Gac Sanit. 2017;31(1):2–10

Original article

Health conditions and role limitation in three European Regions: a public-health perspective

Gabriela Barbaglia[a,b], Núria D. Adroher[c], Gemma Vilagut[b,d,e], Ronny Bruffaerts[f], Brentan Bunting[g], José Miguel Caldas de Almeida[h], Silvia Florescu[i], Giovanni de Girolamo[j], Ron de Graaf[k], Josep Maria Haro[l,m], Hristo Hinkov[n], Vivianne Kovess-Masfety[o], Herbert Matschinger[p], Jordi Alonso[b,d,e,*]

[a] *Agency for Health and Quality Assessment of Catalonia (AQuAS), Barcelona, Spain*
[b] *Universitat Pompeu Fabra, Department of Experimental Sciences and Health, Faculty of Public Health and Education in Health Sciences, Barcelona, Spain*
[c] *University of Lucerne, Faculty of Humanities and Social Sciences, Department of Health Science and Health Policy, Lucerne, Switzerland*
[d] *Health Services Research Unit, IMIM-Institut Hospital del Mar d'Investigacions Mèdiques, Barcelona, Spain*
[e] *CIBER de Epidemiología y Salud Pública (CIBERESP), Spain*
[f] *Universitair Psychiatrisch Centrum, KU Leuven (UPC-KUL), Leuven, Belgium*
[g] *University of Ulster, School of Psychology, Research Institute of Psychology, Northern Ireland, United Kingdom*
[h] *Universidade Nova de Lisboa, Faculty of Medical Sciences, Mental Health Department, Lisbon Portugal*
[i] *National School of Public Health, Management and Professional Development, Bucharest, Romania*
[j] *Centro San Giovanni di Dio Fatebenefratelli, Brescia, Italy*
[k] *Netherlands Institute of Mental Health and Addiction, Utrecht, The Netherlands*
[l] *Parc Sanitari Sant Joan de Déu, Fundació Sant Joan de Déu, Sant Boi de Llobregat (Barcelona), España*
[m] *CIBER en Salud Mental (CIBERSAM), Spain*
[n] *National Center for Public Health Protection, Department of Mental Health, Sofia, Bulgaria*
[o] *Université Paris Descartes, Department of Epidemiology, Evaluation and Health policies, Paris, France*
[p] *University of Leizpig, Department of Social Medicine, Occupational Health and Public Health, Leipzig, Germany*

ARTICLE INFO

Article history:
Received 24 March 2016
Accepted 26 July 2016
Available online 17 October 2016

Key words:
Common health conditions
Role limitation
Disability
Population attributable risk

ABSTRACT

Objective: To describe the distribution of role limitation in the European population aged 18-64 years and to examine the contribution of health conditions to role limitation using a public-health approach.
Methods: Representative samples of the adult general population (n = 13,666) aged 18-64 years from 10 European countries of the World Mental Health (WMH) Surveys Initiative, grouped into three regions: Central-Western, Southern and Central-Eastern. The Composite International Diagnostic Interview (CIDI 3.0) was used to assess six mental disorders and standard checklists for seven physical conditions. Days with full and with partial role limitation in the month previous to the interview were reported (WMH-WHODAS). Population Attributable Fraction (PAFs) of full and partial role limitation were estimated.
Results: Health conditions explained a large proportion of full role limitation (PAF = 62.6%) and somewhat less of partial role limitation (46.6%). Chronic pain was the single condition that consistently contributed to explain both disability measures in all European Regions. Mental disorders were the most important contributors to full and partial role limitation in Central-Western and Southern Europe. In Central-Eastern Europe, where mental disorders were less prevalent, physical conditions, especially cardiovascular diseases, were the highest contributors to disability.
Conclusion: The contribution of health conditions to role limitation in the three European regions studied is high. Mental disorders are associated with the largest impact in most of the regions. There is a need for mainstreaming disability in the public health agenda to reduce the role limitation associated with health conditions. The cross-regional differences found require further investigation.

Enfermedades comunes y discapacidad en tres regiones europeas: una perspectiva de salud pública

Palabras clave:
Trastornos físicos
Trastornos mentales
Discapacidad
Proporción atribuible de riesgo

RESUMEN

Objetivo: Describir la distribución de la discapacidad en población europea de 18 a 64 años de edad y analizar la contribución de los trastornos físicos y mentales con una perspectiva de salud pública.
Métodos: Se analizaron muestras representativas de población general adulta (n = 13.666) de 10 países europeos participantes en la Iniciativa Mundial de Encuestas para la Salud Mental *(World Mental Health Surveys Initiative)*, agrupados en tres regiones: Centro-Oeste, Sur y Centro-Este. La

* Corresponding author.
E-mail address: jalonso@imim.es (J. Alonso).

http://dx.doi.org/10.1016/j.gaceta.2016.07.008

Entrevista Diagnóstica Internacional Compuesta (CIDI 3.0) se utilizó para evaluar seis trastornos mentales, y siete trastornos físicos fueron autorreportados a partir de una lista estandarizada. Se contabilizaron los días con discapacidad parcial y total del mes previo a la entrevista utilizando una versión modificada de la escala WHO-DAS. Se calcularon las fracciones de riesgo atribuible (PAF).

Resultados: Los trastornos mentales y físicos fueron importantes contribuyentes a la discapacidad total (PAF = 62,6%) y en menor medida a la discapacidad parcial (46,6%). El dolor crónico fue el único trastorno que ha contribuido a explicar tanto la discapacidad total como la parcial en las tres regiones europeas. Los trastornos mentales son los que contribuyen más a la discapacidad total y parcial en los países del Centro-Oeste y del Sur. En los países del Centro-Este, donde los trastornos mentales fueron poco prevalentes, la enfermedad cardiovascular fue la principal contribuyente a la discapacidad.

Conclusión: La contribución de los trastornos físicos y mentales a la discapacidad en las tres regiones europeas estudiadas es importante. Los trastornos mentales están asociados con una gran discapacidad en la mayoría de las regiones. Es necesario incorporar el estudio del impacto de las enfermedades comunes en discapacidad a la agenda de salud pública. Se necesitan estudios adicionales que profundicen en las diferencias regionales encontradas.

