Risk of Late-Life Depression Across 10 European Union Countries
Deconstructing the Education Effect

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Objective: Assess influence of education and noneducation-based measures of socioeconomic status on depression, illuminating the cumulative and income-adjusted effects cross-nationally. Method: Cross-sectional study of 22,777 men and women (50 to 104 years) from 10 European countries. Individual-level data were collected from the Survey of Health, Ageing and Retirement in Europe (SHARE). Results: Educational attainment was a strong predictor of late-life depression across all countries. Depression rates ranged from 18.10% in Denmark to 36.84% in Spain, reflecting a North–South gradient. Odds of depression were approximately twice as high among adults with less than a high school education compared with those of greater educational background ($p < .001$). Inverse association between educational attainment and depression remained significant independent of all other sociodemographic variables. Discussion: Socioeconomic disparities in depression persist throughout later life. Variation in impact of education on depression cross-nationally illuminates need for future research into the protective effects of early-life education.

Keywords: late-life depression; social determinants of health; health inequalities

Late-life depression poses serious economic and social concerns for many countries worldwide as it is a debilitating, costly, and often prolonged condition. Thus far, efforts to examine determinants and prevalence of late-life depression have focused primarily on single countries and individual populations, limiting the generalizability of conclusions in cross-national settings (Ganguli, Du, Dodge, Ratcliff, & Chang, 2006; Schoevers et al., 2003). Furthermore, though numerous studies explore the relationship...
between socioeconomic status (SES) and health, few address theoretical gaps in the understanding of causal mechanisms, because measures of SES (primarily income and education) are used interchangeably without adjustment for the independent influence of education on depression (Laaksonen, Roos, Rahkonen, Martikainen, & Lahelma, 2005; Mackenbach et al., 2005; Veenstra, 2000). Research in developmental psychology and psychiatry suggests that increased education may have an independent protective effect in delaying the onset of depression in addition to preventing high levels of stress and depression in late life (Cagney & Lauderdale, 2002; Richards, Shipley, Fuhrer, & Wadsworth, 2004). The degree to which education is protective and whether this effect varies cross-nationally remains unclear. Therefore, this article attempts to first describe variation in prevalence of late-life depression across a unique sample of 10 European Union (EU) countries; and second, to explain observed differences in health–SES gradients by deconstructing the effect of SES highlighting both cumulative and independent effects of education. By delineating the direct and indirect effects of education on mental health status in later life, it is possible to further the understanding of causal pathways between education and late-life depression, primarily through illuminating the relationship between childhood development and mental health in aging.

Although traditionally overshadowed by studies of physical health among working-aged persons, rising prevalence rates and costs of late-life depression have renewed interest in measures of mental health in older adults. Older adults experience the highest level of depression symptomatology of any age group, often resulting in early retirement and lower self-reported health, further exacerbating the fragile dependency ratio (Braam et al., 2005; Karpansalo et al., 2005). Estimates of the global burden of disease cite depression as the fourth leading cause of morbidity worldwide, projected to rise to third in the year 2020 (Hyman, Kessler, Patel, & Whiteford, 2006; Murray &

Author’s Note: Design: This study employed cross-sectional, individual-level data (outcomes, education, income, comorbidities, and additional socioeconomic covariates) collected from international prospective The Survey of Health, Ageing and Retirement in Europe (SHARE, Release 1). Statistical analyses were conducted to determine main outcome measures: relative differences (odds ratios) and absolute differences in the prevalence of late-life depression in individuals by education level, relative inequality indices. The author would like to acknowledge Axel Börsch-Supan, Norman Daniels, Ichiro Kawachi, and members of the SHARE working group for their instrumental comments on the analysis and composition of this article. Please address correspondence to Keren Ladin, Visiting Research Fellow, Mannheim Institute for Economics and Aging (MEA), L13, 17, Universität Mannheim, 68131 Mannheim, Germany; e-mail: kladin@post.harvard.edu.
Lopez, 1997). The annual economic cost of depression has been estimated at €118 billion in 2004 for 28 European countries, whereas the cost of mental illness in the United States has been estimated at $170 billion annually in health care expenditures and lost productivity (Department of Health and Human Services [DHHS], 2002; Sobocki, Jonsson, Angst, & Rehnberg, 2006).

