Mental Health and Education Decisions

Francesca Cornaglia
Elena Crivellaro
Sandra McNally

March 2012

I Z A

Mental Health and Education Decisions

Francesca Cornaglia
Queen Mary University of London,
CEP and IZA

Elena Crivellaro
University of Padova

Sandra McNally
CEP, London School of Economics
and IZA

ABSTRACT

Mental Health and Education Decisions[*]

Mental health problems – and depression in particular – have been rising internationally. The link between poor mental health and poor educational outcomes is particularly interesting in the case of the UK which has a low international ranking both on measures of child wellbeing and the probability of early drop-out from the labour market and education. We study this issue using a large longitudinal study of a recent cohort of teenagers in England. We use the General Health Questionnaire to derive measures of poor mental health. We find a large negative association between mental health problems and educational outcomes – where we consider examination results before leaving compulsory education and the probability of being "not in education, employment or training" at a young age. The association is large even after including a very rich set of controls. Results are stronger for girls and also vary according to the different components of the mental health measure. We also explore the potential role of intermediary mechanisms (truancy and risky behaviors).

Corresponding author:

Sandra McNally
Centre for Economic Performance
London School of Economics
Houghton Street
London WC2A 2AE
United Kingdom
E-mail: s.mcnally1@lse.ac.uk

Executive summary

Although poor mental health has often been correlated with poor educational attainment and/or dropping out of education, there have been few longitudinal studies on this subject. In this paper, we investigate this issue using a recent longitudinal study of young people in England. England is a very interesting country to undertake such an investigation because both poor mental health and a high drop-out rate of young people are known to be important by international standards.

The Longitudinal Study of Young People in England allows us to measure mental health at age 14/15 and again at age 16/17. This is measured using the General Health Questionnaire (GHQ12), which is a screening instrument used to detect the presence of symptoms of mental illness and depression in particular. We associate poor mental health with examination performance (in GCSE exams) at age 16 and with the probability of being observed as being "not in education, employment or training" at age 17/18.

Detailed specifications suggest that "poor mental health" (i.e. being above a threshold considered as "at risk" according to the GHQ) is associated with lower examination performance of between 0.083 and 0.158 standard deviations for boys and girls respectively. Although these associations might conceivably be reflecting the influence of unmeasured variables, it is notable that they are very strong

even controlling for a very rich set of controls.

We use a well-known method (proposed by Graetz (1991)) to decompose this measure of "poor mental health" into its component parts. These are "anxiety and depression" – related to excessive worrying and difficulty controlling this worrying; "anhedonia and social dysfunction" – related to reduced interest or pleasure in usual activities; and "loss of confidence or self-esteem". We find that "loss of confidence or self-esteem" drives the association between poor mental health and exam results for boys. For girls this factor is also important but the association is stronger for "anhedonia and social dysfunction". The factor which captures worrying does not seem to be relevant when other controls are included.

"Poor mental health" is positively associated with the probability of being "not in education, employment or training" (NEET). It increases the probability of NEET by 2.7 and 3.3 percentage points for girls and boys respectively after detailed controls are added. This association is high in the context of overall NEET rates of 10.6% and 7.6% for boys and girls in this sample. The association is little influenced by controlling for exam performance at age 16. This is surprising given that one might expect the influence of poor mental health on NEET to operate through exam performance.

We investigate whether these associations are influenced by controlling for past behaviour. For example, mechanisms through which poor mental health might influence exam performance and the prob-

3

ability of being NEET include substance abuse and playing truant from school. We show that these mechanisms have a potential role to play in understanding the relationship between poor mental health and exam performance. However, they have no role to play in understanding the relationship between poor mental health and the probability of being NEET at a young age (except via exam performance at GCSE).

This paper helps documenting the importance of the association between poor mental health, educational attainment and subsequent dropping-out behaviour. It suggests (but does not prove) that there could be a causal mechanism. Thus programmes aimed at improving the mental health of adolescents may be very important for improving educational attainment and reducing the number of young people who are "NEET".

1 Introduction

Poor mental health in childhood is strongly linked to poor mental health later in life and has been shown to have a serious impact on life chances (Richard and Abbott, 2009). Mental health problems may impact on human capital accumulation by reducing both the amount of schooling and the productivity level, which may in turn have lifelong consequences for employment, income and other outcomes (Eisenberg, Golberstein, and Hunt, 2009). Although the link between education and poor mental health has long been established, it has not often been examined in large-scale longitudinal studies. In this paper, we look at this issue in the context of a very recent and large scale study of adolescents in England. England is a particularly interesting country for analysing this issue because of a notably bad performance both on measures of child wellbeing and early drop-out from full-time education. For example, the UK made headlines in the last couple of years for ranking 24th out of 29 European countries on a league table of child wellbeing (Bradshaw and Richardson, 2009). The "long tail" in the educational distribution has long been known to be a feature of the UK labour force and remains the case for younger cohorts. A relatively high proportion of young people end up classified as "not in education, employment or training" (NEET). The 2007 figures from the OECD suggests that the UK ranks 21st out of 25 OECD countries in this respect

(OECD, 2010). Specifically, 11 per cent of 11-18 year olds are not in education, employment or training. This is similar to Italy and Spain but very different from countries such as Germany, France and the US where the relevant statistics are 4.2%, 5.8% and 6.3% respectively.

To what extent is poor mental health and low educational attainment/ drop-out linked? Clearly the association can operate in both directions. From a policy perspective, one would like to know the causal influence of poor mental health on these outcomes. This is notoriously difficult to establish and most research addresses the association rather than the causal impact. The latter can only be established by experiments (which can be difficult to generalise from) or from techniques that allow one to use "exogenous variation" in mental health to predict its causal impact on later outcomes. Recent work by Ding and Lehrer (2007) makes some progress in this direction by using genetic markers. However, such data are hard to come by and not uncontroversial since genes may impact on behaviour through more than one channel. In general, it is difficult to argue that indicators of mental health are exogenous because they are likely to be influenced by life events that are not fully measured in surveys. Nonetheless, it is still useful to know about the association between poor mental health and educational outcomes as this gives some information about the likely importance of mental health compared to other contributing factors (e.g. school or

family characteristics). It is of interest to see whether such indicators continue to have an influence after controlling for many other factors that might explain educational outcomes. Moreover, it is interesting to see to what extent a simple screening device (like the 12 item General Health Questionnaire, used in this paper) is useful for predicting negative outcomes even after controlling for many observable characteristics. Such indicators might be useful for practitioners at school as well as for researchers, particularly since a large amount of mental health problems are thought to go unrecognised and untreated (Richard and Abbott, 2009). Also, early-onset mental disorders tend to co-occur in a complex and poorly understood patterns of comorbidity (Kandel et al. 1999).

The General Health Questionnaire (GHQ) is a screening instrument designed for use in general populations to detect the presence of symptoms of mental ill-health and depression in particular (Goldberg, 1972.). It has been extensively used in the psychological literature and is regarded as one of most reliable indicators of psychological distress or disutility (Argyle, 1989). The 12 item version of the GHQ (GHQ-12) is based on the questions that provided the best discrimination among the original criterion groups. Although most studies use the overall GHQ score as an indicator of mental health, it can be useful to separate the indicator into different factors as they may not all work in the same direction. For example, at lower levels anxiety can actually be productive (Sadock and Sadock,

2000). Graetz (1991) found years of education to be positively correlated with anxiety but negatively correlated with loss of confidence.

One of the contributions of this study is to look not only at the impact of an overall measure of mental health, but also to look at how the different components of the GHQ measure relate to educational attainment and the probability of moving into inactivity at an early age. We find strong patterns of association with respect to the overall measure, particularly for girls. However, we also find that different components are not equally important and that the effects of 'anxiety' and the other factors are indeed associated with outcomes in opposite directions. Secondly, we contribute by saying something about potential mechanisms through which poor mental health may impact on outcomes. For example, poor mental health may impact on later outcomes by intermediary choices such as insufficient investment in effort (e.g. playing truant) and self-medication (e.g. substance abuse). We attempt to say something about the likely importance of these factors. Finally, we perform our analysis using a very recent cohort of young people where there is longitudinal data - and in a country where both poor mental health and early drop-out are known to be very big problems by international standards. It is rare to have data for such a recent cohort (aged 14/15 in 2004) and this might be important because adolescent emotional problems and conduct disorder are known to have become more prevalent in recent decades (Collishaw et al. 2004).

2 A brief literature review

The relationship between mental health and education has been explored in both the psychological literature and the economic literature.

There are many small-scale studies in the psychological literature looking at the relationship between indicators of mental health and educational outcomes. The first study to examine the educational consequences of mental disorders in a national sample for the US was by Berslau et al. (2008). They find strong associations between child-adolescent mood, anxiety, substance use and conduct disorders with termination of schooling prior to each of three educational milestones (high school graduation, college entry among school graduates and completion of four years of college among college entrants). A more recent study also finding large effects (though among a broader set of disorders) is by Berslau et al. (2008). They find that the proportion of school terminations attributable to mental disorders was largest for high school graduation (10.2%) but also meaningful for primary school graduation, college entry, and college graduation. A disadvantage of these studies is that they are cross-sectional and rely on retrospective questions of 'early onset' mental health indicators.

Within the psychological literature, longitudinal studies are rare. An example is the study by Fergusson and Woodward (2002). They

find that the relationship between adolescent depression and subsequent educational underachievement could be fully explained by a range of social, familial and personal factors. Johnson, Cohen, and Dohrenwend (1999) come to a similar conclusion with regard to the association between depression/anxiety disorders and subsequent staying on decisions.

The economic literature has only fairly recently begun to consider the relationship between mental health and educational outcomes. A strength of the contribution made by economists is that typically studies are longitudinal and have big sample sizes.

Currie and Stabile (2006) and Fletcher and Wolfe (2008) both focus on the relationship between ADHD[1] and subsequent educational attainment and find evidence of a strong negative association. This is important because ADHD is one of the most common chronic mental health problems among young children together with conduct disorder and anxiety. However, there are other mental health problems that become more prevalent in early adolescence such as depression. An interesting observation is that the sex difference in mental health problems is reversed in childhood and in early adolescence. For example, depression (and other types of mental health problems) are more prevalent in males in childhood whereas the opposite is true among adolescents and adults (Peterson et al. 1993)[2]

---

[1]Attention deficit hyperactivity disorder.
[2]This finding has been commonly reported in the psychological literature for some time (e.g. Eme 1979; Gove and Herb 1974; Locksley and Douvan 1979).

and research on this issue suggests that this is not related to factors such as response bias on questionnaires or greater openness to acknowledging psychological difficulties. Furthermore depressive symptoms increase (for boys and girls) through early adolescence and the finding that girls suffer more than boys has been consistently documented in many countries (Seiffge-Krenke and Stemmler, 2003). This is true for both clinical levels of depression and subclinical levels such as depressive symptoms and depressive mood (Cicchetti and Toth, 1998). Theories about why this might be the case relate to the timing of puberty, different coping resources, and reaction to stressful life events .

Using longitudinal data, Fletcher (2008) finds a robust negative relationship between depression in high school and subsequent educational attainment, even after controlling for a range of factors. In later work, he finds that the relationship is not very sensitive to the inclusion of sibling fixed effects (Fletcher, 2010). These studies pertain to a recent cohort (students in grades 7-12 in 1994-1995) and are for the US. The timeframe of the research could be important for what he finds because the prevalence of mental health problems has increased over time. In fact, there has been a rise internationally in the prevalence of depression (Cross-National Collaborative Group, 1992). Furthermore, work based on the British birth cohorts and the British Child and Adolescent Mental Health Survey suggests a rise in adolescent emotional problems and conduct disorder from

the mid-1970s up to recent times (Callishaw et al. 2004). Fortunately, we are able to look at the relationship between poor mental health and educational outcomes for a very recent cohort of English students (aged 14/15 in 2004).