Introduction

Disability has become the most important component of the burden of disease.[1] In 2010, low back pain and major depressive disorders were ranked as the third and fourth leading causes of disability worldwide, after HIV/AIDS and road injuries, according to disability adjusted life years (DALYs).[1] Although DALYs help to compare the relative magnitude of the disease burden across diseases and countries, they might not adequately capture the welfare impact of some diseases, for instance mental disorders, as they have a large impact on functioning and quality of life.[2–4] According to the World Report on Disability,[5] infectious diseases (e.g., malaria, tuberculosis and sexually transmitted diseases); non-communicable diseases (e.g., arthritis, hearing disorders, asthma) and injuries (road traffic injuries, occupational injuries and violence) are important causes of health-related disability in developed countries.

The World Mental Health (WMH) Surveys Initiative was launched by the World Health Organization (WHO) to collect comparable data on the burden of mental disorders around the world.[6] Two WHO-WMH reports[3,4] have provided information on the individual and societal-level impact of the disability due to 19 physical and mental conditions in the general population. By means of the WHO-Disability Assessment Schedule 2.0,[7] the full and the partial inability to perform daily activities, as measures of functional impairment, were assessed. Both reports have emphasized, in agreement with the Global Burden of Disease (GBD) 2010 study[1] that back and neck pain, among physical conditions, and depression, among mental disorders, were the most burdensome non-communicable conditions worldwide.

In Europe, nearly 42 million persons of working-age from 15 European countries (16.4%) reported having a long-standing health problem or disability in 2002.[8] However, good sources of data on disability are not available in all European countries and cross-country comparisons are limited due to methodological differences.[9] While harmonization of data on disability among European countries are underway by the European Health Interview Survey, 2008 (EHIS), there is still limited comparable information about the disability burden of health conditions in the working-age population of Europe.

Here data from 10 European countries participating in the World Mental Health surveys initiative (EU-WMH)[10,11] were analysed with two general objectives: first, to describe the distribution of disability in the population aged 18 to 64 years; and second, to examine the contribution of health conditions to disability. We analysed the contribution of mental disorders and physical conditions on two self-reported measures of disability: complete inability (i.e., full role limitation) and partial ability (i.e., partial role limitation) to perform daily activities in three European regions.

Materials and methods

Survey method and samples

Ten European countries (Belgium, Bulgaria France, Germany, Italy, the Netherlands, Northern Ireland, Portugal, Romania and Spain) participated in the European World Mental Health Surveys Initiative (EU-WMH). Household interview surveys were conducted between 2001 and 2009 on probability samples of each country's population aged 18 years or older living in private households. Institutionalized individuals as well as those not able to understand the language of each country, were excluded from the study. Computer-assisted personal interviewing (CAPI) were used except for Bulgaria, were paper-and-pencil (PAPI) format was used. Respondents were selected using stratified multistage clustered-area probability sampling methods (Table 1). Response burden was reduced by splitting-up the single interview into a two-part process in all countries except for Romania (in which the interview was administered in one part). Part 1 was administered to all participants and included the core diagnostic assessment of mood and anxiety disorders. Part 2 was administered to all respondents with a certain number of mood and anxiety symptoms and to a random proportion of those who had none, and included questions about disability, additional mental disorders and information on physical conditions. Part 2 individuals were weighted by the inverse of their probability of selection to adjust for differential sampling, and therefore provide representative data on the target adult general population. Additional details about sampling methods are available elsewhere.[10] The EU-WMH total sample size was 37,289, ranging from 2,357 (Romania) to 5,473 (Spain). Response rates ranged from 45.9% (France) to 78.6% (Spain), with an overall weighted response rate of 63.4%. For this particular work, the 13,666 individuals aged 18 to 64 years, who completed Part 2 of the interview were analysed (Table 1).

Institutional Review Boards (IRB) of each country approved this study.

European regions

Countries were grouped into three regions according to the United Nations Statistic Division: (i) Central-Western Europe (Belgium, France, Germany, the Netherlands and Northern Ireland);

Table 1
EU-WMH surveys: sample characteristics, field dates, and samples sizes by country groups.

Country groups	Survey	Sampling characteristics[a]	Field dates	Sample size (part 1)	Response rate[c]	Sample size (part 2)	Sample size (part 2) 18-64 years
Central-Western				15580		6882	5,493
Belgium	ESEMeD	Stratified multistage clustered probability sample of individuals residing in households from the national register of residents.	2001-2	2419	50.6	1043	863
France	ESEMeD	Stratified multistage clustered sample of working telephone numbers.	2001-2	2894	45.9	1436	1222
Germany	ESEMeD	Stratified multistage clustered probability sample from community resident registries.	2002-3	3555	57.8	1323	1097
The Netherlands	ESEMeD	Stratified multistage clustered probability sample of individuals residing in households.	2002-3	2372	56.4	1094	1387
Northern Ireland (UK)	NISHS	Stratified multistage clustered probability sample of household residents.	2004-7	4340	68.4	1986	924
Southern				14034		5960	4,780
Italy	ESEMeD	Stratified multistage clustered probability sample from municipality resident registries.	2001-2	4712	71.3	1779	1466
Portugal	NMHS	Stratified multistage clustered area probability sample of household residents.	2008-9	3849	57.3	2060	1757
Spain	ESEMeD	Stratified multistage clustered area probability sample of household residents.	2001-2	5473	78.6	2121	1557
Central-Eastern				7675		4590	3,393
Bulgaria	NSHS	Stratified multistage clustered area probability sample of household residents.	2003-7	5318	72.0	2233	1682
Romania	RMHS	Stratified multistage clustered area probability sample of household residents.	2005-6	2357	70.9	2357[b]	1711
Total EU-WMH				37289	63.4	17432	13,666

CAPI: computer-assisted personal interviewing; ESEMeD: European Study of the Epidemiology of Mental Disorders; NISHS: Northern Ireland Study of Health and Stress; NMHS: Portugal National Mental Health Survey; NSHS: Bulgaria National Survey of Health and Stress; PAPI: pencil and paper interviewing; RMHS: Romania Mental Health Survey.

[a] Most WMH surveys are based on stratified multistage clustered area probability household samples in which more subsequent stages of geographic sampling (e.g., towns within counties, blocks within towns, households within blocks) to arrive at a sample of households, in each of which a listing of household members was created and one or two people were selected from this listing to be interviewed. No substitution was allowed when the originally sampled household resident could not be interviewed. These household samples were selected from Census area data in all countries other than France (where telephone directories were used to select households) and the Netherlands (where postal registries were used to select households). Several WMH surveys (Belgium, Germany, Italy) used municipal resident registries to select respondents without listing households.

[b] Romania did not have an age restricted Part II sample.

[c] The response rate is calculated as the ratio of the number of households in which an interview was completed to the number of households originally sampled, excluding from the denominator households known not to be eligible either because of being vacant at the time of initial contact or because the residents were unable to speak the designated languages of the survey.