Driven by devastating human and financial costs, much effort has been focused toward understanding the roots of differential depression morbidity among a growing aging population. Studies continue to document the pervasive scope and influence of social determinants on a broad spectrum of conditions, particularly stress-related illnesses, such as ischemic heart disease, diabetes, smoking behaviors, and mental illness (Barnett, Moon, & Kearns, 2004; Kahn, Wise, Kennedy, & Kawachi, 2000; Mackenbach, Cavelaars, Kunst, & Groenhof, 2000). Education presents a robust indicator of SES and influences life chances through multiple pathways, including via income, social position, social support, health behaviors, social mobility, and literacy (Ross, & Wu, 1996).

Income and education are often used interchangeably to represent socioeconomic position in studies evaluating the relationship between socioeconomic position and health. In reality, however, the effects of education and income, although often correlated, are distinct and reflect unique means by which social determinants influence disease. The life course perspective yields fresh insights regarding the direct role of education in predicting life chances, as numerous mental illnesses have modifiable precursors in early life (Miech & Hauser, 2001; Richards et al., 2004). A direct pathway suggests that integral components of early-life education, such as increased stimulation, cognitive development, and social maturation directly promote mental health later in life (Hart et al., 2004; Hetzman, 1999). Early education has also been shown to influence physical well-being, motor development, socioemotional development, attitudes to learning, linguistic development, self-regulation, and health literacy (Kestila et al., 2006). Education predicts life chances indirectly by shaping future occupational opportunities, earning potential, and reducing exposure to environmental toxins. Thus far, isolating the direct effect of education on health, as well as distinguishing between the influence of highly correlated social determinants such as educational attainment and income remain a challenge, particularly in cross-national studies (Jürges, 2007; Miech & Hauser, 2001; Williams, 1995).

This article seeks to answer three main questions, namely what is the predictive influence of education on late-life depression? Does this influence vary across countries? And finally, does the education effect persist independently of alternate socioeconomic markers, in this case, income?
Method

Sample Population

The study population was taken from The Survey of Health, Ageing and Retirement in Europe (SHARE, Release 1), a prospective observational study reflecting a randomly selected sample of 22,777 noninstitutionalized men and women aged 55 years and older living in Austria, Germany, Sweden, the Netherlands, Spain, Italy, France, Denmark, Greece, and Switzerland in 2004 (Börsch-Supan et al., 2005). The comprehensive survey included sociodemographic indicators and data regarding physical, emotional and psychosocial health, and health behaviors. The average age of participants was 66.6 years (standard deviation \[SD\] = 10.2), with ages ranging from 50 to 104 years. Females comprised 55% \(n = 12,267\) of participants with males comprising the remaining 45% \(n = 10,024\); see Table 1). A total of 447 participants were excluded from this analysis because of missing values in the EURO–D scale, while an additional 883 participants were excluded because of missing values in education or other covariates. Surveys were administered by professional survey specialists in an attempt to reduce sampling error, interpretation, and recall biases. Individual response rates varied between countries, from 73.7% in Spain to 93.3% in France, with an average individual response rate of 86.3%. (For a detailed review of sampling methodology, please see Börsch-Supan & Jürges, 2005.)

Measures

Outcome measures of depression. The dependent variable used in this analysis was mental health distress, signified by the presence of depression. Depressive symptomatology was assessed using the EURO–D scale. The EURO–D is a well-established 12-item scale that has been validated in several cross-European studies of depression, with a higher score reflecting a greater degree of depression (Hisham, 2006; Prince, Harwood, Thomas, & Mann, 1998; Prince, Reischies et al., 1999). Respondents were asked to rate the levels at which they had experienced feelings of depression, pessimism, wishing death, guilt, irritability, tearfulness, fatigue, sleeping troubles, loss of interest, loss of appetite, reduction in concentration, and loss of enjoyment during the preceeding month. Responses were coded either 1 meaning presence of feeling or 0 meaning absence of feeling. Respondents were also asked about their history of depression.
### Table 1

