Original Investigation

Psychotic Experiences in the General Population
A Cross-National Analysis Based on 31 261 Respondents From 18 Countries

John J. McGrath, PhD, MD; Sukanta Saha, PhD; Ali Al-Hamzawi, MD; Jordi Alonso, DrPH, MD; Evelyn J. Bromet, PhD; Ronny Bruffaerts, PhD; José Miguel Caldas-de-Almeida, PhD, MD; Wai Tat Chiu, AM; Peter de Jonge, PhD; John Fayyad, MD; Silvia Florescu, PhD, MD; Oye Gureje, MD; Josep Maria Haro, PhD, MD; Chiyi Hu, PhD, MD; Viviane Kovess-Masfety, PhD, MD; Jean Pierre Lepine, HDR, MD; Carmen C. W. Lim, MSc; Maria Elena Medina Mora, PhD; Fernando Navarro-Mateu, PhD, MD; Susana Ochoa, PhD; Nancy Sampson, BA; Kate Scott, PhD; Maria Carmen Viana, PhD, MD; Ronald C. Kessler, PhD

IMPORTANCE Community-based surveys find that many otherwise healthy individuals report histories of hallucinations and delusions. To date, most studies have focused on the overall lifetime prevalence of any of these psychotic experiences (PEs), which might mask important features related to the types and frequencies of PEs.

OBJECTIVE To explore detailed epidemiologic information about PEs in a large multinational sample.

DESIGN, SETTING, AND PARTICIPANTS We obtained data from the World Health Organization World Mental Health Surveys, a coordinated set of community epidemiologic surveys of the prevalence and correlates of mental disorders in representative household samples from 18 countries throughout the world, from 2001 through 2009. Respondents included 31 261 adults (18 years and older) who were asked about lifetime and 12-month prevalence and frequency of 6 types of PEs (2 hallucinatory experiences and 4 delusional experiences). We analyzed the data from March 2014 through January 2015.

MAIN OUTCOMES AND MEASURES Prevalence, frequency, and correlates of PEs.

RESULTS Mean lifetime prevalence (SE) of ever having a PE was 5.8% (0.2%), with hallucinatory experiences (5.2% [0.2%]) much more common than delusional experiences (1.3% [0.1%]). More than two-thirds (72.0%) of respondents with lifetime PEs reported experiencing only 1 type. Psychotic experiences were typically infrequent, with 32.2% of respondents with lifetime PEs reporting only 1 occurrence and 31.8% reporting only 2 to 5 occurrences. We found a significant relationship between having more than 1 type of PE and having more frequent PE episodes (Cochran-Armitage $z = -10.0$; $P < .001$). Lifetime prevalence estimates (SEs) were significantly higher among respondents in middle- and high-income countries than among those in low-income countries (7.2% [0.4%], 6.8% [0.3%], and 3.2% [0.3%], respectively; χ^2_2 range, 7.1-58.2; $P < .001$ for each) and among women than among men (6.6% [0.2%] vs 5.0% [0.3%]; $\chi^2_1 = 16.0$; $P < .001$). We found significant associations with lifetime prevalence of PEs in the multivariate model among nonmarried compared with married respondents ($\chi^2_2 = 23.2$; $P < .001$) and among respondents who were not employed ($\chi^2_4 = 10.6$; $P < .001$) and who had low family incomes ($\chi^2_3 = 16.9$; $P < .001$).

CONCLUSIONS AND RELEVANCE The epidemiologic features of PEs are more nuanced than previously thought. Research is needed that focuses on similarities and differences in the predictors of the onset, course, and consequences of distinct PEs.

JAMA Psychiatry. doi:10.1001/jamapsychiatry.2015.0575
Published online May 27, 2015.

Supplemental content at jamapsychiatry.com

Author Affiliations: Author affiliations are listed at the end of this article.

Corresponding Author: John J. McGrath, PhD, MD, Queensland Brain Institute, University of Queensland, St Lucia, Queensland, Australia 4072 (j.mcgrath@uq.edu.au).

In recent years, interest in the epidemiologic landscape of hallucinations and delusions has grown.[1,2] These psychotic experiences (PEs) are reported by a sizeable minority of the general population. A recent meta-analysis based on 61 studies[2] reported that the median lifetime prevalence of PE was 7.2%. Because this prevalence is substantially higher than the lifetime morbid risk for psychotic disorders, such as schizophrenia (median morbid risk, 0.7%),[3] the field of psychiatric epidemiology has been forced to rethink how PEs fit into the epidemiologic landscape of psychotic disorders. The terms used to describe these experiences have also evolved over time. Although *psychoticlike experiences* has been used, we will use the general term *psychotic experiences* to encompass *hallucinatory experiences* (HEs) and *delusional experiences* (DEs).[2]

Early work on the epidemiologic features of PEs[4] focused on these experiences as risk indicators for later conversion to full psychosis. This type of research has an appealing logic because many of the risk factors associated with PEs are also associated with schizophrenia and psychosis.[5] Additional evidence has accumulated that PEs are also associated with the subsequent onset of a wide array of common mental disorders, including anxiety, mood, and substance use disorders,[6-8] and with an increased risk for suicidal ideation and intent.[9-11] Thus, awareness is growing that the presence of PEs may reflect a vulnerability to a wide range of adverse mental health outcomes (in addition to psychotic disorders).[4,12-16] These findings and the concern that antipsychotics may be inappropriately used to treat individuals with isolated PEs may have influenced the decision to exclude *attenuated psychosis syndrome* in recently revised diagnostic criteria.[17]

As the empirical data have accumulated, systematic reviews[2,15,18,19] have pooled prevalence estimates and applied meta-regression techniques to explore the sociodemographic correlates of PEs. These reviews provide valuable clues to the nature of PEs but also highlight important gaps in the literature. Four of these gaps are of special importance for the present study.

First, the use of pooling in systematic reviews of PEs has encouraged the use of coarse dichotomous measures (eg, presence or absence of lifetime prevalence) to harmonize the wide array of scales and diagnostic instruments used to assess PEs.[2] This dichotomy has reduced the subtlety of the associations examined in these reviews. Second, the studies included in the systematic reviews have varied in many key design elements. As noted by Linscott and van Os,[2] substantial heterogeneity in the data has hampered analyses related to the relationship between PEs and sociodemographic variables. Third, most of the community studies of PE prevalence and correlates have been performed in high-income countries. A major exception is the World Health Survey, which included 4 brief PE questions in surveys of 52 nations.[20] However, the World Health Survey assessment of PEs had several limitations (eg, it lacked information on the frequency of PE occurrence, and questions about DEs were not asked in a fashion that excluded experiences related to alcohol, illicit drugs, or sleep). Finally, to allow pooling of data from different studies, some reviews have collapsed different variables across orthogonal axes. For example, Kaymaz et al[15] compiled composite variables related to weak and strong PEs that in theory could be built from data related to (1) the count of different types of PEs, (2) the frequency of occurrence, (3) associated distress, (4) comorbidity, and/or (5) certainty (eg, confidence in the psychotic nature of the experience).