Other recent longitudinal studies that consider the relationship between adolescent mental health problems and educational attainment have much to say about depression in particular (Ding and Lehrer 2007; Eisenberg, Golberstein, and Hunt 2009; Fletcher 2008) and all suggest that this has a strong negative impact on educational attainment. Ding and Lehrer (2007) and Fletcher (2008) look at this separately by gender and find that effects are only important for girls. The paper by Fletcher (2008) is closest to our paper in terms of the age group of students, outcomes and methodology (although he has a different measure of mental health, and the paper relates to a different time and country). He comments that it is not possible to provide evidence on the mechanism behind the association between depression and dropping out of high school because many of the choices that adolescents make before dropping out of school (e.g. skipping school) are not adequately captured in the data set. We are fortunate to be able to say something about these potential mechanisms because relevant questions are asked in the survey that we use.

3 Data

We use data from the Longitudinal Survey of Young People in England (LSYPE). This is a longitudinal data set which surveyed children aged between 13 and 14, beginning in 2004, for a total of around 14,000 young people. Parents are also surveyed and that data has been linked with administrative data on pupil test scores (including prior performance) and school-level information. Pupils (and parents) are surveyed each year up to age 18/19 (so far). The data set contains a very rich set of information about each young person. For example, it provides information on educational attainment, school information, family background as well as attitudes and behaviour. Young people respond to the 12-item General Health Questionnaire (GHQ) on two occasions - when the they are aged 14/15 (i.e. Wave 2) and again when they are aged 16/17 (i.e. Wave 4). We restrict our sample to people who answer all the GHQ questions in both waves. About 75% of young people answered all the GHQ questions in each Wave. 60% of young people answered all the questions in both waves and this reduces the sample to 8,122.[3]

The GHQ measure will be further described in the next section (a detailed description is provided in Appendix A1 and A2). We only retain observations for which we have valid test scores. The sample size is then 7,832. Descriptive statistics for the variables used in our

---

[3] We have replicated our analysis when including people who answered 11 out of the 12 questions. Our results are not sensitive to this increase of our sample.

analysis are shown in Appendix A1 (Table A1.1 and A1.2). The sample used is similar to the full sample in many respects (such as the proportion 'not in educaion, employment or training' at age 17/18; parental qualifications and work status; family structure). For the most part, differences between the samples are quite small - although the sample used is a little better performing than the full sample in terms of exam results and in terms of socio-economic status (income and parental education). The samples are compared in Table A1.2.

Our outcome variables are the (standardized) test score at age 16 and whether the person is classified as 'not in education, employment or training' (i.e. NEET) in Wave 5 (i.e. at age 17/18). The age 16 test score comes from the GCSE exam (General Certificate of Secondary Education) which all students in the UK undertake before leaving the compulsory phase of education at age 16. The National Curriculum is organized into different Key Stages. The GCSE exam marks the end of Key Stage 4. In many of our specifications, we control for test scores taken in national tests at the end of primary school (the end of Key Stage 2). The examination scores are all taken from administrative data that have been merged to survey data. Figure 1 summarizes the main variables used in the analysis.

Figure 1: LSYPE Dataset. Measures of Mental Health and Educational Attainment

| Wave 1
2004 | Wave 2
2005 | Wave 3
2006 | Wave 4
2007 | Wave 5
2008 |

Controls

| -Individual characteristics
-Family characteristics

Average age: 13 | -GHQ → Mental health variables

Average age: 14 | Potential mechanisms→
-Substance abuse
-Truancy
Average age: 15 | -GHQ → Mental health variables

Average age: 16 | |

Outcomes

Administrative data:
KS4-GCSE
Point scores

Neet status at age 17
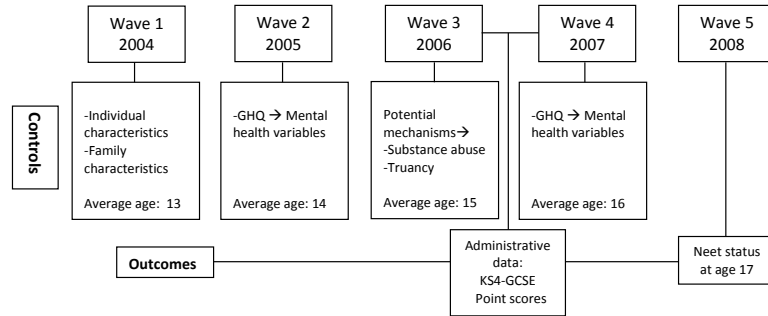
3.1 The GHQ

The 12-item General Health Questionnaire (GHQ-12) is a self-reported measure of psychological morbidity intended to detect "psychiatric disorders among respondents in community settings and non-psychiatric clinical settings" (Goldberg and Williams, 1988). It is a measure of state which focuses mainly on the inability to carry out normal functions and the emergence of distressing symptoms. The GHQ-12 is a shorter version of a longer health questionnaire (originally 60-items) assessed by the World Health Organization and is used in studies about psychological disorders in primary health care. Due to its brevity and its capacity to retain many desirable psychometric properties, the GHQ-12 is widely used in clinical practice, epidemiological research and psychological research (Goldberg et al. 1997; Graetz 1991; Thomas, Benzeval, and Stansfeld 2005;

Sweeting et al. 2009). It is also a very commonly used measure of individual well-being by economists in the UK literature (e.g. Clark and Oswald 1994; McCulloch 2001; Wigging et al. 2004; Gardner and Oswald 2007).[4]

The questionnaire consists of 12 statements about aspects of well-being relating to worry, tension or sleeplessness. The respondent is asked to report his/her status over the past four weeks compared to what he/she considers "usual". There are six items that are positive descriptions of mood states (e.g "felt able to overcome difficulties"), and six that are negative descriptions of mood states (e.g. "felt like a worthless person"). The respondent states whether he/she is experiencing the symptom "much less than usual", "less than usual", "the same as usual" or "more than usual" (see Appendices 2 and 3).

The most common scoring methods are as follows:

1. a Likert score, which assigns each response a value from zero to three, with zero indicating the highest level of well-being and three indicating the lowest. The answers are then summed to form the overall GHQ measure of psychiatric illness or mental well-being (total range 0-36) .

---

[4] Many of these studies use data from the British Household Panel Survey (BHPS) since it is one of the most detailed panel surveys which contains GHQ data. McCulloch (2001) uses the GHQ12 as an outcome of individual adversity associated with a census-based indicator of deprivation. Clark, Georgelli, and Sanfey (2001) use the GHQ to show that the unemployed have lower levels of mental well-being compared to working people. Similarly, Thomas, Benzeval, and Stansfeld (2005) use the GHQ as an outcome variable to measure the impact of different kinds of employment transitions (into various forms of non-employment) on psychological wellbeing. The GHQ has also been used widely in the literature on job satisfaction (Gardner and Oswald 2007, Callan et al. 2001).

2. a binary score system which assigns binary values to the responses from each question (where 1 indicates a low level of psychological well-being). The total score (over all items) varies between 0 and 12.

In both cases, the scoring is done such that high numbers indicate decreased levels of psychological well-being. Psychologists refer to being over a given threshold (beyond which the respondent is deemed to have mental health problems) as "caseness". When the binary score system is used, thresholds commonly applied in the literature are two, three and four positive items. We apply the most stringent threshold to indicate mental health problems or "risky cases" (i.e. 0-3: no ill-health; 4-12: high probability of common mental disorders).

Many studies have analysed the dimensionality of the GHQ, assessing psychological morbidity in two or three dimensions rather than as a unidimensional index. The most common factorization is the one by Graetz (1991). He has proposed a three-dimensional model of the GHQ where questions can be used to create three distinct factors: Factor 1: "Anxiety and depression"- related to excessive worrying and difficulty controlling this worrying, Factor 2: "Anhedonia and social dysfunction"- related to reduced interest or pleasure in usual activities, and Factor 3: "Loss of confidence or self-esteem". This is a useful distinction since different aspects of

17

GHQ-12 may be associated with behaviour in different ways (potentially in opposite directions). In our analysis we consider both the overall measure of mental health (both over a certain threshold and measured continuously), and these different components.

In the survey, the GHQ questions are asked directly to the young person in Waves 2 and 4.In Table 1 we show summary statistics for key variables in our analysis.

Table 1: Main variables

Variable	Description	Boys	Girls	Boys at risk	Girls at risk
Panel A: Mental Health variables*					
GHQ at risk	GHQ 12 score >= 4.	0.110	0.248	1	1
	Risky threshold for GHQ12 "caseness".	(0.31)	(0.43)	(0)	(0)
GHQ Likert (0-1)	GHQ expressed in a continuous range [0-1].	0.236	0.312	0.500	0.543
	The 12-GHQ questions are measured with the Likert scoring method (1-2-3-4) and then divided by 36.	(0.13)	(0.17)	(0.13)	(0.14)
Anxiety and Depression **	Continuous values ranging from 0-1.	0.235	0.338	0.615	0.670
	Includes four 'negative' items related to anxiety and depression.	(0.21)	(0.25)	(0.18)	(0.17)
Loss of confidence**	Continuous values ranging from 0-1	0.139	0.240	0.501	0.572
	Includes two 'negative' items related to self confidence.	(0.21)	(0.28)	(0.29)	(0.29)
Anhedonia and Social dysfunction. **	Continuous values ranging from 0-1.	0.269	0.318	0.423	0.449
	Include six "positive" items testing the ability to perform daily activities and to cope with everyday problems.	(0.12)	(0.13)	(0.16)	(0.16)
Panel B: Output variables					
Standardized point scores	GCSE Standardized point scores	-0.107	0.115	-0.097	0.060
	Key Stage 4. (i.e. 16/17 years.)	(1.02)	(0.96)	(1.09)	(1.01)
Neet in W5	Not in education, employment or training at age 17/18.	0.106	0.076	0.124	0.098

*= Mental health variables collected in wave 2 (i.e. when young person is 14/15 years old). These variables are available also in W4, see appendix for detailed descriptive statistics.

**= See appendix for the construction of these indexes.

Panel A shows that a fairly high percentage of boys and girls are classified as "at risk" by the binary measure (at Wave 2) - 11 per cent of boys and almost 25 per cent of girls. Girls have a higher probability of mental health problems in each of the three dimensions

of the GHQ (anxiety and depression, loss of confidence, anhedonia and social disfunction). If we look at the outcome variables (panel B), we see that both boys and girls "at risk" have lower outcomes with regard to the test score at age 16 and the probability of being "not in education, employment or training" than people not at risk. However, on average girls fare better than boys (even within the subpopulation of people "at risk").