(ii) Southern Europe (Italy, Portugal and Spain); and (iii) Central-Eastern Europe (Bulgaria and Romania).

Measurements

1) Mental disorders

DSM-IV mental disorders were assessed using the WHO Composite International Diagnostic Interview (CIDI),[12] version 3.0, a fully structured research diagnostic interview designed for use by trained lay interviewers to provide diagnoses of mental disorders according to the definitions and criteria of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV). Standardized common procedures were followed to guarantee cross-survey comparability of data.[13] Mental disorders evaluated were: Depressive disorder (major depressive episode), and any anxiety disorder (panic disorder and/or agoraphobia, social phobia, specific phobia, generalized anxiety disorder and post-traumatic stress disorder).

2) Physical conditions

Physical conditions were assessed with a checklist based on the U.S. National Health Interview Survey.[14] Respondents were asked about a number of symptom-based conditions and a number of silent conditions, diagnosed by a health professional. Seven conditions or groups of conditions were included: arthritis, cardiovascular disorders (heart attack, heart disease, hypertension and stroke), severe headaches or migraines, insomnia, chronic pain (back or neck pain or other chronic pain), respiratory disorders (seasonal allergies, asthma, chronic obstructive pulmonary disease, emphysema), and other physical conditions with low prevalence estimates (<2%), which included cancer, neurological diseases, diabetes, or digestive disorders (stomach or intestine ulcer or irritable bowel disorder).

Both mental disorders and physical conditions had to be present in the 12-months before the interview.

3) Disability

Role limitation was assessed with a modified version of the WHO Disability Assessment Schedule 2 (WMH-WHODAS),[7]

based on the conceptual model of the International Classification of Functioning, Disability and Health (ICF). Respondents were asked about the number of days in the last 30 days, in which they were totally unable to carry out their daily life activities (full role limitation) or they were able to perform their daily life activities, but only partially (partial role limitation). A day with partial role limitation was defined as a day on which respondents had either (a) to cut down on what they did, (b) to cut back on quality of what they did, and (c) needed extreme effort to perform as usual. An aggregate measure of partial role limitation was computed: ([0.50]*quantity cut down days) + ([0.50]*quality cut back days) + ([0.25]*extreme effort days). If this sum exceeded 30, it was set to 30 giving the measure a range from 0 to 30.[3,4]

Statistical analysis

We used a two-part modelling approach to separately assess the association of full and partial role limitation with health conditions, controlling for age, sex, employment status, education, marital status and country. Interactions with sex were tested in all models but interaction terms did not reach statistical significance in any model. First, a logistic regression equation was used to predict the probability of reporting days with role limitations in the total sample. Subsequently a Generalized Linear Regression Model equation was used to predict the scores in those individuals reporting days with full and with partial role limitation (the specification for both outcomes was a normal distribution with an identity link function).[15] Each model included the health conditions, the covariates, and the number of conditions starting at two to avoid colinearity. For each of the outcomes, four models were built (all 10 countries together plus one for each region).

Population attributable fraction (PAF) as a societal-level measure

PAFs[16,17] were estimated to evaluate the expected effect of either preventing or successfully treating one or more of the health conditions included as predictors in our regression equations. PAF can be interpreted as the proportion of days with full/partial role limitation that would not have occurred in the absence of the predictor disorders. As the outcome was continuous, the calculation of PAF was done as follows: the predicted value of a health condition on the dependent variables (i.e., full or partial role limitation) was distributed across a number of coefficients from two distinct models, logistic and GLM. (More detail is presented in the Supplementary Box, in the Appendix online).

Data were weighted to account for known probabilities of selection as well as to restore age and gender distributions of the population within countries. An additional weight was added to restore the relative dimension of the population across countries.[15] The standard errors were calculated using the Jackknife Repeated Replication method, implemented in a SAS macro (SAS Version 9.2).

Results

Sample characteristics are displayed in Table 2. Regions were similar in gender distribution (about 50-51% were women) and in mean age (40.2 years). Approximately one third of the participants reported not being married at the time of the interview (32.2%), with a significantly lower proportion of married participants in Central-Eastern Europe (26.8%). Completed high school or more varied from 92.7% in Central-Western to only 50% in Southern Europe. Unemployment also varied: from the lowest rate in Central Western Europe (26.5%) to the highest rate in Central-Eastern (48.8%). Almost one in ten individuals (9.5%) reported a full role limitation day and about 18.0%, a partial role limitation day in the

Table 2
Sample characteristics of the population sample aged 18-64 years in the WMH surveys in the 10 European countries (EU-WMH).