Leading commentators have repeatedly called for more fine-grained analyses of PEs to guide the field.[1,21] The present report provides initial results of analyses designed to address the above limitations by examining data collected in the World Health Organization World Mental Health (WMH) surveys, a series of population-based surveys administered in many countries using consistent instruments and field procedures designed to facilitate pooled cross-national analyses of the prevalence and correlates of mental disorders. These data provide an unprecedented opportunity to explore the epidemiologic landscape of PEs.

Methods

Participants

The WMH surveys are a coordinated set of community epidemiologic surveys administered in probability samples of the household population in countries throughout the world (http://www.hcp.med.harvard.edu/wmh/). Data were collected from 2001 through 2009. Eighteen of the 26 completed WMH surveys administered the Composite International Diagnostic Interview (CIDI) psychosis module. These 18 countries are distributed across North and South America (Colombia, Mexico, Peru, Brazil [São Paulo], and the United States), Africa (Nigeria), the Middle East (Iraq and Lebanon), Asia (People's Republic of China [Shenzhen]), the South Pacific (New Zealand), and Europe (Belgium, France, Germany, Italy, the Netherlands, Portugal, Romania, and Spain). All 18 surveys were based on multistage, clustered-area probability, household sampling designs (**Table 1**). The weighted mean response rate across all 18 countries was 72.1%. Most surveys were based on nationally representative sample frames, but a few excluded rural areas (ie, Colombia and Mexico) or focused on particular regions (ie, Nigeria and China) or cities (Brazil). Participating sites were grouped into 3 country-level income strata according to World Bank criteria[22,23] as low- and lower middle-income countries (Colombia, Iraq, Nigeria, China, and Peru), upper middle–income countries (Brazil, Lebanon, Mexico, and Romania), and high-income countries (the European countries, New Zealand, and the United States). The age ranges reported herein include 18 years and older except in 3 countries (Mexico, Colombia, and Peru) in which 65 years was the upper age limit.

In keeping with previous studies of PEs,[10,12,24-29] we made the a priori decision to exclude individuals who had PEs with positive findings of a screen for possible schizophrenia and/or psychosis and manic depression and/or mania (ie, respondents who reported schizophrenia, psychosis, or manic depression and/or mania in response to the question, "What did the doctor say was causing this/these experiences?" and those who ever took any antipsychotics for these symptoms). This

Table 1. WMH Sample Characteristics by Income Categories and Final Sample for PEs[a]

Country by Income Level[b]	Sample Characteristics[c,d]	Field Dates	Age Range, y	Sample Size, No. of Respondents		Response Rate, %[e]
				Part 1	With PE	
Low and Lower Middle						
Colombia	All urban areas of the country	2003	18-65	4426	722	87.7
Iraq	Nationally representative	2006-2007	18-96	4332	4329	95.2
Nigeria	21 of the 36 states in the country	2002-2003	18-100	6752	1417	79.3
PRC[f]	Shenzhen metropolitan area	2006-2007	18-88	7132	2468	80.0
Peru	Nationally representative	2004-2005	18-65	3930	530	90.2
Total	NA	NA	NA	26 572	9466	84.7
Upper Middle						
Brazil	São Paulo metropolitan area	2005-2007	18-93	5037	2922	81.3
Lebanon	Nationally representative	2002-2003	18-94	2857	1029	70.0
Mexico	All urban areas of the country	2001-2002	18-65	5782	715	76.6
Romania	Nationally representative	2005-2006	18-96	2357	2357	70.9
Total	NA	NA	NA	16 033	7023	75.8
High						
Belgium	Nationally representative	2001-2002	18-95	2419	319	50.6
France	Nationally representative	2001-2002	18-97	2894	301	45.9
Germany	Nationally representative	2002-2003	18-95	3555	408	57.8
Italy	Nationally representative	2001-2002	18-100	4712	617	71.3
Netherlands	Nationally representative	2002-2003	18-95	2372	348	56.4
New Zealand[f]	Nationally representative	2003-2004	18-98	12 790	7263	73.3
Portugal	Nationally representative	2008-2009	18-81	3849	2053	57.3
Spain	Nationally representative	2001-2002	18-98	5473	1159	78.6
United States	Nationally representative	2002-2003	18-99	9282	2304	70.9
Total	NA	NA	NA	47 346	14 772	65.5
Total	NA	NA	NA	89 951	31 261	72.1

Abbreviations: NA, not applicable; PRC, People's Republic of China; PEs, psychotic experiences; WMH, World Mental Health.

[a] Exclusions are described in the Participants subsection of the Methods section; 31 261 respondents remained after exclusions.

[b] Based on data from the World Bank Data and Statistics 2008.[22]

[c] Surveys were administered by the Colombian National Study of Mental Health, Iraq Mental Health Survey, Nigerian Survey of Mental Health and Well-being, La Encuesta Mundial de Salud Mental en el Peru, Lebanese Evaluation of the Burden of Ailments and Needs of the Nation, Mexico National Comorbidity Survey, Romania Mental Health Survey, European Study of the Epidemiology of Mental Disorders, New Zealand Mental Health Survey, Portugal National Mental Health Survey, and US National Comorbidity Survey Replication.

[d] Most WMH surveys are based on stratified, multistage, clustered-area probability household samples in which samples of areas equivalent to counties or municipalities in the United States were selected in the first stage, followed by 1 or more subsequent stages of geographic sampling (eg, 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 1 or 2 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, and Italy) used municipal resident registries to select respondents without listing households. Thirteen of the 18 surveys are based on nationally representative household samples.

[e] 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 to be ineligible because of being vacant at the time of initial contact or because the residents were unable to speak the designated languages of the survey. The weighted mean response rate is 72.1%.

[f] For the purposes of cross-national comparisons, we limit the sample to those older than 18 years.

process resulted in the exclusion of 140 respondents (0.4% of all respondents), leaving 31 261 respondents for this study (Table 1).

