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The association between psychotic experiences and disability: results from the WHO World Mental Health Surveys

Navarro-Mateu F, Alonso J, Lim CCW, Saha S, Aguilar-Gaxiola S, Al-Hamzawi A, Andrade LH, Bromet EJ, Bruffaerts R, Chatterji S, Degenhardt L, de Girolamo G, de Jonge P, Fayyad J, Florescu S, Gureje O, Haro JM, Hu C, Karam EG, Kovess-Masfety V, Lee S, Medina-Mora ME, Ojagbemi A, Pennell B-E, Piazza M, Posada-Villa J, Scott KM, Stagnaro JC, Xavier M, Kendler KS, Kessler RC, McGrath JJ. The association between psychotic experiences and disability: results from the WHO World Mental Health Surveys.

Objective: While psychotic experiences (PEs) are known to be associated with a range of mental and general medical disorders, little is known about the association between PEs and measures of disability. We aimed to investigate this question using the World Mental Health surveys.
Method: Lifetime occurrences of six types of PEs were assessed along with 21 mental disorders and 14 general medical conditions. Disability was assessed with a modified version of the WHO Disability Assessment Schedule. Descriptive statistics and logistic regression models were used to investigate the association between PEs and high disability scores (top quartile) with various adjustments.
Results: Respondents with PEs were more likely to have top quartile scores on global disability than respondents without PEs (19.1% vs. 7.5%; $\chi^2 = 190.1$, $P < 0.001$) as well as greater likelihood of cognitive, social, and role impairment. Relationships persisted in each adjusted model. A significant dose–response relationship was also found for the PE type measures with most of these outcomes.
Conclusions: Psychotic experiences are associated with disability measures with a dose–response relationship. These results are consistent with the view that PEs are associated with disability regardless of the presence of comorbid mental or general medical disorders.

F. Navarro-Mateu[1], J. Alonso[2,3,4], C. C. W. Lim[5], S. Saha[6,7], S. Aguilar-Gaxiola[8], A. Al-Hamzawi[9], L. H. Andrade[10], E. J. Bromet[11], R. Bruffaerts[12], S. Chatterji[13], L. Degenhardt[14], G. de Girolamo[15], P. de Jonge[16,17], J. Fayyad[18], S. Florescu[19], O. Gureje[20], J. M. Haro[21], C. Hu[22], E. G. Karam[23,24,25], V. Kovess-Masfety[26], S. Lee[27], M. E. Medina-Mora[28], A. Ojagbemi[29], B.-E. Pennell[30], M. Piazza[31,32], J. Posada-Villa[33], K. M. Scott[34], J. C. Stagnaro[35], M. Xavier[36], K. S. Kendler[37], R. C. Kessler[38], J. J. McGrath[6,7,39], on behalf of the WHO World Mental Health Survey Collaborators[†]

Significant outcomes

- Respondents with psychotic experiences have a significantly increased odds of being in the top quartile scores on disability measures related to cognitive, social and role impairment (compared to respondents without PEs).
- The risk is above and beyond the risk associated with comorbid general medical and mental disorders.
- There was a dose–response relationship between increased PE types and likelihood of disability.

Limitations

- We did not have access to valid measures of clinical psychotic disorders in our sample.
- While we were able to assess the WHODAS for the previous 30 days, we do not have information on disability across the lifespan.
- While cross-sectional studies cannot deduce that PEs lead to subsequent disability, some respondents who reported high recent disability scores may have had this level of disability prior to the onset of PEs.

