Original article

The individual and societal effects of non-psychotic serious mental disorders on earnings in Belgium

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Abstract

Purpose. — The purpose of this study is to examine the association between non-psychotic serious mental disorders and earnings in the general population of Belgium on both the individual- and society-level.

Subjects and methods. — Data stem from a cross-sectional population study of the non-institutionalized adult (between 18 and 64) population from Belgium ($N = 863$). The third version of the Composite International Diagnostic Interview (CIDI-3.0) was administered to assess 12-month non-psychotic serious mental disorders and annual earnings. Multivariate approaches were used to estimate the observed and estimated annual earnings for persons with serious mental disorders, controlling for sociodemographic variables and alcohol disorders.

Results. — On the individual-level, 12-month serious mental disorders significantly predicted the probability of having any earnings ($OR = 0.32$; $95\%CI = 0.14–0.74$). Respondents with serious mental disorders had 12-month earnings of 5969€ less than expected in the absence of serious mental disorders. Taking into account the prevalence of serious mental disorders (i.e. 4.9%), the society-level effects of serious mental disorders in 2002 can be estimated at about 1797 million € per year for the Belgian general population.

Discussion. — Non-psychotic serious mental disorders had considerable impact on annual earnings.

Conclusion. — This is the first study in Belgium that addresses the association between mental illness and earnings. Serious mental disorders are associated with individual- and societal-level impairments and loss of human capital.

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Keywords: Mental disorders; Impact; Human capital; Earnings

1. Introduction

Epidemiological research on mental disorders systematically yielded consistent findings on the role of mental disorders in the society. A first finding is that mental disorders are common: by-and-large, between 10 and 25% of the adult general population in western countries meet the criteria for a DSM-IV mental disorder in a given year [12]. A second consistent finding is that these mental disorders have a large impact on the daily life of those who meet the criteria for a disorder. A traditional and often used measure is role functioning or role impairment [8,35]. One major disadvantage of

using role impairment is that it is actually an individual-level measure of impact that provides a valid measure of short-term role impairment. Against the light that mental disorders may have a long-lasting and a societal impact [30], appropriate measures of the impact of mental disorders are strongly needed. Society-level effects of mental disorders can be estimated by their influence on educational attainment [15], or by modelling their effects on income [17]. Especially the effects mental disorders have on earnings are a relatively infrequent albeit interesting measure because the effects of mental disorders on both the individual and society level of productive human capital are estimated. Most research of the effects mental disorders yield on annual earnings stem from the United States. Previous US studies estimated an annual loss of \$44.1 billion in 1985 [33], \$77 billion in 1992 [20], and \$193

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billion in 2002 [25]. Based on the findings from the National Epidemiologic Survey on Alcohol and Related Conditions ($N = 43,093$), income was found to be significantly lower (i.e. between 13 and 16%) in persons with suicide attempts [23]. In the National Comorbidity Survey-Replication ($N = 4982$), income was 35–42% lower for respondents who met the criteria for serious mental disorders [25].

To date, data are still limited in their completeness and comparability. Prior research of the effects of mental disorders on earnings has several limitations. First, most research has been conducted in the United States. There are almost no studies that estimate this influence on a European level. Country-specific estimates might however be important because these may contain concise and detailed implications for policy makers. Second, most (US) studies studied the effects of mental disorders on earnings in employed versus non-employed persons, but there were (except one – [25]) no studies that found the influence of mental disorders among employed persons to investigate whether mental disorders may have an influence on the level of earnings. Third, most studies performed in this field have included data that were not representative for a general population.

In this report we use Belgian data from the European Study on the Epidemiology of Mental Disorders (ESEMEd), a part of the World Mental Health surveys (WMH). The WMH surveys are a consortium of general population surveys using a structured psychiatric interview generating DSM-IV disorders. Data were also gathered on the respondents' annual earnings (before taxes). The aims of this study were: (a) to estimate, with advanced statistical methods, the effect of non-psychotic serious mental disorders on annual earnings and (b) to simulate this effect on the societal-level.

