Education and Mental Health in Europe: School attainment as a mean to fight depression

Maria Sironi
University of Pennsylvania

ABSTRACT

Poor mental health is a major burden of disease in Europe. The cost to society is substantial and is estimated to increase as the population ages. A high level of education is associated with better health and greater longevity both in developed and developing countries, but little research has been done on mental health and depression. Using a multilevel framework and data collected through the third edition of the European Social Survey, I estimated the association between school attainment and depression in 23 countries across Europe. I found a significant relationship between higher education level and better mental health. The magnitude of this relationship is small but not negligible. Increasing overall education among new generations is not likely to substantially prevent the prevalence of mental disorders in a country, but can attenuate it. The results of the analysis suggest that other factors might help reducing the risk of depression, such as employment and living with a partner. Finally, I argued and showed some evidence that mental health conditions cannot be investigated without considering individuals within their socio-economic context.

Keywords: Mental health, depression, education, European Social Survey, multilevel model.

1. INTRODUCTION

Mental health is currently one of the biggest public health issues facing every country in Europe. Data suggests that mental health problems affect at least one in four people at some time in their lives. The prevalence of mental health disorders is especially high in the European region. Out of 870 million people living in the European region, about 100 million people are estimated to suffer from anxiety and depression (WHO, 2005). Neuropsychiatric disorders are the second greatest cause of the burden of disease after cardiovascular diseases. They account for 19.5% of all disability-adjusted life-years (DALYs – years lost to ill health and premature death). Depression alone is the third greatest cause, accounting for 6.2% of all DALYs and the number of people with these disorders is likely to increase further as population ages. Moreover, in many countries, mental health problems account for 35–45% of absenteeism from work. The economic costs to society of poor mental health is enormous; the International Labor Organization cautiously estimates that the cost of mental disorders account for 3–4% of the gross national product in the Member States of the EU (Gabriel and Liimatainen, 2000). Too often, the widespread stigma attached to mental health problems jeopardizes the development and implementation of mental health policy. Governments have now begun to recognize the importance of mental well-being for all citizens. Mental well-being is fundamental to one's quality of life and, given the large costs to society, policies reducing the risk of mental illness would likely have large private and social returns.

Education is the indicator that most consistently has shown a significant relationship with different measures of health and mortality. A high level of education is associated with better health and greater longevity (Cutler et al. 2006, 2008). Education affects health outcomes through several mechanisms. The main argument is that education, through the enhancement of knowledge and skills, enables individuals to adopt a healthier lifestyle and more coherent health-related behaviors (e.g. less tobacco and alcohol consumption). Moreover, education improves problem-solving abilities and, in turn, increases the possibility to access information about new medical technologies

(Grossman, 1972, 2000, 2005; Smith 2007). Additionally, in recent years, another mechanism has been widely studied: higher levels of schooling might be associated with more favorable psychosocial attributes and greater ability to deal with acute and chronic stress (Lantz et al., 2005; Ross & Wu, 1995; Schnittker & McLeod, 2005). A large body of literature has estimated that there are big effects of education on several health outcomes, yet, mental health has been largely ignored. Estimating the effect of education on mental health is an important policy issue, not only due to its potential to reduce the social costs of depression but also as an additional, and not often discussed, rationale to scale up the delivery of education, showing that there is even greater return to educational investment (Chevalier & Feinstein, 2007). Mental health has been conceptualized by the WHO as a state of well-being in which the individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to his or her community. As a consequence, the main difficulty in addressing mental health is the measurement issue. Self-reported measures of depression are problematic because individuals may misreport or underreport their status due to fear of stigma or lack of awareness of their own mental health status. Measurement error will bias the estimates of the returns to education if it is not independent of the individual's educational attainment.

In this study, I estimate the association between education and an indicator of mental health (mainly depression and anxiety) using information collected in the European Social Survey (ESS), administered in 2006 in 24 countries that are members of the European region. I explored this relationship by employing a two-level model. The hierarchical structure of the data (individuals grouped within regions and countries) enables to control for the possible correlation existing among individuals living in the same country, permitting one to understand how much of the variability in the difference in mental health outcomes is due to country-level variation and how much to individual-level variation. Eventually, multilevel models allow the inclusion of country-level

variables (e.g. GDP, HID) and the evaluation of the importance of country characteristics in explaining individual level variation in mental health.

The ESS is a cross sectional survey and is not able to inform us about the causal nature of the relationship between education and self-reported mental health, but it is possible to shed some light on the theoretical arguments behind this association.

The outline of the paper is the following. An overview of the background literature is presented in section 2, then section 3 discusses data used in the analysis and the multilevel model applied to them. Results are discussed in section 4 and conclusions are articulated in section 5.

2. BACKGROUND

There is limited evidence on the effect of educational attainment on mental health. Depression has been associated mainly with genetic characteristics (Zubenko et al., 2003), childhood environment and prior history (Lewinsohn et al., 1998), age and gender. Depressive symptoms seem to increase with age, due also to an increased prevalence of disability and of poor physical health. Moreover, women report, on average, higher levels of self-reported depressive problems with respect to men. Biological explanations might be found in pre-menstrual hormone fluctuations and the significance of post-maternity depression.