[1]UDIF-SM, Subdirección General de Planificación, Innovación y Cronicidad, Servicio Murciano de Salud. IMIB-Arrixaca. CIBERESP-Murcia, Murcia, Spain, [2]Health Services Research Unit, IMIM-Hospital del Mar Medical Research Institute, Barcelona, Spain, [3]Pompeu Fabra University (UPF), Barcelona, Spain, [4]CIBER en Epidemiología y Salud Pública (CIBERESP), Barcelona, Spain, [5]Queensland Brain Institute, The University of Queensland, St. Lucia, QLD, Australia, [6]Queensland Centre for Mental Health Research, University of Queensland, St. Lucia, QLD, Australia, [7]Queensland Brain Institute, University of Queensland, St. Lucia, QLD, Australia, [8]Center for Reducing Health Disparities, UC Davis Health System, Sacramento, CA, USA, [9]College of Medicine, Al-Qadisiya University, Diwaniya governorate, Iraq, [10]Section of Psychiatric Epidemiology - LIM 23, Institute of Psychiatry, University of São Paulo Medical School, São Paulo, Brazil, [11]Department of Psychiatry, Stony Brook University School of Medicine, Stony Brook, NY, USA, [12]Campus Gasthuisberg, Universitair Psychiatrisch Centrum - Katholieke Universiteit Leuven (UPC-KUL), Leuven, Belgium, [13]Department of Information, Evidence and Research, World Health Organization, Geneva, Switzerland, [14]National Drug and Alcohol Research Centre, University of New South Wales, Sydney, NSW, Australia, [15]Unit of Epidemiological and Evaluation Psychiatry, Istituti di Ricovero e Cura a Carattere Scientifico (IRCCS)-St. John of God Clinical Research Centre, Brescia, Italy, [16]Developmental Psychology, Department of Psychology, Rijksuniversiteit Groningen, Groningen, The Netherlands, [17]Interdisciplinary Center Psychopathology and Emotion Regulation, Department of Psychiatry, University Medical, Center Groningen, Groningen, The Netherlands, [18]Institute for Development, Research, Advocacy & Applied Care (IDRAAC), Beirut, Lebanon, [19]National School of Public Health, Management and Professional Development, Bucharest, Romania, [20]Department of Psychiatry, University College Hospital, Ibadan, Nigeria, [21]Parc Sanitari Sant Joan de Déu, CIBERSAM, Universitat de Barcelona, Barcelona, Spain, [22]Shenzhen Institute of Mental Health & Shenzhen Kangning Hospital, Shenzhen, China, [23]Department of Psychiatry and Clinical Psychology, Faculty of Medicine, Balamand University, Beirut, Lebanon, [24]Department of Psychiatry and Clinical Psychology, St George Hospital University Medical Center, Beirut, Lebanon, [25]Institute for Development Research Advocacy and Applied Care (IDRAAC), Beirut, Lebanon, [26]Ecole des Hautes Etudes en Santé Publique (EHESP), Paris Descartes University, Paris, France, [27]Department of Psychiatry, Chinese University of Hong Kong, Tai Po, Hong Kong, [28]National Institute of Psychiatry Ramón de la Fuente, Mexico City, Mexico, [29]College of Medicine, University of Ibadan; University College Hospital, Ibadan, Nigeria, [30]Survey Research Center, Institute for Social Research, University of Michigan, Ann Arbor, MI, USA, [31] Universidad Cayetano Heredia, Lima, Peru, [32] National Institute of Health, Lima, Peru, [33] Faculty of Social Sciences, Colegio Mayor de Cundinamarca University, Bogota, Colombia, [34]Department of Psychological Medicine, University of Otago, Dunedin, Otago, New Zealand, [35]Departamento de Psiquiatría y Salud Mental, Facultad de Medicina, Universidad de Buenos Aires, Argentina, [36]Chronic Diseases Research Center (CEDOC) and Department of Mental Health, Faculdade de Ciências Médicas, Universidade Nova de Lisboa, Campo dos Mártires da Pátria, Lisbon, Portugal, [37]Department of Psychiatry, Virginia Commonwealth University, Richmond, VA, USA, [38]Department of Health Care Policy, Harvard Medical School, Boston, MA, USA and [39]National Centre for Register-based Research, Aarhus BSS, Aarhus University, Aarhus, Denmark

Key words: psychotic experiences; disability; World Mental Health Survey; World Health Organization; Disability Assessment Schedule

John McGrath, Queensland Brain Institute, The University of Queensland, St Lucia, QLD 4076, Australia.
E-mail: j.mcgrath@uq.edu.au

[†]The members of WHO World Mental Health Survey are listed in Appendix 1.

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Introduction

Approximately 1 in 20 people in the general community report psychotic experiences (PEs; which include hallucinations and delusions) at some stage in their life (1, 2). Recent population-based studies have found that PEs are associated with a range of mental (3, 4) and general medical disorders (5, 6). Studies have also shown that those with lifetime PEs tend to have poorer functional outcomes, such as poorer neuropsychological functioning (7) and greater general psychological distress (8, 9). Based on this evidence, it is generally believed that PEs may offer a severity marker in the context of other mental disorders. Thus, those with comorbid PEs and mental disorders would have greater impairment, which would be reflected in greater levels of disability in domains such as cognition (i.e., concentration, memory, and thinking clearly), social interactions, and the ability to work and/or perform normal activities. It is also feasible that those with PEs in the absence of mental disorders may have impairments across a range of domains. The World Health Organization Disability Assessment Schedule (WHODAS) has been proposed as the gold standard for assessing disability in different domains of mental and general medical disorders (10–14). Apart from overall WHODAS disability scores (henceforth called global disability), there are several nested domains that may be particularly affected by mental disorders (compared to general medical disorders). For example, PEs would be more likely to disrupt domains such as cognition, social relationships, and role

functioning, more so than domains such as mobility or basic self-care.

There is some evidence that PEs are associated with impaired functional outcomes in the young. In a sample of adolescents, Kelleher et al. (15) found that those with PEs had poorer functional outcomes compared to those without PEs. Functional deficits in those with PEs have also been described among help-seeking adolescents (16) and young adults (9). A large cross-national study also reported a relationship between the PEs and general health status derived from 16 health-related domains (17). There is robust evidence that individuals with psychotic disorders experience disability across a range of domains (13, 14, 18, 19), with recent evidence from meta-analyses indicating that those at high risk of psychosis also suffer from disability (20, 21). Based on these findings, and if psychosis can be considered to occur on a continuum (22), it is reasonable to hypothesize that individuals with PEs but without a psychotic disorder *per se* are also more likely to have disability (compared to those without PEs). As PEs are known to be highly comorbid with mental and general medical disorders (3, 5), it is expected that the association between PEs and disability will be influenced by the presence of such disorders (i.e., strong association between PEs and disability in the presence of comorbidity). Thus, multivariable models are required to disentangle the associations of PEs, and mental and general medical comorbidities with disability. We also investigated whether among respondents with one or more PEs, there was a dose–response relationship between the number of PE types and disability outcomes. These research questions were examined using data from the WHO World Mental Health (WMH) surveys, one of the largest datasets obtained from multiple countries with diverse cultural backgrounds.

