 (1.60)	6.00 (1.56)	5.84 (1.54)	5.44 (1.66)	5.65 (1.61)
Equates hard work with success – M (SD)[a]	7.54 (1.25)	7.04 (1.41)	7.32 (1.34)	7.49 (1.29)	7.18 (1.36)	7.34 (1.34)
Social media use – M (SD)[b]	2.34 (2.67)	2.68 (3.23)	2.49 (2.94)			
Social media use – N (%)[c]				247 (7.4%)	322 (9.5%)	569 (8.4%)
Less often or never				600 (18.0%)	504 (14.8%)	1,104 (16.4%)
2-3 times a day				434 (13.0%)	430 (12.6%)	864 (12.8%)
Every 2-3 hours				697 (20.9%)	647 (19.0%)	1,344 (19.9%)
Once every hour				1,356 (40.7%)	1,504 (44.1%)	2,860 (42.4%)
Multiple times an hour				247 (7.4%)	322 (9.5%)	569 (8.4%)

Parents' Highest Qualification – N (%)[d,e]						
Below GCSE or no qualification	504 (16.3%)	660 (26.1%)	1,164 (20.7%)	492 (14.8%)	746 (21.9%)	1,238 (18.4%)
GCSE grades A-C or equivalent	551 (17.9%)	768 (30.4%)	1,319 (23.5%)	1,214 (36.4%)	1,596 (46.8%)	2,810 (41.7%)
GCE, A Level or equivalent	498 (16.2%)	473 (18.7%)	971 (17.3%)	450 (13.5%)	384 (11.3%)	834 (12.4%)
Higher education below degree level	604 (19.6%)	368 (14.6%)	972 (17.3%)	470 (14.1%)	312 (9.2%)	782 (11.6%)
Degree or equivalent	926 (30.0%)	259 (10.2%)	1,185 (21.1%)	709 (21.3%)	370 (10.9%)	1,079 (16.0%)
Frequency of Alcohol Use – N (%)[f, g]						
Never	779 (26.0%)	470 (19.3%)	1,249 (23.0%)	1,185 (35.8%)	1,038 (30.8%)	2,223 (33.3%)
Once every couple of months or less	539 (18.0%)	432 (17.7%)	971 (17.9%)	1,270 (38.3%)	1,429 (42.4%)	2,699 (40.4%)
1-3 times a month	971 (32.4%)	711 (29.2%)	1,682 (30.9%)	753 (22.7%)	741 (22.0%)	1,494 (22.4%)
Once a week or more	711 (23.7%)	826 (33.9%)	1,537 (28.3%)	106 (3.2%)	163 (4.8%)	269 (4.0%)

a. Measured at wave 2 (age 14/15) in LSYPE1 and LSYPE2.
b. Available in LSYPE1 only. Measured at wave 8 (age 25).

c. Available in LSYPE2 only. Measured at wave 5 (age 17/18).
d. Measured at wave 4 (age 16/17) in LSYPE1 and wave 1 (age 13/14) in LSYPE2.
e. In LSYPE1, indicates the highest qualification held by the main or second parent. In LSYPE2, indicates the highest qualification held by the mother or father.
f. Categories differed slightly from stated at LSYPE2, as follows: Never; Once a month or less; 2-3 times a month; 2 or more times a week.
g. Measured at wave 4 (age 16/17) in LSYPE1 and LSYPE2.

Notes:
1. Data from Analysis 3 eligible sample.
2. Data are unweighted.
3. Red cells indicate time points where data was not available for that dataset.

Table 11: p values from the interaction terms for each potential predictive variable.

Variable	LSYPE1	LSYPE2
Locus of control	0.002	0.304
Equates hard work with success	0.923	0.907
Social media use	0.882	0.022
Parents' highest qualification	0.927	0.302
Frequency of alcohol use	0.394	0.772

Notes

1. Data are from Analysis 3 eligible sample.
2. All models adjusted for sex, ethnicity, parents' socioeconomic status, parents' highest qualification and family composition.
3. All models weighted using weight from main outcome wave – wave 8 (age 25) for LSYPE1 and wave 6 (age 18/19) for LSYPE2.

Table 12: Mean difference in symptoms of common mental disorder between young people who did and did not attend higher education in LSYPE1, for each predictor.

Variable	Attended higher education	Did not attend higher education	Total
Locus of control			
Unadjusted	-0.45 (-0.65 to -0.24)	-0.38 (-0.61 to -0.16)	-0.42 (-0.57 to -0.26)
Adjusted	-0.48 (-0.69 to -0.28)	-0.36 (-0.58 to -0.13)	-0.42 (-0.57 to -0.26)
Equates hard work with success			
Unadjusted	-0.18 (-0.38 to 0.03)	-0.17 (-0.41 to 0.07)	-0.20 (-0.36 to -0.04)
Adjusted	-0.16 (-0.40 to 0.08)	-0.19 (-0.39 to 0.02)	-0.17 (-0.33 to -0.01)
Social media use			
Unadjusted	0.16 (0.06 to 0.25)	0.15 (0.04 to 0.26)	0.15 (0.08 to 0.23)
Adjusted	0.14 (0.04 to 0.24)	0.13 (0.02 to 0.24)	0.14 (0.06 to 0.21)
Parents' Highest Qualification			
Unadjusted			

Below GCSE or no qualification	*Reference category (base)*	*Reference category (base)*	*Reference category (base)*
GCSE grades A-C or equivalent	0.08 (-0.96 to 1.12)	-0.45 (-1.36 to 0.46)	-0.32 (-1.05 to 0.40)
GCE, A Level or equivalent	-0.15 (-1.25 to 0.94)	-0.62 (-1.61 to 0.37)	-0.52 (-1.29 to 0.24)
Higher education below degree level	0.06 (-1.03 to 1.14)	-0.71 (-1.65 to 0.23)	-0.47 (-1.18 to 0.24)
Degree or equivalent	-0.46 (-1.46 to 0.54)	-0.16 (-1.23 to 0.92)	-0.66 (-1.34 to 0.03)
Adjusted			
Below GCSE or no qualification	*Reference category (base)*	*Reference category (base)*	*Reference category (base)*
GCSE grades A-C or equivalent	-0.18 (-1.33 to 0.97)	-0.49 (-1.47 to 0.50)	-0.40 (-1.20 to 0.39)
GCE, A Level or equivalent	-0.39 (-1.60 to 0.81)	-0.60 (-1.70 to 0.51)	-0.56 (-1.41 to 0.30)
Higher education below degree level	-0.15 (-1.38 to 1.09)	-0.62 (-1.73 to 0.49)	-0.44 (1.27 to 0.38)