**Sample Characteristics**

<table>
<thead>
<tr>
<th>Country</th>
<th>Total</th>
<th>Male</th>
<th>Female</th>
<th>50-60</th>
<th>61-70</th>
<th>71-80</th>
<th>81-104</th>
<th>Low</th>
<th>Mid-Range</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>1,920</td>
<td>802</td>
<td>1,118</td>
<td>553</td>
<td>736</td>
<td>432</td>
<td>199</td>
<td>603</td>
<td>942</td>
<td>375</td>
</tr>
<tr>
<td>Denmark</td>
<td>1,623</td>
<td>743</td>
<td>880</td>
<td>614</td>
<td>471</td>
<td>343</td>
<td>195</td>
<td>410</td>
<td>705</td>
<td>508</td>
</tr>
<tr>
<td>France</td>
<td>1,629</td>
<td>712</td>
<td>917</td>
<td>640</td>
<td>418</td>
<td>389</td>
<td>182</td>
<td>861</td>
<td>465</td>
<td>303</td>
</tr>
<tr>
<td>Germany</td>
<td>2,894</td>
<td>1,348</td>
<td>1,546</td>
<td>930</td>
<td>1,100</td>
<td>613</td>
<td>251</td>
<td>505</td>
<td>1,571</td>
<td>818</td>
</tr>
<tr>
<td>Greece</td>
<td>1,946</td>
<td>854</td>
<td>1,092</td>
<td>746</td>
<td>536</td>
<td>452</td>
<td>212</td>
<td>1,211</td>
<td>418</td>
<td>317</td>
</tr>
<tr>
<td>Italy</td>
<td>2,493</td>
<td>1,114</td>
<td>1,379</td>
<td>761</td>
<td>932</td>
<td>596</td>
<td>204</td>
<td>1,937</td>
<td>376</td>
<td>180</td>
</tr>
<tr>
<td>Netherlands</td>
<td>2,799</td>
<td>1,300</td>
<td>1,499</td>
<td>1,105</td>
<td>876</td>
<td>553</td>
<td>265</td>
<td>1,593</td>
<td>652</td>
<td>554</td>
</tr>
<tr>
<td>Spain</td>
<td>2,297</td>
<td>959</td>
<td>1,338</td>
<td>665</td>
<td>676</td>
<td>635</td>
<td>321</td>
<td>1,960</td>
<td>172</td>
<td>165</td>
</tr>
<tr>
<td>Sweden</td>
<td>2,923</td>
<td>1,368</td>
<td>1,555</td>
<td>945</td>
<td>1,003</td>
<td>624</td>
<td>351</td>
<td>1,530</td>
<td>528</td>
<td>865</td>
</tr>
<tr>
<td>Switzerland</td>
<td>923</td>
<td>433</td>
<td>490</td>
<td>306</td>
<td>294</td>
<td>206</td>
<td>117</td>
<td>483</td>
<td>205</td>
<td>235</td>
</tr>
<tr>
<td>Total</td>
<td>21,447</td>
<td>9,633</td>
<td>11,814</td>
<td>7,265</td>
<td>7,042</td>
<td>4,843</td>
<td>2,297</td>
<td>11,093</td>
<td>6,034</td>
<td>4,320</td>
</tr>
</tbody>
</table>
This analysis used a dichotomized EURO–D scale analogous to a clinical depression diagnosis, which for the purposes of this article was defined as a EURO–D score greater than 3. This cut point has been validated in the EURODEP study, across the continent, against a variety of clinically relevant indicators (Prince, Reischies et al., 1999). Those scoring above this level would be likely to be diagnosed as suffering from a depressive disorder. The estimate of Cronbach’s $\alpha$ reflecting internal reliability of the EURO–D scale in this study is .72.

Independent variables: Education. Educational attainment was classified using the 1997 International Standard Classification of Education (ISCED-97) created by the United Nations Educational, Scientific, and Cultural Organization (UNESCO). Given cross-national variation in educational systems, years of education do not accurately portray high school equivalency. Therefore, the ISCED-97 was used as an instrument transforming data collected from different systems into a comparable international framework. The ISCED-97 scale was designed to “serve as an instrument suitable for assembling, compiling, and presenting comparable indicators and statistics of education both within individual countries and internationally” (UNESCO, 2006). The ISCED-97 has been proven valid cross-nationally and has been used extensively in cross-national European studies and by the Organization for Economic Cooperation and Development (OECD; UNESCO, 2006).