Aims of the study

To examine the relationship between PEs and disability after adjusting for mental and general medical comorbidities, based on the WHO World Mental Health surveys.

Method

Sample

The WMH surveys are a coordinated set of community surveys administered to probability samples of the non-institutionalized population in countries throughout the world (www.hcp.med.harvard.edu/WMH) (23). We examined the 19 WMH surveys that included both the CIDI Psychosis Module and the WHO Disability Schedule (WHO-DAS) described below. The 19 countries are distributed across North and South America (Argentina, Brazil-Sao Paulo, Colombia, Mexico, Peru, and USA), Africa (Nigeria), the Middle East (Iraq, Lebanon), Asia (Shenzhen in the People's Republic of China), the South Pacific (New Zealand), and Europe (Belgium, France, Germany, Italy, the Netherlands, Portugal, Romania, and Spain). Most of the WMH surveys were based on multistage, clustered area probability household sampling designs except Belgium, Germany, and Italy which used municipal resident registries to select respondents (Table S1). The weighted average response rate across all 19 countries was 72.3%.

In keeping with previous studies of PEs (2, 3, 24–26), we made the *a priori* decision to exclude individuals who had PEs but who also screened positive for possible schizophrenia/psychosis and manic-depression/mania [i.e., respondents: (i) who reported *(1) schizophrenia/psychosis* or *(2) manic-depression/mania* in response to the question '*What did the doctor say was causing (this/these) experiences?*'; and (ii) whoever took any antipsychotic medications for these symptoms]. This resulted in the exclusion of 91 respondents (0.4% of all respondents), leaving 33 370 respondents for this study.

Procedures

All surveys were conducted in the homes of respondents by trained lay interviewers. Informed consent was obtained before beginning the interview in all countries. Procedures for obtaining informed consent and data protection (ethical approvals) were reviewed and approved by the institutional review boards of the collaborating organizations in each country (27). Standardized interviewer training and quality control procedures were used consistently in the surveys. Full details of these procedures are described elsewhere (28, 29).

All WMH interviews had two parts. Part I, administered to all respondents, assessed core mental disorders. Part 2, which included demographic characteristics, disability, additional mental disorders, PEs, and general medical disorders, was administered to respondents who met lifetime criteria for a Part I disorder and a random proportion of the rest. Part 2 individuals were weighted by the inverse of their probability of selection to restore representativeness. Additional weights were used to adjust for differential probabilities of selection within households, non-response, and to

match the samples to population socio-demographic distributions.

Data collection and data items

The instrument used in the WMH surveys was the WHO Composite International Diagnostic Interview (CIDI) (29), a validated, fully structured diagnostic interview (https://www.hcp.med.harvard.edu/wmhcidi/download-the-who-wmh-cidi-instruments/) designed to assess the prevalence and correlates of a wide range of mental disorders according to the definitions and criteria of both the DSM-IV and ICD-10 diagnostic systems. WHO translation, back-translation, and harmonization protocols were used to adapt the CIDI for use in each participating country.

Psychotic experiences (PEs). The CIDI Psychosis Module included questions about six PE types – two related to hallucinatory experiences (visual hallucinations and auditory hallucinations) and four related to delusional experiences (thought insertion/withdrawal, mind control/passivity, ideas of reference, plot to harm/follow) (Table S2a,b). Respondents were asked whether they ever experienced each PE (e.g., '*Have you ever seen something that wasn't there that other people could not see?'; 'Have you ever heard any voices that other people said did not exist?'* etc.). Only PEs occurring when the person was '*not dreaming, not half-asleep, or not under the influence of alcohol or drugs*' were included. Respondents who reported PEs were then asked about frequency/occurrences of the PEs in their lifetime. In this study, we present two key PE-related metrics: (i) number of PE types (henceforth referred to as *PE type metric)* and (ii) frequency of occurrence of PE episodes. We derived frequency per year by dividing the number of PE episodes by the time since onset of the PEs (age at interview minus age of onset, henceforth referred to as *annualized frequency metric* (24)).

Disability. Disability was assessed using a modified version of the WHO Disability Assessment Schedule II (WHODAS-II) for use in the WMH surveys (30, 31). The WMH-WHODAS-II asked about disability in the 30 days prior to the interview across five domains (Table S2c): (1) understanding and communicating *(cognitive),* for example, difficulties with concentration, memory, understanding, or ability to think clearly; (2) getting around *(mobility),* for example, difficulties with standing for long periods, moving around, or getting out of their home; (3) self-care *(self-care),* for example, difficulties with washing, getting dressed, and feeding; (4) getting along with others *(social interaction),* for example, difficulties with maintaining a normal social life or participating in social activities; and (5) role impairment *(role functioning),* for example, inability to carry out normal activities, cutting back on the amount or quality of usual activities, extreme effort needed to perform at one's usual level. *Global* WHODAS disability is the mean of these five domains. Further details of the scale are presented elsewhere (31).