In Table 2 we show the proportion of boys and girls who scored positively (i.e. indicating worry/stress) with respect to each component of the GHQ at age 14/15 (Wave 2; columns 1 and 4), and at age 16/17 (Wave 4; columns 2 and 5). Panel A reports the proportion of adolescents who could be defined as "at risk" according to the stringent threshold (i.e. where worry/anxiety is indicated in the response to at least 4 out of 12 questions). We also report results for a lower threshold - at least 2 out of 12 questions . For comparison, we show the same data for 15 year olds from a recent survey of Scottish children (Sweeting, Young, and West, 2009). The comparable data are shown in columns 3 and 6. It is interesting to observe how similar the English and the Scottish studies are in terms of the overall incidence of poor mental health as well as for each separate indicator.[5]

Other insights from this Table are that girls report a higher level

_____

[5] Our GHQ scores are in line also with a study in the Netherlands about young people aged 18-24 (Hoeymans, Garssen, Westert, and Verhaak, 2004). They find a 'GHQ caseness' of 25% for young people aged 18-24, as well as higher rates for females.

of stress or worry than boys according to all indicators. Also, the incidence of poor mental health increases with age.

Table 2: Comparing GHQ in the LSYPE with Scottish data.

VARIABLES	(1) Boys Wave 2 Age 14/15	(2) Boys Wave 4 Age 16/17	(3) Boys in Scotland 2006 Age 15	(4) Girls Wave 2 Age 14/15	(5) Girls Wave 4 Age 16/17	(6) Girls in Scotland 2006 Age 15
Panel A: GHQ at risk						
GHQ at Risk: standard (>=2)	15.5	22.8	21.5	32.2	38.7	44.1
GHQ at Risk: stringent (>=4)	11	16.1	10.2	24.7	29.8	26.7
Panel B: Factor 1- Anxiety and Depression						
Felt constantly under strain	19.6	29.1	21.9	33.2	41.4	36.5
Being feeling unhappy or depressed	14.7	18.9	18.5	29.6	32.5	37.2
Lost much sleep over worry	11.9	17.7	16.4	24.2	31.8	29.5
Felt you could not overcome your difficulties	13.4	16.3	14.9	23.6	26.3	26.2
Panel C: Factor 2- Loss of confidence						
Been losing confidence in yourself	10.9	12.4	12.8	22.2	24.2	26.4
Been thinking of yourself as a worthless person	6.1	7.2	6.8	14.7	14.9	16.1
Panel D: Factor 3- Anhedonia and Social Dysfunction						
Been feeling reasonably happy, all things considered (disagree)	6.5	9.1	9.7	13.6	17.1	21.7
Felt you were playing a useful part in things (disagree)	5.8	8.9	8.1	9.6	11.8	15.1
Felt capable of making decisions about things (disagree)	3.2	4.1	5.2	6.3	9.6	13.3
Been able to face up to your problems (disagree)	4.7	5.9	6.9	10.8	13.3	16.6
Been able to enjoy your day-to-day activities (disagree)	7.5	12.8	11.1	12.6	18.6	15.2
Been able to concentrate on whatever you are doing (disagree)	9.7	11.7	15.4	17.6	19.4	32.0
Observations	4067	4067	1505	3765	3765	1539

3.2 Predicting poor mental health

Although not the main focus of our work, it is of interest to investigate how poor mental health, as measured by the GHQ, relates to pupil characteristics. A table showing summary statistics for variables used in our analysis for the whole sample and according to whether young people are "at risk" is shown in Appendix Table A1.1. We estimate a Probit model where the dependent variable is the threshold beyond which someone might be thought of as "at risk". The results are reported in Appendix Table A1.3.

We have run separate regressions for boys and girls. The first specification includes only basic controls (family income, ethnicity, parental education). In a second specification, we include a broad range of controls - many personal and family characteristics as well as school level characteristics.

Results are qualitatively similar when using the continuous mental health measure. One of the most striking facts is how poorly the variables collectively explain poor mental health (no matter how we measure it). This suggests either that the GHQ does not have much informational content or that it simply does not correlate well with the usual indicators found in surveys, even though the information set is fairly rich. The main part of our analysis (and much of the literature) rejects the first explanation - it seems that the GHQ-12 does indeed have informational content. However, poor mental health is

not well predicated by the usual indicators available to researchers and to schools (e.g. knowledge of test scores, family circumstances, socio-economic status and school characteristics).

Relatively few variables are significantly different from zero, and this is more often the case for girls. For girls, among the variables that significantly effect the probability of having "poor mental health" (i.e. above the critical threshold) are family income (negative), whether the young person has a disability (positive), whether English is the main language of the household (positive), whether the parent is in good health (negative), the age 11 test score in English (positive), whether the young person goes to an independent school (negative). For boys, significant variables include whether the mother works full-time (negative), age 11 test score in Science (negative), age 11 test score in English (positive), and some school-level variables.

Although the data set used here is very rich, it is nonetheless true that variables highlighted in the psychological literature are probably not well captured by the included variables. For instance, many psychological studies emphasise 'deficient active coping capacity' as a relevant variable (Andrews et al. 1978, Seiffge-Krenke 1995 and 2000). Various other studies point to a strong association between negative self-related cognitions and attribution styles including low self-esteem, low self-consciousness and helplessness in depressive adolescents (Harter and Jackson, 1993).

Moreover, parental rejection, lack of parental warmth and support, and disturbed parent-child relationships have also been frequently identified as strongs correlates of adolescent depression.[6] Vernberg (1990) highlights the importance of low peer contact and peer rejection. Steinhausen and Metzke (2000) correlate depression with "a strongly controlling, highly competitive, less participation-oriented and low accepting school environment" (Zurich Adolescence Psychiatry and Psychopathology Study). Unfortunately these concepts are difficult to measure in survey data.

4 Conceptual framework

In order to investigate the relationship between mental health and educational attainment, we use a simple model of human capital accumulation. We follow the model proposed by Rosen (1977).[7]

The relationship between earnings, y, and years of schooling, s, is assumed to be deterministic, and individuals, who differ in ability, A, maximize the present value of lifetime earnings and compare benefits with costs in deciding how much schooling to acquire.

$$y = f(s; A)$$

The discounted value of schooling net of foregone earnings, depends on the price of the skills acquired at school, the interest (dis-

---

[6]Barrera and Garrison-Jones (1992); Stark (1900); Steinhausen and Metzke (2000).
[7] This relies on Becker's fundamental contribution (Becker, 1962).

count) rate, and the ability of the individual. The benefit of schooling is increasing in both ability and price of skills acquired and decreasing in the interest rate. A worker characterised by a certain level of ability will decide to continue studying if the benefit exceeds the cost.

Fletcher (2008) was the first to include mental health in this framework.[8] He interprets ability as a function of mental health (d), and identifies two ways in which mental illness can influence education. First, assuming that mental illness decreases concentration during schooling (i.e. $A'(d) < 0$), mental illness lowers the returns to education because it affects the "individual's capacity or ability to learn".[9] Furthermore, Fletcher argues that mental illness can negatively affect the entire length of life or the duration of employment and therefore reduce the expected labour market benefits of education. This could lead individuals to invest less in schooling.

Within this framework we investigate the relationship between mental health and education decisions using a reduced-form approach. We assume schooling to be a function of individual, family and school-level characteristics.

$$S^* = s(C, F, Sc) \tag{1}$$

where S^* is both the optimal schooling level and schooling per-

---

[8] Also Eisenberg, Golberstein, and Hunt (2009) use the same conceptual framework.

[9] For a summary of the empirical evidence on the link between schooling and mental health, see Roeser, Eccles, and Strobel (1998).

formance; C represents individual characteristics (including mental health status and ability); F family characteristics; and Sc school level characteristics. We are mainly interested in C, particularly mental health status. Our analysis is conducted separately for boys and girls.

Our main objective is to investigate the importance of mental health on schooling, where for schooling we mean both examination performance (test scores in the national exam before the end of compulsory education - GCSE) and schooling decisions (dropping out or NEET, "Not in Education, Employment or Training"). Thus, our outcome variables are the GCSE standardized test score and whether an individual is NEET at age 17/18.

We separately consider three different measures of mental health: "GHQ caseness" (i.e. an indicator variable denoting whether the individual is "at risk" of poor mental health according to the highest threshold used by pscyhologists with regard to the GHQ); a continuous measure ranging from 0 to 1, GHQ Likert; and the three components of the continuous measure (i.e. the Graetz factors).

Our basic OLS specification includes the mental health variable(s) and socio-economic and demographic controls (income, ethnicity and parental education). We later include a wider range of other potentially confounding variables (personal and family characteristics, and school level controls).

Let $MH_{i,t}$ be the mental health status of an individual i measured in wave 2; $edu_{i,s,t+n}$ represents our outcome variables: the GCSE point scores ($st.ptsc_{i,s,t+2}$) and NEET status ($neet_{i,s,t+3}$) of individual i in school s at time t.

We consider the following main (OLS) specification:

$$edu_{i,s,t+n} = \alpha_1 + \alpha_2 MH_{it} + \alpha_3 X_i + \alpha_4 Z_{i,s} + \varepsilon_i \qquad (2)$$

where X_i is a vector of personal and family characteristics, Z_{is} a vector of school characteristics, and ε_i the error component.

We then attempt to control for unobserved heterogeneity by including school fixed effects. Our preferred specification is:

$$edu_{i,s,t+n} = \alpha_1 + \alpha_2 MH_{i,t} + \alpha_3 X_i + u_s + \varepsilon_i \qquad (3)$$

where u_s is the secondary school fixed effect. When we consider "NEET" as an outcome variable we include a measure of mental health in wave 4 in some specifications (i.e. GHQ) in addition to the measure taken at wave 2. In some specifications we include the examination score at age 16 as a control variable (i.e. the GCSE standardized point score).

The most detailed specification for "NEET" as an outcome variable is thus:

$$neet_{i,s,t+3} = \beta_1 + \beta_2 MH_{i,t} + \beta_3 MH_{i,t+2} + \beta_4 X_i + \beta_5 st.ptsc_{i,s,t+2} + u_s + \varepsilon_i$$

$$(4)$$

In the last part of the paper we consider schooling as a function of both mental health and risky behaviors. We hypothesize that the individual may respond to poor mental health by engaging in "risky behaviours". We are interested to investigate the extent to which the effect of mental health on outcomes might be "explained" through a behavioural response. We measure "risky behavior" (RB) as consumption of cigarettes, alcohol and cannabis; and whether the individual says that he/she skips classes (i.e. truancy).

We estimate the following model:

$$st.ptscu_{i,s,t+2} = \gamma_1 + \gamma_2 MH_{i,t} + \gamma_3 X_i + \gamma_4 RB_{i,t+1} + u_s + \varepsilon_i \quad (5)$$

for standardized test scores as an outcome and

$$neet_{i,s,t+3} = \beta_1 + \beta_2 MH_{i,t} + \beta_3 MH_{i,t+2} + \beta_4 X_i + \beta_5 RB_{i,t+1} + \beta_6 st.ptsc_{i,s,t+2} + u_s + \varepsilon_i$$

$$(6)$$

for the "NEET" outcome.

In these models, mental health has a potential indirect effect on outcomes via risky behavior (substance abuse and truancy). There

27

might also be a direct effect of "risky behavior" on outcomes. The timing is the following: mental health status, $MH_{i,t}$, is measured in wave 2, risky behaviors (RB) are collected in wave 3, and outcome variables (exam score and NEET status) are collected in waves 4 and 5 respectively.

One potential problem is that the indicators of risky behavior and mental health are likely to be serially correlated with (their own) past measures. Thus, past "risky behavior" might potentially cause the onset of mental health problems (rather than the other way round). Although this generates an additional problem of interpretation with regard to equations (5) and (6), we still think this is an interesting exercise that will at least give some suggestive results on the interrelationship between mental health, "risky behavior" and outcome variables.