	N	Age mean (se)	Females % (se)	Not married % (se)	High school or more % (se)	Non-employment % (se)[b]	Any mental disorder % (se)	Any physical condition % (se)	Full role limitation % (se)[c]	Partial limitation % (se)[c]
Central-Western	5,493	40.6 (0.4)	49.8 (1.2)	32.0 (1.1)	92.7 (0.7)	26.5 (1.2)	14.3 (0.9)	45.7 (1.4)	12.5 (0.7)	22.8 (0.9)
Belgium	863	40.0 (0.6)	49.7 (2.3)	30.6 (1.9)	77.1 (3.6)	27.0 (1.8)	13.8 (1.8)	43.9 (2.3)	10.4 (1.5)	26.0 (2.3)
France	1222	39.7 (0.5)	50.6 (1.9)	26.9 (1.7)	. (.)[a]	22.9 (1.6)	19.0 (1.7)	48.2 (2.3)	9.2 (1.4)	25.9 (1.9)
Germany	1097	41.5 (0.7)	49.3 (1.9)	36.3 (1.9)	97.6 (0.7)	29.0 (2.1)	11.3 (1.4)	44.3 (2.3)	8.3 (1.3)	17.2 (1.8)
N. Ireland	1387	39.3 (0.4)	49.8 (1.6)	39.6 (2.1)	96.1 (0.5)	25.9 (1.6)	18.1 (1.6)	48.9 (2.2)	17.0 (1.4)	18.1 (1.4)
The Netherlands	924	39.6 (0.6)	49.3 (2.3)	27.4 (2.9)	77.6 (1.6)	25.8 (2.9)	13.5 (1.1)	44.9 (2.9)	16.1 (2.2)	30.2 (2.7)
Southern	4,780	39.7 (0.3)	50.0 (1.2)	34.2 (1.1)	50.0 (1.3)	34.1 (1.0)	10.1 (0.5)	41.5 (1.2)	7.6 (0.5)	17.0 (0.8)
Italy	1466	40.4 (0.4)	50.0 (1.7)	34.1 (1.6)	47.3 (2.1)	32.9 (1.5)	7.9 (0.7)	43.2 (1.7)	8.0 (1.0)	16.1 (1.2)
Portugal	1757	40.7 (0.4)	50.7 (1.6)	31.7 (1.4)	62.6 (1.5)	28.0 (1.2)	21.2 (0.9)	48.9 (1.7)	8.0 (0.7)	17.9 (1.2)
Spain	1557	38.4 (0.5)	49.7 (2.0)	35.1 (1.8)	49.9 (1.7)	37.7 (1.9)	9.6 (0.9)	36.9 (2.0)	7.0 (0.8)	17.0 (1.8)
Eastern	3,393	39.6 (0.3)	50.7 (1.3)	26.8 (1.1)	59.8 (1.5)	48.8 (1.4)	6.5 (0.5)	40.1 (1.1)	7.6 (0.5)	12.2 (0.7)
Bulgaria	1682	41.1 (0.5)	50.0 (1.6)	24.0 (2.0)	73.9 (1.3)	37.9 (1.9)	8.6 (0.7)	35.3 (1.2)	5.7 (0.6)	16.2 (1.2)
Romania	1711	39.2 (0.4)	51.0 (1.7)	27.6 (1.3)	55.8 (1.8)	51.9 (1.7)	5.9 (0.6)	41.5 (1.4)	9.3 (0.8)	8.5 (0.7)
All countries	13,666	40.2 (0.2)	50.0 (0.8)	32.2 (0.7)	69.7 (0.8)	31.7 (0.8)	11.9 (0.5)	43.4 (0.9)	9.5 (0.3)	18.0 (0.5)
Comparison between countries		3.371	0.103	6.880	139.950	23.158	29.755	6.852	9.036	19.630
X^2 (p value)		(.0004)	(0.9996)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
Comparison between regions		1.937	0.176	12.003	301.939	67.438	27.680	5.061	3.251	9.955
X^2 (p value)		(0.1441)	(0.8387)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(0.0068)	(<0.0001)	(<0.0001)

N: unweighted; %: weighted.

[a] Education in France was collected differently from the other countries.

[b] Non-employees included students, unemployed, early retirement, permanently disabled, fulfilling domestic tasks and care responsibility.

[c] The proportion of individuals reporting either a full or a partial role limitation day in the previous month.

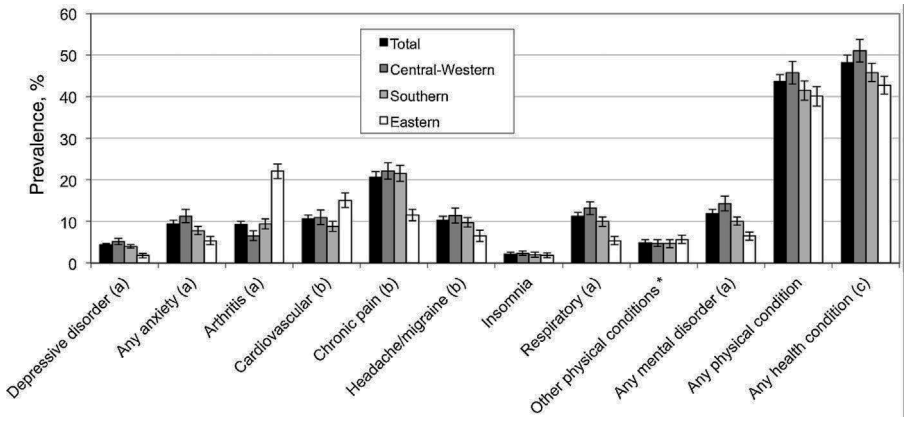

Figure 1. Prevalence rates and 95% Confidence Intervals of health conditions by European regions (EU-WMH).
*Other physical conditions: cancer, neurological diseases, diabetes, or any digestive disorders (stomach or intestine ulcer or irritable bowel disorder).
[a] All three European regions showed statistically significant differences in the prevalence of health conditions (95%CI does not overlap).
[b] Central-Eastern Europe showed statistically significant differences in the prevalence of health conditions in comparison with Central-Western and Southern Europe (95%CI does not overlap).
[c] Central-Western Europe showed statistically significant differences in the prevalence of health conditions in comparison with Southern and Central-Eastern Europe (95%CI does not overlap).

previous month. Central-Western Europe was the region with more full and partial role limitation days.

About half of the sample (48.2%) had a health condition (Central-Western Europe, 51.1%; Southern, 45.8%; and Central-Eastern Europe, 42.7%) (Fig. 1). Physical conditions were three times more prevalent than mental disorders (43.9% vs. 11.9%, respectively). Prevalence of mental disorders varied among regions, from 14.3% in Central-Western, 10.1% in Southern, and 6.5% in Central-Eastern Europe. Regional differences were observed for arthritis (Central-Eastern, 22.1% compared to Central-Western and Southern Europe). Central-Eastern Europe showed marked differences in regard to cardiovascular diseases as a highly prevalent condition (15.1%), and headache/migraine (6.6%) and chronic pain disorders (11.5%) as low prevalence conditions, in comparison with the other two regions.

As shown in Figure 2, about 30% of individuals reporting health conditions had any role limitation. Among those with any role limitation due to health conditions, around 60% reported partial, 15% reported full, and 25% reported both. Role limitation, particularly partial limitation, was significantly higher among individuals with any mental disorder (43.3%), than among those with a physical condition (29.1%). Mental disorders categories presented similar proportion of any role limitation. Among physical conditions, insomnia and other physical conditions presented the highest while cardiovascular and respiratory the lowest proportion of any role limitation.

Figure 3 shows the Population Attributable Fraction (PAFs) of full (Fig. 3 A) and partial (Fig. 3 B) role limitation for physical conditions and mental disorders. In the overall sample (black column) the PAFs for all the health conditions were 62.6% for full role limitation and 46.6% for partial role limitation. This PAF difference was statistically significant at the overall level but not within the regions. Figure 3 A shows that the PAFs of full role limitation were similar for both types of conditions (physical and mental). This was also the case in two of the regions, but not for Central-Eastern Europe (white column) where the PAF for full role limitation attributable to mental disorders was lower than that attributable to physical conditions. In Figure 3 B no statistically significant differences were observed across regions on the contributions from each type of disorder to partial role limitation, again, with the exception of Central-Eastern Europe.