Mental disorders. The WMH CIDI assessed lifetime history of 21 mental disorders, including *mood disorders* (major depressive episode, and bipolar disorders); *anxiety disorders* (panic disorder, generalized anxiety disorder (GAD), specific phobia, social phobia, agoraphobia without panic, post-traumatic stress disorder (PTSD), and separation anxiety disorder (SAD) further divided into childhood and adult SAD); *behaviour disorders* (intermittent explosive disorder, attention-deficit disorder, oppositional defiant disorder, and conduct disorder); *eating disorders* (anorexia nervosa, bulimia nervosa, and binge eating disorder); and *substance-use disorders* (alcohol abuse, alcohol dependence, drug abuse, and drug dependence). Clinical reappraisal studies indicate that lifetime diagnoses based on the CIDI have good concordance with diagnoses based on blinded clinical interviews (32).

General medical conditions. General medical conditions were assessed with a standard checklist based on the US National Health Interview Survey (33). Fourteen conditions were assessed in this study. Specifically, respondents were asked whether they had a lifetime history of arthritis, stroke, back or neck pain, other chronic pain, chronic headaches, and seasonal allergies, and whether they were ever told by a doctor or other health professional that they had cancer, heart disease, high blood pressure, diabetes, epilepsy, peptic ulcer, asthma, or chronic lung disease. Prior research has demonstrated good concordance between self-report illness and medical records (34).

Statistical Analysis

The scores computed for each disability domain ranged from 0 to 100 (higher scores indicated greater disability). Because the distributions were skewed toward the very low end of the scale, each score was dichotomized into present (upper quartile of the distribution) and absent (bottom three quartiles). A series of multivariable logistic regression models was used to investigate the

relationship between the PEs and disability. Analyses adjusted for country as well as: (i) socio-demographic characteristics (gender, age at interview, education, employment history, marital status, household income, and nativity (Model 1); (ii) socio-demographic characteristics and lifetime mental disorders (Model 2); (iii) socio-demographic characteristics and lifetime general medical conditions (Model 3); and (iv) all of the above (Model 4).

Next, we examined whether extent of comorbidity influenced the association between PE and disability. We thus constructed logistic models and stratified by four levels of mental comorbidity (0, 1, 2–3, and 4 or more), and three levels of general medical comorbidity (0, 1–2, and 3 or more) in predicting the disability outcomes (i.e., within the subgroup with a certain number of comorbidity disorders, is the presence of PEs associated with greater disability). These analyses adjusted for country, socio-demographic characteristics, and other mental or general medical disorders respectively (see details in the tables' footnotes). Interaction models were constructed and Wald Chi-square from these models were used to examine for significant differences in the estimates within the varying levels of mental/general medical comorbidity.

Finally, to explore the impact of number of PEs, we restricted the analyses to those with PEs, and repeated the logistic regression models (adjusted models) using *PE type* (two or more PE types vs. 1 PE type) and *PE annualized frequency metric* (median split) as predictors of disability. While the disability measures were based on the last 30 days, it is possible that some respondents may have had PE onset during the period covered by the disability assessment; we therefore undertook sensitivity analyses by repeating the main analyses in the subgroup with PE onset prior to the last 12 months.

As the WMH data are both clustered and weighted, the design-based Taylor series linearization implemented in SUDAAN software was used to estimate standard errors and evaluate the statistical significance of coefficients. All significance tests were evaluated using 0.05-level two-sided tests.

Results

The lifetime prevalence of PEs was 5.7% (S.E. = 0.2). Among those with PEs, 27.8% (S.E. = 1.4) reported more than one PE type (Table S3). The socio-demographic characteristics of respondents with (n = 2488) and without PEs (n = 30 882) are presented in Table S4. One or more general medical conditions were reported by 77.5% (S.E. = 1.4) of respondents with PEs, while the comparable proportion in those without PEs was 59.0% (S.E. = 0.4). Similarly, mental disorders were reported by 58.0% (S.E. = 1.8) of respondents with PEs, while the comparable proportion in those without PEs was 28.2% (S.E. = 0.4).

Disability

Table 1 shows that apart from the self-care domain, the proportion of respondents with disability (top quartile of the scale) was higher in those with one or more PEs than among those without PEs. For example, 19.1% (S.E. =1.1) of the respondents with a PE had global disability

Table 1. Percentage of respondents with scores on or above the 75th percentile in WMH-WHODAS disability domains, by psychotic experiences (PEs) and related metrics