2. Subjects and methods

2.1. Subjects

The European Study on the Epidemiology of Mental Disorders (ESEMEd) is a nationally representative survey that was conducted between April 2001 and June 2002 of the French and Dutch speaking household residents aged 18 or older in Belgium. The initial response rate was 47.5%. In order to increase this moderate rate, 20% of the initial refusers were re-approached, of which 25.4% did participate in the study. Weights were applied to these initial refusers to optimize representativity of the study. This conversion resulted in a final response rate of 50.7%. Internal sub-sampling was used to reduce respondent burden and average interview time and cost by dividing the interview into two parts. Part 1 included the core diagnostic assessment of mental disorders ($N = 2419$). Part 2 included questions about correlates and additional mental and physical disorders administered to all part 1 respondents who met the lifetime criteria for any core disorder plus a probability sub-sample of the other respondents ($N = 1043$). Annual earnings were assessed in part 2, but only of respondents between the ages of 18 and 64 ($N = 863$). Part 2 respondents were weighted by the inverse of their probability

of selection for part 2 of the interview to adjust for differential sampling.

2.2. Methods

2.2.1. Training and field procedures

The central World Mental Health (WMH) staff trained bilingual (Dutch/French) supervisors in each country. The WHO translation protocol was used to translate instruments and training materials [18]. Persons who could not speak Dutch or French were excluded from the fieldwork. Quality control protocols, described in more detail elsewhere [21], were standardized across World Mental Health countries to check on interviewer accuracy and to specify data cleaning and coding procedures. The institutional review board of the organization that coordinated the survey in each country approved and monitored compliance with procedures for obtaining informed consent and protecting human subjects [32].

2.2.2. Mental disorder assessment

The survey used the third version of the Composite International Diagnostic Interview (CIDI-3.0) [24], a fully structured diagnostic interview, to assess mental disorders. Field trials and later clinical calibration studies showed that all the disorders considered herein were assessed with acceptable reliability and validity in the original CIDI [36]. The recent clinical reappraisal studies carried out in four WMH countries have provided evidence for a good concordance between CIDI-3.0 diagnoses and diagnoses based on blinded re-interviews, with area under the receiver operator characteristics curve ranging between 0.73–0.93 for lifetime mood/anxiety disorders, and 0.83–0.88 for 12-month mood/anxiety disorders [19]. Disorders were assessed using the definitions and criteria of the *Diagnostic and Statistical Manual of Mental Disorders, fourth edition (DSM-IV)* [2]. Serious mental disorders were defined accordingly to criteria stipulated in the Alcohol, Drug Abuse, and Mental Health Administration (ADAMHA) Reorganization Act [27]. We used this classification of “serious mental disorders” instead of “severe and persistent illness” since the number of ESEMEd respondents with severe and persistent mental illness was too small for reliable analysis. “Serious mental disorders” were considerably more prevalent and included severe and persistent mental illness plus either a 12-month suicide attempt with serious lethality intent, an impulse control disorder with repeated serious violence, or any other disorder that resulted in 30 or more days in which the respondent could not carry out daily activities as usual in the 12 months before interview. All other 12-month DSM-IV/CIDI mental disorders were included in a second category, while other lifetime mental disorders constituted a third category. Controls were included for 12-month and other lifetime DSM-IV alcohol abuse disorders, with or without dependence.

2.2.3. Assessment of annual earnings

Respondents were asked to report their personal earnings in the past 12 months, before taxes. Respondents were instructed

to count only wages and other stipends from employment (excluding pensions, investments, or other financial assistance). Earnings were divided into quartiles in the sub-sample of respondents who had any earnings to define (i.e. 79.0% of the sample). The 12-month earning categories used for the Belgian sample were: (a) low earnings (less than 10,000€), (b) low-average earnings (higher than 10,000€ but lower than 15,000€), (c) high-average earnings (higher than 15,000€ and lower than 26,200€), and (d) high earnings (>26,200€). We also included an inflation factor of 13.2% to generate recent estimates. This factor was calculated from an annual mean inflation of 2.09% in Belgium between 2001 and 2007 [13]. Applying this inflation rate enabled us to adjust our earnings estimates, and thus to provide estimates for 2007.

