

# **Education as inefficient resource against depressive symptoms in the Czech Republic: cross-sectional analysis of the HAPIEE study**

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Abstract:

**Background:** Increasing educational level of the population could be a strategy to prevent depression. We investigated whether education may offer a greater benefit for mental health to women and to individuals living in socioeconomically disadvantaged areas.

**Methods:** We performed a cross-sectional study using data on 6964 Czech participants of the Health, Alcohol and Psychosocial factors in Eastern Europe study (on average 58 years old; 53% women). Binary logistic regression was used to examine the association of education with depressive symptoms, adjusting for several groups of covariates. Interactions were tested between education and sex as well as between education and socioeconomic advantage of the area of residence.

**Results:** Higher education was strongly associated with lower odds of depressive symptoms, independently of sociodemographic characteristics, health behavior and somatic diseases. This association was attenuated after adjusting for other markers of individual socioeconomic position (work activity, material deprivation and household items). There were no interactions between education and either sex or socioeconomic advantage of the area of residence.

**Conclusions:** We did not find an independent association between education and depressive symptoms after controlling for other socioeconomic markers in a sample with a formative history of communistic ideologies. Women or individuals from socioeconomically disadvantaged areas do not seem to gain a larger mental health benefit from education.

## Introduction

Depression occurs almost twice as frequently in women than in men, affects to a larger extent socioeconomically disadvantaged individuals and is in particular common in Central and Eastern Europe.<sup>1-5</sup> This region has undergone profound structural changes that were initiated by the fall of communistic regimes in 1989, when the countries have transformed their economies from closed and centrally planned toward open and market oriented.<sup>6</sup> Despite major improvements in health and life expectancy of the population after the revolution,<sup>7-9</sup> mental health of several sub-groups of the population may be now threatened. In particular, older adults who grew up, gained education and professional training before the revolution may not be able to adjust to current demands of the rapidly changed society, face socioeconomic disadvantages and be at risk of ill mental health.

Numerous studies suggest that formal education offers benefit for mental health and may protect against depressive symptoms.<sup>10</sup> Several mechanisms may explain this association. High education leads to more fulfilling careers and a higher socioeconomic position (SEP) that can promote the feeling of control over life. It also provides better knowledge, choices and access to healthy life styles and health care, leading to healthier behavior and less somatic morbidity. However, high education can also develop qualities that enable coping with life's problems and stresses, such as a sense of mastery, self-efficacy as well as cognitive and socioemotional skills. Such qualities may provide protection against depressive symptoms independently of individual SEP, health behavior and somatic morbidity. Studies also suggest that the protective effects of education on depressive symptoms are larger for women, the youngest and oldest adults.<sup>11-15</sup> Furthermore, education may also provide a greater benefit for emotional well-being of individuals who were initially socioeconomically disadvantaged,<sup>14</sup> when it acts as a unique resource that enables them to escape socioeconomic hardship.

The Czech Republic, a country situated in Central and Eastern Europe, has recently launched a reform of mental health care with the goal to modernize the outdated and inefficient care of people with mental illness, destigmatize mental disorders and reduce the risks for their development.<sup>2</sup> Education is one of the most important determinants of health in the Czech Republic,<sup>16</sup> however, the proportion of persons with university education is lower than in many countries in the European Union, largely as a consequence of communist ideology that overvalued manual labor and vocational education.<sup>17</sup> Given the high burden of depression in Central and Eastern European countries<sup>1</sup> and the large sex differences and strong socioeconomic gradient in depression,<sup>18,19</sup> it is of great interest to investigate whether women and individuals in socioeconomically disadvantaged areas could gain a greater benefit from

education on their mental health. On a sample of older adults from the Czech Republic, we tested the following three hypotheses: (i) higher education is associated with lower burden of depressive symptoms, (ii) this association is independent of individual SEP, health behavior and somatic morbidity and (iii) the protective effect of education is strongest for women and individuals from socioeconomically disadvantaged areas.