Degree or equivalent	-0.59 (-1.76 to 0.59)	-0.01 (-1.29 to 1.27)	-0.55 (-1.41 to 0.30)
Frequency of Alcohol Use			
Unadjusted			
Never	*Reference category (base)*	*Reference category (base)*	*Reference category (base)*
Once a month or less	1.02 (0.20 to 1.85)	0.13 (-1.01 to 1.26)	0.53 (-0.20 to 1.26)
2-3 times a month	0.64 (0.00 to 1.28)	0.17 (-0.86 to 1.19)	0.37 (-0.28 to 1.02)
2 or more times a week	1.09 (0.41 to 1.75)	0.27 (-0.75 to 1.29)	0.65 (-0.02 to 1.31)
Adjusted			
Never	*Reference category (base)*	*Reference category (base)*	*Reference category (base)*
Once a month or less	0.78 (-0.22 to 1.79)	-0.05 (-1.29 to 1.18)	0.26 (-0.59 to 1.12)
2-3 times a month	0.50 (-0.37 to 1.37)	0.09 (-1.08 to 1.26)	0.21 (-0.62 to 1.03)

2 or more times a week	1.10 (0.17 to 2.03)	0.29 (-0.86 to 1.43)	0.58 (-0.24 to 1.40)

Notes:

1. Data from Analysis 3 eligible sample.
2. All models adjusted for sex, ethnicity, parents' socioeconomic status, parents' highest qualification and family composition.
3. All models weighted using weight from main outcome wave – wave 8 (age 25) for LSYPE1.

Table 13: Mean difference in symptoms of common mental disorder between young people who did and did not attend higher education in LSYPE2, for each predictor.

Variable	Attended higher education	Did not attend higher education	Total
Locus of control			
Unadjusted	-0.41 (-0.60 to -0.23)	-0.53 (-0.72 to -0.35)	-0.45 (-0.58 to -0.32)
Adjusted	-0.41 (-0.59 to -0.23)	-0.51 (-0.70 to -0.32)	-0.45 (-0.58 to -0.32)
Equates hard work with success			
Unadjusted	-0.29 (-0.48 to -0.09)	-0.25 (-0.45 to -0.05)	-0.24 (-0.39 to -0.09)
Adjusted	-0.29 (-0.49 to -0.10)	-0.27 (-0.46 to -0.07)	-0.27 (-0.41 to -0.12)
Social media use			
Unadjusted			
Less often or never	*Reference category (base)*	*Reference category (base)*	*Reference category (base)*
2-3 times a day	0.35 (-0.58 to 1.27)	0.02 (-0.89 to 0.94)	0.17 (-0.47 to 0.81)
Every 2-3 hours	0.47 (-0.53 to 1.47)	-0.39 (-1.36 to 0.59)	0.00 (-0.68 to 0.68)

Once every hour	0.75 (-0.15 to 1.64)	0.37 (-0.57 to 1.31)	0.54 (-0.12 to 1.21)
Multiple times an hour	1.98 (1.13 to 2.84)	1.01 (0.22 to 1.81)	1.44 (0.87 to 2.00)
Adjusted			
Less often or never	*Reference category (base)*	*Reference category (base)*	*Reference category (base)*
2-3 times a day	0.09 (-0.82 to 1.00)	-0.36 (-1.27 to 0.55)	-0.19 (-0.83 to 0.45)
Every 2-3 hours	-0.09 (-1.07 to 0.89)	-1.13 (-2.11 to -0.14)	-0.68 (-1.36 to -0.00)
Once every hour	0.25 (-0.64 to 1.13)	-0.31 (-1.24 to 0.61)	-0.10 (-0.76 to 0.56)
Multiple times an hour	1.37 (0.53 to 2.21)	0.01 (-0.81 to 0.83)	0.59 (0.01 to 1.18)
Parents' Highest Qualification			
Unadjusted			
Below GCSE or no qualification	*Reference category (base)*	*Reference category (base)*	*Reference category (base)*
GCSE grades A-C or equivalent	1.31 (0.68 to 1.94)	0.10 (-0.50 to 0.70)	0.56 (0.10 to 1.01)

GCE, A Level or equivalent	1.01 (0.28 to 1.75)	0.51 (-0.31 to 1.33)	0.69 (0.14 to 1.24)
Higher education below degree level	0.79 (0.04 to 1.55)	0.69 (-0.34 to 1.73)	0.64 (0.01 to 1.27)
Degree or equivalent	1.68 (0.95 to 2.41)	0.46 (-0.37 to 1.29)	1.10 (0.56 to 1.65)
Adjusted			
Below GCSE or no qualification	*Reference category (base)*	*Reference category (base)*	*Reference category (base)*
GCSE grades A-C or equivalent	1.29 (0.64 to 1.93)	0.03 (-0.54 to 0.61)	0.49 (0.05 to 0.93)
GCE, A Level or equivalent	1.09 (0.32 to 1.86)	0.16 (-0.67 to 0.99)	0.50 (-0.07 to 1.07)
Higher education below degree level	0.87 (0.08 to 1.66)	0.50 (-0.53 to 1.53)	0.52 (-0.11 to 1.14)
Degree or equivalent	1.65 (0.85 to 2.44)	0.17 (-0.69 to 1.04)	0.89 (0.33 to 1.45)
Frequency of Alcohol Use			