			Disability domain‡									
	Global WHODAS		Cognitive		Mobility		Self-care		Social Interaction		Role functioning	
PEs	%†	S.E.	%†	S.E.	%†	S.E.	%†	S.E.	%†	S.E.	%†	S.E.
I. PEs												
No PEs (n = 30882)	7.5	0.2	1.8	0.1	2.7	0.1	0.7	0.1	0.9	0.1	6.6	0.2
Any PEs (n = 2488)	19.1	1.1	6.9	0.6	5.0	0.6	1.1	0.3	3.5	0.4	16.3	1.1
χ^2_1 [P-value]	190.1*	[<0.001]	208.7*	[<0.001]	21.9*	[<0.001]	2.8	[0.092]	101.0*	[<0.001]	138.1*	[<0.001]
II. PE type metric (among those with PEs)												
1 PE item (n = 1706)	16.2	1.3	4.9	0.6	4.6	0.9	0.7	0.2	2.5	0.4	13.7	1.2
2 or more PE items (n = 782)	26.4	2.5	12.0	1.6	5.9	1.2	2.2	1.0	6.1	1.2	23.1	2.5
χ^2_1 [P-value]	17.8*	[<0.001]	31.0*	[<0.001]	0.7	[0.401]	10.6*	[0.001]	15.3*	[<0.001]	17.1*	[<0.001]
III. PE annualized frequency metric (among those with PEs)												
≤0.3 episodes (n = 1259)	17.8	1.6	5.7	0.8	5.5	1.0	1.1	0.4	2.5	0.4	15.4	1.6
>0.3 episodes (n = 1229)	20.5	1.5	8.2	1.0	4.5	0.7	1.1	0.5	4.7	0.8	17.4	1.5
χ^2_1 [P-value]	2.1	[0.147]	5.5*	[0.020]	0.7	[0.418]	0.0	[0.972]	10.1*	[0.002]	1.1	[0.287]

*Significant at the .05 level, 2-sided test.

†Estimates are based on weighted data.

‡Scores were dichotomized and defined as a score on or above the 75th percentile of the distribution of disability. For example, 7.5% in the first cell is the proportion of respondents with score on or above the 75th percentile (high disability) on global WHODAS among those with no psychotic experiences.

Table 2. Associations between psychotic experiences with disability (n = 33 370)

	M1: Adj for socio-demographic variables‡		M2: Adj for socio-demographic variables + comorbid mental disorders§		M3: Adj for socio-demographic variables + comorbid general medical disorders¶		M4: Adj for socio-demographic variables + comorbid mental + general medical disorders**	
Disability domain†	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
Global WHODAS	2.9*	(2.5–3.4)	2.1*	(1.8–2.5)	2.1*	(1.8–2.5)	1.7*	(1.4–2.1)
Cognitive	3.6*	(2.9–4.5)	2.2*	(1.7–2.7)	2.5*	(2.0–3.1)	1.8*	(1.4–2.3)
Mobility	1.7*	(1.3–2.3)	1.5*	(1.1–2.0)	1.3	(0.9–1.7)	1.2	(0.9–1.6)
Self-care	1.8	(0.9–3.7)	1.5	(0.7–2.9)	1.4	(0.7–2.9)	1.2	(0.6–2.5)
Social interaction	3.9*	(2.9–5.3)	2.1*	(1.5–2.9)	2.8*	(2.0–3.9)	1.9*	(1.4–2.7)
Role functioning	2.7*	(2.3–3.3)	2.0*	(1.7–2.5)	2.0*	(1.7–2.4)	1.7*	(1.3–2.0)

OR, Odds ratio; CI, Confidence interval.

*Significant at the .05 level, 2-sided test.

†Outcome: WMH WHODAS domain score on or above the 75th percentile of the distribution.

Each row in the table represents a logistic regression model of any PE (ref: no PE) as predictor of high disability.

‡M1: All models adjusted for country and socio-demographic variables (sex, age, education, employment history, marital status, household income, and nativity).

§M2: All models adjusted for country, socio-demographic variables, and 21 DSM-IV mental disorders (listed in Table S4).

¶M3: All models adjusted for country, socio-demographic variables, and 14 general medical disorders (listed in Table S4).

**M4: All models adjusted for country, socio-demographic variables, 21 DSM-IV mental disorders, and 14 general medical disorders (listed in Table S4).

compared to 7.5% (S.E. =0.2) without PEs (χ^2_1 = 190.1, $P < 0.001$). Similarly, those with two or more PE items were more likely to have a disability (χ^2_1 = 17.8, $P < 0.001$).

Association between any PEs with disability

Table 2 summarizes the associations between PEs and presence of disability. In Model 1, which adjusted for country and socio-demographic characteristics, PEs were significantly associated with an increased odds of each disability domain except self-care. Respondents with PEs had about three times the odds of global disability compared to respondents with no PEs (OR=2.9, 95% CI =2.5–3.4). Within the five WHODAS domains, the odds ratios ranged from 1.7 to 3.9, with the highest OR associated with social interaction (OR=3.9, 95% CI =2.9 -5.3).

The general pattern shown in Model 1 persisted in models 2 and 3, which adjusted for mental health and general medical conditions separately, and in Model 4, which included all covariates in models 1–3. Thus, Model 4 indicated that after full adjustment, a significant association was found between PEs and global disability (OR = 1.7, 95% CI = 1.4–2.1). The associations remained significant for three disability domains, namely cognitive (OR = 1.8, 95% CI = 1.4–2.3), social interaction (OR = 1.9, 95% CI = 1.4–2.7), and role functioning (OR = 1.7, 95% CI = 1.3–2.0).