2.2.4. Statistics

Data are provided in numbers (*N*), weighted proportions (%), means (*M*), and standard errors (*SE*). In order to estimate the effect of serious mental disorders on annual earnings, both logistic regression analysis and general linear models were used. Three analyses were used to elucidate the relationship between serious mental disorders and annual earnings. The first analysis (model 1) estimated the effect of serious mental disorder on annual earnings in the entire sample (*N* = 863), without including other mental disorders as a control variable. The second analysis (model 2) estimated the predictive values of serious mental disorders on having earnings or not among those respondents with serious mental disorders (*N* = 66). The third analysis (model 3) estimated the effect of serious mental disorders on the level of earnings among those respondents with serious mental disorders who reported to have earnings (*N* = 46). General linear models were used for continuous dependent variables (in models 1 and 3); multiple logistic regression was used for the binary dependent variable (of model 2). Results were unadjusted in model 1 and adjusted for the possible influence of age, sex, and alcohol disorders in models 2 and 3.

We used general linear models (GLM) to estimate the effect of serious mental disorders on earnings [25]. To model the effects of mental disorders on the annual earnings properly, GLM was used using pre-specified non-linear relationships and specified error structures to estimate one-part models. GLMs fit highly skewed earnings data better than two-part models [6,26]. Simulations yielded two estimates of predicted earnings for each respondent. The first estimate was based on the actual characteristics of the respondent (i.e. meeting criteria for serious mental disorders); the second was based on the counterfactual assumption that none of the respondents had a serious mental disorder. Individual-level differences between these estimates were then averaged across all respondents with serious mental disorders to estimate the mean individual-level decrease in earnings associated with serious mental disorders. Society-level differences were obtained by the estimated prevalence of serious mental disorders and by the size of the non-institutionalized Belgian general population between the ages of 18 and 64. Demographic rate standardization [34] was then used to decompose

societal-level estimates into components based on the effects of serious mental disorders on (a) the probability of having any earnings and (b) the effects of mental disorders on the amount earned by respondents with earnings. More details on the statistical methods used to model the effects of serious mental disorders on annual earnings are described elsewhere [25].

3. Results

3.1. Distribution of annual earnings

The prevalence rates of DSM-IV mental disorders were 4.9% for 12-month serious mental disorders, 9.6% for other 12-month mental disorders, and 13.8% for other lifetime mental disorders (Table 1). There were no significant gender differences in the distribution of our three mental disorder categories ($\chi^2 = 2.09$, ns). About eight in 10 respondents (i.e. 79.0%) reported any earning in the past 12 months, with significantly more male respondents than female reporting any earning (85.9 versus 71.2%, respectively; $\chi^2 = 10.15$, $p < 0.05$). Males were significantly more likely than females

Table 1
Sociodemographic characteristics of the sample.