Unadjusted			
Never	*Reference category (base)*	*Reference category (base)*	*Reference category (base)*
Once a month or less	0.60 (0.07 to 1.12)	0.56 (-0.02 to 1.13)	0.55 (0.18 to 0.93)
2-3 times a month	0.68 (0.10 to 1.26)	0.62 (-0.03 to 1.27)	0.64 (0.20 to 1.08)
2 or more times a week	1.73 (0.42 to 3.03)	1.63 (0.19 to 3.06)	1.61 (0.58 to 2.65)
Adjusted			
Never	*Reference category (base)*	*Reference category (base)*	*Reference category (base)*
Once a month or less	0.42 (-0.15 to 1.00)	0.40 (-0.22 to 1.03)	0.39 (-0.03 to 0.81)
2-3 times a month	0.46 (-0.18 to 1.09)	0.48 (-0.21 to 1.17)	0.46 (-0.02 to 0.94)
2 or more times a week	1.90 (0.62 to 3.17)	1.59 (0.19 to 2.99)	1.67 (0.65 to 2.68)

Notes:
1. Data from Analysis 3 eligible sample.
2. All models adjusted for sex, ethnicity, parents' socioeconomic status, parents' highest qualification

and family composition.
3. All models weighted using weight from main outcome wave – wave 6 (age 18/19) for LSYPE2.

Summary of findings

In this chapter, we found no evidence that predictive factors for common mental health disorders differ according to whether young people attended higher education. The predictive factors we investigated included alcohol use, social media, parental education levels, locus of control and equating hard work with success. It is possible that differences between the two groups exist with regard to risk factors we did not investigate, which would require further research.

Chapter 6 – Conclusions

We investigated symptoms of common mental disorder in young people who attended higher education, compared with those who did not attend. In the LSYPE2 cohort, we found that young people who were in higher education had higher subsequent levels of common mental disorder than those who were not. This difference was observed during the first year of higher education, when young people were 18/19 years of age in 2018. In LSYPE1, we found no evidence of a difference in symptoms of common mental disorder between young people who had or had not attended higher education. This difference was observed when young people were 25 years of age in 2015, after they had or had not entered higher education between 18 and 20 years of age.

Our findings in LSYPE2 suggest that 18/19 year olds who started higher education in 2018 experienced a small increase in their risk of common mental disorders, compared with young people who did not attend higher education. The effect size for the association between higher education and mental health in LSYPE2 was relatively small. However, small effects can still be of public health importance, especially when the risk factor is common (Rothman et al., 2013).

There are several reasons why higher education might increase the risk of symptoms of common mental disorder. The limited number of studies in this area suggest that these include financial stress, academic pressures (e.g. workload, exam stress, fear of failure), and changes to social relationships and living arrangements that may cause isolation, loneliness or lack of support (Duffy et al., 2019; McCloud and Bann, 2019; Thorley, 2017).

LSYPE2 is one of the most contemporary sources of data on young people's education and health and is highly relevant to policy. Our finding that young people who attended higher education in 2018/19 had higher levels of common mental disorder than the rest of the population has implications for policy, higher education, and mental health services. As existing research demonstrates, symptoms of common mental disorder are often impairing (Thapar et al., 2012). They can adversely affect educational performance, social relationships and physical health, and they increase the risk of suicide and self-harm (Thapar et al., 2012). Most people with common mental disorders never seek treatment (McManus, 2018). Our finding suggests that closing this so-called "treatment gap" is important in higher education settings as well as the general population. Higher education students might also face problems when they do seek treatment. They may find it difficult to access treatment, as referrals to mental health services in higher education settings have increased (Universities UK, 2018).

In LSYPE1, we found no evidence of a difference in the mental health of young people after they had attended higher education compared to those who had not at age 25. We have considered two possibilities for the different findings we observed across the LSYPE datasets and time periods. First, it is possible that higher education leads to a relatively short-term increase in symptoms of common mental disorder. We may have detected this in LSYPE2 (but not LSYPE1) because the mental health outcome was measured at age 18/19 (during the young person's first year at higher education). The negative effect that higher education may initially have on mental health may disappear by age 25, when mental health was assessed in LSYPE1. However, because mental health outcomes were not assessed after age 18/19 in LSYPE2, we cannot rule out the possibility that there is a long-term effect of higher education on mental health in this cohort of young people. Similarly, due to the lack of data, we cannot rule out that possibility that there is short-term effect of higher education on mental health in LSYPE1.

We also examined the history of common mental disorder symptoms, from age 13 to 17, whilst the young people were in secondary school or further education. In LSYPE2, young people who would later attend higher education had fewer symptoms of common mental disorder than those who would not at age 14/15. There were no differences at other time-points during secondary school or further education. In LSYPE1, young people who would later attend higher education had more symptoms of common mental disorder than those who would not at age 16/17. There was no difference at any other time-point during secondary school or further education.

There could be stressors associated with the anticipation of attending higher education, which increase symptoms of common mental disorder, and explain the difference we observed in LSYPE1. For example, young people who later attend higher education might experience higher levels of academic pressure during secondary school or further education than those who do not. However, as this finding was not replicated in the more recent LSYPE2 cohort, it requires further investigation. If true, our finding in LSYPE1 points to the importance of preventing and treating common mental disorders in the higher education population from the point of entry. The finding also has implications for the prevention and management of common health problems in schools, which is high on the policy agenda. We found no evidence that predictive factors for common mental health disorder differed between higher education groups, so further research in this area is needed.

Our findings should be considered in light of several limitations. Although we adjusted for a large number of potential confounders, like most observational studies, we cannot rule out residual confounding. We cannot therefore be certain that associations were causal. Attendance at higher education was measured after young people had started their course but it was self-reported. The proportion of

young people who entered higher education straight after secondary school or further education was higher in our study than in administrative data for this age group. It is unclear why this occurred but it might affect our results. Replication of our study in other large representative cohorts would therefore be useful. Comparisons between LSYPE1 and LSYPE2 were limited by the fact that, after the age of 16/17, symptoms of common mental disorder were not measured at the same time-points. Finally, we did not investigate whether our associations differed according to whether higher education students were full-time or part-time.