Measures and Assessments

All WMH surveys were conducted face to face in the homes of respondents by trained lay interviewers. Written informed consent was obtained before beginning the interviews in all countries. Procedures for obtaining informed consent and protecting individuals (ethical approval) were approved and monitored for compliance by the institutional review boards of the collaborating organizations in each country.[30] Full details of these procedures are described elsewhere.[31,32]

All WMH interviews had 2 parts. Part 1 was administered to all respondents and contained assessments related to core mental disorders. Part 2 included additional information relevant to a wide range of survey aims, including assessment of PEs. All respondents who met criteria for any part 1 *DSM-IV* mental disorder and a probability sample of other respondents were administered part 2. Respondents to part 2 were weighted by the inverse of their probability of selection for part 2 to adjust for differential sampling. Within the different sites,

questions related to PEs were administered to all respondents or a random sample of those administered part 2. Analyses in this study were based on the weighted part 2 subsample of respondents administered the CIDI psychosis module. Additional weights were used to adjust for differential probabilities of selection within households and for nonresponse and to match the samples to sociodemographic distributions in the population.

The instrument used in the WMH surveys was the World Health Organization CIDI,[33] a validated, fully structured diagnostic interview designed to assess the prevalence and correlates of a wide range of mental disorders according to the definitions and criteria of the diagnostic systems of the *DSM-IV*[34] and *International Statistical Classification of Diseases, 10th Revision*.

The CIDI psychosis module included questions about the following 6 PE types: 2 related to HEs (visual and auditory hallucinations) and 4 related to DEs (2 bizarre delusional items [thought insertion and/or withdrawal and mind control and/or passivity] and 2 paranoid delusional items [ideas of reference and plot to harm and/or follow]) (eTables 1 and 2 in the Supplement). For example, respondents were asked if they ever experienced PEs (eg, "Have you ever heard any voices that other people said did not exist?"). This question was followed by a probe question to determine whether the reported PEs ever occurred when the person was not "dreaming or half-asleep or under the influence of alcohol or drugs." Only responses of the latter type are considered herein. The sequence of these follow-up probe types differed slightly between the first 6 WMH surveys, which were administered in Europe (Belgium, France, Germany, Italy, the Netherlands, and Spain), and those in the remaining 12 countries (eTables 1 and 2 in the Supplement).

Respondents who reported PEs were then asked about the presence of the PEs in the past 12 months and the frequency and/or occurrences of the PEs in their lifetime. In this study, we present prevalence estimates for any PE, any HE (with or without associated DEs), any DE (with or without associated HEs), pure HEs (without DEs), and pure DEs (without HEs). In addition, we will present the following 2 key PE-related metrics: (1) count of types of PEs (henceforth referred to as PE type metric) and (2) frequency of occurrence of PE episodes (henceforth referred to as PE frequency metric). Respondents may have had more than 1 hallucination and/or delusion type associated with a single episode of PE. For the PE frequency metric, reported frequency of lifetime PE episodes was divided into the following 5 categories: 1 time only, 2 to 5 times, 6 to 10 times, 11 to 100 times, and 101 times or greater. This 5-category scheme was collapsed into 1 to 10 vs 11 or more times in the analyses of sociodemographic correlates of PE frequency among respondents with lifetime PEs.

The sociodemographic factors considered herein include sex, age, number of years of education, employment history, marital status, family income, and nativity (ie, born inside the country of assessment). For the bivariate and multivariate analyses, the sociodemographic variables were stratified into broad categories based on methods described elsewhere.[30]

Statistical Analysis

Data were analyzed from March 2014 through January 2015. Weighted prevalence estimates were calculated for the various PE types and related metrics. Odds ratios and design-corrected 95% CIs are reported. Because the WMH survey data featured geographic clustering and weighting, SEs of parameter estimates were generated using the design-based Taylor series linearization method[35] implemented in a commercially available macro (SAS, version 9.4; SAS Institute, Inc). Multivariate significance was evaluated using Wald χ^2 tests based on design-corrected coefficient variance-covariance matrices. The association between the PE type metric and the PE frequency metric was evaluated using the Cochran-Armitage test.[36] Statistical significance was evaluated consistently using 2-tailed .05-level tests.

Results

Prevalence of PEs

Table 2 presents country-specific lifetime PE prevalence estimates. Lifetime prevalence (SE) of at least 1 PE was reported by 5.8% (0.2%) of the 31 261 respondents. Lifetime prevalence of any HE was 5.2% (0.2%); of any DE, 1.3% (0.1%). The median (interquartile range) of lifetime PEs, HEs, and DEs were 5.5% (2.8%-7.5%), 4.4% (1.8%-6.5%), and 1.3% (0.9%-1.8%), respectively (eFigures 1-3 in the Supplement present the cumulative distribution of PE, HE, and DE estimates, respectively). Twelve-month prevalence (SE) of any PE was 2.0% (0.1%), whereas the median (interquartile range) was 1.4% (1.0%-2.8%).

Lifetime prevalence (SE) of PEs was significantly higher among women than men (6.6% [0.2%] vs 5.0% [0.3%]; $\chi^2_1 = 16.0$; $P < .001$). Similar sex differences were found for prevalence of HEs (5.9% [0.2%] vs 4.3% [0.3%]; $\chi^2_1 = 19.4$; $P < .001$) but not DEs (1.4% [0.1%] vs 1.3% [0.1%]; $\chi^2_1 = 0.3$; $P = .61$). The significant sex difference was also found for respondents with pure HEs (5.2% [0.2%] vs 3.7% [0.3%]; $\chi^2_1 = 19.3$; $P < .001$) but not pure DEs (0.7% [0.1%] vs 0.7% [0.1%]; $\chi^2_1 = 0.1$; $P = .80$).

Significant differences were found across the 3 country-level income strata in lifetime prevalence of any PE, any HE, and any DE. In each comparison, the prevalence estimates were significantly higher among respondents in middle- and high-income countries than among those in low-income countries (χ^2_2 range, 7.1-58.2; $P < .001$ for each) (Table 2).

Prevalence of Individual PEs and the Distribution of the PE Type Metric

Table 3 shows the lifetime prevalence estimates (SE) of individual PE types and counts of different PE types. The most common PE type overall was visual hallucinations (3.8% [0.2%]), followed by auditory hallucinations (2.5% [0.1%]). Prevalence estimates of individual DE types were low (0.3%-0.7%). Among those with any lifetime PE, 72.0% (representing 4.2% of the total sample) reported only 1 PE type; 21.1% (representing 1.2% of the total sample), exactly 2 types; and 6.8% (representing 0.4% of the total sample), 3 or more types.