Table 3 presents PAFs of full and partial role limitation for each health condition and by region. Results should be interpreted as follows: of 100% of the role limitation reported by participants, depressive disorders contribute to explain 12.7% of full role limitation and 12.1% of partial role limitation in Europe. Overall, anxiety, depression, chronic pain and other physical conditions contributed the highest PAFs to full role limitation. While chronic

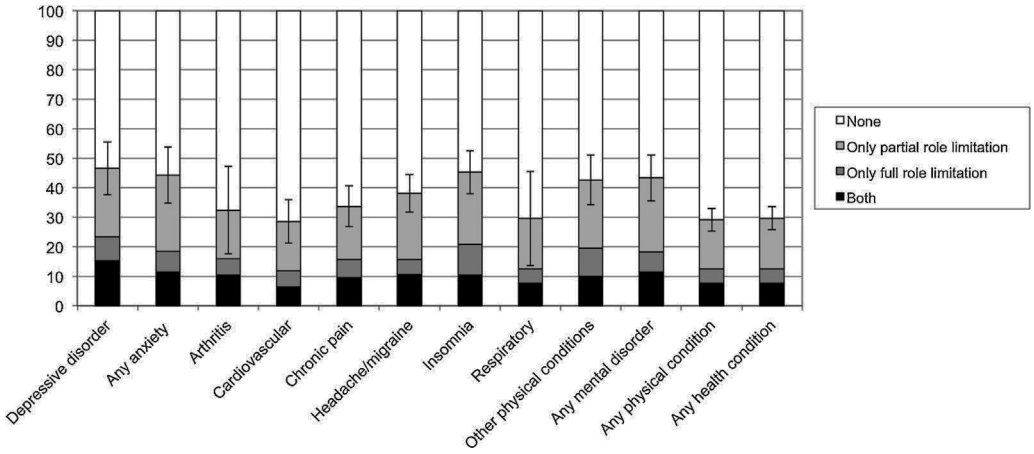

Figure 2. Distribution of role limitation's categories by health conditions (EU-WMH). Error bars (95%CI) are calculated for any role limitation.

Table 3
Population attributable Fraction (PAF) of days with full and partial role limitation due to common health conditions by European region (EU-WMH).

	Total		Central-Western Europe		Southern Europe		Eastern Europe	
	PAF Full limitation % (se)	PAF Partial limitation % (se)	PAF Full limitation % (se)	PAF Partial limitation % (se)	PAF Full limitation % (se)	PAF Partial limitation % (se)	PAF Full limitation % (se)	PAF Partial limitation % (se)
Mental disorders								
Depressive disorder	12.7 (2.4)[a]	12.1 (1.7)[a]	8.9 (3.4)[a]	13.9 (2.5)[a]	24.4 (4.2)[a]	13.8 (2.9)[a]	3.5 (4.2)	1.8 (2.8)
Any anxiety	19.6 (3.9)[a]	7.6 (2.2)[a]	21.8 (5.1)[a]	4.4 (2.9)	16.8 (5.5)[a]	13.6 (3.1)[a]	6.7 (3.8)	9.4 (3.6)[a]
Physical conditions								
Arthritis	5.2 (2.8)	8.0 (1.9)[a]	4.6 (3.4)	6.2 (2.4)[a]	16.9 (5.4)[a]	14.9 (3.2)[a]	-19.3 (7.8)[a]	0.1 (2.7)
Cardiovascular	4.6 (3.2)	2.2 (1.6)	1.5 (3.4)	-1.1 (1.5)	3.7 (4.8)	5.0 (2.8)	17.5 (6.1)[a]	17.5 (5.7)[a]
Chronic pain	15.3 (3.9)[a]	14.5 (2.8)[a]	15.6 (5.7)[a]	11.3 (3.6)[a]	12.6 (5.4)[a]	19.2 (4.7)[a]	18.0 (5.8)[a]	19.8 (5.0)[a]
Headache/migraine	3.6 (2.5)	4.3 (1.6)[a]	2.5 (3.1)	3.1 (2.1)	5.8 (4.7)	4.2 (2.8)	12.5 (5.4)[a]	6.5 (2.9)[a]
Insomnia	5.5 (2.7)[a]	5.0 (1.6)[a]	7.3 (4.7)	6.8 (2.3)[a]	2.1 (2.8)	1.4 (1.6)	4.6 (1.4)[a]	3.1 (1.9)
Respiratory	-0.4 (2.3)	2.5 (1.7)	2.0 (3.5)	2.0 (2.5)	-4.8 (3.5)	6.7 (3.1)[a]	-0.6 (3.1)	-5.5 (1.7)[a]
Other physical conditions	16.4 (3.6)[a]	3.0 (1.2)[a]	17.9 (4.4)[a]	2.6 (1.5)	13.5 (3.8)[a]	0.1 (2.2)	12.9 (8.2)	8.6 (3.3)[a]
Any mental disorder	28.9 (3.3)[a]	18.6 (2.4)[a,b]	27.5 (4.7)[a]	17.4 (3.3)[a]	36.3 (4.5)[a]	25.2 (3.4)[a]	9.8 (4.7)[a,b]	11.7 (4.2)[a,b]
Any physical condition	41.2 (4.3)[a]	33.9 (2.9)[a,b]	40.8 (6.3)[a]	28.5 (4.4)[a]	42.3 (6.0)[a]	41.3 (4.2)[a]	40.0 (7.0)[a,b]	38.2 (4.7)[a,b]
Any health condition	62.6 (3.7)[a]	46.6 (3.2)[a]	64.5 (5.1)[a]	45.1 (4.9)[a]	63.6 (5.2)[a]	53.8 (3.9)[a]	45.2 (7.3)[a]	41.5 (5.3)[a]

n: unweighted; %: weighted.
The societal predicted values for both outcomes come from a two-part modelling approach and were obtained by multiplying predicted values of the logistic (first part) and GLM (second part) equations. The estimates of both role limitation variables were calculated based on the actual data, and then under the counterfactual assumption that the condition no longer existed.
All models adjusted by age, sex, employment status, country, marital status, education and the number of conditions starting by two.
[a] Statistical significance <0.05.
[b] Statistical significance <0.05 between any mental disorder and any physical condition.