Years of schooling and level of education have been rarely studied as one of the main cause of mental health, but it is an important variable to take into consideration. Investing in education might be one preventive measure to reduce the risk of bad mental health outcomes or to suffer from long-term stress. Like for other health outcomes, the effect of education on depression can be direct or can be established through an indirect channel. For example, education might be associated with other variables (e.g. income, occupation) that influence individuals' mental health. Increasing the years of schooling may help train people in decision-making, problem-solving, perseverance and adaptive skills, all of which are important to cope with stress and reduce the risk to develop

depressive illnesses. However, it is possible that more qualified individuals report fewer mental health problems because of the links between education, occupation and income. Education increases the probability of achieving a higher occupational grade and to benefit from higher earnings (which conceivably lead to greater access to better health care), more control over the working life, more varied and challenging work. All these factors could be at the basis of a lower level of depression (Chevalier & Feinstein, 2007). Furthermore, education reduces the probability to remain unemployed and to divorce, which are two important sources of stress (Jalovaara, 2004). Many difficulties, consequently, are encountered when trying to estimate the influence of education on mental health. Reverse causality can play a role in this relationship: non-cognitive skills, such as attention and self-esteem -associated to higher mental health-, have been found to have an impact on educational attainment (Heckman et al., 2006). Finally, the context in which people live and grow up cannot be disregarded when addressing depression and anxiety. Geography by itself can have a significant role in determining the onset of depression, given its influence on lifestyles, values and weather conditions (Costa-Font & Gil, 2006). Additionally, the socio-economic development of a country can explain an overall low level of depression through a better access to mental health care and less stigmatization of the phenomenon.

Studies addressing European countries do not agree on the effect of education on depression. Costa-Font and Gil (2006) analyzed the degree of socio-economic inequality in reported depression in Spain. They found evidence of a significant role for education in determining socio-economic inequalities in diagnosed depression and that may explain why equality of income would not solve the problem. Another work focusing on United Kingdom found that education significantly reduces the risks of adult depression, especially among women, even if the effect is non-linear and is larger at low to mid-levels of education (Chevalier & Feinstein, 2007). Having a secondary education qualification in Britain, according to their results, appears to reduce the risk of adult depression (age 42) by 5% to 7%. Using a longitudinal study the two authors were able to study the causal effect of

schooling on mental health and to rule out endogeneity problems that may bias the estimates in cross-sectional contexts. An opposite finding is reported in a very recent study on Finland (Johansson et al., 2009). Their estimates point out to mostly insignificant effects of education on common mental disorder and cast doubts on the view that the length of formal education would be a particularly important determinant of mental health later in life. This mixed evidence leaves open the question of whether the burden for the society of mental health problems can be reduced through investing in higher education among new generations.

3. DATA AND METHODS

The data used in this paper comes from the third edition of the European Social Survey, a cross-sectional survey administered in 2006 in 24 countries of the European region. Its main aim is to outline the attitudes of the different regions towards religion, politics, and moral issues, while also depicting their social habits and how they are changing over time.

The main questionnaire covers many different topics and, other than collecting demographic characteristics of the respondent, asks questions related to physical and mental health. Hence, it gives access to information on individuals' number of years of education and their qualification level, their occupational and marital status, some parents' characteristics and depression-related variables. In particular, 18 questions address the mental and psychological situation of the individual in the last week (e.g. "Felt depressed, how often past week", "Felt lonely, how often past week", "Felt sad, how often past week", "Felt anxious, how often past week"). Respondents can give a score to any single item, going from 1 to 4 for some questions and from 1 to 5 to others[1]. Starting from these 18 variables I built a "depression indicator", ranging from 0 to 1: scores given to each question are summed up and then divided by the maximum possible score, equal to 76.

[1] See the Appendix for details about country averages for each component of the indicator

In this way the indicator ranges from 0, when the respondent does not show any sign of depression, to 1, in case of major depression symptoms. The reliability of the depression indicator can be discussed, not having any literature records[2]. However, many well-established indexes are based on very similar questions, e.g. CES-D and GHQ questionnaires (Radloff, 1977; Goldberg, 1978).

As already mentioned we implement a multi-level analysis in order to control for the possible correlation existing among individuals living in the same country and to accommodate macro variables to better understand to what extent country characteristics explain variations in depressive disorders. Citizens of the same country share both observed and unobserved macro-contexts. The multi-level statistical model facilitates the analysis of such hierarchical structure through a decomposition of the error term, one being individual-specific and the other being country-specific (Goldstein, 2003). Our model can be written as follows:

$$MHS_{ic} = \beta_0 + \beta_1 Edu_{ic} + \beta_2 X_{ic} + \beta_3 P_{ic} + \mu DEV_c + u_{0c} + \varepsilon_{irc}$$

where MSH_{ic} represents mental health score of individual *i* in country *c*, Edu_{ic} is the level of education reported by respondents (or the number of years of schooling), X_{ic} is a vector of individual characteristics, P_{ic} is a vector of parents' characteristics and Dev_c is the level of socio-economic development measured at the country level. u_{0c} is the country specific error terms, while ε_{irc} is individual specific. There are several benefits of this modelling scheme. First, the decomposition of the error term ensures that the standard errors for the parameters associated with variables measured at the country level are correctly estimated, hence ensuring that hypothesis tests are reliable. However, a more substantive benefit is that we easily observe to what extent variation in the outcome varies at the different levels of interest. Thus, the typical strategy in this kind of models is to start with a null model, where no explanatory variables are included. As explanatory variables at either the individual or the country levels are added, we

[2] Cronbach's alpha for the 18 variables included in the score is 0.8834

can easily observe to what extent these explain the observed variation in the outcome of interest. The role of country characteristics on explaining the outcome is first observed through its direct effect measured by its coefficient, and secondly, through its ability to reduce variation in the outcome compared to model including just individual-level characteristics. The latter effect is commonly expressed through the intra-class correlation coefficient (ICC) ρ, which is defined as:

$$\rho = \frac{Var(u_{0c})}{Var(u_{0c}) + Var(\varepsilon_{ic})}$$

where $Var(u_{0c})$ is the variance across countries and $Var(\varepsilon_{ic})$ among individuals in country *c*.