More research is needed to investigate mechanisms underlying the association between higher education attendance and levels of common mental disorder. For instance, further research could take place at different time-points within the academic year and across academic years and beyond, to examine how these differences might fluctuate. Such research might shed further light on whether higher education leads to a relatively short-term increase in symptoms of common mental disorder, or whether there are longer-term effects. This, alongside other suggested additional research, is vital to inform the development of mental health interventions aimed at students and young people.

Specifically, our finding of higher levels of common mental disorder among students points to the importance of preventing and treating common mental disorders in higher education, encouraging students to be aware of and seek treatment from available support services. Although demand for mental health services is high, these findings suggest the need for higher education providers to focus resources towards students in their first year of study.

Our finding in LSYPE1 (although not replicated in LSYPE2), that during secondary school, young people who later enter higher education may already have more symptoms of common mental disorder than the general population similarly requires further investigation. These findings also have potential implications for policy and mental health services. They underscore the importance of preventing and managing common health problems in schools, which is high on the policy agenda.

Appendices

List of tables

Appendix Table 1: Demographic characteristics of young people overall and those who did and did not attend higher education, with weighted percentages.

Variable – N (%)	**LSYPE1**			**LSYPE2**		
	Attended higher education	**Did not attend higher education**	**Total**	**Attended higher education**	**Did not attend higher education**	**Total**
Sex[a]						
Female	1,530 (57.8%)	1,084 (51.1%)	2,614 (54.4%)	1,731 (54.6%)	1,509 (49.0%)	3,240 (51.9%)
Male	1,166 (42.2%)	1,052 (48.9%)	2,218 (45.6%)	1,373 (45.4%)	1,515 (51.0%)	2,888 (48.1%)
Ethnicity[b]						
White	1,830 (85.9%)	1,724 (92.3%)	3,554 (89.0%)	2,255 (78.8%)	2,497 (86.4%)	4,752 (82.4%)
Mixed	105 (2.2%)	102 (2.3%)	207 (2.3%)	135 (4.0%)	125 (3.6%)	260 (3.8%)
Indian	275 (3.9%)	57 (0.9%)	332 (2.4%)	103 (3.5%)	56 (1.9%)	159 (2.7%)

Pakistani	151 (2.4%)	95 (1.6%)	246 (2.0%)	136 (3.9%)	85 (2.7%)	221 (3.4%)
Bangladeshi	123 (0.9%)	65 (0.7%)	188 (0.8%)	112 (1.7%)	48 (0.9%)	160 (1.3%)
Black African	77 (1.4%)	20 (0.5%)	97 (0.9%)	170 (3.5%)	81 (1.8%)	251 (2.7%)
Black Caribbean	57 (0.7%)	46 (0.7%)	103 (0.7%)	80 (1.0%)	86 (1.2%)	166 (1.1%)
Other	78 (2.6%)	27 (1.0%)	105 (1.9%)	113 (3.7%)	46 (1.6%)	159 (2.7%)
Parents' Socioeconomic Status[c, d]						
Managerial and professional occupations	1,557 (64.1%)	783 (37.6%)	2,340 (51.4%)	1,694 (60.5%)	1,239 (47.2%)	2,933 (54.2%)
Intermediate occupations	456 (16.3%)	471 (22.2%)	927 (19.2%)	686 (21.7%)	728 (24.2%)	1,414 (22.9%)
Lower supervisory, routine occupations and not currently working	683 (19.5%)	882 (40.1%)	1,565 (29.5%)	724 (17.9%)	1,057 (28.6%)	1,781 (23.0%)
Parents' Highest Qualification[d, e]						
Degree or equivalent	815 (34.1%)	224 (9.9%)	1,039 (22.4%)	670 (24.5%)	335 (13.1%)	1,005 (19.1%)

Higher education below degree level	536 (21.3%)	319 (15.4%)	855 (18.5%)	440 (15.0%)	278 (9.7%)	718 (12.5%)
GCE, A Level or equivalent	445 (17.6%)	419 (20.4%)	864 (18.9%)	421 (13.8%)	345 (11.5%)	766 (12.7%)
GCSE grades A-C or equivalent	485 (18.0%)	646 (32.1%)	1,131 (24.8%)	1,126 (35.2%)	1,429 (47.3%)	2,555 (40.9%)
Below GCSE or no qualification	415 (9.0%)	528 (22.2%)	943 (15.4%)	447 (11.5%)	637 (18.4%)	1,084 (14.8%)
Family Composition[d]						
Married/cohabiting	2,252 (83.9%)	1,530 (70.0%)	3,782 (77.2%)	2,456 (83.0%)	2,169 (77.2%)	4,625 (80.2%)
Lone parent or no parents in the household	444 (16.1%)	606 (30.0%)	1,050 (22.8%)	648 (17.0%)	855 (22.8%)	1,503 (19.8%)
Antisocial Behaviour (in past 12 months)[l, m]	299 (10.7%)	465 (22.4%)	764 (16.3%)	170 (5.5%)	299 (9.6%)	469 (7.5%)
Experienced Bullying (in past 12 months)[m]	642 (26.0%)	645 (31.1%)	1,287 (28.4%)	839 (27.5%)	970 (31.7%)	1,809 (29.5%)
Frequency of Alcohol Use[j, k]						