## **Methods**

### **Source of data**

We analyzed data from the Czech arm of the Health, Alcohol and Psychosocial factors In Eastern Europe (HAPIEE) study.<sup>6</sup> HAPIEE is a prospective cohort study designed to investigate the effects of traditional as well as non-conventional risk factors for non-communicable diseases in Central and Eastern Europe during the post-communist transition. The study population in the Czech Republic includes a sample of six following towns: Karviná-Havířov, Hradec Králové, Jihlava, Kroměříž, Liberec and Ústí nad Labem. The methodology of the HAPIEE study has been described in detail elsewhere.<sup>6</sup>

Briefly, the cohort consists of a random sample of men and women aged 45–69 years at baseline, stratified by sex and 5-year age groups and selected from population registers. The baseline data collection was conducted in 2002–04 using face-to-face interviews at participants' homes. A total of 8856 individuals (mean age 58 years, 53% women) took part (response rate 55%). The HAPIEE study was approved by the ethics committees at University College London, UK and the National Institute of Public Health in Prague, Czech Republic. This analysis was additionally approved by the ethics committee at the National Institute of Mental Health in Klecany, Czech Republic. All participants gave a written informed consent.

### **Socioeconomic disadvantage of the area of residence**

We divided the Czech towns into two groups according to their index of socioeconomic deprivation. This index was calculated, using a previously established method,<sup>20</sup> for year 2001, for each district in the Czech Republic based on five material factors and four social factors. Material factors were rate of non-family houses, living space per person (m<sup>2</sup>), rate of households without a care, rate of households without a phone and rate of households that do not own a recreational object (such as summer house). Social factors were unemployment rate, rate of persons living without a partner, rate of persons with only basic education and rate of incomplete families with children. The index is a sum of *z* scores of each factor, with higher values indicating more socioeconomic disadvantage (range –2.4 to 11.9).

The index reached very high levels in two towns (Karviná 11.2, Ústí nad Labem 11.9), very low levels in three towns (Jihlava -2.4; Hradec Králové -2.2 and Kroměříž -2.1) and medium level in Liberec (3.9). In the present study, we operationalized socioeconomic disadvantage of the residence by reaching the high levels of this index and socioeconomic advantage by reaching low levels. Therefore, we excluded participants from Liberec and categorized the remaining individuals into two groups: socioeconomically disadvantaged towns (Karviná and Ústí nad Labem) and socioeconomically advantaged towns (Jihlava, Hradec Králové and Kroměříž).

### **Depressive symptoms**

Depressive symptoms were measured by the 20-item Center for Epidemiological Studies-Depression (CES-D) scale.<sup>21</sup> CES-D is a widely used and validated self-reported measure of depressive symptomatology in the general population. Individuals are asked to rate how often over the past week they experienced 20 different symptoms associated with depression. The items relate to feelings of depressed mood, hopelessness and loneliness as well as changes in appetite, concentration, sleep, enjoyment and other factors, as listed in detail elsewhere.<sup>21</sup> Possible response options are 0 (rarely or none of the time), 1 (some or little of the time), 2 (moderately or much of the time) and 3 (most or almost all the time). The total score ranges from 0 to 60, with higher scores indicating greater severity of depressive symptoms. We defined depressive symptoms with 16 and more points as previous studies identified this is a cutoff suggesting an increased risk of clinical depression.<sup>22,23</sup>

### **Education**

Information about education was collected as a part of the interview as is categorized as follows: (i) primary or lower, (ii) vocational, (iii) secondary and (iv) university.

### **Covariates**

Covariates were chosen based on literature as sociodemographic characteristics, factors related to individual SEP, health behavior and somatic diseases that are associated with education and depression.<sup>1,24,25</sup> Sociodemographic characteristics include age (years), sex (men vs. women), marital status (no partner vs. partner) and social contact (little vs. high social contact, assessed by questions about contact with relatives or friends). Factors related to individual SEP are current work activity (working vs. in pension vs. unemployed vs. other), material deprivation score (assessed by how often individuals did not have money for food, clothing and household bills) and number of owned household items. Health behaviors are smoking status (current

smokers vs. ex-smokers vs. non-smokers), high frequency of alcohol consumption (drinking five times/week or more vs. drinking less), obesity (body mass index  $\geq 30$ ) and physical activity (hours/week). Somatic diseases are self-reported hypertension, diabetes mellitus or hypercholesterolemia, cardiovascular disease (heart attack, angina, ischemic heart disease or stroke) and cancer. Details about the covariates can be found elsewhere.<sup>[23,26–30](#)</sup>

## Statistical analysis

From the 8856 participants, we excluded 1402 citizens of Liberec, 463 persons with missing data on depressive symptoms and 28 persons with missing data on education, leaving 6964 people in the analytical sample. Individuals with missing data on any covariate were kept in the sample. We present data as means  $\pm$  SD, median and interquartile range or frequency (*n*, %), where appropriate. To compare characteristics of the respondents between those with and without socioeconomic disadvantage of the residence as well as between men and women, we used  $\chi^2$  test for categorical variables, independent samples *t*-test for normally distributed continuous variables and Mann–Whitney test for skewed continuous variables.