One limitation of this analytical framework is that we are not able to estimate the causal effect of education on mental health, given the cross-sectional nature of the data set and the fact that multi-level model cannot correct the possible biased estimates (coming from endogeneity problems).

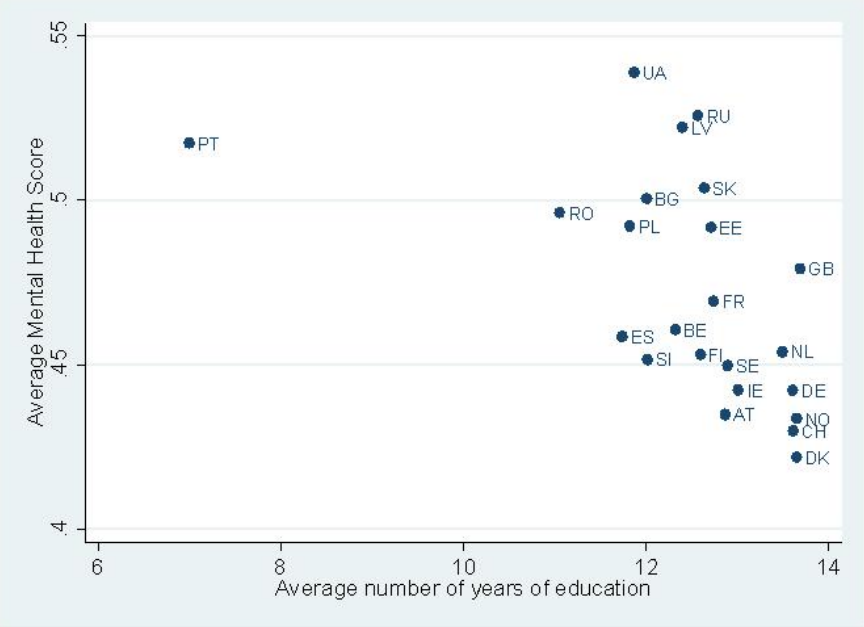
The investigation was carried out in 23 countries throughout the Eurasian region but with different characteristics and diverse institutions including: social democratic countries (Denmark, Finland, Norway and Sweden), conservative countries (Austria, Belgium, France, Germany, Netherlands and Switzerland), liberal countries (Great Britain and Ireland), Southern European (Portugal and Spain) and Eastern European countries (Bulgaria, Estonia, Hungary, Latvia, Poland, Romania, Slovakia, Slovenia and Ukraine). From the original sample of 24 countries I excluded Cyprus because of missing information on education. The sample consists of 29,500 individuals older than 25 years, of which 13,549 are males and 15,951 females. Since women report mental health problems more frequently than men, I considered males and females separately in the analysis. Important characteristics of the sample are described in Table 1, which includes country averages of the main variables used in the analysis.

Table 1. Descriptive Statistics of the main variables used in the analysis, by country

Country	N	% Female	Mental Helath Score (0=Min-1=Max)		Average Sample Age	Average # years of education	Education Level (% in each category)			Self Reported Health - Good or Very Good	% Going to church once a month or more	% with at least 1 child	% Employed	% Currently in a partnership (Marriage or cohabitation)	% with parents employed when 14 years old	
			Mean	St. Dev.			I or <	II	III	%					Father	Mother
Austria	1,541	54.6	0.435	0.10	49.95	12.87	15.83	73.20	10.97	77.6	32.4	74.6	66.00	57.8	92.0	45.4
Belgium	1,288	53.7	0.461	0.11	51.75	12.32	26.09	40.92	33.00	73.5	18.6	81.5	57.07	78.0	91.8	36.6
Bulgaria	773	61.6	0.501	0.13	52.28	12.01	2.98	75.81	21.22	54.6	16.7	88.2	51.23	70.9	94.6	85.3
Switzerland	1,490	54.1	0.430	0.09	52.12	13.62	6.24	65.84	27.92	82.7	25.4	71.0	63.36	66.0	94.6	42.0
Germany	1,907	50.3	0.442	0.10	51.53	13.61	0.68	65.50	33.82	60.0	18.0	74.9	56.48	71.7	90.7	54.5
Denmark	1,201	50.1	0.422	0.09	51.80	13.65	1.25	63.28	35.47	76.7	11.3	81.3	67.19	77.4	95.0	58.5
Estonia	888	57.5	0.492	0.11	52.03	12.71	2.25	70.72	27.03	40.5	9.0	83.7	64.41	67.3	87.6	84.9
Spain	1,329	52.4	0.459	0.11	49.37	11.74	36.42	42.59	20.99	60.5	31.2	71.1	58.54	71.1	94.1	27.6
Finland	1,556	51.5	0.453	0.10	53.02	12.60	21.34	44.09	34.58	63.0	12.5	78.0	55.53	73.3	88.6	71.6
France	1,429	52.2	0.469	0.12	51.27	12.74	20.43	48.08	31.49	62.6	15.0	80.8	58.43	69.2	93.8	46.3
UK	1,698	55.1	0.479	0.11	53.40	13.69	0.65	64.37	34.98	71.7	19.7	76.7	56.07	61.4	91.0	52.6
Ireland	1,074	53.6	0.442	0.10	49.75	13.02	17.69	59.12	23.18	81.5	63.8	71.7	58.29	64.8	91.0	24.2
Latvia	880	64.3	0.522	0.10	50.69	12.40	2.73	69.09	28.18	43.5	17.0	82.6	63.30	59.3	82.8	79.0
Netherlands	1,476	52.5	0.454	0.10	51.33	13.50	9.76	61.65	28.59	71.9	22.2	71.4	60.64	64.3	93.4	27.5
Norway	1,413	48.8	0.434	0.09	50.34	13.65	0.42	58.95	40.62	77.1	12.7	80.3	73.25	75.1	94.7	54.1
Poland	1,062	51.7	0.492	0.13	48.62	11.83	20.81	64.22	14.97	53.4	75.0	84.0	57.34	74.8	87.8	70.0
Portugal	1,621	61.2	0.517	0.12	53.99	6.99	65.08	24.31	10.61	41.8	46.5	82.4	49.72	68.0	97.8	41.8
Romania	1,266	49.8	0.496	0.10	50.91	11.05	12.16	73.62	14.22	49.4	51.0	82.2	43.92	76.5	88.7	54.7
Russia	1,144	59.5	0.526	0.12	49.69	12.57	5.86	62.94	31.21	28.9	12.3	86.5	62.94	58.7	87.2	82.7
Sweden	1,381	50.1	0.450	0.10	51.73	12.90	13.54	47.79	38.67	75.9	10.4	79.8	70.89	74.7	94.1	61.1
Slovenia	1,033	56.3	0.452	0.10	50.75	12.02	21.01	61.67	17.33	54.1	30.2	81.5	54.79	74.2	76.7	50.4
Slovakia	1,080	51.0	0.504	0.10	47.73	12.64	0.93	84.81	14.26	59.4	43.2	81.9	62.50	73.2	92.0	68.4
Ukraine	970	61.8	0.539	0.13	51.82	11.87	10.10	62.89	27.01	28.0	27.5	89.4	49.38	64.9	83.0	82.3
Tot	29500															