Table 3 presents the association between PEs and disability at different levels of mental comorbidity (0, 1, 2–3, 4+ mental disorders) (models 5–8). The general pattern of the associations between PEs and disability remained significant and constant in each of the models. There were no significant group differences between the four levels of comorbidity estimates and any domains of disability (χ^2_3 range between 1.6 and 7.2; all P -values were non-significant).

Similarly, in Table 4, when we examined the associations for individuals with different numbers of general medical conditions (0, 1–2, and 3+), the previously mentioned significant associations between any PEs and disability persisted regardless of the number of comorbid general medical disorders. We did not find any group differences, similar to the finding for mental disorders in Table 3, indicating that the associations of PEs and disability were constant across number of general medical comorbidities.

In summary, we found that any PEs were associated with increased odds of disability and that the significant associations between PEs and different domains of disability were constant across different levels of mental or general medical comorbidities.

Association between any PE type and frequency metrics with disability

Table 5 summarizes the associations between type and annualized frequency metrics of PEs and disability using similar adjustments from Model 4 in Table 2. For type metric, there was a dose–response relationship between number of PEs and global disability (OR = 1.5, 95% CI = 1.1–2.1) as well as for three of the five domains (cognitive:

Table 3. Associations between psychotic experiences with disability by number of comorbid mental disorders (n = 33 370)

	M1 from Table 2 (Adj for socio-demographic variables)‡		Among subset of respondents with								Test for the significance of differences across 4 subsamples (M5–M8)	
			M5: No comorbid mental disorder§		M6: 1 comorbid mental disorder¶		M7: 2–3 comorbid mental disorders**		M8: 4 or more comorbid mental disorders**			
Disability domain†	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	X^2_3	[*P*-value]
Global WHODAS	2.9*	(2.5–3.4)	2.5*	(1.7–3.6)	1.5*	(1.0–2.2)	2.2*	(1.7–2.8)	2.1*	(1.5–2.9)	7.2	[0.065]
Cognitive	3.6*	(2.9–4.5)	2.1	(1.0–4.3)	2.3*	(1.4–3.8)	2.2*	(1.6–3.1)	1.7*	(1.2–2.5)	4.0	[0.266]
Mobility	1.7*	(1.3–2.3)	1.8	(0.9–3.3)	0.9	(0.5–1.6)	1.4	(0.9–2.1)	1.4	(0.8–2.6)	3.1	[0.369]
Self-care	1.8	(0.9–3.7)	1.3	(0.3–4.7)	0.2	(0.0–1.7)	3.5*	(1.5–7.9)	1.4	(0.7–3.1)	3.3	[0.352]
Social interaction	3.9*	(2.9–5.3)	2.5	(1.0–6.2)	1.0	(0.4–2.6)	2.2*	(1.3–3.8)	2.4*	(1.5–3.8)	1.6	[0.650]
Role functioning	2.7*	(2.3–3.3)	2.4*	(1.7–3.5)	1.6*	(1.1–2.3)	1.9*	(1.5–2.5)	1.9*	(1.4–2.6)	6.5	[0.088]

OR, Odds ratio; CI, Confidence interval.

*Significant at the .05 level, 2-sided test.

†Outcome: WMH WHODAS domain score on or above the 75th percentile of the distribution.

Each row in the table represents a logistic regression model of any PE (ref: no PE) as predictor of high disability.

‡All models adjusted for country and socio-demographic variables (sex, age, education, employment history, marital status, household income, and nativity).

§M5: All models adjusted for country, socio-demographic variables in those without any comorbid mental disorder.

¶M6: All models adjusted for country, socio-demographic variables, and 20 DSM-IV mental disorders in those with one comorbid mental disorder.

**M7–8: All models adjusted for country, socio-demographic variables, and 21 DSM-IV mental disorders in those with 2-3 or 4+ comorbid mental disorders.

Table 4. Associations between psychotic experiences with disability by number of comorbid general medical disorders (n = 33 370)

	M1 from Table 2 (Adj for socio-demographic variables)‡		Among subset of respondents with						Test for the significance of differences across 3 subsamples (M9–M11)	
			M9: No comorbid general medical disorders§		M10: 1–2 comorbid general medical disorders¶		M11: 3 or more comorbid general medical disorders¶			
Disability domain†	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	X^2_2	*P*-value
Global WHODAS	2.9*	(2.5–3.4)	4.7*	(2.6–8.4)	2.0*	(1.5–2.5)	1.9*	(1.5–2.4)	3.5	[0.177]
Cognitive	3.6*	(2.9–4.5)	3.4*	(1.6–7.4)	3.4*	(2.4–4.8)	2.0*	(1.5–2.7)	4.4	[0.108]
Mobility	1.7*	(1.3–2.3)	3.0	(0.9–9.8)	1.6	(1.0–2.7)	1.0	(0.7–1.5)	2.0	[0.361]
Self-care	1.8	(0.9–3.7)	0.5	(0.0–10.4)	2.4	(0.7–8.7)	1.1	(0.5–2.4)	2.0	[0.359]
Social interaction	3.9*	(2.9–5.3)	10.4*	(4.8–22.3)	2.5*	(1.5–4.2)	2.2*	(1.4–3.5)	5.7	[0.059]
Role functioning	2.7*	(2.3–3.3)	4.3*	(2.4–7.6)	1.7*	(1.3–2.3)	1.9*	(1.5–2.5)	3.0	[0.223]

OR, Odds ratio; CI, Confidence interval.