Never	653 (13.4%)	380 (12.5%)	1,033 (13.0%)	1,094 (31.0%)	893 (27.0%)	1,987 (29.0%)
Once every couple of months or less	486 (18.5%)	379 (17.8%)	865 (18.2%)	1,189 (39.8%)	1,297 (43.4%)	2,486 (41.6%)
1-3 times a month	893 (37.7%)	636 (32.1%)	1,529 (35.0%)	718 (25.5%)	682 (24.1%)	1,400 (24.8%)
Once a week or more	664 (30.3%)	741 (37.6%)	1,405 (33.8%)	103 (3.8%)	152 (5.6%)	255 (4.7%)
Cannabis Use (ever)	673 (28.3%)	785 (38.7%)	1,458 (33.3%)	554 (18.7%)	771 (26.3%)	1,325 (22.4%)
General Quality of Health						
Very good	1,488 (54.3%)	1,031 (47.3%)	2,519 (51.0%)	1,363 (44.6%)	1,127 (38.3%)	2,490 (41.5%)
Fairly good	1,064 (40.1%)	928 (44.4%)	1,992 (42.1%)	1,543 (49.3%)	1,560 (51.0%)	3,103 (50.1%)
Not very good or not good at all	144 (5.6%)	177 (8.3%)	321 (6.9%)	198 (6.1%)	337 (10.7%)	535 (8.3%)
Disability Status[j]	163 (6.4%)	177 (8.9%)	340 (7.6%)	286 (9.0%)	412 (13.2%)	698 (11.1%)

Carer Status[i]	203 (6.6%)	165 (7.7%)	368 (7.2%)	125 (3.6%)	180 (5.2%)	305 (4.4%)

a. Measured at wave 6 (age 18/19) in LSYPE1 and wave 1 (age 13/14) in LSYPE2.Measured at wave 4 (age 16/17) in LSYPE1 and wave 1 (age 13/14) in LSYPE2 (missing data supplemented with wave 2 data).
b. Parents' socioeconomic status is based on the socioeconomic status of whichever parent (mother or father) has the highest employment category.
c. Measured at wave 4 (age 16/17) in LSYPE1 and wave 1 (age 13/14) in LSYPE2.
d. In LSYPE1, indicates the highest qualification held by the main or second parent. In LSYPE2, indicates the highest qualification held by the mother or father.
e. At LSYPE1, antisocial behaviour includes taking part in any of the following: vandalising public property; shoplifting; graffitiing on walls; fighting or public disturbance. At LSYPE2, the following: damaging anything in a public place on purpose that does not belong to them; shoplifting; graffitiing anywhere; hitting or attacking someone on purpose with or without using an object or weapon.
f. Measured at wave 3 (age 15/16) in LSYPE1 and LSYPE2.
g. Categories differed slightly from stated at LSYPE2, as follows: Never; Once a month or less; 2-3 times a month; 2 or more times a week.
h. Measured at wave 4 (age 16/17) in LSYPE1 and LSYPE2.
i. In LSYPE1, indicates whether young person has been a carer at wave 4 (age 16/17) or wave 5 (age 17/18). In LSYPE2, indicates whether young person has been a carer at wave 4 (age 16/17) only.

Notes:
1. Data from Analysis 1 complete case sample - N = 4,832 for LSYPE1 and N = 6,128 for LSYPE2.
2. Data are weighted using the weight applicable to the wave each variable was measured at.

Appendix Table 2: Mean difference in symptoms of common mental disorder between young people who did and did not attend higher education, adjusted for each confounder separately.

Model	Mean Difference (95% Confidence Interval), *p* value	
	LSYPE1	**LSYPE2**
Did not attend higher education	*Reference category (base)*	*Reference category (base)*
Unadjusted model	-0.46 (-0.88 to -0.05), p = .030	0.43 (0.07 to 0.79), p = .020
Sex	-0.54 (-0.96 to -0.13), p = .011	0.24 (-0.11 to 0.59), p = .173
Ethnicity	-0.42 (-0.85 to -0.00), p = .049	0.47 (0.11 to 0.82), p = .011
Parents' Socioeconomic Status	-0.38 (-0.80 to 0.04), p = .078	0.39 (0.03 to 0.76), p = .034
Parents' Highest Qualification	-0.33 (-0.75 to 0.09), p = .118	0.33 (-0.04 to 0.69), p = .077
Family Composition	-0.38 (-0.80 to 0.03), p = .070	0.46 (0.10 to 0.82), p = .012
Antisocial Behaviour	-0.40 (-0.83 to 0.03),p = .066	0.47 (0.11 to 0.83), p = .010
Experienced Bullying	-0.34 (-0.74 to 0.07), p = .107	0.55 (0.19 to 0.90), p = .002
Frequency of Alcohol Use	-0.42 (-0.84 to -0.01), p = .046	0.48 (0.12 to 0.84), p = .009
Cannabis Use (ever)	-0.37 (-0.79 to 0.05), p = .087	0.53 (0.17 to 0.88), p = .004
Carer Status	-0.46 (-0.88 to -0.04), p = .033	0.45 (0.09 to 0.81), p = .014
General Health	-0.34 (-0.75 to 0.08), p = .114	0.72 (0.38 to 1.06), p <.001
Disability Status	-0.42 (-0.83 to -0.00), p = .048	0.52 (0.16 to 0.87), p = .004

GHQ at previous wave	-0.75 (-1.15 to -0.35), p < .001	0.14 (-0.18 to 0.45), p = .396

Notes:

1. Data from Analysis 1 complete case sample - N = 4,832 for LSYPE1 and N = 6,128 for LSYPE2.
2. Analyses weighted using weight from main outcome wave – wave 8 (age 25) for LSYPE1 and wave 6 (age 18/19) for LSYPE2.
3. GHQ at previous wave refers to wave 4 (age 16/17) for LSYPE1 and wave 5 (age 17/18) for LSYPE2.

Appendix Table 3: Mean (SD) symptoms of common mental disorder by demographics.

Variable	Mean (Standard Deviation)	
	LSYPE1	LSYPE2
Sex[a]		
Female	12.07 (5.99)	13.18 (6.95)
Male	10.96 (5.79)	10.29 (5.84)
Ethnicity[b]		
White	11.74 (5.88)	11.89 (6.54)
Mixed	11.54 (7.01)	12.49 (7.32)
Indian	10.70 (5.54)	12.03 (7.17)
Pakistani	10.89 (5.77)	10.59 (6.31)
Bangladeshi	10.63 (5.97)	11.94 (7.74)
Black African	10.23 (4.64)	10.48 (5.97)
Black Caribbean	11.87 (6.58)	11.95 (6.80)
Other	12.10 (6.36)	11.84 (6.37)
Parents' Socioeconomic Status[c, d]		
Managerial and professional occupations	11.46 (5.76)	11.94 (6.43)
Intermediate occupations	11.54 (5.83)	11.82 (6.66)
Lower supervisory, routine occupations and not currently working	11.70 (6.22)	11.61 (6.84)

Notes:
1. Data from Analysis 1 complete case sample - N = 4,832 for LSYPE1 and N = 6,128 for LSYPE2.
2. Data are unweighted.