A more general problem is omitted variable bias. Mental health and outcome variables may both be influenced by a third unobserved variable. This problem is particularly intractable with regard to the issue at hand because it is difficult to think of variables that influence mental health while having no direct influence on educational outcomes. As referred to earlier, recent work on genetic markers (Ding and Lehrer, 2007) has made some progress in this direction. In our analysis, we have no such instrument. However, we have an extremely rich longitudinal data set which allows us to deal with this problem (at least partially) by controlling for a very large number

of individual, family and school characteristics.

5   Results

The outcome variables considered are as follows: the "standard-ized points score" measured in a national examination at age 16 (GCSE) - from administrative data linked to the Wave 4 survey, and whether the individual is classified as "not in education, employment or training" (NEET) measured in Wave 5 (age 17/18). Mental health variables are recorded in Waves 2 and 4. In all regressions we cluster standard errors at the school-level.

In this section we present OLS results with a set of "basic controls" (ethnicity, parental income and education), with "additional controls" (very detailed controls for individuals, families and schools), and then we show the results including school fixed effects. Summary statistics for the full set of controls are reported in Appendix A1, Table A1.1 .

5.1   Mental health and examination performance at age 16

Table 3 presents the results when we consider the standardized point score as outcome variable. The table is structured in two panels: the first refers to boys and the second to girls. Column 1 shows the results when only basic controls are included. Then we progressively introduce more controls in columns 2 and 3. In column 3 we

also control for secondary school fixed effects. Coefficients are shown for the variable of interest - whether the individual is deemed to be at risk of mental illness because he/she scores positive on at least 4 of the 12 items of the General Health Questionnaire (GHQ) in Wave 2 (i.e when he/she was 14/15). In the simplest specification (with only basic controls), a negative relationship between the mental health indicator and exam performance at age 16 is shown only for girls. Poor mental health is associated with a reduction in exam scores of 0.086 standard deviations for girls. The inclusion of additional controls strengthens the relationship for both boys and girls (with the inclusion of school fixed effects being particularly important for boys). The most detailed specification (column 3) suggests that poor mental health is associated with lower exam performance of 0.083 and 0.158 standard deviations for boys and girls respectively. These are large coefficients and indicate that poor mental health may be a serious problem (for educational outcomes) if these associations reflect causality. Furthermore, these results suggest that the GHQ measure has strong predictive power even after controlling for a rich set of variables. [10]

In Table 4 we replicate the regressions presented in Table 3 using a continuous measure of mental health (i.e. the GHQ Likert). Results show a similar pattern as in Table 3, except that in the regression with only basic controls (column 1), the association be-

---

[10]See Appendix Table A1.4 for the full set of controls.

tween the mental health indicator and exam performance is positive for boys. We explore this counter-intuitive result by breaking down the mental health indicator into its components (below). However with regard to the overall measure, the positive coefficient turns negative as soon as additional controls are included (column 2).

In Table 5 we break down the continous measure of mental health to its constituent parts (as described in Section 3.1). Panels A and B show results for boys and for girls respectively. Column 1 shows that a positive association with the first factor ("anxiety and depression") is set against a negative association with the second factor ("loss of confidence"). This makes intuitive sense in the context of the literature as lower levels of anxiety may be productive Sadock and Sadock (2000). This result is also consistent with results reported by Graetz (1991) who found that, for young people, anxiety is associated with more schooling. However, as we include more controls, the association between "anxiety and depression" and exam performance becomes smaller and statistically insignificant both for girls and boys. This suggests that any positive effect of anxiety on exam performance is captured by past educational attainment at age 7, family characteristics, and student sorting to secondary schools. When we focus on our preferred specification - the most detailed specification including secondary school fixed effects (column 3) - we see that "loss of confidence" remains important for boths boys and girls. "Anhedonia and social dysfunction" is also important (and the dominant

31

factor) for girls.

Table 3: Standardized point score as outcome. MH=GHQ at risk

Panel A: Boys

VARIABLES	(1) Basic controls	(2) Additional controls	(3) (2) + school Fixed effects
GHQ at risk	-0.001	-0.055	-0.083*
	[0.048]	[0.037]	[0.036]
Observations	3923	3923	3923
Adjusted R-squared	0.134	0.478	0.569

Panel B: Girls

GHQ at risk	-0.086**	-0.148**	-0.158**
	[0.034]	[0.027]	[0.026]
Observations	3644	3644	3644
Adjusted R-squared	0.137	0.479	0.574

Notes: Robust standard errors in brackets. ** p<0.05, * p<0.10. Each regression includes terciles of income dummies (Baseline is lowest tercile), ethnicity dummies (Mixed, Indian, Pakistani, Bangladeshi, Black Caribbean, Black African, other. Baseline is white ethnicity) and parental education dummies for both father and mother (University qualification, A-Level qualification, GCSE qualification, other qualification. Baseline is no qualification). The "Additional Controls" specification includes both personal and family characteristics and school level controls such as: whether young person has a disability, English as the main language of household, whether is a step family, dummies for family type (Married couple, lone father, lone mother, no parents in the household. Baseline is cohabiting couple), whether mother and father are working full time or part time, number of siblings, birth weight, whether born on time, if single parent family at birth, whether parents are in good health, total score in science, maths and english at KS2. School level controls are: average key stage 2 score of the primary school the pupil attended, school size, % of students with statements of special educational needs, % of students eligible to receive free school meals, % of students who do not speak English as a first language, School type dummies (Independent school; semi-autonomous school; special school. Baseline is other state school), whether grammar school, % achieving 5 or more grades at A-C in GCSE, 2004.

Table 4: Standardized point score as outcome. MH=GHQ Likert (0-1)

Panel A: Boys

VARIABLES	(1) Basic controls	(2) Additional controls	(3) (2) + school Fixed effects
GHQ Likert (0-1)	0.278**	-0.143	-0.158*
	[0.116]	[0.093]	[0.085]
Observations	3923	3923	3923
Adjusted R-squared	0.133	0.478	0.569

Panel B: Girls

GHQ Likert (0-1)	-0.191**	-0.407**	-0.420**
	[0.093]	[0.075]	[0.066]
Observations	3644	3644	3644
Adjusted R-squared	0.137	0.479	0.574

Notes: Robust standard errors in brackets. ** $p<0.05$, * $p<0.10$. Each regression includes terciles of income dummies, ethnicity dummies and parental education dummies for both father and mother. The "Additional Controls" specification includes both personal and family characteristics and school level controls.

Table 5: Standardized point score as outcome. MH=Graetz factors

Panel A: Boys

VARIABLES	(1) Basic controls	(2) Additional controls	(3) (2) + school Fixed effects
Anxiety and Depression	0.488**	0.142**	0.075
	[0.087]	[0.069]	[0.072]
Loss of confidence	-0.479**	-0.252**	-0.218**
	[0.087]	[0.065]	[0.069]
Anhedonia and Social Dysfunction	0.301**	-0.030	0.017
	[0.134]	[0.106]	[0.103]
Observations	3923	3923	3923
Adjusted R-squared	0.143	0.480	0.569

Panel B: Girls

VARIABLES	(1) Basic controls	(2) Additional controls	(3) (2) + school Fixed effects
Anxiety and Depression	0.432**	0.021	-0.051
	[0.085]	[0.068]	[0.065]
Loss of confidence	-0.435**	-0.161**	-0.143*
	[0.075]	[0.059]	[0.057]
Anhedonia and Social Dysfunction	-0.280**	-0.332**	-0.238**
	[0.142]	[0.109]	[0.102]
Observations	3644	3644	3644
Adjusted R-squared	0.147	0.480	0.574

Notes: Robust standard errors in brackets. ** $p<0.05$, * $p<0.10$. Each regression includes terciles of income dummies, ethnicity dummies and parental education dummies for both father and mother. The "Additional Controls" specification includes both personal and family characteristics and school level controls.

5.2 Mental health and the probabilty of being "Not in Education, Training or Employment" (NEET)

Our dataset allows us to measure whether the teenager effectively drops out of education and employment (known as "Not in Education, Training or Employment" or NEET) at age 17/18 (Wave 5). As shown in Table 1, the percentage of boys and girls that are NEET at this age is 10.6% and 7.6% respectively .

In Tables 6 and 7 we show estimates using the same specifications as described above for exam peformance, progressively introducing controls (columns 1-3). Then we include exam performance to discern whether there is an association between poor mental health and NEET over and above any association that works through exam performance (column 4). In column 5 we also include a measure of mental health at age 15/16 (as well the measure at age 13/14). This shows whether the association of early mental health problems with NEET remains after we control for later mental health and exam performance.

Table 6 shows the results where mental health is measured by whether the individual is over the relevant threshold (4 out of 12 positive answers) and deemed to be "at risk". Table 7 presents the same specifications where we use the continuous measure of mental health (the Likert measure) instead of the threshold. In both tables, panels A and B show results for boys and girls respectively.

In Table 6 the coefficients are similar for boys and girls - but more precisely estimated for girls. The results in columns 1-3 are not very sensitive to the inclusion of controls (although coefficients increase a little when more controls are included). Column 3 shows that poor mental health (measured at age 13/14) is positively associated with the probability of drop-out (or NEET) by 2.7 and 3.3 percentage points for boys and girls respectively - although this is only statistically significant for girls. This coefficient is very sizeable given the baseline figures for NEET. Surpisingly, the coefficient is only moderately reduced by including a control for exam performance (column 4) - suggesting that the association between poor mental health and NEET does not operate primarily through how the student does at school. Including a later measure of mental health - GHQ in wave 4 (column 5) - also moderately reduces the coefficient on the earlier measure. In the case of boys, the later measure of mental health shows a stronger association with NEET (and is statistically significant).

When we replicate these regressions using the continuous measure of mental health (Table 7), the difference between boys and girls is larger. The early mental health measure only has explanatory power for girls. As before, the coefficient is little affected by including detailed controls, exam performance at age 16, and subsequent measures of mental health. However, when we use the later measure of mental health (measured at age 15/16), a positive coeffi-

cient is shown for boys which is similar in magnitude to that shown for girls with regard to the earlier measure of mental health.

In Table 8 we break down the continuous measure of mental health into its components. The structure of the table is the same as for table 7. We observe that "anhedonia and social dysfunction" seems to be driving the entire association for girls. For boys, this breakdown is largely uninformative - reflecting the overall lower association between early measures of mental health and NEET. However, when the analysis includes the components of the later mental health measure (column 5), "anhedonia and social dysfunction" shows up as an important factor for boys too. The magnitude of the association between this component of mental health and NEET is very similar to that found for girls when using the earlier measure of mental health.

This analysis shows that there is a relationship between early indicators of mental health and the probability of drop-out. Although this is stronger for girls, we find similar patterns for boys using a later measure of mental health. The component "anhedonia and social dysfunction" seems to drive effects in both cases. These measures have a strong association with NEET over and above any association that might be influenced by examination performance.