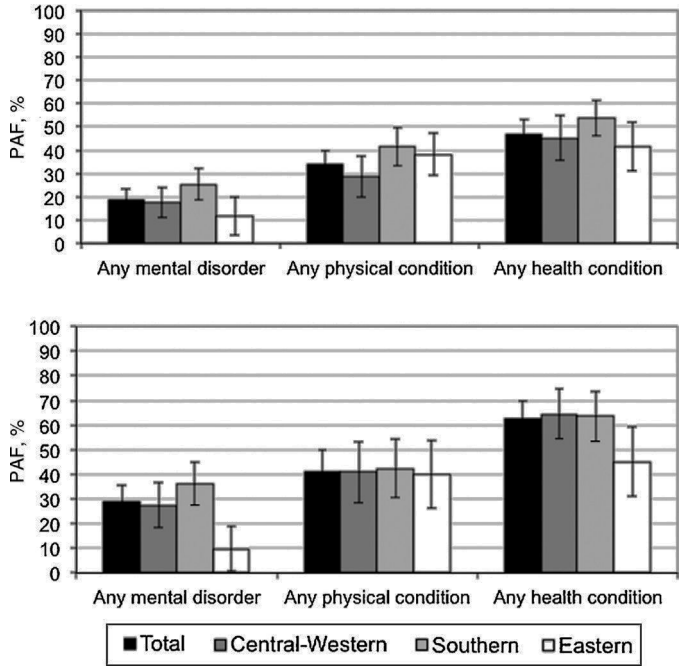

Figure 3. Full role limitation (A) and partial role limitation (B) expressed as population attributable fractions (PAFs) by European regions (EU-WMH).

pain, depression, arthritis, anxiety, insomnia, headache/migraines and other physical conditions had the highest PAFs of partial role limitation. In Central-Western and in Southern Europe, depression and anxiety were substantial contributors to full role limitation. In Southern Europe, mental disorders also significantly contributed to partial role limitation. In Central-Eastern Europe almost all physical conditions, particularly cardiovascular diseases and chronic pain, contributed importantly to full and partial role limitation. Chronic pain was the health condition that substantially and consistently contributed to full and to partial role limitation in all European regions.

Discussion

Our paper has four major findings. First, about two-thirds of the total full role limitation and about one-half of the partial role limitation are associated with nine health conditions in Europe. Theoretically, role limitations could be largely reduced by treating or successfully preventing these nine health conditions. Other burdensome health conditions not included in this study (for instance, hearing loss and visual impairment),[5] as well as non-health related determinants (work-related and non-work related factors[18,19]) could cause role limitations left unexplained in this study. Second, chronic pain was the single condition that contributed the most to both disability measures in all European Regions. This is very consistent with the Global Burden of Disease Study results,[1] in which low back pain is the leading cause of disability in Europe, and with previous studies reporting that musculoskeletal conditions, especially back and neck pain, are the most common cause of physical disability in Western countries.[1] Third, regional differences were observed: depressive and anxiety disorders were important contributors to full and to partial role limitation in Central-Western and Southern Europe, while in Central-Eastern Europe cardiovascular diseases and headache/migraine were more important contributors. Previous studies have also reported that mental disorders represent a substantial burden in some European countries[20–22] and in other countries.[23] And fourth, Central-Eastern Europe was the region in which mental disorders contributed the lowest share of full and partial role limitation. This finding is in contrast with the GBD study, which ranked depression as one of the ten leading causes of disability in Bulgaria and in Romania. Reasons for this difference are not easy to grasp from our data, but we speculate with possible explanations below.

Our analysis was restricted to a population sample of working age individuals (18-64 years), thus, while this is not a sample of workers, full and partial role limitation estimates might be interpreted as proxy measures of absenteeism and presenteeism, respectively. Accordingly, health conditions have a much larger impact on absenteeism than on presenteeism. This is because, in general, other non-health related factors frequently account for work performance.[18,19] Work-related factors (e.g., shift work,

physical work, employment position, among others) together with non work-related characteristics (e.g., family life, financial situation, adverse life events, among others) have also been shown to be relevant in explaining work performance. Nevertheless, the proportion of reduced functioning explained by common and treatable health conditions is far from negligible. Moreover, given that partial disability predicts future full disability,[24] our findings carry important policy-making implications. A previous study[25] of over one million workers showed that the cost of productivity losses associated to health conditions would be about 40% of the medical costs generated by the same health conditions. Thus, reducing the impact of prevalent disorders should be a priority in occupational health policies in all European regions.

Chronic pain, anxiety, and depression explained almost half of all health-related full role limitation reported in Central-Western (46.3%) and in Southern Europe (53.8%); and chronic pain, cardiovascular diseases and headache/migraines did so in Central-Eastern Europe (48.0%). The most important cross-regional difference was the small proportion of disability explained by mental disorders in Central-Eastern Europe in comparison with the other two regions. WMH survey data are cross-nationally comparable as they were assembled using a standardized protocol for sampling, interviewing, coding and analysing.[15] So, it is likely that this cross-regional difference might be explained by reasons other than methodological issues. All health conditions that significantly contributed to full role limitation in our study were respectively listed among the top-ten highly disabling conditions in the 2010 GBD study, except for mental disorders in Central-Eastern Europe. In terms of DALYs, major depressive disorders ranked eighth and sixth as the most disabling condition in Bulgaria and Romania, respectively. Similarities and differences between 2010 GBD study and WMH have been extensively discussed[26] but, in general, DALYs and PAFs are population-based disability measures that can be compared. It is known that prevalence and disability are not directly correlated; in particular, mental disorders are conditions with low prevalence but associated with large limitations in functioning.[21] However, post hoc analyses of our data (not presented) showed a significantly lower proportion of partial role limitation in Romania compared to other countries with low prevalence of mental disorders (Italy and Germany). We speculate that specific cultural traits of the Romani population could account for this difference[27,28] that fosters an underestimation of functional limitations associated with health conditions. Such underestimation would lead to underreporting functional limitations, resulting in measurement bias (i.e., a possible differential item functioning). Future research should address these country-specific differences in order to elucidate the true burden of mental disorders in Central-Eastern countries.

The impact of co-morbid conditions on health status is usually sub-additive.[29] This could imply that to accomplish a more substantial decrease of the impact of co-morbid conditions on disability, all conditions, not only one in particular, should be addressed. We tested this hypothesis by including the number of co-morbid conditions in all models. For full role limitation, the coefficient of the number of co-morbid conditions was negative and statistically significant, while for partial limitation, the coefficient was non-significant. Our results would therefore be consistent with findings reported by Alonso et al.[29] Nevertheless, we are aware that a simple co-morbidity count term is not the optimal way of controlling for co-morbidity: in addition to consider all co-morbid conditions at once, as we did here, it would also be necessary to consider which co-morbidity patterns are associated to higher or lower decrements in health. A previous study[30] showed that depression in combination with certain chronic conditions (asthma, diabetes, angina) produced a greater decrement in health than any of these conditions alone or depression alone. Further exploration of patterns of chronic conditions and impact on disability is necessary.