Appendix Table 4: Demographic characteristics of young people with and without exposure data (higher education status).

Variable – N (%)	**LSYPE1**		**LSYPE2**	
	Exposure data (n = 9,794)	**No exposure data (n = 6,328)**	**Exposure data (n = 6,922)**	**No exposure data (n = 6,178)**
Sex[a]				
Female	4,871 (49.7%)	0 (0%)	3,642 (52.6%)	2,691 (43.6%)
Male	4,923 (50.3%)	5 (100.0%)	3,280 (47.4%)	3,487 (56.4%)
Ethnicity[b]				
White	6,640 (68.0%)	1,333 (66.1%)	5,340 (77.3%)	4,532 (75.3%)
Mixed	472 (4.8%)	120 (5.9%)	292 (4.2%)	271 (4.5%)
Indian	688 (7.0%)	79 (3.9%)	183 (2.7%)	113 (1.9%)
Pakistani	559 (5.7%)	110 (5.5%)	250 (3.6%)	208 (3.5%)
Bangladeshi	438 (4.5%)	86 (4.3%)	182 (2.6%)	145 (2.4%)

Black African	366 (3.7%)	119 (5.9%)	287 (4.2%)	327 (5.4%)
Black Caribbean	359 (3.7%)	111 (5.5%)	195 (2.8%)	238 (4.0%)
Other	243 (2.5%)	60 (3.0%)	183 (2.7%)	188 (3.1%)
Parents' Socioeconomic Status[c, d]				
Managerial and professional occupations	4,153 (44.4%)	592 (32.8%)	3,210 (47.7%)	1,951 (32.3%)
Intermediate occupations	1,725 (18.4%)	322 (17.8%)	1,567 (22.8%)	1,405 (23.3%)
Lower supervisory, routine occupations and not currently working	3,475 (37.2%)	893 (49.4%)	2,091 (30.5%)	2,686 (44.5%)
Parents' Highest Qualification[d, e]				
Degree or equivalent	1,851 (19.3%)	220 (11.6%)	1,097 (15.9%)	627 (10.4%)
Higher education below degree level	1,553 (16.2%)	248 (13.0%)	790 (11.5%)	560 (9.3%)
GCE, A Level or equivalent	1,642 (17.2%)	284 (14.9%)	849 (12.3%)	641 (10.6%)

GCSE grades A-C or equivalent	2,261 (23.6%)	505 (26.6%)	2,875 (41.8%)	2,636 (43.5%)
Below GCSE or no qualification	2,263 (23.6%)	644 (33.9%)	1,276 (18.5%)	1,591 (26.3%)
Family Composition[d]				
Married/cohabiting	7,071 (73.0%)	1,099 (55.6%)	5,155 (74.7%)	3,815 (62.1%)
Lone parent or no parents in the household	2,609 (27.0%)	878 (44.4%)	1,747 (25.3%)	2,325 (37.9%)
Antisocial Behaviour (in past 12 months)[l, m]	1,724 (18.3%)	788 (28.5%)	512 (7.6%)	362 (12.9%)
Experienced Bullying (in past 12 months)[m]	2,436 (26.6%)	729 (27.5%)	1,950 (30.0%)	838 (31.0%)
Frequency of Alcohol Use[j, k]				
Never	2,271 (24.2%)	448 (24.8%)	2,309 (33.7%)	630 (31.6%)
Once every couple of months or less	1,657 (17.7%)	294 (16.2%)	2,749 (40.1%)	797 (40.0%)

1-3 times a month	2,712 (28.9%)	441 (24.4%)	1,529 (22.3%)	437 (21.9%)
Once a week or more	2,746 (29.3%)	627 (34.6%)	271 (4.0%)	128 (6.4%)
Cannabis Use (ever)	3,044 (32.1%)	793 (42.8%)	1,472 (21.4%)	582 (29.1%)
General Quality of Health				
Very good	4,937 (51.6%)	962 (51.3%)	2,758 (40.0%)	848 (42.2%)
Fairly good	3,971 (41.5%)	772 (41.2%)	3,513 (50.9%)	975 (48.5%)
Not very good or not good at all	668 (7.0%)	142 (7.6%)	627 (9.1%)	186 (9.3%)
Disability Status[j]	699 (7.2%)	135 (7.1%)	825 (12.0%)	238 (11.8%)
Carer Status[i]	841 (8.7%)	141 (7.4%)	360 (5.2%)	100 (4.9%)

a. Measured at wave 6 (age 18/19) in LSYPE1 and wave 1 (age 13/14) in LSYPE2.
b. Measured at wave 4 (age 16/17) in LSYPE1 and wave 1 (age 13/14) in LSYPE2 (missing data supplemented with wave 2 data).
c. Parents' socioeconomic status is based on the socioeconomic status of whichever parent (mother or father) has the highest employment category.
d. Measured at wave 4 (age 16/17) in LSYPE1 and wave 1 (age 13/14) in LSYPE2.
e. In LSYPE1, indicates the highest qualification held by the main or second parent. In LSYPE2, indicates the highest qualification held by the mother or father.
f. At LSYPE1, antisocial behaviour includes taking part in any of the following: vandalising public property; shoplifting; graffitiing on walls; fighting or public disturbance. At LSYPE2, the following: damaging anything in a public place on purpose that does not belong to them; shoplifting;

graffitiing anywhere; hitting or attacking someone on purpose with or without using an object or weapon.

g. Measured at wave 3 (age 15/16) in LSYPE1 and LSYPE2.
h. Categories differed slightly from stated at LSYPE2, as follows: Never; Once a month or less; 2-3 times a month; 2 or more times a week.
i. Measured at wave 4 (age 16/17) in LSYPE1 and LSYPE2.
j. In LSYPE1, indicates whether young person has been a carer at wave 4 (age 16/17) or wave 5 (age 17/18). In LSYPE2, indicates whether young person has been a carer at wave 4 (age 16/17) only.