Table 2. Lifetime and 12-Month Prevalence of PEs in the WMH Surveys

Country by Income Level[a]	Prevalence, No. (%) [SE][b]				Total Sample, No. of Respondents[c]
	Lifetime				
	Any PE	Any HE	Any DE	12-mo PE	
Low and lower middle					
Colombia	73 (7.5) [1.2]	68 (7.1) [1.2]	11 (0.9) [0.3]	25 (2.1) [0.5]	722
Iraq	51 (1.2) [0.2]	46 (1.1) [0.2]	13 (0.4) [0.2]	25 (0.7) [0.2]	4329
Nigeria	39 (2.2) [0.5]	32 (1.7) [0.4]	16 (1.0) [0.4]	15 (1.0) [0.4]	1417
PRC	151 (5.3) [0.8]	116 (3.8) [0.6]	54 (1.8) [0.4]	45 (1.4) [0.3]	2468
Peru	36 (6.4) [1.4]	33 (6.1) [1.4]	7 (1.1) [0.4]	18 (3.3) [0.9]	530
Total	350 (3.2) [0.3]	295 (2.6) [0.2]	101 (0.9) [0.1]	128 (1.2) [0.2]	9466
Upper middle					
Brazil	548 (14.9) [0.9]	471 (13.3) [0.9]	183 (3.6) [0.3]	230 (5.6) [0.4]	2922
Lebanon	37 (1.9) [0.4]	30 (1.6) [0.4]	14 (0.6) [0.3]	15 (0.9) [0.4]	1029
Mexico	53 (4.1) [1.0]	49 (3.6) [0.9]	12 (0.8) [0.4]	22 (1.4) [0.4]	715
Romania	24 (1.0) [0.4]	21 (0.9) [0.4]	5 (0.1) [0.1]	9 (0.3) [0.1]	2357
Total	662 (7.2) [0.4]	571 (6.4) [0.4]	214 (1.7) [0.1]	276 (2.7) [0.2]	7023
High					
Belgium	32 (8.3) [2.5]	19 (5.0) [1.6]	20 (5.7) [2.3]	11 (4.1) [2.4]	319
France	27 (5.7) [1.4]	23 (4.9) [1.3]	7 (1.6) [0.6]	6 (1.3) [0.7]	301
Germany	25 (2.8) [0.5]	16 (1.8) [0.4]	13 (1.3) [0.3]	6 (1.0) [0.2]	408
Italy	38 (4.5) [0.8]	31 (3.5) [1.0]	16 (1.9) [0.6]	12 (1.3) [0.5]	617
The Netherlands	47 (10.8) [2.5]	41 (10.1) [2.5]	11 (1.6) [0.5]	13 (3.0) [1.2]	348
New Zealand	724 (6.9) [0.4]	667 (6.5) [0.4]	134 (0.9) [0.1]	271 (2.4) [0.2]	7263
Portugal	140 (5.2) [0.7]	106 (3.9) [0.5]	66 (2.6) [0.5]	43 (1.7) [0.3]	2053
Spain	91 (6.7) [1.5]	77 (5.8) [1.5]	35 (1.4) [0.4]	19 (0.9) [0.2]	1159
United States	249 (8.6) [0.9]	232 (8.2) [0.9]	41 (1.3) [0.2]	79 (2.8) [0.4]	2304
Total	1373 (6.8) [0.3]	1212 (6.2) [0.3]	343 (1.4) [0.1]	460 (2.2) [0.2]	14 772
All	2385 (5.8) [0.2]	2078 (5.2) [0.2]	658 (1.3) [0.1]	864 (2.0) [0.1]	31 261

Abbreviations: DE, delusional experience; HE, hallucinatory experience; PRC, People's Republic of China; PE, psychotic experience; WMH, World Mental Health.

[a] Based on data from the World Bank Data and Statistics 2008.[22]

[b] Numbers indicate the unweighted number of respondents who reported the PEs. Prevalence estimates are based on weighted data. PEs indicate any of 6 types; HEs, any of 2 types; and DEs, any of 4 types.

[c] Indicates the total unweighted number of respondents who were asked about PEs.

Distribution of the PE Frequency Metric and the Relationship Between PE Type and Frequency Metrics

Psychotic experiences were typically infrequent, with 32.2% of the respondents with lifetime PEs reporting only 1 episode (**Table 4**). An additional 31.8% of respondents with lifetime PEs experienced only 2 to 5 PE episodes. Thus, for nearly two-thirds of respondents (64.0%) with lifetime PEs, these experiences occurred only 1 to 5 times in their lives. An additional 10.0% of respondents with lifetime PEs reported 6 to 10 lifetime episodes; 20.0%, 11 to 100 episodes; and 6.0%, 101 or more episodes. The relationship between the PE type metric and the PE frequency metric is best displayed in **Table 5**. Those respondents with more PE types are disproportionately more likely to have more PE episodes (Cochran-Armitage z, −10.0; $P < .001$).

Associations Between Sociodemographic Factors With Lifetime PEs, HEs, and DEs

eTable 3 in the Supplement shows the association of sociodemographic variables with lifetime PEs, HEs, and DEs in bivariate and multivariate models. The following sociodemographic variables were associated with increased odds ratios for PEs, HEs, and DEs in both models: (1) being a homemaker or classified as having other employment (eg, looking for work or disabled) vs employed (for PEs, multivariate model, $\chi^2_4 = 10.6$; $P < .001$); (2) being nonmarried (ie, never married or separated, widowed, or divorced) vs married (for PEs, multivariate model, $\chi^2_2 = 23.2$; $P < .001$); and (3) lower vs high household income level (for PEs, multivariate model, $\chi^2_3 = 16.9$; $P < .001$). In addition to these findings, several sociodemographic variables were associated with only 1 type of PE. Young respondents (aged 18-29 years) were significantly more likely to have DEs (compared with those older than 60 years), whereas age was unrelated to HEs (and overall PEs). Although female sex was associated with an increased prevalence of PEs (in both models), this finding was driven by an increased risk for HEs (but not DEs). Low educational level, in comparison, was associated with an increased risk for DEs (but not HEs). Unexpectedly, those born outside the country (ie, migrants) were significantly less likely than the native born to report HEs (but not DEs) in the bivariate and multivariate models.