For the purpose of this analysis, the education scale has been divided into tertiles, with low, middle, and high educational categories defined as less than a high school degree (ISCED-97 ranking 0-2), high school equivalency (ISCED-97 ranking 3), and higher educational attainment (ISCED-97 ranking 5-6), respectively. ISCED-97 Levels 0 through Level 2 include preprimary education, primary education, and lower secondary education. The middle educational category in this analysis reflects ISCED-97 Level 3, corresponding to upper secondary education and high school equivalency. In this analysis, high education was categorized as any education beyond high school equivalency. This categorization best isolates the impact of education on life chances by illustrating a dose–response relationship across educational categories. Further analyses reflect that years of educational attainment were highly correlated with the ISCED-97 classifications (UNESCO, 2006).

Additional covariates. Models adjusted for covariates of interest potentially modifying the relationship between education and mental health (see Figure 1). Age (by deciles) and gender were included in all models, as
female gender and increased age have been highly correlated with depression (Prince, Reischies et al., 1999). Income is often used as an indicator of personal wealth and access to quality health care services (Kahn, Wise, Kennedy, & Kawachi, 2000). Given that income has also been strongly associated with depression, several models adjusted for income in an attempt to isolate the independent direct impact of education on depression (Table 2b). Household-size-adjusted annual income per country was converted from a continuous variable into tertiles, where the middle and top tertiles were included leaving the bottom tertile as a reference. Pooled across all countries, the lowest tertile of household-size adjusted annual income was less than €15,600, the middle was between €29,450 and €55,725 annually, and top tertile on average reported more than €55,725 annually. Average income exceeded €45,000 in three countries: Denmark, the Netherlands, and Switzerland. Average income was reported between €30,000 and €45,000 in Austria, France, Germany, and Sweden, and less than €30,000 in Italy, Greece and Spain. The three largest components of income included pension income, employment income, and imputed rent (Börsch-Supan et al., 2005).

Additional covariates thought to mediate the relationship between education and mental health included cohabitation, the presence of chronic diseases (such as cardiovascular disease, hypertension, high cholesterol,
diabetes, lung disease, asthma, arthritis, and osteoporosis), and functional mobility (coded 1 if one or more activities of daily living or instrumental activities of daily living limitations were reported). Figure 1 illustrates ways in which these covariates may influence depression, and thus they were included in the model. When included in the model (Table 2b), low functional mobility was the strongest predictor of depression in the elderly population in comparison with other covariates (Cole & Dendukuri, 2003).

Analysis

Initial bivariate analyses examined the association between depression caseness and educational attainment, age, gender, household-adjusted income, cohabitation, and the presence of chronic illness, illuminating the crude risk associated with fewer years of education. The independent contributions of these variables were then determined via multivariate logistic regression models, using the high education category (greater than high school attainment) as a reference, thus illustrating the dose–response relationship across educational categories. Regression models adjusted for the unequal within-country distribution of education, group size, and cross-cultural differences in survey interpretation by restricting all analyses to the internal country level, thereby circumventing these biases entirely. An age- and gender-adjusted model was constructed to evaluate the cumulative effect of education on health outcomes (Table 2). Table 2b illustrates a multivariate model, which included additional variables including annual household-size adjusted income (delineating the direct influence of education from the indirect via income), cohabitation (accounting a higher degree of social support), functional disability, and the presence of chronic disease. All covariates were adjusted as continuous variables, apart from age (categorized by deciles), gender, and income (categorized by tertiles).

International comparison of socioeconomic-based health gradients is complicated by variation in the population-specific distributions of socioeconomic indicators. The relative index of inequality (RII) explicitly addresses this concern by using information from the entire range of social categories while maintaining sensitivity to the direction of the gradient (Harper & Lynch, 2005). RII were calculated following the methodology outlined by Sergeant and Firth (2006). In each country, every individual was assigned a socioeconomic rank dependent on educational attainment, assuming values between 0 and 1. Assuming that the rate of incidence of the depression, as measured by the EURO–D clinical cut-point, is dependant on education, the resulting RII is calculated by regressing the depression
Table 2
Odds of Depression by Education Level and Country