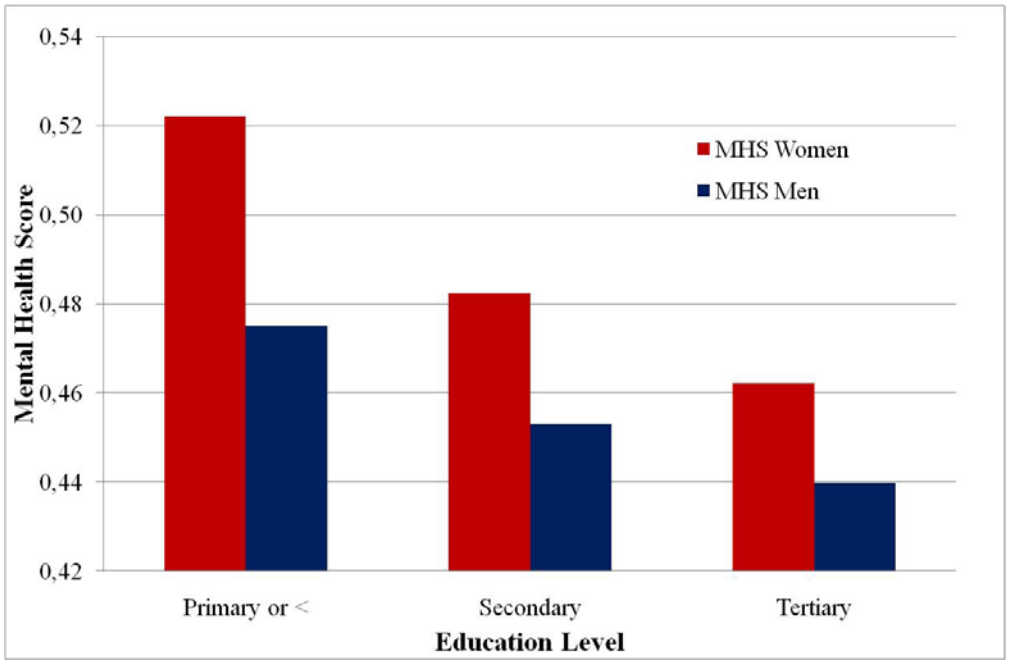
As we can see in Table 1, the country with the lowest score of depression is Denmark (0.422), while it is highest in Ukraine (0.539). The country averages do not show great variability, but it is possible to observe a geographic gradient: the score is generally higher in Eastern Europe and decreases moving from the East to the Continental Europe, achieving its minimum in the Scandinavian region. The average number of years of education ranges from 11 (Romania) to 13.7 (UK and Denmark). Combining information on education and depression we notice that the geographical clustering persists (see Graph 1).

Graph 1. Years of Education and Mental Health Score, by Country



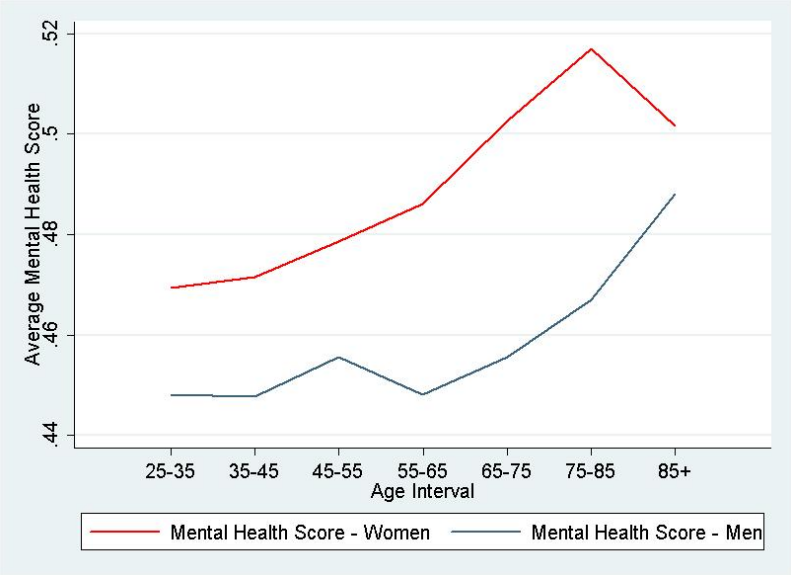
The positive association between mental health and schooling remains when quality of education as well, and not only quantity, is assessed. As we jump from primary (or less) to secondary and from secondary to tertiary education (University or PhD) the average mental health score decreases both among men and among women (see Graph 2).