Table 6: NEET in W5 as an outcome, MH=GHQ at risk

Panel A: Boys

VARIABLES	(1) Basic controls	(2) Additional controls	(3) (2) + school Fixed effects	(4) (3)+GCSE pt.sc.	(5) (4) +MH at W4
GHQ at risk, W2	0.021	0.023	0.027	0.029	0.022
	[0.017]	[0.017]	[0.017]	[0.018]	[0.018]
GHQ at risk, W4					0.028*
					[0.016]
GCSE Standardized point score				-0.033*	-0.033*
				[0.009]	[0.009]
Observations	3655	3655	3655	3525	3525
Adjusted R-squared	0.010	0.019	0.045	0.054	0.055

Panel B: Girls

GHQ at risk, W2	0.030**	0.031**	0.033**	0.027*	0.021*
	[0.011]	[0.011]	[0.011]	[0.011]	[0.012]
GHQ at risk, W4					0.017
					[0.011]
GCSE Standardized point score				-0.042**	-0.042**
				[0.008]	[0.008]
Observations	3468	3468	3468	3357	3357
Adjusted R-squared	0.014	0.038	0.053	0.061	0.062

Notes: Robust standard errors in brackets. ** $p<0.05$, * $p<0.10$. Each regression includes terciles of income dummies, ethnicity dummies and parental education dummies for both father and mother. The "Additional Controls" specification includes both personal and family characteristics and school level controls.

Table 7: NEET in W5 as an outcome, MH=GHQ Likert

Panel A: Boys

VARIABLES	(1) Basic controls	(2) Additional controls	(3) (2) + school Fixed effects	(4) (3)+GCSE pt.sc.	(5) (4) +MH at W4
GHQ Likert in W2	0.012	0.032	0.026	0.026	-0.020
	[0.039]	[0.040]	[0.041]	[0.042]	[0.045]
GHQ Likert in W4					0.123**
					[0.043]
GCSE Standardized point score				-0.033**	-0.035**
				[0.009]	[0.009]
Observations	3655	3655	3655	3525	3525
Adjusted R-squared	0.010	0.020	0.046	0.055	0.057

Panel B: Girls

	(1)	(2)	(3)	(4)	(5)
GHQ Likert in W2	0.102**	0.108**	0.114**	0.087**	0.081**
	[0.031]	[0.031]	[0.029]	[0.029]	[0.032]
GHQ Likert in W4					0.015
					[0.031]
GCSE Standardized point score				-0.041**	-0.042**
				[0.008]	[0.008]
Observations	3468	3468	3468	3357	3357
Adjusted R-squared	0.016	0.040	0.055	0.062	0.062

Notes: Robust standard errors in brackets.** p<0.05, * p<0.10. Each regression includes terciles of income dummies, ethnicity dummies and parental education dummies for both father and mother. The "Additional Controls" specification includes both personal and family characteristics and school level controls.

Table 8: NEET in W5 as outcome. MH= Graetz factors.

Panel A: Boys

VARIABLES	(1) Basic controls	(2) Additional controls	(3) (2) + school Fixed effects	(4) (3)+GCSE pt.sc.	(5) (4) +MH at W4
Anxiety and Depression W2	-0.016	-0.001	0.005	-0.000	-0.015
	[0.031]	[0.031]	[0.034]	[0.034]	[0.036]
Loss of confidence W2	0.031	0.018	0.012	0.017	0.010
	[0.032]	[0.032]	[0.033]	[0.034]	[0.034]
Anhedonia and Social Dysfunction W2	-0.006	0.015	0.008	0.009	-0.026
	[0.050]	[0.051]	[0.050]	[0.051]	[0.054]
Anxiety and Depression W4					0.026
					[0.034]
Loss of confidence W4					0.018
					[0.033]
Anhedonia and Social Dysfunction W4					0.099*
					[0.058]
GCSE Standardized point score				-0.033**	-0.034**
				[0.009]	[0.009]
Observations	3655	3655	3655	3525	3525
Adjusted R-squared	0.009	0.019	0.045	0.054	0.056

Panel B: Girls

VARIABLES	(1) Basic controls	(2) Additional controls	(3) (2) + school Fixed effects	(4) (3)+GCSE pt.sc.	(5) (4) +MH at W4
Anxiety and Depression W2	0.027	0.041*	0.045	0.043	0.039
	[0.024]	[0.024]	[0.028]	[0.028]	[0.030]
Loss of confidence W2	-0.003	-0.015	-0.019	-0.017	-0.016
	[0.023]	[0.023]	[0.025]	[0.025]	[0.026]
Anhedonia and Social Dysfunction W2	0.109*	0.115*	0.126**	0.084*	0.080*
	[0.046]	[0.045]	[0.045]	[0.045]	[0.048]
Anxiety and Depression W4					0.013
					[0.029]
Loss of confidence W4					-0.010
					[0.025]
Anhedonia and Social Dysfunction W4					0.015
					[0.050]
GCSE Standardized point score				-0.042**	-0.042**
				[0.008]	[0.008]
Observations	3468	3468	3468	3357	3357
Adjusted R-squared	0.016	0.041	0.056	0.062	0.061

Notes: Robust standard errors in brackets. ** p<0.05, * p<0.10. Each regression includes terciles of income dummies, ethnicity dummies and parental education dummies for both father and mother. The "Additional Controls" specification includes both personal and family characteristics and school level controls.

5.3 Potential mechanisms

Finally, we investigate to what extent the observed associations can be "explained" by including possible behavioral mechanisms. For example, individuals may respond to poor mental health by substance abuse and by skipping classes at school. In addition to any direct effect these behaviors might have on exam performance and NEET, they might also wipe out some of the observed effect of poor mental health on these outcomes. "Substance abuse" is proxied by whether the individual (at age 14/15) has ever consumed cigarettes, alcohol or cannabis. Whether they have missed school is measured by whether they self-report as ever having played truant at age 14/15. The indicator of mental health is measured in the previous wave and the outcome indicators are all measured in subsequent waves. However, as discussed earlier, endogeneity problems can affect this analysis because of serial correlation between current and past behavior. While substance abuse may lead to mental health problems, it might also be a reaction to mental health problems. Nonetheless, we believe that this is still an interesting exercise.

In Table 9 we show results where the dependent variable is exam performance at age 16 and mental health is measured on the continuous Likert scale. We start by showing the association between poor mental health and exam performance in the most detailed specification (i.e. replicating Table 4, column 3). We then show how the

41

association changes when controlling for truancy (column 2), indicators of substance abuse (column 3), and risky behaviors altogether (column 4). Results for boys (Panel A) show that the association between poor mental health and exam performance is wiped away by either or both of these controls. For girls (Panel B), controlling for these potential mechanisms reduces the association by about half (i.e. the coefficient goes from -0.42 in column 1 to -0.20 in column 5). This is "explained" equally by truancy and by consumption of both cigarettes and cannabis.

In Table 10 we estimate similar regressions when the dependent variable is NEET at Wave 5. Our starting point is the most detailed specification when controlling for measures of mental health at age 14/15 and at age 16/17, as well as exam performance at age 16 (table 7, column 5). As discussed previously, the earlier measure of mental health is important for girls whereas the later measure is important for boys. The regressions show that truancy has no association with the outcome variable for boys (any effect is entirely absorbed through the association between truancy and exam performance). Although there is a small association between consumption of cigarettes and the probability of being NEET, this does nothing to the association between mental health and NEET for boys. Analogous regressions for girls (Panel B) show that only truancy has an association with NEET over and above any association that operates via exam performance. The association between mental health

and NEET is reduced, but only moderately. Thus there seems to be evidence that these mechanisms play an indirect role in explaining NEET throught their impact on the exam scores.

¹¹

---

[11]We use a more stringent definition of truancy. In the questionnaire people are asked "Have you ever played truancy in the past 12 months?". We have excluded people who answered positively to the truancy question but, when asked about the frequency, they answered to have played truancy "only the odd day/that class". We have replicated our estimations using the original variable, results are slightly different: for neet in W5 as an outcome truancy does not have an effect for girls.

Table 9: Potential mechanisms with the GCSE standardized point scores as an outcome.

Panel A: BOYS

VARIABLES	(1) secondary school FE	(2) + Truancy	(3) +Consumption of substances	(4) +Risky behaviors
GHQ Likert (0-1) W2	-0.158*	-0.081	-0.024	0.010
	[0.085]	[0.084]	[0.083]	[0.082]
Cigarette ever			-0.312**	-0.273**
			[0.032]	[0.033]
Alcohol ever			-0.024	-0.016
			[0.031]	[0.031]
Cannabis ever			-0.211**	-0.188**
			[0.029]	[0.029]
Any truant		-0.518**		-0.359**
		[0.046]		[0.046]
Observations	3923	3923	3923	3923
Adjusted R-squared	0.569	0.586	0.601	0.609

Panel B: GIRLS

GHQ Likert (0-1) W2	-0.420**	-0.319**	-0.244**	-0.198**
	[0.066]	[0.066]	[0.065]	[0.065]
Cigarette ever			-0.247**	-0.219**
			[0.030]	[0.030]
Alcohol ever			-0.024	-0.017
			[0.032]	[0.032]
Cannabis ever			-0.174**	-0.143**
			[0.032]	[0.031]
Any truant		-0.510**		-0.374**
		[0.048]		[0.048]
Observations	3644	3644	3644	3644
Adjusted R-squared	0.574	0.589	0.600	0.608

Notes: Robust standard errors in brackets. ** p<0.05, * p<0.10. Each regression includes terciles of income dummies, ethnicity dummies and parental education dummies for both father and mother, controls for personal and family characteristics and school fixed effects.

Table 10: Potential mechanisms with NEET as an outcome.

Panel A: BOYS

VARIABLES	(1) secondary school FE	(2) (1)+ Truancy	(3) (1) +consumption of substances	(4) (1)+Risky behaviors
GHQ Likert (0-1) W2	-0.020	-0.021	-0.029	-0.028
	[0.045]	[0.045]	[0.045]	[0.045]
GHQ Likert (0-1) W4	0.123**	0.122**	0.120**	0.121**
	[0.043]	[0.043]	[0.043]	[0.043]
Cigarette ever			0.050**	0.051**
			[0.017]	[0.017]
Alcohol ever			-0.005	-0.005
			[0.016]	[0.016]
Cannabis ever			-0.010	-0.009
			[0.015]	[0.015]
Any truant		-0.001		-0.013
		[0.024]		[0.025]
GCSE Standardized point score	-0.035**	-0.034**	-0.029**	-0.030**
	[0.009]	[0.009]	[0.009]	[0.009]
Observations	3525	3525	3525	3525
Adjusted R-squared	0.057	0.057	0.059	0.059

Panel B: GIRLS

GHQ Likert (0-1) W2	0.081**	0.070**	0.082**	0.073**
	[0.032]	[0.032]	[0.033]	[0.033]
GHQ Likert (0-1) W4	0.015	0.009	0.017	0.011
	[0.031]	[0.031]	[0.031]	[0.031]
Cigarette ever			0.008	0.003
			[0.014]	[0.014]
Alcohol ever			-0.005	-0.006
			[0.014]	[0.014]
Cannabis ever			-0.007	-0.014
			[0.014]	[0.015]
Any truant		0.091**		0.094**
		[0.022]		[0.022]
GCSE Standardized point score	-0.042**	-0.035**	-0.042**	-0.037**
	[0.008]	[0.008]	[0.008]	[0.008]
Observations	3357	3357	3357	3357
Adjusted R-squared	0.062	0.067	0.061	0.067

Notes: Robust standard errors in brackets. ** p<0.05, * p<0.10. Each regression includes terciles of income dummies, ethnicity dummies and parental education dummies for both father and mother, controls for personal and family characteristics and school fixed effects

6 Conclusion

A growing literature shows that mental health disorders in adolescence have potentially long term effects on adult mental health. In this paper we show how poor mental health in early adolescence has a strong negative association with subsequent examination performance and drop-out from the labour market and education. England is a particularly interesting country for considering these issues because of a low international ranking both on measures of child wellbeing and on early drop-out.