	Total (<i>N</i> = 863) % (SE)		Male (<i>N</i> = 385) % (SE)		Female (<i>N</i> = 478) % (SE)	
<i>Mental disorders</i>						
12-month SMI	4.9	1.0	4.4	1.5	5.4	1.5
Other 12-month disorders	9.6	1.1	8.3	1.5	10.9	1.8
Other lifetime disorders	13.8	1.9	10.9	1.9	16.7	2.5
<i>Annual earnings</i>						
Any 12-month earnings	79.0	1.5	85.9	2.2	72.0	3.0
<i>Earning categories</i>						
Low earnings	31.6	2.7	25.8	4.0	38.6	5.2
Low-average earnings	15.8	1.8	15.5	2.5	16.3	2.8
High-average earnings	37.0	2.8	35.7	2.6	38.5	5.0
High earnings	15.6	2.3	23.0	3.8	6.6	1.7
<i>Sociodemographic and clinical controls</i>						
<i>Sex</i>						
Male	50.3	2.3	—	—	—	—
Female	49.7	2.3	—	—	—	—
<i>Age</i>						
18–24	13.9	1.6	14.0	3.3	13.8	3.4
25–39	35.9	2.0	33.5	2.4	38.3	3.2
40–54	34.9	2.2	35.1	4.3	34.7	3.4
55–64	15.3	1.7	17.4	2.8	13.2	1.5
<i>Alcohol disorder^a</i>						
Other lifetime dependence	1.7	0.6	2.8	1.3	0.5	0.3
12-month abuse	1.1	0.3	1.5	0.5	0.6	0.3
without dependence						
Other lifetime	6.8	1.3	11.4	2.0	2.2	1.0
abuse without dependence						
12-month dependence	0.6	0.3	0.5	0.4	0.7	0.5

^a The four categories of alcohol disorders are mutually exclusive. Respondents with a lifetime history of alcohol dependence who were in partial remission in the 12 months before interview were coded as having 12-month dependence. Only respondents who did not meet the criteria for a 12-month disorder were eligible for classification as having a lifetime disorder.

to have high earnings (23.0 versus 6.6%; $\chi^2 = 5.23$, $p < 0.05$). Respondents between the ages of 25 and 54 reported the highest earnings, with slightly more male respondents in the highest age category ($\chi^2 = 0.41$, $p < 0.05$). Lastly, alcohol disorders were common among male respondents, but this was only the case for lifetime abuse and dependence ($\chi^2 = 18.23$, $p < 0.05$ and $\chi^2 = 7.85$, $p < 0.05$, respectively) and not for 12-month disorders ($\chi^2 = 2.94$, ns and $\chi^2 = 0.10$, ns, respectively).

3.2. Individual effects of serious mental disorders on earnings

The first analysis (model 1) estimated the effect of serious mental disorder on annual earnings in the entire sample, without including control variables. This analysis resulted in a non-significant effect of serious mental disorders on earnings ($\beta = -0.38$; 95%CI = -0.95 to 0.20 , $p = 0.19$). However, if this analysis was disaggregated by the separate effects of serious mental disorders on having earnings or not (model 2), a different picture emerges. Respondents with serious mental disorders (compared to those without) were significantly less likely to have earnings (OR = 0.32; 95%CI = 0.14 – 0.74 , $p < 0.01$). A third analysis (model 3) estimated the effect of serious mental disorders on the level of earnings among those who reported to have earnings. Serious mental disorders did not have a significant effect on the level of earnings ($\beta = -0.06$; 95%CI = -0.49 to 0.38 , $p = 0.79$). This may be due to the lack of power following the small sample of persons with serious mental disorders who declared to have earnings ($N = 46$). Nevertheless, we want to illustrate our estimates of the population impact of serious mental disorders on annual earnings through a comparison of the mean observed and mean expected earnings for both male and female respondents (Table 2). In the sub-sample of respondents with serious mental disorders, the expected annual earnings of respondents approximate (in the absence of serious mental disorders) 15,722€, compared with the mean observed earnings of 9748€ in those with serious mental disorders. The difference is estimated at 5974€ per year or 498€ per month (or 37.9% of the expected earnings), being the estimated effect of serious mental disorders on annual earnings. The effect of serious mental disorders is higher for men (i.e. 9768€ per year, or 41.1%) than for women (2859€ per year, or 31.3%). This simulation was repeated among respondents who declared to have earnings. Similarly, we found a difference between the

estimated annual earnings for respondents without and with serious mental disorders: 21,207 and 14,117€, respectively. Again, the estimated effect of serious mental disorders was higher for male respondents (i.e. 11,085€ per year) than for female respondents (i.e. 734€ per year).