Associations of Sociodemographic Factors With PE Type and PE Frequency Metrics

Among the factors that influence the PE type metric (in those who had experienced PEs) in the multivariate model, the 3 younger strata (ie, spanning 18-59 years) were significantly more likely to have more than 1 PE type (compared with those aged ≥60 years) (eTable 4 in the Supplement). None of the other sociodemographic characteristics was associated with the PE type metric. Among the correlates of the PE frequency metric, student status was significantly associated with a lower fre-

Table 3. Lifetime Prevalence of Individual PEs in the WMH Surveys

Type[a]	Lifetime Prevalence, No. (%) [SE][b]
HE	
Visual	1545 (3.8) [0.2]
Auditory (verbal)	1051 (2.5) [0.1]
Any	2078 (5.2) [0.2]
DE	
Thought insertion and/or withdrawal	193 (0.4) [0.0]
Mind control and/or passivity	148 (0.3) [0.0]
Ideas of reference	209 (0.4) [0.0]
Plot to harm and/or follow	328 (0.7) [0.1]
Any	658 (1.3) [0.1]
PE	
Any	2385 (5.8) [0.2]
No. of PE types	
1	1631 (4.2) [0.2]
2	544 (1.2) [0.1]
≥3	210 (0.4) [0.0]
All[c]	31 261 (100)[0.0]

Abbreviations: DE, delusional experience; HE, hallucinatory experience; PE, psychotic experience; WMH, World Mental Health.

[a] PEs indicate any of 6 types; HEs, any of 2 types; and DEs, any of 4 types.

[b] Numbers indicate the unweighted number of respondents who reported the PEs. Prevalence estimates are based on weighted data.

[c] Indicates the total unweighted number of respondents who were asked about PEs.

quency of PE occurrence. None of the other sociodemographic variables was associated with PE frequency (eTable 5 in the Supplement).

Discussion

Based on cross-national samples from 18 countries, we found that 5.8% of respondents reported having 1 or more PEs at least once in their lifetime and 2.0% in the previous year. These overall estimates are broadly consistent with those in the previous literature.[2] Our study contributes important new information regarding the count of PE types and frequency of PEs that go beyond the issues considered in previous community-based studies of PEs. Perhaps the most striking finding is that PEs are infrequent for most of the individuals who experience them, with 32.2% reporting 1 PE episode in their life and 64.0% reporting no more than 5 lifetime occurrences. In the general population, those with 2 or more types of PEs are also significantly more likely to have more PE episodes. For example, of those who reported 3 or more PE types, nearly one-quarter (24.5%) reported 101 or more occurrences.

Our findings provide an empirical foundation on which to investigate factors that influence the persistence of PEs.[1] When viewed within the context of the gap between 12-month and lifetime PE estimates from the present study (ie, 2.0% vs 5.8%), we can infer that most individuals do not have persistent PEs (mindful that lifetime prevalence estimates for mental health disorders are often biased downward owing to underreporting).[37] Linscott and van Os[2] estimated that of those individuals who report any PEs, approximately 80% would have had transient experiences. This estimate is consistent with our empirical finding that about 64.0% of individuals with PEs report only 1 to 5 lifetime occurrences.

Based on the set of PEs examined, our study confirms that HEs were more common than DEs (5.2% vs 1.3%), and this general pattern was consistent across the 3 country-level income strata. Lifetime prevalence of PEs was lower in the low-income to lower middle-income countries (3.2%) compared with the upper middle-income and high-income countries (7.2% and 6.8%, respectively). Although we cannot compare our results directly with the single previous cross-national study of PEs[20] owing to differences in how the PEs were assessed, both studies (optimized for consistent design and PE assessment) provided insights in variation between sites.

One of the strengths of cross-national studies, such as the WMH Survey, is that they are able to identify risk factors that exist consistently across countries despite site-specific cultural factors. We found an increased prevalence of HEs and DEs associated with being unmarried or not employed and having a lower household income level. However, certain demographic features were differentially associated with HEs but not DEs and vice versa. For example, women had a significantly higher prevalence of HEs but not DEs. We found a significant relationship between being younger and having DEs but not HEs. Unexpectedly, migrants in our study were significantly less likely to report lifetime HEs (compared with native-born respondents). These novel findings provide important points of distinction between the epidemiologic features of psychotic disorders and PEs.[5,38]

Although several sociodemographic variables were significantly associated with the lifetime prevalence of PEs, these features were not associated with the PE type metric or the PE frequency metric. We speculate that comorbid psychiatric illness (eg, depression and anxiety disorders) and other risk factors known to be associated with PEs and mental disorders (eg, family history, substance use, and trauma exposure) may contribute to these PE-related metrics. The comprehensive nature of the WMH survey will allow us to explore these hypotheses in future analyses.

Although our study has many strengths (eg, large sample size, range of countries, uniform methods for data collection, and innovative analysis of PE-related metrics), several limitations are notable. In keeping with other population-based surveys, we relied on trained lay interviewers to administer the questionnaire. Although we excluded those individuals who had screen-positive findings for possible psychotic disorders, we did not have access to valid measures of clinical psychotic disorders. Lifetime prevalence estimates are prone to underreporting.[37] We only assessed 4 types of DEs, and these probes may have been insensitive to culture-specific delusional beliefs.[16]

Table 4. Frequency of Lifetime Occurrence of PEs Among Respondents Who Reported Ever Having 1 or More PEs in the WMH Surveys