Although there are many studies that look at the relationship between mental health and education, there are not many large-scale longitudinal studies where it has been possible to look at the relationship for a recent cohort while also controlling for a wide range of personal, family and school characteristics. In our study we show that whereas it is difficult to "explain" poor mental health by a large range of characteristics, measures of poor mental health have a strong association with subsequent educational outcomes and the probability of being "not in education, employment or training" (or NEET).

The measure of poor mental health comes from the General Health Questionnaire (GHQ-12), which is a screening instrument designed for use in general populations to detect the presence of symptoms of mental health (depression in particular). An insight

from this study is how useful such a simple indicator might be for predicting who is "at risk" from negative educational outcomes - even after allowing for all the usual observable characteristics available to researchers and school practitioners.

We conduct our analysis separately for boys and girls. Our findings show stronger patterns of association for girls than for boys (which is consistent with previous literature). We also find that different components of mental health are not equally important with respect to the outcomes considered here. "Anhedonia and social dysfunction" seems to be most important after including detailed controls. "Loss of confidence" also shows a strong association with examination performance.

Finally, we consider potential mechanisms through which poor mental health may impact on outcomes. Individuals may respond to poor mental health by engaging in risky behaviors (consumption of substances -cigarettes, alcohol and cannabis) and by missing school. In addition to any direct effect these behaviors might have on exam performance and NEET, they may reduce some of the observed effect of poor mental heath on these outcomes. Our results suggest that this is a reasonable hypothesis with regard to examination results but not with regard to NEET where they do not make any difference. The overall picture presented in this paper suggests that mental distress is strongly associated with poor educational outcomes and early drop-out. This research helps illustrate the po-

tential importance of programmes aimed at improving the mental
health of adolescents.

Appendix

A1: Additional tables

Table A1.1: Descriptive statistics for boys and girls.

Variable	(1) Boys	(2) Boys At risk	(3) Girls	(4) Girls At risk
Name	Mean (sd)	Mean (sd)	Mean (sd)	Mean (sd)
Panel A: Outcome variables				
GCSE Point scores	402.98	404.33	433.72	426.08
	(142.35)	(151.86)	(133.31)	(140.72)
GCSE Standardized pt. scores	-0.056	-0.047	0.156	0.103
	(0.988)	(1.05)	(0.925)	(0.97)
Neet in W5	0.106	0.124	0.076	0.098
Panel B: Risky behaviour variables				
Ever smokes cigarettes.	0.177	0.234	0.251	0.360
Ever had alcoholic drink	0.694	0.731	0.690	0.758
Ever tried cannabis	0.255	0.303	0.211	0.323
Ever played truancy	0.065	0.102	0.057	0.108
Panel C: Mental Health variables				
GHQ at risk in w2	0.110	1	0.248	1
GHQ at risk in w4	0.161	0.412	0.298	0.541
GHQ likert in w2	8.496	18.0	11.218	19.56
	(4.822)	(4.70)	(6.13)	(5.10)
GHQ likert in w4	8.966	12.93	11.67	15.53
	(5.133)	(6.70)	(6.29)	(7.16)
GHQ likert in 0-1 w2	0.236	0.50	0.311	0.543
	(0.134)	(0.131)	(0.170)	(0.142)
GHQ likert in 0-1 w4	0.249	0.359	0.324	0.431
	(0.142)	(0.186)	(0.174)	(0.198)
Anxiety in w2	0.235	0.614	0.338	0.670
	(0.208)	(0.183)	(0.254)	(0.170)
Anxiety in w4	0.267	0.433	0.376	0.527
	(0.224)	(0.263)	(0.25)	(0.243)
Loss of confidence w2	0.139	0.5	0.239	0.572
	(0.212)	(0.29)	(0.282)	(0.29)
Loss of confidence w4	0.136	0.277	0.235	0.385
	(0.214)	(0.280)	(0.279)	(0.327)
Social dysfunction w2	0.269	0.423	0.317	0.449
	(0.124)	(0.157)	(0.135)	(0.158)
Social dysfunction w4	0.277	0.351	0.321	0.389
	(0.119)	(0.156)	(0.135)	(0.165)

continue

Panel D: Demographic controls				
White	0.736	0.723	0.709	0.707
Mixed eth.	0.047	0.064	0.048	0.060
Indian	0.068	0.047	0.056	0.044
Pakistani	0.047	0.044	0.050	0.044
Bangladeshi	0.029	0.033	0.043	0.044
Black Caribbean	0.026	0.020	0.031	0.032
Black African	0.026	0.040	0.029	0.030
Other	0.0182	0.267	0.029	0.036
1st lowest quantile of income	0.302	0.289	0.318	0.329
2nd lowest quantile of income	0.306	0.331	0.305	0.291
Highest quantile of income	0.392	0.378	0.376	0.379
Panel E: Key stage 2 variables				
Total score in science	56.86	56.79	56.23	57.47
	(17.68)	(19.58)	(17.69)	(17.51)
Total score in maths	64.305	65.19	61.30	63.09
	(24.65)	(25.703)	(24.09)	(24.11)
Total score in english	57.19	58.72	61.08	62.94
	(18.92)	(20.32)	(19.24)	(19.17)
Panel F: More detailed controls				
Mum with high qualification	0.255	0.285	0.230	0.265
Mum with gce a level	0.129	0.118	0.127	0.118
Mum Gcse grades a-c	0.262	0.251	0.263	0.250
Mum with Other qualification	0.088	0.08	0.091	0.088
Mum with No qualifications	0.186	0.178	0.204	0.187

continue

Dad with high qualification	0.200	0.216	0.197	0.210
Dad with gce a level	0.132	0.129	0.118	0.116
Dad Gcse grades a-c	0.166	0.146	0.166	0.161
Dad with Other qualification	0.048	0.046	0.051	0.045
Dad with No qualifications	0.149	0.124	0.142	0.128
Dad work full time	0.674	0.65	0.649	0.634
Dad work part time	0.030	0.031	0.30	0.033
Mum work full time	0.337	0.314	0.333	0.349
mum work part time	0.35	0.347	0.348	0.344
English spoken as main lang,	0.906	0.904	0.894	0.911
Married couple	0.709	0.665	0.705	0.68
Cohabiting couple	0.072	0.077	0.063	0.064
Lone parent	0.206	0.247	0.217	0.237
No parent	0.008	0.008	0.0082	0.005
Good_health (of parent in w1)	0.871	0.87	0.859	0.849
# of siblings	1.53 (1.129)	1.541 (1.14)	1.563 (1.18)	1.505 (1.13)
Birth weight	3.149 (1.056)	3.082 (1.13)	3.014 (0.975)	3.02 (0.969)
Single parent family at birth	0.178	0.207	0.168	0.168
Child with disability/illness	0.132	0.124	0.096	0.117
Child was born on time	0.424	0.432	0.458	0.454
Having at least one younger siblings	0.60	0.572	0.606	0.594
Having at least one elder siblings	0.58	0.628	0.586	0.597

Source: Authors' computation of LSYPE data.

Table A1.2: Descriptive Statistics. Sample comparison.

Variables	(1) Whole sample (13539)	(2) Completed MH Sample (8122)	(3) Restricted sample (7832)
Name	Mean (sd)	Mean (sd)	Mean (sd)
Panel A: Outcome variables			
GCSE Point scores	376.15 (157.36)	411.18 (144.03)	417.79 (138.91)
GCSE Standardized pt. scores	0 (1)	0.222 (0.91)	0.264 (0.88)
Neet in W5	0.105	0.093	0.091
Panel B: Risky behavior variables			
Ever smokes cigarettes.	0.210	0.213	0.212
Ever had alcoholic drink	0.59	0.68	0.69
Ever tried cannabis	0.217	0.233	0.233
Ever played truancy	0.067	0.062	0.061
Panel C: Key stage 2 variables			
Total score in science	52.05 (20.29)	55.21 (19.25)	56.55 (17.68)
Total score in maths	56.56 (26.84)	61.20 (25.93)	62.86 (24.43)
Total score in english	53.85 (22.35)	57.37 (21.18)	59.06 (19.16)
No test taken in math	0.036	0.022	0
No test taken in science	0.030	0.019	0
No test taken in english	0.042	0.026	0
Panel D: More detailed controls			
Mum with high qualification	0.204	0.238	0.243
Mum with gce a level	0.114	0.126	0.128
Mum Gcse grades a-c	0.252	0.260	0.263
Mum with Other qualification	0.09	0.09	0.08
Mum with No qualifications	0.24	0.20	0.19

Continue

Dad with high qualification	0.163	0.196	0.199
Dad with gce a level	0.111	0.124	0.126
Dad Gcse grades a-c	0.160	0.166	0.166
Dad with Other qualification	0.052	0.05	0.05
Dad with No qualifications	0.166	0.148	0.146
Dad work full time	0.608	0.657	0.662
Dad work part time	0.033	0.03	0.03
Mum work full time	0.313	0.33	0.335
mum work part time	0.317	0.347	0.35
English spoken as main lang,	0.872	0.899	0.9
Married couple	0.667	0.704	0.707
Cohabiting couple	0.074	0.068	0.068
Lone parent	0.23	0.213	0.211
No parent	0.011	0.008	0.008
(of parent in w1)	0.841	0.863	0.866
# of siblings	1.62	1.56	1.54
	(1.23)	(1.17)	(1.15)
Birth weight	2.99	3.07	3.08
	(1.09)	(1.02)	(1.012
Single parent family at birth	0.192	0.176	0.173
Child with disability	0.128	0.120	0.115
Child was born on time	0.435	0.439	0.44
1st Lowest quantile of income	0.333	0.31	0.30
2nd lowest quantile of income	0.333	0.31	0.30
Highest quantile of income	0.333	0.387	0.39

Source: Authors' computation of LSYPE data.

53

Table A1.3: Mental health as outcome. Probit estimation- marginal effects.