We performed binary logistic regression to estimate odds ratios (ORs) with 95% confidence intervals (CIs) for the associations of education (independent variable) with depressive symptoms (dependent variable), adjusting for multiple factors combined into four groups that represent mechanisms and pathways that are hypothesized to act as confounder or mediators in the relationship between education and depressive symptoms. Model 0 was adjusted for age and sex; Model 1 for age, sex and other sociodemographic characteristics; Model 2 for age, sex and factors related to individual SEP; Model 3 for age, sex and health behaviors; and Model 4 for age, sex and somatic diseases. In the end, we included all covariates into Model 5. To explore, whether the role of education on depressive symptoms differs by sex, we included two-way interaction terms between sex and education in each model. Similarly, we included interaction between sex and socioeconomic disadvantage of the residence. Likelihood ratio (LR) test was used to assess the interaction effect. In addition, we explored analyses stratified by sex and socioeconomic disadvantage of the residence. The analysis was conducted using STATA.<sup>[15](#)</sup>

## Results

We studied 6964 individuals (on average 58 years old; 53% women, table 1). Higher education was associated with lower odds of depressive symptoms in a dose–response fashion in the age–sex adjusted model (OR for university vs. primary or lower education 0.51; 95% CI 0.40–0.65; *P* for trend < 0.001; table 2). Adjusting for sociodemographic characteristics (Model 1), health

behaviors (Model 3) and somatic diseases (Model 4) slightly attenuated this association, which remained statistically significant ( $P$  for trend  $<0.001$  in all models). Adjusting for factors related to individual SEP (Model 2) diminished the association the most, which lost statistical significance (OR for university vs. primary or lower education 0.83; 95% CI, 0.63–1.08;  $P$  for trend 0.14). In the fully adjusted model, the association of education with depressive symptoms was not significant (OR for university vs. primary or lower education 0.85; 95% CI, 0.64–1.14;  $P$  for trend 0.19).

There was no statistically significant interaction between education and socioeconomic disadvantage of the area of residence ( $P$  values from LR test:  $P = 0.77$  in Model 0,  $P = 0.72$  in Model 1,  $P = 0.81$  in Model 2,  $P = 0.73$  in Model 3,  $P = 0.66$  in Model 4 and  $P = 0.17$  in Model 5). The ORs with 95% CI for the interaction terms are presented in Supplementary table S1. When stratified by socioeconomic disadvantage of the area of residence and adjusted for age and sex, higher education was associated with lower odds of depressive symptoms in individuals from both the socioeconomically advantaged (OR for university vs. primary or lower education 0.51; 95% CI, 0.36–0.71) and disadvantaged residence (OR 0.50; 95% CI, 0.34–0.72) with a similar magnitude of association (Supplementary table S2).

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There was no statistically significant interaction between education and sex either; the  $P$  values for interaction in LR test were  $P = 0.52$  in Model 0,  $P = 0.50$  in Model 1,  $P = 0.72$  in Model 2,  $P = 0.61$  in Model 3,  $P = 0.44$  in Model 4 and  $P = 0.70$  in Model 5 (details shown in [Supplementary table S3](#)). When stratified by sex ([Supplementary table S4](#)), higher education was in a dose–response fashion associated with lower depressive symptoms in both men and women, with a slightly larger magnitude of the association for men (OR for university vs. primary or lower education 0.45; 95% CI, 0.30–0.70) than for women (OR 0.52; 95% CI, 0.38–0.71), when adjusted for age. In women, adjusting for different groups of covariates attenuated the association, but the dose–response pattern remained in all models. In men, when adjusting for factors related to individual SEP in Model 2, the dose–response pattern disappeared. In the

fully adjusted Model 2, the association of education was not significant in either sex, however, the magnitude seemed larger in men (OR 0.76; 95% CI, 0.45–1.26) than in women (OR 0.87; 95% CI, 0.60–1.25).

## Discussion

In the present study, on older adults from a post-communist country situated in Central and Eastern Europe, we found that more educated people had less frequently symptoms of depression; however, the protective effects of high education did not persist after accounting for individual characteristics, in particular factors related to individual SEP. We did not find evidence that education posits a greater protective potential in women or in socioeconomically disadvantaged towns.