Graph 2. Average Male and Female Depression Score, by Education Level



Age is another important factor when looking at mental health and depression. Depressive symptoms increase with age, also because of increased disability and poorer physical health. Graph 3 illustrates this increasing trend, again maintaining the distinction between males and females. For women in the last age interval (85 years of age or more) we actually observe a decrease relative to those 75-85 years old, even if fairly small.

Graph 3. Male and Female Mental Health Score, by Age Interval



4. RESULTS

The results of the two-level regressions for men and women are presented separately. Specifications (1) and (2) in Table 2 include only individual-level variables, representing respondent's characteristics. The key variable of interest is education, that is measured as *years of full-time education completed* in (1) and as *education level* in (2). Among several education categories I created three levels of school attainment, that is primary education or less, secondary education (i.e. high school) and tertiary (i.e. University degree, PhD). Our reference category is the lowest level of school attainment, hence we expect negative coefficients (smaller depression score) for the other two categories. In any specification I control for age, as graphs above show that depression increases significantly with age.

Individual characteristics investigated together with education are religious service attendance (=1 if going to church at least once a month), parenthood (=1 if respondent has at least one child), employment status (if with a job or unemployed) and "marital" status (if the respondent is currently in a co-residential union, either a marriage or a consensual unions).

The relationship between religiousness and mental health can be controversial. People may find relief in faith and there seems to be some consensus that higher levels of religiosity may be inversely associated with the prevalence of depression scores and other measure of mental health (Hank & Schaan, 2007; Hackney & Sanders, 2003; Koenig & Larson, 2001; McCullough & Larson, 1999), particularly among older religious adults. People who are involved frequently in organized religion and who highly value their religious faith for intrinsic reasons are at a substantially reduced risk of depressive disorders; however, people who are involved in religion for reasons of self-interest are at a decidedly higher risk for depressive symptoms (McCullough & Larson, 1999). Childbearing, moreover, can be associated with depression and mental disorders among mothers, especially among young mothers (Liao, 2003).

As illustrated in Table 2[3] an additional year of school reduces the mental health score by 0.2%, that is a very small change in absolute value. However, this refers to only one additional year of education. Hence, if we consider an increase in education by 5 years, it leads do a decrease in the depression score by 1%. Considered the low variability of the score both at individual and country level this is not a negligible change. Being a father does not have any association with depression, while having strong religious attitudes (provided that going to church is a proxy for religiousness strength) reduces the score by 0.5%. What seems to be more important to explain differences in mental health is having a partner and being employed. Those who were in a partnership at the time of the survey report a score that is 4% lower than those who are not. Having a job, additionally, reduces depression by 3.2%. The picture does not change when we look at quality of education. Coefficients for individual characteristics remain unchanged, but analysis of the level of education shows how moving from primary to secondary or to tertiary attainment may have some greater effect on depression. Those who went to high-school report a score 2% lower than those who just have primary education or less. Those with a college degree or a PhD do not differ much from those who have secondary education. In fact, they have a mental health score 2.2% lower than those with primary education. I did not include any income measure[4], as to not lose certain countries (i.e. Estonia, Romania and Ukraine) for which income information is missing. Yet, running the model with the income variable and just 20 countries does not show significant changes in our main results.

The intra-class correlation coefficient tells us that the variability of mental health across countries is low, given that the proportion of the total variance accounted for by country-level variance is just 8%.

[3] Given the peculiarity of Portugal (very low education) I replicated my analysis excluding Portuguese. Results stay constant, signs of coefficients are unchanged and their magnitude does not show any remarkable difference.

[4] The ESS reportss household annual income from all sources, providing 12 income categories in which respondents have to place themselves.

Table 2. Factors associated with mental health outcomes, males (13,549 observations)

Depression	(1) Years		(2) Level		(3) Work & Age		(4) Mother		(5) Father		(6) GDP		(7) HDI	
Constant	0.497	***	0.493	***	0.521	***	0.499	***	0.504	***	0.554	***	0.899	***
	(0.011)		(0.011)		(0.017)		(0.012)		(0.012)		(0.013)		(0.049)	
Age	0.002	***	0.002	***	0.001		0.002	***	0.002	***	0.002	***	0.002	***
	(0.000)		(0.000)		(0.001)		(0.000)		(0.000)		(0.000)		(0.000)	
Years of Education	-0.002	***												
	(0.000)													
II Education			-0.018	***	-0.018	***	-0.017	***	-0.016	***	-0.018	***	-0.019	***
			(0.003)		(0.003)		(0.003)		(0.003)		(0.003)		(0.003)	
III Education			-0.022	***	-0.022	***	-0.020	***	-0.020	***	-0.022	***	-0.022	***
			(0.002)		(0.003)		(0.003)		(0.004)		(0.003)		(0.003)	
Church Attendance	-0.005	**	-0.005	**	-0.005	**	-0.005	**	-0.005	**	-0.005	**	-0.005	**
	(0.002)		(0.002)		(0.002)		(0.002)		(0.002)		(0.002)		(0.002)	
At least one child	0.002		0.003		0.003		0.003		0.003		0.003		0.003	
	(0.002)		(0.002)		(0.002)		(0.002)		(0.002)		(0.002)		(0.002)	
In a Partnership	-0.041	***	-0.041	***	-0.040	***	-0.041	***	-0.041	***	-0.041	***	-0.041	***
	(0.002)		(0.002)		(0.002)		(0.002)		(0.002)		(0.002)		(0.002)	
Employed	-0.032	***	-0.032	***	-0.053	***	-0.032	***	-0.032	***	-0.032	***	-0.032	***
	(0.002)		(0.002)		(0.009)		(0.002)		(0.002)		(0.002)		(0.002)	
Age*Employed					0.0004	**								
					(0.000)									
II Education – Mother							-0.007	***						
							(0.002)							
III Education – Mother							0.000							
							(0.004)							
Mother employed when 14							-0.001							
							(0.002)							
II Education – Father									-0.007	***				
									(0.002)					
III Education – Father									0.000					
									(0.003)					
Father employed when 14									-0.009	***				
									(0.003)					
GDP pc (2006 $ ppp, /100)											-0.002	***		
											(0.000)			
HDI (x100)													-0.004	***
													(0.001)	
Variance across countries	0.0008		0.0009		0.0009		0.0009		0.0009		0.0002		0.0002	
Individual Variance	0.0095		0.0096		0.0095		0.0095		0.0095		0.010		0.010	
ICC	0.077		0.083		0.083		0.085		0.083		0.022		0.019	