*Significant at the .05 level, 2-sided test.

†Outcome: WMH WHODAS domain score on or above the 75th percentile of the distribution.

Each row in the table represents a logistic regression model of any PE (ref: no PE) as predictor of high disability.

‡All models adjusted for country and socio-demographic variables (sex, age, education, employment history, marital status, household income, and nativity).

§M9: All models adjusted for country and socio-demographic variables in those without any comorbid general medical disorders.

¶M10–11: All models adjusted for country, socio-demographic variables, and 14 general medical disorders in those with 1–2, 3, or more comorbid general medical disorders.

OR = 1.7, 95% CI = 1.1–2.6; social interaction: OR = 1.7, 95% CI = 1.0–2.8; role functioning: OR = 1.6, 95% CI = 1.1–2.4). For the annualized frequency metric, those with more frequent PEs (compared to those with less frequent PEs) had a greater odds of disability only in the social interaction domain (OR = 1.7, 95% CI = 1.0–2.9).

Finally, when we repeated the main analyses (as shown in Table 2) in the subgroup with PE onset prior to the 12 months preceding the interview, the significant associations between PEs and different domains of disability (Table 2) were confirmed (Table S5). The general pattern of the dose–response relationships between PEs and disability also persisted (data not shown).

Discussion

Based on a cross-national analysis of 19 countries, we found that compared to individuals without PEs, those with PEs were significantly more likely to report one or more disabilities as measured by the modified WHODAS scale. The associations persisted after adjustment for mental and general medical comorbidities. Among those with PEs, greater number of PEs was significantly associated

Table 5. Associations between psychotic experiences (2 or more vs. 1 PE type, more than 0.3 annualized episodes vs. 0.3 or less) with disability in the subgroup of those with psychotic experiences (n = 2488)

	PE type metric‡		PE annualized frequency metric§	
Disability domain†	OR	(95% CI)	OR	(95% CI)
Global WHODAS	1.5*	(1.1–2.1)	1.1	(0.8–1.5)
Cognitive	1.7*	(1.1–2.6)	1.0	(0.7–1.6)
Mobility	1.2	(0.6–2.6)	1.1	(0.6–1.8)
Self-care	1.7	(0.6–4.5)	0.5	(0.1–1.9)
Social interaction	1.7*	(1.0–2.8)	1.7*	(1.0–2.9)
Role functioning	1.6*	(1.1–2.4)	1.0	(0.7–1.4)

OR, Odds ratio; CI, Confidence interval.

*Significant at the .05 level, 2-sided test.

†Outcome: WMH WHODAS domain score on or above the 75th percentile of the distribution.

‡Each row represents a logistic regression model of 2 or more PE items (ref: 1 PE item) as predictor of high disability (ref: non-severe) adjusting for country, socio-demographic variables, 21 DSM-IV mental disorders, and 14 general medical disorders.

§Each row represents a logistic regression model of 0.4 or more episodes per year (ref: ≤0.3 episodes) as predictor of high disability (ref: non-severe) adjusting for country, socio-demographic variables, 21 DSM-IV mental disorders, and 14 general medical disorders.

with global disability (and three of the five specific disability domains), after adjusting for mental and general medical disorder comorbidities.

As hypothesized, respondents reporting PEs were more likely to report disability on three of the five specific domains (cognitive, social interaction, and role functioning) although not in domains related to self-care and mobility. Furthermore, the general pattern of findings persisted after we adjusted for a comprehensive number of mental health disorders (21 DSM-IV mental disorders, including almost all anxiety disorders, mood and impulse control disorders, and substance-use disorders) and 14 chronic general medical conditions (including many chronic or relapsing diseases). These results indicate that PEs are associated with greater disability regardless of any comorbid general medical or mental disorders. Social interaction, cognitive and role functioning were the most prominent disability domains associated with PEs. Interestingly, when we repeated the main analysis to exclude those with recent onset of PEs, the general pattern of findings persisted. The dose–response relationship between PE type and disability also persisted. Overall, these findings lend weight to the hypothesis that the presence of PEs contributes to disability, regardless of the presence of comorbid mental and/or general medical disorders.

Reassuringly, we found no association between PEs and impairment in self-care and mobility. It is possible that those with distressing PEs, such as hallucinations, may subsequently have impaired concentration, just as it is possible that those with persecutory delusions may be less able to initiate and sustain social relationships. We hope to explore these hypotheses in future studies (i.e., specificity of PE subtype and disability domains).

The findings contribute to a growing body of the literature suggesting that PEs, regardless of the presence or absence of mental disorders, are linked to functional impairment (15). However, alternative hypotheses cannot be excluded. For example, birth cohort studies have found that PEs were more common in children with (i) lower intelligence (35), (ii) cognitive deficits such as slower processing speed (36), or (iii) neurodevelopmental disorders including dyslexia, dyspraxia, and related problems (37). Thus, both PEs and disability may be downstream consequences of neurodevelopmental disorders (38), rather than causally related. Regardless of the causal pathways, our findings indicate that those with PEs are more disabled. Apart from disability, it is important to recall that those with PEs are more likely to report higher levels of general psychological distress (8) and have an increased risk of self-harm (39). Until we have a clearer understanding of the causal pathways linking PEs and disability, it would be premature to suggest that our findings have immediate clinical implications.