Sample by Type	PE Frequency Metric: Row Sample Size, No.[a]	Prevalence by No. of PEs, % (SE)[b]: 1	2-5	6-10	11-100	≥101
Non-ESEMed						
Visual HE	1379	31.9 (1.7)	32.0 (1.7)	10.5 (1.0)	18.7 (1.4)	6.7 (0.9)
Auditory (verbal) HE	965	20.8 (1.9)	31.7 (2.2)	11.1 (1.3)	26.5 (1.9)	9.9 (1.3)
Any HE	1871	30.4 (1.4)	32.4 (1.4)	10.0 (0.8)	20.6 (1.3)	6.6 (0.8)
Thought insertion and/or withdrawal DE	162	28.9 (4.1)	27.1 (3.9)	9.7 (2.0)	15.6 (2.9)	18.8 (3.3)
Mind control and/or passivity DE	136	27.1 (5.0)	18.2 (3.5)	11.8 (2.5)	24.2 (4.5)	18.8 (4.6)
Ideas of reference DE	169	15.5 (2.6)	24.5 (4.5)	13.2 (2.8)	23.7 (4.0)	23.1 (5.2)
Plot to harm and/or follow DE	278	36.4 (3.5)	26.2 (2.8)	12.6 (2.2)	18.7 (2.4)	6.0 (1.8)
Any DE	556	29.1 (2.5)	27.6 (2.1)	12.6 (1.5)	18.2 (1.8)	12.5 (2.0)
Any PE[c]	2125	31.7 (1.4)	31.9 (1.3)	10.1 (0.7)	20.0 (1.2)	6.4 (0.7)
1 PE type[c]	1452	37.5 (1.7)	32.3 (1.5)	8.9 (0.8)	18.0 (1.4)	3.3 (0.7)
2 PE types[c]	491	16.7 (3.3)	35.3 (3.6)	12.8 (2.5)	24.9 (2.5)	10.3 (1.9)
≥3 PE types[c]	182	17.2 (2.8)	17.6 (3.5)	13.8 (3.4)	25.6 (3.9)	25.8 (4.3)
ESEMed[c]						
Any PE	260	36.4 (3.3)	30.7 (2.9)	9.5 (1.5)	20.3 (2.3)	3.2 (0.9)
1 PE type	179	43.0 (3.9)	29.6 (3.7)	4.3 (1.4)	21.0 (2.1)	2.1 (0.9)
2 PE types	53	23.6 (8.6)	33.7 (4.7)	32.3 (5.7)	6.8 (1.3)	3.6 (1.4)
≥3 PE types	28	2.1 (0.6)	34.0 (12.1)	2.5 (1.0)	48.2 (12.5)	13.2 (5.6)
All[c]						
Any PE	2385	32.2 (1.3)	31.8 (1.2)	10.0 (0.7)	20.0 (1.1)	6.0 (0.6)
1 PE type	1631	38.1 (1.5)	32.0 (1.4)	8.4 (0.7)	18.3 (1.2)	3.2 (0.6)
2 PE types	544	17.4 (3.1)	35.1 (3.3)	14.6 (2.3)	23.2 (2.2)	9.7 (1.8)
≥3 PE types	210	15.6 (2.5)	19.3 (3.3)	12.7 (3.1)	27.9 (3.9)	24.5 (3.9)

Abbreviations: DE, delusional experience; ESEMeD, European Study of the Epidemiology of Mental Disorders; HE, hallucinatory experience; PE, psychotic experience; WMH, World Mental Health.

[a] Indicates the unweighted number of respondents who reported PEs.

[b] Prevalence estimates are based on weighted data.

[c] Types include any of 6.

Conclusions

We have provided, to our knowledge, the most comprehensive description of the epidemiologic landscape of PEs published to date. Although the lifetime prevalence of PEs is 5.8%, these events are typically rare. For nearly one-third of individuals who have PEs (ie, 32.2%), these events were solitary (ie, 1 event only). In the general population, a small subgroup of individuals has multiple types of PEs and experiences these types of PEs more frequently. The research community needs to leverage this fine-grained information to better determine how PEs reflect risk status. Our study highlights the subtle and variegated nature of the epidemiologic features of PEs and provides a solid foundation on which to explore the bidirectional relationship between PEs and mental health disorders.

Table 5. Cross-Table of PE Frequency Metric and PE Type Metric in the WMH Surveys

PE Type Metric[a]	Row Sample Size, No.[b]	PE Frequency Metric: Prevalence by No. of PEs, % (SE)[c]: 1	2-5	≥6	Cochran-Armitage *z* Statistic	*P* Value for *z* Statistic[d]	χ^2 Test	*P* Value for $\chi^{2d,e}$
1	1631	38.1 (1.5)	32.0 (1.4)	29.9 (1.5)	−10.0	<.001	32.1	<.001
≥2	754	16.9 (2.4)	31.2 (2.6)	51.8 (2.9)				

Abbreviations: PE, psychotic experience; WMH, World Mental Health.

[a] Includes any of 6 types.

[b] Indicates the unweighted number of respondents who reported PEs in all countries.

[c] Prevalence estimates are based on weighted data.

[d] Significant at .05 level, 2-sided test.

[e] Indicates *df* of 2.

ARTICLE INFORMATION

Submitted for Publication: February 10, 2015; final revision received and accepted March 24, 2015.

Published Online: May 27, 2015. doi:10.1001/jamapsychiatry.2015.0575.

Author Affiliations: Queensland Centre for Mental Health Research, The Park Centre for Mental Health, Wacol, Australia (McGrath, Saha); Discipline of Psychiatry, University of Queensland, St Lucia, Australia (McGrath, Saha); Queensland Brain Institute, University of Queensland, St Lucia, Australia (McGrath, Saha); College of Medicine, Al-Qadisiya University, Al Diwaniya City, Iraq (Al-Hamzawi); Health Services Research Unit, Instituto Hospital del Mar de Investigaciones Médicas, Institut de Recerca Hospital del Mar, Barcelona, Spain (Alonso); Centros de Investigación Biomédica en Red (CIBER) en Epidemiologõia y Salud Puïblica, Barcelona, Spain (Alonso); Department of Psychiatry, Stony Brook University School of Medicine, Stony Brook, New York (Bromet); Universitair Psychiatrisch Centrum–Katholieke Universiteit Leuven, Campus Gasthuisberg, Leuven, Belgium (Bruffaerts); Chronic Diseases Research Center and Department of Mental Health, Faculdade de Ciências Médicas, Universidade Nova de Lisboa, Lisbon, Portugal (Caldas-de-Almeida); Department of Health Care Policy, Harvard Medical School, Boston, Massachusetts (Chiu, Sampson, Kessler); Department of Psychiatry, Interdisciplinary Center, Psychopathology and Emotion Regulation, University of Groningen, University Medical Center, Groningen, the Netherlands (de Jonge); Institute for Development, Research, Advocacy, and Applied Care, Beirut, Lebanon (Fayyad); National School of Public Health, Management and Professional Development, Bucharest, Romania (Florescu); Department of Psychiatry, University College Hospital, Ibadan, Nigeria (Gureje); Parc Sanitari Sant Joan de Déu, Centros de Investigación Biomédica en Red de Salud Mental, Universitat de Barcelona, Barcelona, Spain (Haro, Ochoa); Shenzhen Insitute of Mental Health and Shenzhen Kanging Hospital, Shenzhen, China (Hu); Ecole des Hautes Etudes en Santé Publique, EA 4057 Paris Descartes University, Paris, France (Kovess-Masfety); Hôpital Lariboisière Fernand Widal, Assistance Publique Hôpitaux de Paris, Institut National de la Santé et de la Recherche Médicale, l'Unité Mixte de Recherche S 1144, University Paris Diderot and Paris Descartes, Paris, France (Lepine); Department of Psychological Medicine, Dunedin School of Medicine, University of Otago, Dunedin, New Zealand (Lim, Scott); National Institute of Psychiatry Ramón de la Fuente, Mexico City, Mexico (Mora); Subdirección General de Salud Mental, Servicio Murciano de Salud, Instituto Murciano de Investigación Biosanitaria Virgen de la Arrixaca, Centro de Investigación Biomédica en Red de Epidemiología y Salud Pública, Murcia, Spain (Navarro-Mateu); Department of Social Medicine, Federal University of Espírito Santo, Vitória, Brazil (Viana).