After applying the mean annual inflation factor in Belgium for the period 2001–2007 (i.e. 2.09% per year – [13]), we could see that in a simulation for 2007, the adjusted losses in earnings for persons with serious mental disorders (compared to those without) are about 6763€ per year (or 563€ per month), with ranges between 3236€ for women (or, about 270€ per month) and 11,057€ for men (or, about 921€ per month).

3.3. Societal effects of serious mental disorders on earnings

We projected the individual effects to the 6,137,923 persons aged 20–64 in the non-institutionalized general population living in Belgium (3,086,142 males and 3,051,781 females) in the time span this survey was performed [14], taking into account the estimated prevalence of 12-month serious mental disorders in Belgium (i.e. 4.9% for the whole sample; 4.4% for male and 5.4% for female respondents). Based on our analyses, the number of Belgian adult inhabitants with serious mental disorders is estimated at approximately 300,758 persons (135,790 males and 164,796 females). The society-level effects of serious mental disorders were about 1797 million € per year, with markedly higher society-level impact for males (about 1317 million €) than for females (about 472 million €).

4. Discussion

In accordance with studies performed in the United States (e.g. [17,20,25,33]), our data suggest that mental disorders are connected with a considerable loss of productive human capital. In this, our findings may add to studies that have shown that mental disorders have a major burden in the society. Most of these studies however did not estimate the effects of mental disorders on a society-level. Compared to the only study that used the same methodological approach [25], we could not find evidence that serious mental disorders resulted in lower earnings among respondents who reported to have earnings at all. As this is the first Belgian study that estimates the impact of serious mental disorders on earnings,

Table 2

Effects of non-psychotic serious mental disorders on the expected and observed annual earnings (in €) in Belgium, estimates for 2002.

		Total sample M (SE)	Male respondents M (SE)	Female respondents M (SE)
All respondents with SMI	Mean observed earnings in €	9748 (1101)	14,022 (1430)	6250 (791)
	Mean expected earnings in €	15,722 (1906)	23,790 (2426)	9108 (1153)
	Mean estimated impact of SMI in €	5974 (285)	9768 (653)	2859 (367)
All respondents with SMI and earnings	Mean observed earnings in €	14,117 (773)	14,886 (1336)	12,893 (665)
	Mean expected earnings in €	21,207 (1357)	25,971 (2330)	13,628 (703)
	Mean estimated impact of SMI in €	7090 (390)	11,085 (556)	734 (529)

we could not rule out whether our findings are a systematic or a more spurious finding. In any case, it is quintessential to acknowledge that mental disorders yield important societal burden. For example, cost-of-illness studies have shown that up to a third of illness-related days may be attributed to the comorbidity of mental disorders [3,29]. Yet, only 6% of the Belgian health care budget is spent on the treatment of mental disorders [37].

We could not investigate why exactly annual earnings were much lower for persons with serious mental disorders; the precise pathways that link mental illness and lower earnings should be a subject of further investigation. Against this, there are a few plausible explanations. It could be that persons with serious mental disorders were much more unlikely to be employed. To the extent that this is the case, attention should be paid to increased job training or vocational rehabilitation for persons with serious mental disorders. Moreover, supported working programs have been shown to be effective intervention approaches for persons with serious mental disorders [9]. Against the low age of onset of mental disorders in Belgium [5], it is also plausible that serious mental disorders may have adverse effects on adult employment states through their effects on educational attainment [15]. The pathway proposed in the previous study would be that mental disorders may lead to early school termination, that could, in turn, lead to long-lasting decrements in socio-economic situations. Since there are no systematic studies performed in this field, our explanations remain speculative.

The gender differences we found in the study are interesting to discuss. First, while it is generally known that women have a higher likelihood to meet the criteria for 12-month DSM-IV disorders [12], this is not the case for serious mental disorders. Indeed, after applying a severity gradient, the prevalence figures for serious mental disorders are quite similar for men and women. Second, the economic impact of serious mental disorders was higher for men than women. Indeed, we estimated that serious mental disorders were associated with a decreased earning of approximately 270€ per month for women, compared to 921€ per month for men. Thus, the individual-level impact of serious mental disorders is about three times higher for men than for women. In part, this could be related to the fact that women who meet the criteria for a major depressive episode were less likely to be in the workforce [28]. But this finding may also reflect the gender inequalities in earnings: to date, in the European Union, women are still less likely to have equal earnings as men, even in the same occupational positions [7].