<table>
<thead>
<tr>
<th>Country</th>
<th>Low Education</th>
<th>Mid-Range Education</th>
<th>Country</th>
<th>Low Education</th>
<th>Mid-Range Education</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sweden</td>
<td>1.22 (.98, 1.51)</td>
<td>1.26 (.95, 1.66)</td>
<td>Sweden</td>
<td>0.96 (0.74, 1.26)</td>
<td>1.13 (0.81, 1.59)</td>
</tr>
<tr>
<td>France</td>
<td>1.5 (1.12, 2.00)*</td>
<td>1.36 (.99, 1.87)**</td>
<td>Denmark</td>
<td>0.97 (0.60, 1.55)</td>
<td>0.90 (0.61, 1.33)</td>
</tr>
<tr>
<td>Switzerland</td>
<td>1.56 (1.03, 2.35)*</td>
<td>0.743 (.43, 1.28)</td>
<td>Italy</td>
<td>0.97 (0.60, 1.55)</td>
<td>0.90 (0.61, 1.33)</td>
</tr>
<tr>
<td>Italy</td>
<td>1.75 (1.24, 2.50)*</td>
<td>0.85 (.56, 1.29)</td>
<td>Denmark</td>
<td>0.97 (0.60, 1.55)</td>
<td>0.90 (0.61, 1.33)</td>
</tr>
<tr>
<td>Netherlands</td>
<td>1.76 (1.34, 2.30)*</td>
<td>1.2 (.87, 1.65)</td>
<td>France</td>
<td>1.19 (0.81, 1.75)</td>
<td>1.52 (1.01, 2.29)*</td>
</tr>
<tr>
<td>Denmark</td>
<td>1.86 (1.33, 2.60)*</td>
<td>1.12 (.82, 1.54)</td>
<td>Austria</td>
<td>1.31 (0.81, 2.12)</td>
<td>0.95 (0.61, 1.50)</td>
</tr>
<tr>
<td>Austria</td>
<td>2.48 (1.77, 3.49)*</td>
<td>1.17 (.83, 1.64)</td>
<td>Greece</td>
<td>1.52 (.95, 2.41)</td>
<td>1.80 (1.08, 2.98)*</td>
</tr>
<tr>
<td>Spain</td>
<td>2.98 (1.99, 4.47)*</td>
<td>1.23 (.72, 2.11)</td>
<td>Netherlands</td>
<td>1.64 (1.17, 2.30)*</td>
<td>1.19 (0.80, 1.76)</td>
</tr>
<tr>
<td>Greece</td>
<td>3.2 (2.22, 4.61)*</td>
<td>1.93 (1.27, 2.93)*</td>
<td>Switzerland</td>
<td>1.74 (1.00, 3.03)*</td>
<td>0.83 (0.41, 1.68)</td>
</tr>
<tr>
<td>Germany</td>
<td>3.37 (2.54, 4.46)*</td>
<td>1.55 (1.21, 1.98)*</td>
<td>Spain</td>
<td>2.00 (1.21, 3.29)*</td>
<td>1.10 (0.57, 2.13)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Germany</td>
<td>2.01 (1.39, 2.88)*</td>
<td>1.39 (1.03, 1.86)*</td>
</tr>
</tbody>
</table>

Note: High education was used as the reference category in all analyses. Values in parentheses indicate the limits of the confidence interval.

a. Multivariate model adjusting for gender, age, income, chronic disease, cohabitation, and functional mobility.

*p < .05. **p < .01.
incidence rate in each educational category on the proportion of the national population of lower socioeconomic rank (Figure 3). A larger RII illustrates a greater relative risk of depression because of low education. (For a detailed discussion of the methodology and derivation of RII, please see Sergeant & Firth, 2006.) Analyses employed the survey data analysis software STATA (version 8.0) and R (Version 2.4.1).

**Results**

Descriptive statistics reflecting sample characteristics are presented in Table 1. The southern European countries show a large gender gap with higher rates of depression among older women, although a significant gender gap exists across all countries. Both past and current depressions are significantly more common among unmarried respondents than among married respondents (Börsch-Supan et al., 2005). National depression rates among participating countries ranged from 18.1% in Denmark to 36.8% in Spain (Figure 2). Although prevalence ranged widely amongst the 10 countries, a clear bimodal distribution was evident between the Nordic/ Eastern European countries reporting depression prevalence rates close to 22% and the Mediterranean countries, with rates close to 34% (Figure 2). Perhaps surprisingly, the distribution fell neatly into two categories (with Italy as the only outlier), mirroring the historic economic disparity of the European North–South gradient, characterized by poorer health outcomes in Southern countries (Laaksonen et al., 2001).