Note: p-values, +p<=0.10:*+p<=0.05:**+p<=0.01***. Standard errors in parentheses. Each specification includes age^2.

Specification (3) adds information about the interaction between age and working status. It shows that the effect of aging differs between those in the labor force and those who are unemployed. There is a significant association between age and depression among those who are employed, the higher the age the higher the depression score. The effect of age, however, becomes insignificantly different from zero for individuals not in the labor force.

Specification (4) and (5) add some background characteristics related to respondent's parents. I looked at parents' education level and whether they were employed when people in the survey were 14. I expected to find lower levels of depressive disorders among those who grew up in a better environment. Father's and mother's schooling and their occupational status when the respondent was in her adolescence might be proxies for the household environment. Coefficients for respondent's educational attainment and individual characteristics remained constant. Depression is 0.7% lower when parents have a secondary education level, while there is no difference between having parents very low educated and with a university degree. An interesting finding was that it does not matter if the mother was working when respondent was 14, but it does if the father was employed (even though to a small extent given the coefficient of -0.009).

Finally, I investigated the importance of macro-contexts in which individuals take decisions. Specification (6) and (7) include the GDP per capita (2006 $, purchasing power parity) and the Human Development Index (2005)[5], respectively. Both variables are socio-economic development indicators and might be helpful in explaining heterogeneity in mental health across European countries. Nations with a higher degree of development would probably have better health care facilities (including mental health care) and better policies to prevent depressive disorders. In fact, both GDP and HDI have a negative and significant coefficient, but its magnitude is rather small.

[5] See the Appendix for details about country-level variables.

What it is important to notice is that, when we include context variables, the intra-class correlation coefficient ρ decreases from 8% to 2%. Differences in socio-economic development are able to explain more than 70% of the variance in mental health score across countries. Therefore, it is important to take into account economic institutions and the social context in each country, and not only individual characteristics, to better understand factors behind depressive problems.

Results for women (Table 3) do not show large differences relative to those described for men.

As mentioned previously, females have a higher average mental health score (the constant in each specification is higher). Coefficients for education covariates are slightly larger, meaning that schooling contributes more to limit depression among women than among men. On the other hand, being employed and having a partner are less important in the case of females. However, their role remains positive and of similar magnitude as education.

One main distinction between men and women concerns parenthood. We saw that having a child does not influence depression among males. Table 3 shows that motherhood is associated with a 0.5% higher mental health score (higher depression). This result might be due to the different amount of time that mothers and fathers allocate to childcare, with women taking care of their sons and daughters on a more regular basis than their partner (with an increase in the level of daily life stress).

Table 3. Factors associated with mental health outcomes, females (15,951 observations)

Depression	(1) Years		(2) Level		(3) Work & Age		(4) Mother		(5) Father		(6) GDP		(7) HDI	
Constant	0.531	***	0.520	***	0.518	***	0.524	***	0.539	***	0.592	***	0.985	***
	(0.012)		(0.012)		(0.015)		(0.012)		(0.013)		(0.013)		(0.059)	
Age	0.001	***	0.001	***	0.001	**	0.001	**	0.001	***	0.001	***	0.001	***
	(0.000)		(0.000)		(0.000)		(0.000)		(0.000)		(0.000)		(0.000)	
Years of Education	-0.003	***												
	(0.000)													
II Education			-0.026	***	-0.026	***	-0.023	***	-0.023	***	-0.026	***	-0.027	***
			(0.003)		(0.003)		(0.003)		(0.003)		(0.003)		(0.003)	
III Education			-0.040	***	-0.040	***	-0.037	***	-0.037	***	-0.040	***	-0.041	***
			(0.003)		(0.003)		(0.003)		(0.003)		(0.003)		(0.003)	
Church Attendance	-0.009	***	-0.009	***	-0.009	***	-0.009	***	-0.010	***	-0.010	***	-0.009	***
	(0.002)		(0.002)		(0.002)		(0.002)		(0.002)		(0.002)		(0.002)	
At least one child	0.005	*	0.005	**	0.005	**	0.005	**	0.005	**	0.005	**	0.005	**
	(0.002)		(0.002)		(0.002)		(0.002)		(0.002)		(0.002)		(0.002)	
In a Partnership	-0.036	***	-0.036	***	-0.036	***	-0.036	***	-0.036	***	-0.036	***	-0.036	***
	(0.002)		(0.002)		(0.002)		(0.002)		(0.002)		(0.002)		(0.002)	
Employed	-0.021	***	-0.021	***	-0.019	**	-0.021	***	-0.020	***	-0.021	***	-0.021	***
	(0.002)		(0.002)		(0.008)		(0.002)		(0.002)		(0.002)		(0.002)	
Age*Employed					0.0000									
					(0.000)									
II Education - Mother							-0.009	***						
							(0.002)							
III Education - Mother							-0.002							
							(0.004)							
Mother employed when 14							0.002							
							(0.002)							
II Education - Father									-0.008	***				
									(0.002)					
III Education - Father									-0.002					
									(0.003)					
Father employed when 14									-0.017	***				
									(0.003)					
GDP pc (2006 $ ppp, /100)											-0.003	***		
											(0.000)			
HDI (x100)													-0.005	***
													(0.001)	
Variance across countries	0.0011		0.0012		0.0012		0.0012		0.0012		0.0003		0.0003	
Individual Variance	0.0116		0.0116		0.0116		0.0116		0.0116		0.012		0.012	
ICC	0.086		0.092		0.092		0.092		0.092		0.024		0.024	