We believe that our estimates of serious mental disorders on annual earnings are somewhat underestimated because of several reasons. First, the instrument we used did not include estimates for a number of mental disorders that are generally known to have more societal impact (e.g. mental disorders due to a medical condition, or psychotic spectrum disorders) than those who were included in the survey. Moreover, the ESEMeD study did not assess persons hospitalized in institutions, incarcerated in prisons, or the homeless. Among these populations, serious mental disorders are estimated in the

22–33% range [20,22]. Second, there is a bulk of studies that have shown that, not only in clinical but also in general population samples, mental disorders are often comorbid with chronic physical conditions (such as back or neck pain, migraine, or arthritic pain). The comorbidity between 12-month mental disorders and 12-month physical conditions has in Belgium been estimated to be between 43 and 48% [3]. We believe that, if we would have included these physical conditions in our prediction models, the estimated decrements in annual earnings would have been greater, especially in the light that comorbid pain conditions and mental disorders yielded additional negative effects of role impairment [11].

The results presented here should be interpreted against the following limitations. First, the implications of our results are limited to the disorders included in the analyses. Psychotic disorders were not included in the Belgian version of CIDI-3.0 for reasons of reducing respondent burden. The present analyses may have therefore underestimated the associations between serious mental disorders and earning because we did not examine the possible effects of this group of disorders. For example, persons with psychotic disorders had 27–74% lower odds to be employed compared to persons without psychotic disorders [31]. But also among those who were employed, psychotic disorders were significantly associated with lower earnings [16]. Second, our data stem from the use of a full-structured psychiatric interview. This implies that, among others, earnings were assessed using self-reports rather than financial or administrative records. However, the estimates of annual earnings we obtained in this study were quite comparable with the national figures. The mean annual income (after taxes) per Belgian inhabitant (in the 20–64 age range) in the period 1997–2005 was estimated at 9899€ [14]. By contrast, in this study the mean annual earning before taxes in the period 2001–2002 approximated 15,147€. If we adjust this income for applicable tax rates in this period [4], the earnings after taxes were estimated in the 9090–10,600€ range, a feature that fits well with the national earnings after taxes (i.e. 9899€). Third, our data did not allow us to make any causal inference on the association between serious mental disorders and annual earnings, although we may assume that there is a reciprocal effect of low earnings on the risk of mental disorders [10]. Fourth, the response rate of the sample was moderate. Although weighting strategies were used to optimize the representativity of the study, it is plausible that our results were biased because persons with serious mental disorders might have been less likely to participate in this study. Although the prevalence of mental disorders is independent in ESEMeD countries with lower response rates [1], we could not rule out that the low response rates may have biased the association between serious mental disorders and earnings. May be the most important limitation, the fifth, pertains to the relatively small response rate. Our estimations of differences in earnings were based on a sample of 66 persons who met the criteria for serious mental disorders and 797 persons without serious mental disorders. Indeed, we should stress that our results are more likely indicative of the associations between serious mental disorders and earning.

The sums of the loss of earnings on the national level should therefore be interpreted as an indication and first estimate of the differences in earnings than definite facts. It is evident that our estimates should be refuted, confirmed, or refined in further studies.

5. Conclusion

From this first Belgian study investigating the relationship between serious mental disorders and annual earnings, three main findings stand out. First, serious mental disorders were associated with significant decreased odds of having any annual earnings but not with having lower earnings. Second, the decrease of annual earnings in persons with serious mental disorders is estimated to be about 38%, with marked differences between male and female respondents. Third, on the level of the Belgian general adult population (younger than 65), serious mental disorders were associated with a loss of approximately 1800 million € in personal earnings per year.

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