Author Contributions: Dr Kessler had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.
Study concept and design: McGrath, Al-Hamzawi, Alonso, Haro, Kovess-Masfety, Lepine, Ochoa, Viana, Kessler.
Acquisition, analysis, or interpretation of data: Saha, Alonso, Bromet, Bruffaerts, Caldas-de-Almeida, Chiu, de Jonge, Fayyad, Florescu, Gureje, Haro, Hu, Kovess-Masfety, Lepine, Lim, Mora, Navarro-Mateu, Ochoa, Sampson, Scott, Viana, Kessler.
Drafting of the manuscript: McGrath, Saha, Al-Hamzawi, Kessler.
Critical revision of the manuscript for important intellectual content: McGrath, Saha, Alonso, Bromet, Bruffaerts, Caldas-de-Almeida, Chiu, de Jonge, Fayyad, Florescu, Gureje, Haro, Hu, Kovess-Masfety, Lepine, Lim, Mora, Navarro-Mateu, Ochoa, Sampson, Scott, Viana, Kessler.
Statistical analysis: McGrath, Saha, Chiu, Lim, Sampson, Kessler.
Obtained funding: McGrath, Alonso, Bruffaerts, Caldas-de-Almeida, Gureje, Kovess-Masfety, Lepine, Mora.
Administrative, technical, or material support: McGrath, Bromet, Caldas-de-Almeida, de Jonge, Gureje, Hu, Lepine, Ochoa.
Study supervision: Fayyad, Navarro-Mateu, Ochoa, Sampson.

Conflict of Interest Disclosures: During the past 3 years, Dr Kessler has been a consultant for Hoffman-La Roche, Inc, Johnson & Johnson Wellness and Prevention, and Sanofi and has served on advisory boards for Mensante Corporation, Plus One Health Management, Lake Nona Institute, and US Preventive Medicine. No other disclosures were reported.

Funding/Support: Each World Mental Health (WMH) country obtained funding for its own survey. The São Paulo Megacity Mental Health Survey is supported by Thematic Project Grant 03/00 204-3 from the State of São Paulo Research Foundation; the Shenzhen Mental Health Survey, by the Shenzhen Bureau of Health and the Shenzhen Bureau of Science, Technology, and Information; the Colombian National Study of Mental Health, by the Ministry of Social Protection and the Saldarriaga Concha Foundation; the European Study of the Epidemiology of Mental Disorders project, by contracts QLG5–1999–01042 and 2004123 from the European Commission, the Fondo de Investigación Sanitaria (the Piedmont Region [Italy]), grant FIS 00/0028 from the Instituto de Salud Carlos III (Spain), grant SAF 2000–158-CE from the Ministerio de Ciencia y Tecnología (Spain), grants Centro de Investigación Biomédica en Red CB06/02/0046 and Redes Temáticas de Investigación Cooperativa en Salud RD06/0011 REM-TAP from the Departament de Salut, Generalitat de Catalunya, Spain, Instituto de Salud Carlos III, other local agencies, and an unrestricted educational grant from GlaxoSmithKline; the Iraq Mental Health Survey (IMHS), by funding from the Japanese and European funds through United Nations Development Group Iraq Trust Fund; the Lebanese National Mental Health Survey, by the Lebanese Ministry of Public Health, the World Health Organization (WHO) (Lebanon), anonymous private donations to the Institute for Development, Research, Advocacy and Applied Care, Lebanon, and unrestricted grants from Janssen Cilag, Eli Lilly and Company, GlaxoSmithKline, Roche, and Novartis; the Mexican National Comorbidity Survey (MNCS), by grant INPRFMDIES 4280 from The National Institute of Psychiatry Ramon de la Fuente, grant CONACyT-G30544-H from the National Council on Science and Technology, and supplemental support from the Pan American Health Organization; the New Zealand Mental Health Survey, by the New Zealand Ministry of Health, Alcohol Advisory Council, and the Health Research Council; the Nigerian Survey of Mental Health and Well-being, by the WHO (Geneva), the WHO (Nigeria), and the Federal Ministry of Health, Abuja; the Peruvian World Mental Health Study, by the National Institute of Health of the Ministry of Health of Peru; and the US National Comorbidity Survey Replication, by grant U01-MH60220 from the National Institute of Mental Health, the National Institute on Drug Abuse, the Substance Abuse and Mental Health Services Administration, grant 044708 from the Robert Wood Johnson Foundation, and the John W. Alden Trust. Additional support was from John Cade Fellowship APP1056929 from the National Health and Medical Research Council (Dr McGrath).

Role of the Funder/Sponsor: The funding sources had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication.

Disclaimer: The views and opinions expressed in this report are those of the authors and should not be construed to represent the views or policies of any of the sponsoring organizations, agencies, or the WHO.

Additional Contributions: The surveys discussed in this article were administered in conjunction with the WHO WMH Survey Initiative. The WMH staff assisted with instrumentation, fieldwork, and data analysis, and these activities were supported by grant R01MH070884 from the US National Institute of Mental Health, the John D. and Catherine T. MacArthur Foundation, the Pfizer Foundation, grants R13-MH066849, R01-MH069864, and R01 DA016558 from the US Public Health Service, Fogarty International Research Collaboration award R01-TW006481 from the Fogarty International Center, the Pan American Health Organization, Eli Lilly and Company, Ortho-McNeil Pharmaceutical, Inc, GlaxoSmithKline, and Bristol-Myers Squibb.

REFERENCES

1. van Os J. The many continua of psychosis. *JAMA Psychiatry*. 2014;71(9):985-986.