Note: p-values, +p<=0.10:*+p<=0.05:**+p<=0.01***. Standard errors in parentheses. Each specification includes age^2.

5. CONCLUSIONS AND FUTURE RESEARCH

Analyzing education and mental health problems in Europe sheds some light on how depressive symptoms are associated with both individuals' and country's characteristics. I found, consistently with the literature, that there is higher average depression among women and among elderly. Moreover education is positively correlated with mental health: more qualified individuals show better mental health outcomes. This association is rather small: around 0.2-0.3% lower depression score for any additional year of education and between 2% and 3% lower score for those with secondary and tertiary qualifications (relative to primary or less). However, this effect is not negligible, also considering the low variability in the depression score at individual and country level in the analyzed sample. This suggests that investing in education may have potential long-term benefits on mental health in Europe. Even though it would not be possible to prevent depressive disorders, extending the average number of years of education could attenuate them.

Other individuals' features, moreover, appear to be strongly related to depressive disorders, like being employed and being in a co-residential union. Surely, there is the possibility that educational attainment is connected to working and marital status. Higher education facilitates people in finding a job, or at least is found to decrease the probabilities of unemployment and divorce. Based on these results, men and women with tertiary education, who are employed and currently in a partnership report a depression score that is 10% lower than the one for those with primary education, unemployed and without a partner.

In addition, it is important not to neglect the context in which individuals live and come up with decisions on how to shape their life course. Socio-economic development can explain most of the differences in mental health outcomes across European countries.

This analysis has limitations that need to be considered. The main one was determined by the cross-sectional nature of the European Social Survey. It is not possible to establish causal connections between education and mental health given the possible endogeneity characterizing the relationship.

There might be something, that we are not able to observe, that influences both the risk of being affected by depression and the educational attainment. These factors can be brought back to genetic endowments and/or to health conditions in childhood. Having longitudinal data would help eliminating these time-invariant characteristics in order to establish an unambiguous cause-effect link.

Further investigation on this issue reveals the existence of endogeneity in our specification. This leads to an attempt to estimate the actual causal effect of formal education on mental health in adulthood by using an instrumental variables technique, where parental education levels are used as instruments for individual education. I did not control for differences in the country of residence, but I did find a positive effect of education on mental health (with very similar coefficients to those estimated through the multilevel framework, see the Appendix for details).

The individual physical health returns from education are of considerable importance. It seems that education might impact mental health outcomes as well, thus reducing the risk of showing depressive symptoms throughout life. This could produce the conclusion that in European countries studying hard might not be enough to eradicate depression in adult ages, but certainly makes possible to have better mental health outcomes, especially if schooling comes along with an occupation and a stable partner.