	Boys		Girls	
	(1)	(2)	(4)	(5)
VARIABLES	Basic controls	Additional controls	Basic controls	Additional controls
Income: 2nd tercile	0.013	0.012	-0.045*	-0.050**
	(0.019)	(0.019)	(0.024)	(0.025)
Income: 3rd tercile (highest)	-0.004	-0.005	-0.039	-0.045*
	(0.018)	(0.018)	(0.025)	(0.026)
Ethnicity=mixed	0.038	0.035	0.054	0.039
	(0.027)	(0.027)	(0.036)	(0.036)
Ethnicity=Indian	-0.028*	-0.035*	-0.048	-0.048
	(0.017)	(0.018)	(0.030)	(0.033)
Ethnicity=Pakistani	0.001	-0.006	-0.018	0.009
	(0.027)	(0.030)	(0.034)	(0.045)
Ethnicity= Bangladeshi	0.031	0.029	0.024	0.051
	(0.035)	(0.042)	(0.049)	(0.061)
Ethnicity=Black Caribbean	-0.028	-0.022	-0.003	-0.010
	(0.027)	(0.029)	(0.042)	(0.043)
Ethnicity=Black African	0.051	0.035	-0.006	0.028
	(0.039)	(0.040)	(0.040)	(0.048)
Ethnicity=Other	0.059	0.056	0.059	0.066
	(0.049)	(0.048)	(0.043)	(0.047)
Mother: highest qualifc.=university	0.016	0.011	0.051**	0.013
	(0.018)	(0.018)	(0.025)	(0.026)
Mother: highest qualifcation=Alevel	-0.005	-0.005	0.002	-0.031
	(0.019)	(0.020)	(0.029)	(0.028)
Mother: highestQualification=GCSE	0.003	-0.001	0.005	-0.016
	(0.017)	(0.018)	(0.023)	(0.024)
Mother: highest qualifcation other	-0.005	-0.002	0.013	0.006
	(0.020)	(0.021)	(0.030)	(0.030)
Father: highest qualific=university	0.030	0.018	0.020	0.005
	(0.020)	(0.020)	(0.027)	(0.028)
Father: highest qualification=A-level	0.024	0.015	0.011	-0.005
	(0.023)	(0.021)	(0.030)	(0.030)
Father: highest qualification=GCSE	0.012	0.007	0.008	-0.001
	(0.020)	(0.020)	(0.027)	(0.027)
Father: highest qualification=other	0.018	0.006	-0.008	-0.012
	(0.030)	(0.028)	(0.038)	(0.038)
Step family		-0.009		0.021
		(0.019)		(0.031)
Married couple		-0.012		-0.025
		(0.024)		(0.034)
Lone father		0.112		0.061
		(0.163)		(0.138)
Lone mother		-0.062**		0.092
		(0.030)		(0.077)
No parents in the household		-0.039		-0.095
		(0.078)		(0.109)
Young person has a disability		-0.001		0.058**
		(0.014)		(0.025)
English is the main Language of household		-0.009		0.068**
		(0.025)		(0.031)

Continue

	(1)	(2)	(3)	(4)
Father: works part-time		0.028		0.020
		(0.039)		(0.048)
Father: works full-time		0.026		-0.017
		(0.020)		(0.029)
Mother: works part-time		-0.014		0.026
		(0.013)		(0.021)
Mother: works full-time		-0.021		0.034
		(0.013)		(0.022)
Number of siblings		-0.001		-0.001
		(0.005)		(0.007)
Birth weight		-0.004		0.005
		(0.009)		(0.014)
Birth on time		0.008		0.002
		(0.010)		(0.016)
Single parent family(when child born)		0.017		-0.021
		(0.016)		(0.021)
Parent in good health		-0.009		-0.039*
		(0.016)		(0.022)
Total score in Science (KS2)		-0.002**		0.000
		(0.001)		(0.001)
Total score in Maths (KS2)		0.000		-0.000
		(0.000)		(0.001)
Total score in English (KS2)		0.002**		0.003**
		(0.001)		(0.001)
average point score (KS2)		0.004		0.004
		(0.004)		(0.005)
Nb. Of pupils on roll (KS3)		-0.000		-0.000
		(0.000)		(0.000)
% pupils with sen (KS3)		-0.004		0.009*
		(0.004)		(0.005)
% of 15 year old pupils achieving 5+ a*-c		-0.001**		0.000
		(0.000)		(0.001)
% pupils eligible for FSM		-0.001**		-0.001
		(0.001)		(0.001)
% pupils whose 1st language is not english		0.000		0.001
		(0.000)		(0.001)
Grammar school		0.013		-0.030
		(0.032)		(0.041)
Independent school		0.070		-0.247**
		(0.129)		(0.022)
Autonomous school		0.012		-0.014
		(0.012)		(0.018)
Special school		0.158		
		(0.262)		
Observations	4063	4047	3765	3765
Pseudo R2	0.00796	0.0304	0.00557	0.0262

Note: Robust standard errors in parentheses. ** p<0.01, ** p<0.05, * p<0.1.

Table A1.4: Standardized test scores as outcome. GHQ at risk.
Full specification.

Panel A: BOYS

VARIABLES	(1) +parental education	(2) +KS2 attainment	(3) +secondary FE
GHQ at risk in W2	-0.001	-0.055	-0.083**
	[0.048]	[0.037]	[0.036]
Income: 2nd tercile	0.093	0.064	0.075*
	[0.058]	[0.048]	[0.045]
Income: 3rd tercile (highest)	0.279**	0.057	0.066
	[0.057]	[0.048]	[0.046]
Ethnicity=mixed	0.022	0.044	0.061
	[0.071]	[0.057]	[0.055]
Ethnicity=Indian	0.481**	0.416**	0.426**
	[0.071]	[0.064]	[0.060]
Ethnicity=Pakistani	0.157**	0.372**	0.412**
	[0.078]	[0.074]	[0.073]
Ethnicity= Bangladeshi	0.427**	0.440**	0.448**
	[0.110]	[0.105]	[0.098]
Ethnicity=Black Caribbean	-0.206**	0.075	-0.014
	[0.095]	[0.079]	[0.078]
Ethnicity=Black African	0.083	0.251**	-0.014
	[0.092]	[0.092]	[0.085]
Ethnicity=Other	0.112	0.256**	0.283**
	[0.128]	[0.108]	[0.092]
Mother: highest qualifc.=university	0.630**	0.210**	0.235**
	[0.061]	[0.045]	[0.043]
Mother: highest qualifcation=Alevel	0.464**	0.136**	0.158**
	[0.063]	[0.048]	[0.046]
Mother: highestQualification=GCSE	0.333**	0.105**	0.111**
	[0.057]	[0.043]	[0.040]
Mother: highest qualifcation other	0.075	0.021	0.010
	[0.071]	[0.056]	[0.049]
Father: highest qualific=university	0.424**	0.114**	0.115**
	[0.054]	[0.042]	[0.044]
Father: highest qualification=A-level	0.189**	0.070	0.054
	[0.058]	[0.046]	[0.046]
Father: highest qualification=GCSE	0.141**	0.063	0.050
	[0.053]	[0.042]	[0.043]
Father: highest qualification=other	-0.153*	-0.112*	-0.082
	[0.078]	[0.060]	[0.061]
Step family		-0.103**	-0.128**
		[0.052]	[0.047]
Married couple		0.000	0.041
		[0.055]	[0.052]
Lone father		0.035	-0.158
		[0.260]	[0.214]
Lone mother		-0.259**	-0.230*
		[0.115]	[0.118]
No parents in the household		0.152	-0.047
		[0.301]	[0.256]
Young person has a disability		-0.126**	-0.105**
		[0.038]	[0.034]
English is the main Language of household		-0.089	-0.087
		[0.067]	[0.057]

continue

56

Father: works part-time		0.115	0.149*
		[0.084]	[0.077]
Father: works full-time		0.076	0.079*
		[0.048]	[0.046]
Mother: works part-time		0.064*	0.035
		[0.035]	[0.033]
Mother: works full-time		0.035	0.031
		[0.038]	[0.034]
Number of siblings		-0.042**	-0.033**
		[0.012]	[0.012]
Birth weight		-0.003	-0.005
		[0.020]	[0.020]
Birth on time		-0.018	-0.020
		[0.024]	[0.024]
Single parent family(when child born)		-0.013	0.028
		[0.038]	[0.037]
Parent in good health		0.114**	0.104**
		[0.041]	[0.037]
Total score in Science (KS2)		0.006**	0.006**
		[0.002]	[0.002]
Total score in Math (KS2)		0.014**	0.013**
		[0.001]	[0.001]
Total score in English (KS2)		0.020**	0.020**
		[0.001]	[0.001]
average point score (KS2)		-0.051**	
		[0.009]	
Nb. Of pupils on roll (KS3)		0.000	
		[0.000]	
% pupils with sen (KS3)		0.015	
		[0.012]	
% of 15 year old pupils achieving 5+ a*-c		0.012**	
		[0.002]	
% pupils eligible for FSM		0.007**	
		[0.002]	
% pupils whose 1st language is not english		-0.003**	
		[0.001]	
Grammar school		-0.249**	
		[0.086]	
Independent school		-0.017	
		[0.531]	
Autonomous school		-0.573	
		[0.635]	
Special school		0.066	
		[0.041]	
Constant	-0.723**	-2.130**	-2.832**
	[0.074]	[0.286]	[0.135]
Observations	3923	3923	3923
Adjusted R-squared	0.131	0.478	0.569

Continue

57

Panel B: GIRLS

VARIABLES	(1) +parental education	(2) +KS2 attainment	(3) +secondary FE
GHQ at risk in W2	-0.086**	-0.148**	-0.158**
	[0.034]	[0.027]	[0.026]
Income: 2nd tercile	0.012	0.073*	0.057
	[0.054]	[0.043]	[0.042]
Income: 3rd tercile (highest)	0.241**	0.125**	0.121**
	[0.054]	[0.042]	[0.043]
Ethnicity=mixed	0.068	0.047	0.021
	[0.072]	[0.059]	[0.054]
Ethnicity=Indian	0.546**	0.406**	0.402**
	[0.075]	[0.065]	[0.061]
Ethnicity=Pakistani	0.289**	0.366**	0.400**
	[0.088]	[0.081]	[0.072]
Ethnicity= Bangladeshi	0.464**	0.390**	0.461**
	[0.091]	[0.089]	[0.088]
Ethnicity=Black Caribbean	-0.067	0.060	0.042
	[0.087]	[0.081]	[0.074]
Ethnicity=Black African	0.067	0.168**	0.260**
	[0.094]	[0.082]	[0.078]
Ethnicity=Other	0.422**	0.329**	0.336**
	[0.098]	[0.079]	[0.070]
Mother: highest qualifc.=university	0.593**	0.214**	0.217**
	[0.054]	[0.043]	[0.041]
Mother: highest qualifcation=Alevel	0.436**	0.139**	0.123**
	[0.057]	[0.045]	[0.045]
Mother: highestQualification=GCSE	0.320**	0.123**	0.106**
	[0.051]	[0.041]	[0.037]
Mother: highest qualifcation other	0.111*	0.053	0.038
	[0.060]	[0.047]	[0.047]
Father: highest qualific=university	0.391**	0.122**	0.136**
	[0.053]	[0.043]	[0.044]
Father: highest qualification=A-level	0.194**	0.029	0.072
	[0.056]	[0.043]	[0.046]
Father: highest qualification=GCSE	0.047	0.001	-0.010
	[0.051]	[0.041]	[0.043]
Father: highest qualification=other	0.045	0.099*	0.080
	[0.078]	[0.059]	[0.059]
Step family		-0.061	-0.025
		[0.045]	[0.047]
Married couple		0.057	0.087
		[0.057]	[0.054]
Lone father		0.284	0.243
		[0.219]	[0.196]
Lone mother		-0.192*	-0.203*
		[0.099]	[0.105]
No parents in the household		0.255	-0.073
		[0.221]	[0.224]
Young person has a disability		-0.095**	-0.115**
		[0.042]	[0.038]
English is the main Language of household		-0.149**	-0.124**
		[0.055]	[0.052]

continue

	(1)	(2)	(3)
Father: works part-time		0.020 [0.078]	0.046 [0.075]
Father: works full-time		0.050 [0.046]	0.029 [0.045]
Mother: works part-time		0.068** [0.032]	0.073** [0.033]
Mother: works full-time		0.055* [0.032]	0.059* [0.034]
Number of siblings		-0.007 [0.012]	-0.011 [0.011]
Birth weight		-0.013 [0.020]	0.007 [0.021]
Birth on time		-0.051** [0.023]	-0.043* [0.023]
Single parent family(when child born)		-0.010 [0.036]	-0.045 [0.036]
Parent in good health		0.080** [0.040]	0.053 [0.035]
Total score in Science (KS2)		0.010** [0.002]	0.009** [0.002]
Total score in Math (KS2)		0.013** [0.001]	0.012** [0.001]
Total score in English (KS2)		0.017** [0.001]	0.019** [0.001]
average point score (KS2)		-0.056** [0.009]	
Nb. Of pupils on roll (KS3)		0.000 [0.000]	
% pupils with sen (KS3)		-0.002 [0.011]	
% of 15 year old pupils achieving 5+ a*-c		0.010** [0.002]	
% pupils eligible for FSM		0.006** [0.002]	
% pupils whose 1st language is not english		-0.003** [0.001]	
Grammar school		-0.037 [0.161]	
Independent school		0.374 [0.244]	
Autonomous school		-0.011 [0.038]	
Special school		0.000 [0.000]	
Constant	-0.410** [0.073]	-1.783** [0.265]	-2.674** [0.132]
Observations	3644	3644	3644
Adjusted R-squared	0.135	0.478	0.573

Notes: Robust standard errors in brackets. ** p<0.05, * p<0.10.