This study follows up on previous authors that investigated the possibility of high education as a resource to prevent depression.<sup>10</sup> Some previous studies suggested that education offers benefit for mental health even when factors related to health behaviors, somatic health, work and current socioeconomic conditions were taken into account.<sup>11</sup> This would indicate that the consequences of formal education may go well beyond the easily measurable socioeconomic and health-related factors. High education may benefit people by giving them unique mental resources enabling resilience to stresses, sense of control and higher cognitive functions leading to the ability to learn, adjust and succeed in pursuing emotional needs. Unfortunately, our study does not indicate that education has such an effect on older adults in the Czech Republic, independently from their current socioeconomic circumstances.

Two competing hypotheses have been formulated about who may benefit more from higher education.<sup>12</sup> The theory of ‘resource multiplication’ posits that higher education will be more beneficial for people with previous advantages. Attaining university could further reinforce their already established healthy habits, perpetuating greater protective effects against depression.<sup>31</sup> On the contrary, the theory of ‘resource substitution’<sup>12</sup> suggests that higher education is more impactful for individuals with previous disadvantages. Access to higher education, bypassing barriers to emotional well-being and minimizing the harms of pre-existing socioeconomic deficits, would have larger benefits for individuals who have fewer alternative resources at their disposal. In our study, we could not detect any difference in emotional benefits of education between towns that are on different extremes in socioeconomic resources. We speculate that the differences between towns were not large enough to observe a difference, as the Czech Republic belongs to countries with a rather high equality, with a GINI index in 2004 reaching 27.5.

Previous authors proposed that education had a larger benefit for women than for men in counteracting depressive symptoms,<sup>12,14,32</sup> supporting the theory of resource substitution. As

women have in general fewer resources, such as power, authority, independence and earnings, education may fill in the gaps, making the unavailability of other resources less harmful on mental health.<sup>12</sup> Contrary to Ross and Mirowski and Shaan et al.,<sup>12,14,32</sup> our study is not in line with it as we did not find any statistical interaction between education and sex. However, we cannot exclude that our study was underpowered to reveal a significant interaction. Stratification by sex suggested that the magnitude of the association of education with depressive symptoms could have been even larger in men. This would support the theory of resource multiplication, which is worrying because this implies that the role of education would be to maintain the status quo and promote the privileged while holding back the disadvantaged.<sup>12</sup> However, when high education does not meet adequate socioeconomic conditions, the protective effect of education does not persist for men either.

The cultural contexts and infrastructures following from the centrally planned education system before the revolution may partly explain our findings. Education has been largely influenced by communistic ideologies, aiming at educating people from working classes, with preference on manual labor and technical subjects over intellectual work as well as overemphasis on the collectiveness over individuality.<sup>33</sup> We speculate that such kind of education may not be sufficient to meet the emotional needs of individuals and help them cope with stressors that threaten their mental health. Furthermore, the political regulation of access to high education deprived several individuals from high education if they came from families that did not fulfill ideological-political criteria. Therefore, our sample is largely different than in studies from countries that did not experience such a regulation from the government, where access to high education is mostly regulated by the resources of families. In addition, for those with higher educational attainment, in particular women,<sup>34,35</sup> there could be fewer adequate work opportunities, therefore the value of education as a resource could not be realized. Then, education is not a mean of control over the persons' resources, which can have detrimental consequences on their mental health. To conclude, the effects of education might be different in varying samples and the history of communistic ideologies in our population may have induced 'resistance' of a positive effect of education.

This study has several limitations. Participants in health surveys are in general healthier and more educated, have a higher SEP and may have lower prevalence of depressive symptoms than non-respondents. This may underestimate the burden of depressive symptoms in our study as well as the association of socioeconomic disadvantage with depression. In addition, the study participants were an urban sample, which may not be representative to the whole Czech population. Our study also has a number of strengths. It examined a large population-based sample of individuals residing in a country situated in Central and Eastern Europe, a region



that has been under-represented in previous studies on mental health.<sup>2,24</sup> In addition, depressive symptoms were assessed by a widely used and validated instrument and a high number of well-measured variables enabled adjustment for a wide range of factors.

Our study indicates that the advantages of higher education on mental health do not go beyond the mechanisms, through which material conditions associated with individual SEP affects mental health. As we did not find any evidence that either women or individuals from socioeconomically disadvantaged areas have a greater benefit of education counteracting depressive symptoms, this study does not suggest that increasing access to education for women or in less socioeconomically advantaged areas would help to decrease the burden of depression.