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APPENDIX

Table A. Details on questions included in mental health score

Country	Optimistic about the future	Feel very positive about myself	I feel as if I am a failure*	My life is close to how I would like it to be	Felt Depressed	Felt everything did as effort	Sleep was restless	Were happy*	Felt lonely	Enjoyed life*	Felt sad	Could not get going	Had a lot of energy*	Felt anxious	Felt tired	Felt calm and peaceful*	Felt bored	Felt really rested when you woke up*
	1=Agree Strongly - 5=Disagree Strongly				**How often past week**, 1=None or almost none of the time - 4=All or almost all of the time													
Austria	2.06	2.01	2.12	2.09	1.43	1.56	1.75	2.05	1.42	2.13	1.53	1.46	2.20	1.60	1.78	2.34	1.31	2.22
Belgium	2.45	2.35	2.14	2.41	1.48	1.66	1.82	2.01	1.36	2.05	1.50	1.49	2.46	1.82	1.96	2.37	1.23	2.47
Bulgaria	2.37	2.04	2.28	2.82	1.68	1.84	1.87	2.53	1.58	2.47	1.80	1.60	2.54	1.96	2.11	2.59	1.55	2.41
Switzerland	2.13	2.01	2.19	2.12	1.42	1.65	1.68	1.93	1.26	1.96	1.48	1.37	2.23	1.73	1.89	2.21	1.16	2.26
Germany	2.21	1.94	2.01	2.33	1.50	1.85	1.76	2.23	1.33	2.36	1.47	1.45	2.26	1.22	1.88	2.16	1.24	2.43
Denmark	2.09	2.09	2.36	1.99	1.23	1.71	1.70	2.05	1.17	1.94	1.31	1.46	2.28	1.20	1.94	1.97	1.18	2.40
Estonia	2.32	2.21	2.89	2.64	1.64	1.81	1.87	2.33	1.45	2.25	1.70	1.67	2.39	1.80	2.06	2.27	1.66	2.41
Spain	2.29	1.97	2.17	2.36	1.50	1.65	1.68	2.00	1.41	2.21	1.63	1.57	2.75	1.41	2.02	2.41	1.41	2.41
Finland	2.20	2.11	3.34	2.17	1.24	1.52	1.65	2.21	1.27	2.11	1.28	1.64	2.53	1.34	1.77	2.27	1.26	2.54
France	2.60	2.56	1.86	2.43	1.53	1.66	1.87	2.13	1.53	1.95	1.58	1.36	2.36	1.79	2.07	2.49	1.32	2.57
UK	2.38	2.24	2.48	2.52	1.43	1.67	1.95	2.06	1.40	2.01	1.55	1.63	2.63	1.57	2.13	2.51	1.45	2.83
Ireland	2.12	2.07	2.27	2.25	1.31	1.56	1.67	1.92	1.36	1.95	1.43	1.51	2.41	1.56	1.97	2.30	1.39	2.57
Latvia	2.43	2.34	2.75	2.82	1.86	1.96	1.95	2.60	1.73	2.59	1.87	1.71	2.49	1.93	2.15	2.47	1.57	2.47
Netherlands	2.37	2.29	2.19	2.46	1.38	1.56	1.69	1.99	1.33	2.03	1.53	1.66	2.29	1.79	1.89	2.26	1.21	2.58
Norway	2.23	2.32	2.60	2.24	1.26	1.40	1.58	2.12	1.24	1.79	1.32	1.46	2.46	1.19	1.83	2.10	1.27	2.56
Poland	2.45	2.08	2.50	2.69	1.74	1.76	1.76	2.36	1.48	2.29	1.69	1.68	2.42	1.67	2.12	2.57	1.53	2.62
Portugal	2.52	2.16	2.28	2.72	1.77	2.23	1.81	2.32	1.70	2.40	1.82	1.86	2.63	1.87	2.13	2.53	1.90	2.68
Romania	2.42	2.17	2.04	2.72	1.50	1.66	2.05	2.64	1.55	2.44	1.74	1.68	2.48	1.99	2.07	2.53	1.59	2.44
Russia	2.44	2.17	2.70	2.99	1.76	1.95	2.00	2.39	1.74	2.49	1.92	1.85	2.48	2.08	2.34	2.53	1.65	2.49
Sweden	2.20	2.12	2.82	2.24	1.29	1.48	1.62	2.06	1.29	2.19	1.36	1.49	2.50	1.43	1.95	2.14	1.38	2.63
Slovenia	2.19	2.04	2.27	2.38	1.43	1.57	1.83	2.05	1.40	2.12	1.61	1.61	2.17	1.47	2.00	2.28	1.42	2.47
Slovakia	2.43	2.27	3.10	2.76	1.62	2.10	1.91	2.30	1.61	2.14	1.88	1.74	2.39	1.68	2.20	2.27	1.39	2.49
Ukraine	2.35	2.17	2.78	3.21	1.76	2.14	2.13	2.32	1.91	2.43	2.08	2.01	2.43	2.13	2.51	2.42	1.85	2.34

*reversed scale

Table B. Country-level variables: pc GDP ($ 2006, ppp) and Human Development Index (2005)

Country	**GDP pc - purchasing power parity (2006)**	**Human Development Index (2005)**
	Value/100	**Value x100**
Austria	35.56	94.8
Belgium	34.71	94.6
Bulgaria	10.13	82.4
Switzerland	37.92	95.5
Germany	31.74	93.5
Denmark	36.35	94.9
Estonia	18.38	86.0
Spain	28.55	94.9
Finland	35.20	95.2
France	33.41	95.2
UK	34.98	94.6
Ireland	41.93	95.9
Latvia	15.88	85.5
Netherlands	36.22	95.3
Norway	43.58	96.8
Poland	15.44	87.0
Portugal	21.94	89.7
Romania	10.09	81.3
Russia	11.97	80.2
Sweden	35.16	95.6
Slovenia	24.17	91.7
Slovakia	17.83	86.3
Ukraine	7.64	78.8
Source	UN Stats Division: http://data.un.org/	UN Development Report (2007): hdr.undp.org

Table C. Instrumental Variable Regressions

Depression	**Males**		**Females**	
IV (Parents Education)	(1) Years	(2) Secondary or Tertiary	(1) Years	(2) Secondary or Tertiary
Constant	0.531 ***	0.534 ***	0.584 ***	0.518 ***
	(0.012)	(0.012)	(0.013)	(0.011)
Age	0.001 ***	0.001 ***	0.001 ***	0.001 ***
	(0.000)	(0.000)	(0.000)	(0.000)
Age^2	0.000 ***	0.000 ***	0.000 ***	0.000 ***
	(0.000)	(0.000)	(0.000)	(0.000)
Years of Education	-0.002 ***		-0.006 ***	
	(0.001)		(0.001)	
II or III Education		-0.039 ***		-0.062 ***
		(0.007)		(0.006)
Church Attendance	-0.001	-0.002	-0.006 ***	-0.007 ***
	(0.002)	(0.002)	(0.002)	(0.002)
At least one child	0.009 ***	0.011 ***	0.010 ***	0.015 ***
	(0.002)	(0.002)	(0.003)	(0.003)
In a Partnership	-0.042 ***	-0.042 ***	-0.041 ***	-0.041 ***
	(0.002)	(0.002)	(0.002)	(0.002)
Employed	-0.035 ***	-0.036 ***	-0.021 ***	-0.024 ***
	(0.003)	(0.002)	(0.002)	(0.002)
Father employed when 14	-0.014 ***	-0.015 ***	-0.019 ***	-0.021 ***
	(0.003)	(0.003)	(0.003)	(0.003)
Number of observations	13549	13549	15951	15951

Note: p-values, +p<=0.10:*+p<=0.05:**+p<=0.01***. Standard errors in parentheses. Only second stage of a two-stage least square estimation is reported.