A2: GHQ Questions

Have you recently...

1. *Concen:* been able to concentrate on whatever you are doing?

2. *NoSleep:* Lost much sleep over worry?

3. *Useful:* felt you were playing a useful part in things

4. *Decide:* felt capable of making decisions about things

5. *Strain:* felt constantly under strain?

6. *Diffic:* feeling you couldn't overcome your difficulties?

7. *Activ:* been able to enjoy normal day to day activities?

8. *Probs:* been able to face up to your problems?

9. *Depress:* been feeling unhappy and depressed?

10. *NoConf:* been losing confidence in yourself?

11. *Wthless:* been thinking of yourself as a worthless person?

12. *Happy:* been feeling reasonably happy, all thing considered?

A3: Graetz factors

The GHQ-12 has been extensively evaluated in terms of its validity and reliability as a uni-dimensional index of severity of psychological morbidity but the issue concerning the nature and the number of factors which are measured by

the GHQ12 is still not completely clear. Many studies have assessed psychological morbidity in two or three dimensions. Several two- and three-dimensional models have been proposed, and to date no study examining the factor structure of the GHQ-12 has found it to be uni dimensional. A version of three-factor solution for the GHQ has been proposed by Graetz (1991). He shows that several advantages can be gained using multidimensional properties of GHQ as well as a single severity score. Using a large Australian sample of young people, and performing maximum likelihood factor analysis with oblique rotation , he reported the GHQ-12 measures three distinct constructs of "Anxiety", "Social dysfunction" and "Loss of confidence". This three-dimensional model of Graetz has been identified the best fitting model by confirmatory factor analysis.

The three-dimensional model of Graetz is computed as follow:

- **Anxiety**= Obtained averaging the following GHQ questions:

Depress: been feeling unhappy and depressed?

Diffic: feeling you couldn't overcome your difficulties?

Strain: felt constantly under strain?

NoSleep: Lost much sleep over worry?

- **Loss of confidence**= Obtained averaging the following GHQ questions:

NoConf: been losing confidence in yourself?

Wthless: been thinking of yourself as a worthless person?

- **Anhedonia and Social Dysfunction**= Obtained averaging the following GHQ questions:

Decide: felt capable of making decisions about things

Useful: felt you were playing a useful part in things

Happy: been feeling reasonably happy, all thing considered?

Probs: been able to face up to your problems?

Activ: been able to enjoy normal day to day activities?

Concen: been able to concentrate on whatever you are doing?

References

ANDREWS, G., C. TENNANT, D. HEWSON, AND G. VAILLANT (1978): "Life Event Stress, Social Support, Coping Style, and Risk of Psychological Impairment.," *The Journal of Nervous and Mental Disease*, 166.

ARGYLE, M. (1989): *The Psychology of Happiness*. Routledge.

BARRERA, M. J., AND C. GARRISON-JONES (1992): "Family and peer social support as specific correlates of adolescent depressive symptoms.," *Journal of Abnormal Child Psychology*, 20, 1–16.

BECKER, G. S. (1962): "Investment in Human Capital: A Theoretical Analysis," *Journal of Political Economy*, 70, 9.

BRADSHAW, J., AND D. RICHARDSON (2009): "An Index of Child Well-Being in Europe," *Child Indicators Research*, 2, 319–351.

BRESLAU, J., M. LANE, N. SAMPSON, AND R. C. KESSLER (2008): "Mental disorders and subsequent educational attainment in a US national sample," *Journal of Psychiatric Research*, 42(9), 708 – 716.

CALLAN, M., D. WAINWRIGHT, M. FORSYTHE, B. WALL, AND S. ALMOND (2001): "Mental health and stress in the workplace: the case of general practice in the UK," *Social Science and Medicine*, 52(4), 499–507.

CICCHETTI, D., AND S. L. TOTH (1998): "The development of depression in children and adolescents.," *American Psychologist.*, 53, 221–241.

CLARK, A., Y. GEORGELLI, AND P. SANFEY (2001): "Scarring: The Psychological Impact of Past Unemployment," *Economica*, 68(270), 221–241.

CLARK, A., AND A. J. OSWALD (1994): "Unhappiness and Unemployment," *The Economic Journal*, 104(424), 648–659.

Collishaw, S., B. Maughan, R. Goodman, and A. Pickles (2004): "Time trends in adolescent mental health.," *Journal of Child Psychology and Psychiatry*, 45, 1350–1362.

Currie, J., and M. Stabile (2006): "Child mental health and human capital accumulation: The case of ADHD," *Journal of Health Economics*, 25(6), 1094–1118.

Ding, W., and S. F. Lehrer (2007): "Do Peers Affect Student Achievement in China's Secondary Schools?," *The Review of Economics and Statistics*, 89(2), 300–312.

Eisenberg, D., E. Golberstein, and J. B. Hunt (2009): "Mental Health and Academic Success in College," *The B.E. Journal of Economic Analysis and Policy*, 9.

Eme, R. (1979): "Sex differences in childhood psychopathology: a review," *Psychological Bulletin*, 86, 574–95.

Fergusson, D. M., and L. J. Woodward (2002): "Mental Health, Educational, and Social Role Outcomes of Adolescents With Depression," *Arch Gen Psychiatry*, 59(3), 225–231.

Fletcher, J., and B. Wolfe (2008): "Child mental health and human capital accumulation: The case of ADHD revisited," *Journal of Health Economics*, 27(3), 794–800.

Fletcher, J. M. (2008): "Adolescent depression: diagnosis, treatment, and educational attainment," *Health Economics*, 17(11), 1215–1235.

——— (2010): "Adolescent depression and educational attainment: Results Using Sibling Fixed Effects.," *Health Economics*, 19, 855–871.

GARDNER, J., AND A. J. OSWALD (2007): "Money and mental wellbeing: A longitudinal study of medium-sized lottery wins," *Journal of Health Economics*, 26(1), 49–60.

GOLDBERG, D., R. GATER, N. SARTORIUS, T. B. USTUN, M. PICCINELLI, O. GUREJE, AND C. RUTTER (1997): "The validity of two versions of the GHQ in the WHO study of mental illness in general health care.," *Psychol Med*, 27, 191–197.

GOLDBERG, D. P. (1972.): *The detection of psychiatric illness by questionnaire.* London: Oxford University Press.

GOLDBERG, D. P., AND P. WILLIAMS (1988): *A user's guide to the General Health Questionnaire.* NFER-Nelson, Windsor.

GOVE, W., AND T. R. HERB (1974): "Stress and mental illness among the young: a comparison of the sexes," *Social Forces*, 53, 256–265.

GRAETZ, B. (1991): "Multidimensional properties of the General Health Questionnaire," *Social Psychiatry and Psychiatric Epidemiology*, 26, 132–138.

HOEYMANS, N., A. GARSSEN, G. WESTERT, AND P. VERHAAK (2004): "Measuring mental health of the Dutch population: a comparison of the GHQ-12 and the MHI-5," *Health and Quality of Life Outcomes*, 2(1), 23.

JOHNSON, J., P. COHEN, AND B. DOHRENWEND (1999): "A longitudinal investigation of social causation and social selection processes involved in the association between socioeconomic status and psychiatric disorder.," *Abnormal Psycholgy*, 108, 490–499.

KANDEL, D., J. JOHNSON, H. BIRD, M. WEISSMAN, S. GOODMAN, B. LAHEY, D. REGIER, AND M. SCHWAB-STONE (1999): "Psychiatric Comorbidity Among Adolescents With Substance Use Disorders: Findings From the

MECA Study," *Journal of the American Academy of Child & Adolescent Psychiatry,*, 38, 693–699.

KESSLER, R. C., C. L. FOSTER, W. B. SAUNDERS, AND P. STANG (1995): "Social consequences of psychiatric disorders, I: Educational attainment," *American Journal of Psychiatry*, 157(7), 1026–1032.

LOCKSLEY, A., AND F. DOUVAN (1979): *Problem behaviour in adolescence.* New York: Brunner-Mazel.

McCULLOCH, A. (2001): "Ward-level deprivation and individual social and economic outcomes in the British Household Panel Study.," *Environment and Planning*, 33, 667–684.

OECD (2010): "Education at a Glance.," Discussion paper, OECD.

PETERSEN, A. C., B. COMPAS, J. BROOKS-GUNN, M. STEMMLER, S. EY, AND K. E. GRANT (1993): "Depression in adolescence.," *Amercan Psychology*, 48, 155–168.

RICHARD, M., AND R. ABBOTT (2009): "Childhood mental health and life chances in post-war Britain. Insights from three national birth cohort studies," Discussion paper, Center for Medical Health, London.

ROESER, R., J. ECCLES, AND K. STROBEL (1998): "Linking the study of schooling and mental health: selected issues and empirical illustrations at the level of individual.," *Educational Psychologist*, 33(4), 58–66.

ROSEN, S. (1977): "Human capital: a survey of empirical research.," *Research in Labor Economics*, 1, 3–40.

SADOCK, B. J., AND V. A. SADOCK (2000): *Kaplan and Sadock's comprehensive textbook of psychiatry.* Philadelphia, PA, US: Lippincott Williams & Wilkins Publishers.

SEIFFGE-KRENKE, I., AND M. STEMMLER (2003): "Coping with everyday stress and links to medical and psychosocial adaptation in diabetic adolescents," *Journal of Adolescent Health*, 33(3), 180 – 188.

STARK, K. D. (1900): *The treatment of depression during childhood: A school-based program.* New York: Guilford.

STEINHAUSEN, H.-C., AND C. W. METZKE (2000): "Adolescent Self-Rated Depressive Symptoms in a Swiss Epidemiological Study," *Journal of Youth and Adolescence*, 29, 427–440.

SWEETING, H., R. YOUNG, AND P. WEST (2009): "GHQ increases among Scottish 15 year olds 1987-2006," *Social Psychiatry and Psychiatric Epidemiology*, 44(7), 579–586.

THOMAS, C., M. BENZEVAL, AND S. A. STANSFELD (2005): "Employment transitions and mental health: an analysis from the British household panel survey," *Journal of Epidemiol Community Health*, 59, 243–249.

VERNBERG, E. M. (1990): "Psychological adjustment and experiences with peers during early adolescence: Reciprocal, incidental, or unidirectional relationships?," *Journal of Abnormal Child Psychology*, 18, 187–198.

WIGGINS, R., P. SCHOFIELD, A. SACKER, J. HEAD, AND M. BARTLEY (2004): "Social position and minor psychiatric morbidity over time in the British Household Panel Survey 1991-1998," *Journal of Epidemiology and Community Health*, 58(9), 779–787.