Risk of depression varied by educational attainment, predictably, reflecting that persons with lower rates of educational attainment experienced higher rates of depression (Erikson, 2001). Although individuals with less education were at significantly higher risk of experiencing depression in late life, cross-nationally the risk varied from a 19.93% increased risk in Sweden to a 39.85% and 31.68% increased risk in Spain and Germany, respectively. Rates of depression were on average 15% higher among adults with low education compared with those of high education (mean high education = 15.45%, mean low education = 30.34%, p < .001).

Within-country logistic regression models revealed that unadjusted odds of depression given low education ranged from approximately 3.37 in Germany to 1.5 in France and 1.56 in Switzerland. Analyses confirm that participants with less than a high school education faced odds 1.87 times higher of experiencing depression than individuals who had completed more schooling. Conversely, compared with those without higher education,
participants with a degree were 0.6 times less likely to experience depression in late life (Table 2a). It should be noted that within most countries, the relationship between low education and depression was more significant than the relationship between higher level education and depression, perhaps illustrating the importance of early education. Independent odds lowered from approximately 2.3 to 1.7 when covariates for confounding (body mass index, functional mobility, chronic disease, and cohabitation) were introduced via multivariate logistic regression, illustrating that the education effect does persist independently of other socioeconomic markers such as income. Results of the multivariate model varied between countries, as illustrated in Table 2b.

Cross-national income inequality was not independently a significant predictor of national depression prevalence rates. It is possible that income was not a significant predictor of depression because many of the expenses generally thought to mediate the relationship between income and depression, namely material deprivation, lack of health care access, and necessity to continue working in a low-paying job, may not be directly applicable to this population as many respondents own their homes, are no longer working, and receive highly subsidized medical care and social services. Independent risks included female gender (2.04) and functional disability (1.23).
Figure 3 illustrates the RII plot for each country, comparing rates of depression (y-axis) across educational categories (x-axis), adjusting for the distinct distribution of education and age of each country. This analysis yielded nearly identical results, emphasizing the clear North–South gradient reflected in
depression morbidity across the educational groups. Education-based mental health disparities are least in Sweden (3.88%) and greatest in Spain (21.67%) and Germany (20.09%). In line with the findings above, the internal health disparities between northern and southern countries reflect the North–South gradient discussed in the literature (Kunst, Groenhof, Mackenbach, & Health, 1998). Results revealed that southern countries suffered not only higher prevalence rates of depression but also the greatest gap in the relative risk of depression between individuals with high versus low education. Thus, the analysis suggests that lower educational attainment is a significant risk factor for depression in aging adults, independent of income effects.

Discussion

By using data from the SHARE, a large, representative, cross-national sample, this article is the first to explore the complex influence of education on late-life depression in an international sample. Findings presented in this article clearly demonstrate that low educational attainment predicts increased likelihood of late-life depression. Furthermore, even after controlling for a wide range of potential confounders, the protective effect of education remains significant even beyond its influence as a measure of SES. Prevalence of late-life depression across the SHARE countries resembled the North–South distribution pattern that has been described for many other conditions (Mackenbach et al., 2000). Although the underlying causes for this North–South gradient remain the topic of much debate, historic economic inequality, limited social mobility, and lower levels of social capital have been cited as potential explanations underlying this phenomenon (Marmot, 2001; Wilkinson, 2002). The degree to which education is protective varies cross-nationally, although the underlying reasons remain unclear and a topic for future research.

Three key challenges to deconstructing the role of early-life education on depression emerge from the literature. First, endogenous causality poses a significant challenge in discerning cause and effect of social position and health, as temporal associations between the two can be increasingly tenuous throughout the life course. Second, the influence of absolute versus relative deprivation remains unclear. That is, to what extent is education protective beyond its impact as a measure of income? Third, few studies have focused on whether the impact of specific social determinants on health outcome varies cross-nationally.