This study has several strengths: It is based on a large sample size from a range of countries, a uniform methodology was used for population sampling and data collection, and innovative PE-related metrics were used. Nevertheless, several study limitations deserve consideration. In keeping with other population-based surveys, evaluations relied on lay interviewers to administer the questionnaire, the CIDI 3.0, and there was no access to clinical validations of the presence of mental and general medical disorders. We excluded those with PEs who screened positive for possible psychotic disorders (based on self-reported schizophrenia and bipolar diagnoses and use of antipsychotic medications). However, we did not have access to valid measures of clinical psychotic disorders in our sample, and thus, it is possible that a small proportion of respondents with a clinical diagnosis involving psychosis were included in the analyses. While we were able to assess the WHODAS for the previous 30 days, we do not have information on disability across the lifespan. Thus, it is feasible that some respondents who reported high recent disability scores may have had this level of disability prior to the onset of PEs. Birth cohort studies will be better able to address this particular issue.

In summary, our study found that compared to individuals without PEs, those with PEs were more likely to report disability regardless of presence or number of comorbid general medical and mental

disorders. There was a dose–response relationship between increased PE types and likelihood of disability. A better understanding of the functional disability of people with PEs across the lifespan may help contextualize the characterization of PEs in the general population.

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Competing interests

In the past 3 years, Dr. Kessler received support for his epidemiological studies from Sanofi Aventis, was a consultant for Johnson & Johnson Wellness and Prevention, and served on an advisory board for the Johnson & Johnson Services Inc. Lake Nona Life Project. Kessler is a co-owner of DataStat, Inc., a market research firm that carries out healthcare research.

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Supporting Information

Additional Supporting Information may be found in the online version of this article:

Table S1. World Mental Health (WMH) sample characteristics by World Bank income categories, and sample for psychotic experiences (PEs)

Table S2a. Six CIDI Psychotic experiences types in six European (ESEMed[a]) sites (Belgium, France, Germany, Italy, Netherlands, Spain)

Table S2b. Six CIDI Psychotic experiences types in 13 non-ESEMed sites (People's Republic of China, Colombia, Lebanon, Mexico, Brazil, Iraq, Nigeria, Peru, Portugal, Romania, USA, New Zealand and Argentina)

Table S2c. Key elements from the WMH-WHODAS disability assessment across all WMH sites

Table S3. Prevalence of psychotic experiences (PEs) and related metrics (n = 33 370)

Table S4. Socio-demographics characteristics of the WMH sample (breakdown by total sample, those with and without psychotic experiences (PEs))

Table S5. Associations between psychotic experiences with disability (excluded respondents with PE onset in the last 12 months)

Appendix 1. WMH collaborators

The WHO World Mental Health Survey collaborators are Sergio Aguilar-Gaxiola, MD, PhD, Ali Al-Hamzawi, MD, Mohammed Salih Al-Kaisy, MD, Jordi Alonso, MD, PhD, Laura Helena Andrade, MD, PhD, Corina Benjet, PhD, Guilherme Borges,ScD, Evelyn J. Bromet, PhD, Ronny Bruffaerts, PhD, Brendan Bunting, PhD, Jose Miguel Caldas de Almeida, MD, PhD, Graca Cardoso, MD, PhD, Somnath Chatterji, MD, Alfredo H. Cia, MD, Louisa Degenhardt, PhD, Koen Demyttenaere, MD, PhD, John Fayyad, MD, Silvia Florescu, MD, PhD, Giovanni de Girolamo, MD, Oye Gureje, MD, DSc, FRCPsych, Josep Maria Haro, MD, PhD, Yanling He, MD, Hristo Hinkov, MD, PhD, Chi-yi Hu, MD, PhD, Yueqin Huang, MD, MPH, PhD, Peter de Jonge, PhD, Aimee Nasser Karam, PhD, Elie G. Karam, MD, Norito Kawakami, MD, DMSc, Ronald C. Kessler, PhD, Andrzej Kiejna, MD, PhD, Viviane Kovess-Masfety, MD, PhD, Sing Lee, MBBS, Jean-Pierre Lepine, MD, Daphna Levinson, PhD, John McGrath, MD, PhD, Maria Elena Medina-Mora, PhD, Jacek Moskalewicz, PhD, Fernando Navarro-Mateu, MD, PhD, Beth-Ellen Pennell, MA, Marina Piazza, MPH, ScD, Jose Posada-Villa, MD, Kate M. Scott, PhD, Tim Slade, PhD, Juan Carlos Stagnaro, MD, PhD, Dan J. Stein, FRCPC, PhD, Margreet ten Have, PhD, Yolanda Torres, MPH, Dra.HC, Maria Carmen Viana, MD, PhD, Harvey Whiteford, MBBS, PhD, David R. Williams, MPH, PhD, Bogdan Wojtyniak, ScD.