Notes:

1. All available data used for each variable. Maximum N for LSYPE1 = 16,122, for LSYPE2 = 13,100.
2. Data are unweighted.

Appendix Table 5: Mean (SD) symptoms of common mental disorder for those who did and did not provide exposure data.

Wave – Mean (95% CI); SD	**LSYPE1**		**LSYPE2**	
	Exposure data (n = 9,794)	**No exposure data (n = 6,328)**	**Exposure data (n = 6,922)**	**No exposure data (n = 6,178)**
Wave 2 (age 14/15)	9.92 (9.79 to 10.05); 5.67	9.41 (9.18 to 9.63); 5.95	10.51 (10.34 to 10.69); 6.37	9.98 (9.73 to 10.22); 6.48
Wave 4 (age 16/17)	10.32 (10.20 to 10.44); 5.90	9.66 (9.36 to 9.95); 6.16	11.86 (11.71 to 12.01); 6.33	10.81 (10.53 to 11.09); 6.38
Wave 5 (age 17/18)			12.24 (12.09 to 12.39); 6.44	10.99 (10.62 to 11.36); 6.07
Wave 6 (age 18/19)			11.90 (11.74 to 12.06); 6.64	N/A[a]
Wave 8 (age 25)	11.70 (11.55 to 11.86); 6.06	11.70 (11.37 to 12.04); 6.65		

a. There were no participants who did not provide exposure data but did provide outcome data at wave 6 (age 18/19).

Notes:

1. All available data used for each variable. Maximum N for LSYPE1 = 16,122, for LSYPE2 = 13,100.
2. Data are unweighted.

Appendix Table 6: Mean difference in symptoms of common mental disorder between young people who did and did not attend higher education, in sample with complete exposure data (missing data on outcome and confounders imputed).

Model	Mean Difference (95% Confidence Interval), *p* value	
	LSYPE1	**LSYPE2**
Did not attend higher education	*Reference category (base)*	*Reference category (base)*
Model 1[a]	-0.254 (-0.593 to 0.085) p=0.142	0.46 (0.19 to 0.82) p=0.011
Model 2[b]	-0.312 (-0.652 to 0.027) p=0.071	0.29 (-0.05 to 0.63) p=0.096
Model 3[c]	-0.126 (-0.50 to 0.242) p=0.501	0.22 (-0.13 to 0.57) p=0.216
Model 4[d]	0.021 (-0.35 to 0.392) p=0.914	0.33 (-0.01 to 0.67) p=0.058
Model 5[e]	0.068 (-.031 to 0.443) p=0.722	0.39 (0.05 to 0.73) p=0.026
Model 6[f]	0.172 (-0.198 to 0.543) p=0.360	0.62 (0.29 to 0.95) p<0.001
Model 7[g]	-0.145 (-0.508 to 0.218) p=0.432	0.39 (0.09 to 0.70) p=0.011

a. Unadjusted model.
b. Adjusted for sex and ethnicity.
c. Model 2 plus parents' socioeconomic status, parents' highest qualification and family composition.
d. Model 3 plus antisocial behaviour and experienced bullying.
e. Model 4 plus alcohol use and cannabis use.
f. Model 5 plus carer status, general quality of health and disability status.
g. Model 6 plus GHQ-12 scores at previous wave - for LSYPE1, this is wave 5 (age 17/18), for LSYPE2, this is wave 4 (age 16/17).

Notes:
1. Data from Analysis 1: N = 9586 for LSYPE1 and N = 6916 for LSYPE2.
2. Analyses weighted to represent the target population using the population weight from wave 1.

Appendix Table 7: Mean difference in symptoms of common mental disorder between young people who did and did not attend higher education, in sample with complete data (missing data on exposure, outcome and confounders imputed).

Model	Mean Difference (95% Confidence Interval), *p* value	
	LSYPE1	**LSYPE2**
Did not attend higher education	*Reference category (base)*	*Reference category (base)*
Model 1[a]	-0.31 (-0.64 to 0.03) p=0.07	0.41 (0.06 to 0.75) p=0.020
Model 2[b]	-0.36 (-0.69 to -.02) p=0.04	0.24 (-0.10 to 0.58) p=0.171
Model 3[c]	-0.15 (-0.52 to 0.22) p=0.41	0.17 (-0.18 to 0.53) p=0.343
Model 4[d]	0.00 (-0.37 to 0.38) p=0.99	0.29 (-0.06 to 0.64) p=0.104
Model 5[e]	.056 (-0.33 to 0.44) p=0.77	0.35 (0.00 to 0.61) p=0.049
Model 6[f]	0.16 (-0.22 to 0.55) p=0.40	0.59 (0.25 to 0.93) p=0.001
Model 7[g]	-0.17 (-0.54 to 0.20) p=0.36	0.35 (0.05 to 0.65) p=0.024

a. Unadjusted model.
b. Adjusted for sex and ethnicity.
c. Model 2 plus parents' socioeconomic status, parents' highest qualification and family composition.
d. Model 3 plus antisocial behaviour and experienced bullying.
e. Model 4 plus alcohol use and cannabis use.
f. Model 5 plus carer status, general quality of health and disability status.
g. Model 6 plus GHQ-12 scores at previous wave - for LSYPE1, this is wave 5 (age 17/18), for LSYPE2, this is wave 4 (age 16/17).

Notes:
1. Data from Analysis 1: N = 15,770 for LSYPE1 and N = 13,100 for LSYPE2.
2. Analyses weighted to represent the target population using the population weight from wave 1.

Appendix Table 8: Weighted mean (SD) symptoms of common mental disorder for those who did and did not attend higher education.