Limitations of the study

Some limitations should be taken into account when interpreting our findings. First, only a limited number of physical conditions and mental disorders were included in the analysis. Future research should include the above-mentioned conditions along with an expansion (e.g., substance use disorders, psychotic disorders) and disaggregation (e.g., anxiety disorders) of those already included. Second, while mental disorders were assessed with a well-established measure,[12] physical conditions were self-reported. Although there is evidence of good correspondence between self-reported[31] conditions (diabetes, heart disease and asthma), and clinical records, we might have underestimated the effect of physical conditions on role limitation. Additionally, the collection of the data was done in different years in some countries within the same region, so this may have had an influence in the differences observed between regions. Third, Eastern Europe was the region with the lowest prevalence estimates of DSM-IV mental disorders and also, as mentioned above, was where the lowest association with disability was observed. Such cross-regional variation in mental disorders prevalence should be interpreted with caution. An extensive discussion on cross-national variations in prevalence estimates of mental disorders in the WMH Surveys can be found in Kessler et al.[13] It remains possible that a greater reluctance of respondents in Eastern countries to admit emotional problems to a stranger. This issue would be supported by some evidence about stigma being a major problem in Central-Eastern countries.[32] It is also possible that the CIDI would not be completely adequate to capture psychopathological syndromes in Eastern countries.[15] A high proportion of sub-threshold cases with psychiatric treatment in countries with low prevalence estimates has been reported.[33] This suggests that there is still room for improvement in the diagnosis of mental disorders. Finally, the data were collected before the peak of the recent financial crisis, which is associated with important health impacts.[34] Changes in health and economic conditions might modify associations described here. In this sense, weighting for non-response was done using general characteristics (e.g., age, sex, and country) while non-response is higher among the less educated, the unemployed and the immigrant populations, characteristics which also are linked with poor mental health. Moreover, in some countries, there was a low response rate that may also have contributed to a selection bias resulting in conservative estimates on the relationship between role limitation and physical and mental diseases.

Conclusions

Notwithstanding these limitations, our results are relevant for health policy, as most of these health conditions are treatable, so the large role limitation impact associated to them might be avoidable. They are also important for research, in particular about the differences in prevalence and in associated disability found in countries from Central-Eastern Europe.

Editor in charge

Alberto Ruano-Ravina.

Transparency declaration

The corresponding author on behalf of the other authors guarantee the accuracy, transparency and honesty of the data and information contained in the study, that no relevant information has been omitted and that all discrepancies between authors have been adequately resolved and described.

Justification on the number of co-authors exceeding the permitted amount

This paper has 14 authors as the WMH Consortium's agreement specify in its publication policy the need of having one co-author from each of the participating countries. This policy is based on the crucial contribution to study design, data collection, pooling and harmonization, as well as their input in the manuscript preparation.

What is known about the topic?

Chronic health conditions are associated with a great deal of disability in Europe. However, disability is differently defined across countries, which makes comparison difficult with the consequent problems at policy-making levels.

What does this study add to the literature?

This study adds information on health-related disability which is comparable through different European Regions. We have considered both partial as well as full role limitation days, providing a full picture of health-related disability. Results show that the contribution of mental disorders and physical conditions to disability at working-age population is high in all the regions studied.

Authorship contributions

All authors have participated actively in the study, and have read and approved the submitted manuscript. G. Barbaglia, N.D. Adroher, J. Alonso and G. Vilagut were involved in the conception and design of the study, the analysis and interpretation of data and critically reviewed the manuscript. G. Barbaglia wrote the manuscript, and N.D. Adroher, G. Vilagut, J. Alonso, S. Florescu and R. de Graaf made substantial contributions to it. R. Bruffaerts, B. Bunting, J.M. Caldas de Almeida, S. Florescu, G. de Girolamo, R. de Graaf, J.M. Haro, H. Hinkov, V. Kovess-Masfety and H. Matschinger participated in the acquisition of data, critically reviewed the manuscript and provided final approval for the manuscript submitted.

Acknowledgements

The ESEMeD project is funded by the European Commission (contracts QLG5-1999-01042; SANCO 2004123 and EAHC 20081308), the Piedmont Region (Italy), Fondo de Investigación Sanitaria, Instituto de Salud Carlos III, Spain (FIS 00/0028), Ministerio de Ciencia y Tecnología, Spain (SAF 2000-158-CE), Departament de Salut, Generalitat de Catalunya, Spain, Instituto de Salud Carlos III (CIBER CB06/02/0046, RETICS RD06/0011 REM-TAP), and other local agencies and by an unrestricted educational grant from GlaxoSmithKline.

We thank the WMH staff for their assistance with instrumentation, fieldwork, and data analysis. A complete list of WMH funding support and publications can be found at: http://www.hcp.med.harvard.edu/wmh.

Funding

This work was supported by the European Commission [QLG5-1999-01042, SANCO 2004123, EAHC 20081308], the Piedmont Region (Italy), Fondo de Investigación Sanitaria, Instituto de Salud Carlos III, Spain [FIS 00/0028-02], Ministerio de Ciencia y Tecnología, Spain [SAF 2000-158-CE], Departament de Salut, Generalitat de Catalunya, Spain [AGAUR 2014 SGR 748 AGAUR 2009 SGR 1095], and other local agencies and by an unrestricted educational grant from GlaxoSmithKline. ESEMeD is carried out in conjunction with the World Health Organization World Mental Health (WMH) Survey. G. Barbaglia was supported by Ministerio de Ciencia e Innovación Rio Hortega grant [CM 10-00099]. No funding bodies had any role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

Conflicts of interests

None.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at doi:10.1016/j.gaceta.2016.07.008.