This article presents an innovative analytical approach to these three issues. First, numerous studies have faced challenges stemming from the confounded
relationship of income and education. For example, in the United States, persons with low education attainment display higher rates of unemployment, thus living much of their lives without health care coverage (Strine et al., 2004). By studying countries where universal health care coverage is offered, the influence of education as a risk factor for mental health can be more directly examined, as access to health care can be defined as relatively constant (Lauderdale, 2001). It should be noted that although coverage is relatively consistent across countries, it is possible that variations in the quality of care exist.

Second, educational attainment presents a particularly robust indicator of SES, as it is most clearly temporally prior to late-life depression (Jürges, 2007). Endogenous causality is a concern intrinsic to studies examining the relationship between SES and health outcomes. In this case it is possible that the hypotheses presented illustrate one direction in a bidirectional pathway. Given the age and characteristics of this population and the definition of income as the previous year’s annual household income, it seems relatively clear that measures of SES employed in this analysis occurred prior to health outcomes and not the reverse. In addition, it seems likely that educational attainment influenced income, given that low education was defined as less than or equal to high school equivalency. Thus it seems probable that the influence of educational attainment would be prior to and relatively free of feedback from income effects.

Finally, the unique cross-national comparison of depression prevalence rates allows for more generalizable findings, as the population includes ethnic and racial minorities, as well as geographic diversity. This comparison illustrates a more comprehensive framework from which to draw comparisons.

**Limitations**

Although the results suggest strong evidence for a significant impact of both between- and within-country inequality (as defined by educational attainment) on late-life mental health, there are primarily two limitations embedded in the study. The first is that the cross-sectional data were collected via surveys and are subject to social-desirability biases of self-reported surveys. The SHARE project, however, does attempt to minimize this bias by employing professional interviewers; thereby minimizing self-report biases (Cheng, 2001). The second limitation stems from the cross-sectional nature of these data, limiting the ability of this study to establish temporality or fully demonstrate longitudinal causality.
The EURO–D scale has been validated for use in cross-national studies of depression; however, there is some debate whether this has been extensive enough to preclude potential cultural bias limiting the generalizability of the findings (Prince, Beekman, et al., 1999; Prince, Reischies et al., 1999). To address this, all analyses are conducted on an intercountry level, thereby avoiding this bias entirely. Distribution of education was unequal and varied between countries (Figure 3). This potentially serious limitation was overcome by employing regression models adjusting for group size, as well as limiting the analysis internally at a country-level.

**Conclusions**

Despite these limitations, there are numerous advantages to this study design and sample. The large sample population establishes a high degree of statistical power, and strengthens the reliability of the findings. Furthermore, using the life-course approach allows for a comprehensive investigation of the longitudinal influence of education on mental health. Although numerous studies have documented increasing trends of depression in late life, as well as the association between depression and educational attainment, few have attempted to disentangle the direct influence of early-life education on the propensity of developing depression in late life. Implications from the results presented above suggest that despite a vast literature detailing the rather uniform effects of socioeconomic determinants of health, there are important subtleties inherent in the causal pathways of distinct socioeconomic indicators, namely education and income.

International variations in depression prevalence, as well as the impact of education on depression risk reflect important areas for further investigation. In line with the theory that greater levels of health inequity result in increased severity of morbidity, findings presented in this article suggests that countries with lower education rates exhibit higher aggregate depression prevalence. Moreover, in these countries, low education conveys higher risk for depression (Figure 3), perpetuating higher levels of both depression and inequality.

Policies aimed at income redistribution suggest that health disparities could be largely alleviated by a more even distribution of income. However, findings highlighting the inherent value of education suggest that redistribution of income or even the presence of universal health care would not solve this problem entirely. If shown to be a risk factor for depression, primary and secondary education in children present a potentially modifiable risk that can be targeted through improved policies promoting high quality and accessible education in early life. Improved educational attainment also
affects increasing human capital, boosting productivity, augmenting lifetime earnings, improving the socialization of the next generation, and decreasing health care costs. Future research is critical to identifying the specific levels at which education becomes a protective factor. Additional unexplored topics include variation in types of education, duration of the school day, qualification and training of teachers, as well as the potential benefit stemming from enrichment subjects. Although there is much left to be determined with respect to the optimal interventions and policies leading to higher levels of education attainment, it seems clear that the tremendous lifelong benefits of education ensure its place as one of the most effective and influential public health and prevention measures.

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