Wave	Mean (95% confidence interval); standard deviation							
	LSYPE1				LSYPE2			
	Attended higher education	Did not attend higher education	Total	N	Attended higher education	Did not attend higher education	Total	N
Wave 2 (age 14/15)	10.35 (10.14 to 10.56); 7.22	9.80 (9.57 to 10.02); 7.66	10.08 (9.92 to 10.23); 7.65	7,078	10.35 (10.10 to 10.60); 7.47	10.73 (10.45 to 11.00); 8.30	10.52 (10.33 to 10.72); 8.13	5,045
Wave 4 (age 16/17)	10.87 (10.66 to 11.09); 7.38	9.76 (9.55 to 9.97); 7.16	10.27 (10.11 to 10.43); 7.66	8,493	12.04 (11.81 to 12.27); 6.76	11.63 (11.39 to 11.87); 7.14	11.83 (11.66 to 12.01); 7.32	6,732
Wave 5 (age 17/18)					12.46 (12.23 to 12.68); 6.59	11.94 (11.68 to 12.19); 7.69	12.19 (12.01 to 12.37); 7.50	6,753
Wave 6 (age 18/19)					11.93 (11.69 to 12.16); 6.99	11.50 (11.26 to 11.75); 7.30	11.70 (11.53 to 11.86); 6.96	6,743
Wave 8 (age 25)	11.66 (11.41 to 11.92); 8.71	12.00 (11.69 to 12.32); 10.99	11.86 (11.65 to 12.08); 10.45	5,611				

Notes:
1. Data from Analysis 2 eligible sample

2. Data are weighted using weight applicable to each outcome wave
3. Red cells indicate time points where data was not available for that dataset.

Appendix Table 9: p values from time variables in the multilevel model.

Variable	LSYPE1	LSYPE2
Time	<.001	<.001
Time interaction[a]	.002	.001
Quadratic time	<.001	<.001
Quadratic time interaction[a]	<.001	<.007

a. Interaction refers to an interaction between the time variable and the exposure (higher education).

Notes

1. Data are from Analysis 2 eligible sample.
2. All models are unadjusted.
3. All models weighted using weight from main outcome wave – wave 8 (age 25) for LSYPE1 and wave 6 (age 18/19) for LSYPE2.
4. All models run separately.

Appendix Table 10: Weighted descriptive statistics for variables classed as predictors, in young people who did and did not attend higher education.

Variable	LSYPE1			LSYPE2		
	Attended higher education	Did not attend higher education	Total	Attended higher education	Did not attend higher education	Total
Locus of control – M (SD)[a]	6.38 (1.75)	5.64 (1.83)	6.04 (1.95)	5.91 (1.60)	5.51 (1.77)	5.72 (1.73)
Equates hard work with success – M (SD)[a]	7.46 (1.57)	6.95 (1.48)	7.23 (1.62)	7.49 (1.31)	7.17 (1.27)	7.34 (1.36)
Social media use – M (SD)[b]	2.32 (3.04)	2.61 (3.63)	2.49 (3.54)			
Social media use – N (%)[c]						
Less often or never				247 (7.5%)	322 (9.1%)	569 (8.3%)
2-3 times a day				600 (18.1%)	504 (15.0%)	1,104 (16.5%)
Every 2-3 hours				434 (12.7%)	430 (12.6%)	864 (12.6%)

Once every hour				697 (21.8%)	647 (19.3%)	1,344 (20.5%)
Multiple times an hour				1,356 (40.0%)	1,504 (44.0%)	2,860 (42.1%)
Parents' Highest Qualification – N (%)[d,e]						
Below GCSE or no qualification	504 (9.5%)	660 (23.3%)	1,164 (16.4%)	492 (11.8%)	746 (19.2%)	1,238 (15.4%)
GCSE grades A-C or equivalent	551 (17.7%)	768 (32.5%)	1,319 (25.0%)	1,214 (35.3%)	1,596 (46.7%)	2,810 (40.9%)
GCE, A Level or equivalent	498 (17.3%)	473 (19.4%)	971 (18.3%)	450 (13.7%)	384 (11.4%)	834 (12.6%)
Higher education below degree level	604 (21.2%)	368 (15.1%)	972 (18.2%)	470 (14.9%)	312 (9.8%)	782 (12.4%)
Degree or equivalent	926 (34.4%)	259 (9.7%)	1,185 (22.1%)	709 (24.3%)	370 (12.9%)	1,079 (18.7%)
Frequency of Alcohol Use – N (%)[f,g]						
Never	779 (14.3%)	470 (13.3%)	1,249 (13.8%)	1,185 (31.4%)	1,038 (28.1%)	2,223 (29.7%)

Once every couple of months or less	539 (18.2%)	432 (17.7%)	971 (18.0%)	1,270 (39.9%)	1,429 (43.0%)	2,699 (41.5%)
1-3 times a month	971 (37.6%)	711 (31.8%)	1,682 (34.7%)	753 (25.0%)	741 (23.6%)	1,494 (24.3%)
Once a week or more	711 (29.9%)	826 (37.2%)	1,537 (33.5%)	106 (3.7%)	163 (5.3%)	269 (4.5%)

a. Measured at wave 2 (age 14/15) in LSYPE1 and LSYPE2.
b. Available in LSYPE1 only. Measured at wave 8 (age 25).
c. Available in LSYPE2 only. Measured at wave 5 (age 17/18).
d. Measured at wave 4 (age 16/17) in LSYPE1 and wave 1 (age 13/14) in LSYPE2.
e. In LSYPE1, indicates the highest qualification held by the main or second parent. In LSYPE2, indicates the highest qualification held by the mother or father.
f. Categories differed slightly from stated at LSYPE2, as follows: Never; Once a month or less; 2-3 times a month; 2 or more times a week.
g. Measured at wave 4 (age 16/17) in LSYPE1 and LSYPE2.

Notes:
1. Data from Analysis 3 eligible sample.
2. Data are weighted using weight from main outcome wave – wave 8 (age 25) for LSYPE1 and wave 6 (age 18/19) for LSYPE2.
3. Red cells indicate time points where data was not available for that dataset.

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