### **Supplementary data**

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Supplementary data are available at *EURPUB* online.

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*Conflicts of interest:* None declared.

**Table 1**

Characteristics of the sample

<b>Characteristics</b>	<b>Value</b>
Depressive symptoms, <i>n</i> (%)	1348 (19)
Education, <i>n</i> (%)	
Primary or lower	878 (13)
Vocational	2581 (37)
Secondary	2540 (37)
University	965 (14)
Sociodemographic characteristics	
Age, mean $\pm$ SD	58.0 $\pm$ 7.1 (range 45–69)
Women, <i>n</i> (%)	3706 (53)
Living with a partner, <i>n</i> (%)	5298 (76)
Little social contact, <i>n</i> (%)	2145 (31)
Socioeconomic position	
Current work activity, <i>n</i> (%)	
Working <sup>a</sup>	3605 (52)
In pension	3056 (44)
Unemployed	206 (3)
Other <sup>b</sup>	47 (1)
Deprivation scale, median (IQR)	0 (3) (range 0–12)
Number of owned items, mean $\pm$ SD	6.9 $\pm$ 2.3 (range 0–12)
Health behaviors	
Smoking, <i>n</i> (%)	
Current smoker	1818 (26)
Former smoker	2050 (30)
Non-smoker	3036 (44)
High alcohol consumption, <i>n</i> (%)	857 (12)
Physical activity (h/week), median (IQR)	10 (15) (range 0–98)
Obesity, <i>n</i> (%)	1762 (26)
Somatic diseases	
Hypertension, <i>n</i> (%)	2564 (37)
Diabetes mellitus/hypercholesterolemia, <i>n</i> (%)	2226 (32)
Cardiovascular disease, <i>n</i> (%)	898 (13)
Cancer, <i>n</i> (%)	418 (6)

Note. IQR, interquartile range.

<sup>a</sup> Working = employed, entrepreneur, self-employed or employed pensioner.<sup>b</sup> Other = housewife or farmer.

**Table 2**

Association of education with depressive symptoms

	<b>OR (95% CI)</b>	<b>P for trend</b>
<b>Model 0: adjusted for age and sex</b>		
Primary or lower	Reference	<0.001
Vocational	0.75 (0.62–0.90)	
Secondary	0.63 (0.52–0.75)	
University	0.51 (0.40–0.65)	
<b>Model 1: adjusted for sociodemographic characteristics</b>		
Primary or lower	Reference	<0.001
Vocational	0.78 (0.65–0.94)	
Secondary	0.64 (0.53–0.77)	
University	0.53 (0.41–0.68)	
<b>Model 2: adjusted for individual socioeconomic position</b>		
Primary or lower	Reference	0.14
Vocational	0.87 (0.71–1.06)	
Secondary	0.84 (0.69–1.03)	
University	0.83 (0.63–1.08)	
<b>Model 3: adjusted for health behaviors</b>		
Primary or lower	Reference	<0.001
Vocational	0.76 (0.63–0.92)	
Secondary	0.64 (0.53–0.78)	
University	0.53 (0.41–0.68)	
<b>Model 4: adjusted for somatic diseases</b>		
Primary or lower	Reference	<0.001
Vocational	0.77 (0.64–0.93)	
Secondary	0.66 (0.54–0.79)	
University	0.57 (0.45–0.74)	
<b>Model 5: adjusted for all covariates</b>		
Primary or lower	Reference	0.19
Vocational	0.92 (0.74, 1.14)	
Secondary	0.87 (0.70, 1.08)	
University	0.85 (0.64, 1.14)	

Notes. Model 1: age, sex, marital status, social contact. Model 2: age, sex, current work activity, material deprivation score, number of owned household items. Model 3: age, sex, smoking status, alcohol consumption, obesity, physical activity. Model 4: age, sex, hypertension, diabetes mellitus or hypercholesterolemia, cardiovascular disease, cancer. Model 5: age, sex, marital status, social contact, current work activity, material deprivation score, number of owned household items, smoking status, alcohol consumption, obesity, physical activity, hypertension, diabetes mellitus or hypercholesterolemia, cardiovascular disease, cancer.

## **Key points**

- In a country situated in Central and Eastern Europe, the association between higher education and lower depressive symptoms was explained by individual socioeconomic position in adulthood.
- The benefit of education on counteracting depressive symptoms does not differ by sex.
- Increasing education of the population would not bring a stronger benefit on mental health for individuals living in socioeconomically disadvantaged areas.

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