References

1. Murray CJ, Vos T, Lozano R, et al. Disability-adjusted life years (DALYs) for 291 diseases and injuries in 21 regions, 1990-2010: a systematic analysis for the Global Burden of Disease Study 2010. Lancet. 2012;380:2197–223.
2. Alonso J, Angermeyer MC, Bernert S, et al. Disability and quality of life impact of mental disorders in Europe: results from the European Study of the Epidemiology of Mental Disorders (ESEMeD) project. Acta Psychiatr Scand Suppl. 2004:38–46.
3. Alonso J, Petukhova M, Vilagut G, et al. Days out of role due to common physical and mental conditions: results from the WHO World Mental Health surveys. Mol Psychiatry. 2011;16:1234–46.
4. Bruffaerts R, Vilagut G, Demyttenaere K, et al. Role of common mental and physical disorders in partial disability around the world. Br J Psychiatry. 2012;200:454–61.
5. World Health Organization. World Bank. World report on disability. Geneva: World Health Organization; 2001. p. 350. Available at: http://www.who.int/disabilities/world_report/2011/report.pdf.
6. Kessler RC, Aguilar-Gaxiola S, Alonso J, et al. The WHO World Mental Health (WMH) Surveys. Psychiatrie (Stuttg). 2009;6:5–9.
7. Von Korff M, Crane PK, Alonso J, et al. Modified WHODAS-II provides valid measure of global disability but filter items increased skewness. J Clin Epidemiol. 2008;61:1132–43.
8. Bautier P. One in six of the EU working-age population report disability. Luxembourg: Eurostat Press Office; 2003.
9. Brunel University. Definition of disability in Europe: a comparative analysis. United Kingdom: European Commission, Directorate-General for Employment and Social Affairs, Department of Social Security and Social Integration; 2002.
10. Alonso J, Chatterji S, He Y, et al. Burdens of mental disorders: the approach of the World Mental Health (WMH) surveys. In: Alonso J, Chatterjii S, He Y, editors. The burdens of mental disorders: global perspectives from the WHO World Mental Health Surveys. New York: Cambridge University Press; 2013. p. 1–6.
11. Alonso J, Angermeyer MC, Bernert S, et al., ESEMeD/MHEDEA 2000 Investigators, European Study of the Epidemiology of Mental Disorders (ESEMeD) Project. Sampling and methods of the European Study of Mental Disorders (ESEMeD) project. Acta Psychiatr Scand. 2004;109:8–20.
12. Kessler RC, Ustun TB. The World Mental Health (WMH) Survey Initiative Version of the World Health Organization (WHO) Composite International Diagnostic Interview (CIDI). Int J Methods Psychiatr Res. 2004;13:93–121.
13. Kessler RC, Aguilar-Gaxiola S, Alonso J, et al. Prevalences and severity of mental disorders in the World Mental Health Survey Initiative Part III: Cross-national comparisons. In: Ronald CK, editor. The WHO World Mental Health Surveys: global perspectives on the epidemiology of mental disorders. New York: Cambridge University Press; 2008. p. 534–40.
14. Evaluation of National Health Interview Survey diagnostic reporting. Vital Health Stat. 1994;120:1–116.
15. Kessler R, Chaterjii S, Heeringa SG, et al. Methods of the World Mental Health surveys. In: Alonso J, Chatterjii S, He Y, editors. The burdens of mental disorders. Cambridge University Press; 2013. p. 26–7.
16. Rockhill B, Newman B, Weinberg C. Use and misuse of population attributable fractions. Am J Public Health. 1998;88:15–9.
17. Northridge ME. Public health methods-attributable risk as a link between causality and public health action. Am J Public Health. 1995;85:1202–4.
18. Hansen CD, Andersen JH. Going ill to work - what personal circumstances, attitudes and work-related factors are associated with sickness presenteeism? Soc Sci Med. 2008;67:956–64.
19. Agudelo-Suárez A, Benavides FG, Felt E, et al. Sickness presenteeism in Spanish-born and immigrant workers in Spain. BMC Public Health. 2010;10:791.

20. de Graaf R, Tuithof M, van Dorsselaer S, et al. Comparing the effects on work performance of mental and physical disorders. Soc Psychiatry Psychiatr Epidemiol. 2012;47:1873–83.
21. Barbaglia G, Duran N, Vilagut G, et al. Effects of common mental disorders and physical conditions on role functioning in Spain. Gac Sanit. 2013;27:480–6.
22. Palazzo C, Ravaud JF, Trinquart L, et al. Respective contribution of chronic conditions to disability in France: results from the national Disability-Health Survey. PLoS One. 2012;7:e44994.
23. Mall S, Lund C, Vilagut G, et al. Days out of role due to mental and physical illness in the South African stress and health study. Soc Psychiatry Psychiatr Epidemiol. 2015;50:461–8.
24. Bergstrom G, Bodin L, Hagberg J, et al. Sickness presenteeism today, sickness absenteeism tomorrow? A prospective study on sickness presenteeism and future sickness absenteeism. J Occup Environ Med. 2009;51:629–38.
25. Mitchell RJ, Bates P. Measuring health-related productivity loss. Popul Health Manag. 2011;14:93–8.
26. Whiteford HA, Ferrrari AJ. The burdens of mental disorders in the Global Burden of Disease Study 2010 and the World Mental Health Surveys: similarities, differences, and implications for mental health research. In: Alonso J, Chatterji S, He Y, editors. The burdens of mental disorders. Cambridge University Press; 2013. p. 221–9.
27. Petrea I, Haggenburg M. Mental health care. In: Rechel B, Richardson E, McKee M, editors. Trends in health systems in the former Soviet countries. Copenhagen: WHO; 2014. p. 159–72.
28. Petrea I. Mental health in former Soviet countries: from past legacies to modern practices. Public Health Rev. 2013;34:2.
29. Alonso J, Vilagut G, Chatterji S, et al. Including information about co-morbidity in estimates of disease burden: results from the World Health Organization World Mental Health Surveys. Psychol Med. 2011;41:873–86.
30. Moussavi S, Chatterji S, Verdes E, et al. Depression, chronic diseases, and decrements in health: results from the World Health Surveys. Lancet. 2007;370:851–8.
31. Kriegsman DM, Penninx BW, van Eijk JT, et al. Self-reports and general practitioner information on the presence of chronic diseases in community dwelling elderly. A study on the accuracy of patients' self-reports and on determinants of inaccuracy. J Clin Epidemiol. 1996;49:1407–17.
32. Krajewski C, Burazeri G, Brand H. Self-stigma, perceived discrimination and empowerment among people with a mental illness in six countries: Pan European stigma study. Psychiatry Res. 2013;210:1136–46.
33. Wang PS, Aguilar-Gaxiola S, Alonso J, et al. Use of mental health services for anxiety, mood, and substance disorders in 17 countries in the WHO world mental health surveys. Lancet. 2007;370:841–50.
34. Barbaglia MG, ten Have M, Dorsselaer S, et al. Negative socioeconomic changes and mental disorders: a longitudinal study. J Epidemiol Community Health. 2015;69:55–62.