2. Linscott RJ, van Os J. An updated and conservative systematic review and meta-analysis of epidemiological evidence on psychotic experiences in children and adults: on the pathway from proneness to persistence to dimensional expression across mental disorders. *Psychol Med*. 2013;43(6):1133-1149.

3. Saha S, Chant D, Welham J, McGrath J. A systematic review of the prevalence of schizophrenia. *PLoS Med*. 2005;2(5):e141. doi:10.1371/journal.pmed.0020141.

4. Werbeloff N, Drukker M, Dohrenwend BP, et al. Self-reported attenuated psychotic symptoms as forerunners of severe mental disorders later in life. *Arch Gen Psychiatry*. 2012;69(5):467-475.

5. Kelleher I, Cannon M. Psychotic-like experiences in the general population: characterizing a high-risk group for psychosis. *Psychol Med*. 2011;41(1):1-6.

6. Freeman D, Fowler D. Routes to psychotic symptoms: trauma, anxiety and psychosis-like experiences. *Psychiatry Res*. 2009;169(2):107-112.

7. Varghese D, Scott J, Welham J, et al. Psychotic-like experiences in major depression and anxiety disorders: a population-based survey in young adults. *Schizophr Bull*. 2011;37(2):389-393.

8. Johns LC, Cannon M, Singleton N, et al. Prevalence and correlates of self-reported psychotic symptoms in the British population. *Br J Psychiatry*. 2004;185:298-305.

9. Nishida A, Sasaki T, Nishimura Y, et al. Psychotic-like experiences are associated with suicidal feelings and deliberate self-harm behaviors in adolescents aged 12-15 years. *Acta Psychiatr Scand*. 2010;121(4):301-307.

10. Saha S, Scott JG, Johnston AK, et al. The association between delusional-like experiences and suicidal thoughts and behaviour. *Schizophr Res*. 2011;132(2-3):197-202.

11. Kelleher I, Devlin N, Wigman JT, et al. Psychotic experiences in a mental health clinic sample: implications for suicidality, multimorbidity and functioning. *Psychol Med*. 2014;44(8):1615-1624.

12. Saha S, Scott JG, Varghese D, McGrath JJ. The association between general psychological distress and delusional-like experiences: a large population-based study. *Schizophr Res*. 2011;127(1-3):246-251.

13. Stochl J, Khandaker GM, Lewis G, et al. Mood, anxiety and psychotic phenomena measure a common psychopathological factor. *Psychol Med*. 2015;45(7):1483-1493.

14. Armando M, Nelson B, Yung AR, et al. Psychotic-like experiences and correlation with distress and depressive symptoms in a community sample of adolescents and young adults. *Schizophr Res*. 2010;119(1-3):258-265.

15. Kaymaz N, Drukker M, Lieb R, et al. Do subthreshold psychotic experiences predict clinical outcomes in unselected non–help-seeking population-based samples? a systematic review and meta-analysis, enriched with new results. *Psychol Med*. 2012;42(11):2239-2253.

16. DeVylder JE, Burnette D, Yang LH. Co-occurrence of psychotic experiences and common mental health conditions across four racially and ethnically diverse population samples. *Psychol Med*. 2014;44(16):3503-3513.

17. Carpenter WT, van Os J. Should attenuated psychosis syndrome be a *DSM-5* diagnosis? *Am J Psychiatry*. 2011;168(5):460-463.

18. Linscott RJ, van Os J. Systematic reviews of categorical versus continuum models in psychosis: evidence for discontinuous subpopulations underlying a psychometric continuum: implications for *DSM-V*, *DSM-VI*, and *DSM-VII*. *Annu Rev Clin Psychol*. 2010;6:391-419.

19. van Os J, Linscott RJ, Myin-Germeys I, Delespaul P, Krabbendam L. A systematic review and meta-analysis of the psychosis continuum: evidence for a psychosis proneness-persistence-impairment model of psychotic disorder. *Psychol Med*. 2009;39(2):179-195.

20. Nuevo R, Chatterji S, Verdes E, Naidoo N, Arango C, Ayuso-Mateos JL. The continuum of psychotic symptoms in the general population: a cross-national study. *Schizophr Bull*. 2012;38(3):475-485.

21. David AS. Why we need more debate on whether psychotic symptoms lie on a continuum with normality. *Psychol Med*. 2010;40(12):1935-1942.

22. World Bank. World Bank data and statistics 2008: country level of economic development. http://web.worldbank.org/WEBSITE/EXTERNAL/DATASTATISTICS/0,contentMDK:20421402~pagePK:64133150~piPK:64133175~theSitePK:239419,00.html. Accessed May 12, 2009.

23. World Bank. *World Development Indicators*. Washington, DC: World Bank; 2003.

24. Saha S, Scott J, Varghese D, McGrath J. The association between physical health and delusional-like experiences: a general population study. *PLoS One*. 2011;6(4):e18566. doi:10.1371/journal.pone.0018566.

25. Saha S, Scott J, Varghese D, McGrath J. Anxiety and depressive disorders are associated with delusional-like experiences: a replication study based on a National Survey of Mental Health and Wellbeing. *BMJ Open*. 2012;2(3):e001001. doi:10.1136/bmjopen-2012-001001.

26. Saha S, Scott JG, Varghese D, Degenhardt L, Slade T, McGrath JJ. The association between delusional-like experiences, and tobacco, alcohol or cannabis use: a nationwide population-based survey. *BMC Psychiatry*. 2011;11:202. doi:10.1186/1471-244X-11-202.

27. Saha S, Scott JG, Varghese D, McGrath JJ. Socio-economic disadvantage and delusional-like experiences: a nationwide population-based study. *Eur Psychiatry*. 2013;28(1):59-63.

28. Scott J, Chant D, Andrews G, Martin G, McGrath J. Association between trauma exposure and delusional experiences in a large community-based sample. *Br J Psychiatry*. 2007;190:339-343.

29. Varghese D, Saha S, Scott JD, Chan RCK, McGrath JJ. The association between family history of mental disorder and delusional-like experiences: a general population study. *Am J Med Genet B Neuropsychiatr Genet*. 2011;156B(4):478-483.

30. Kessler RC, Ustun TB. *The WHO World Mental Health Surveys: Global Perspectives on the Epidemiology of Mental Disorders*. New York, NY: Cambridge University Press; 2008.

31. Kessler RC, Haro JM, Heeringa SG, Pennell BE, Ustün TB. The World Health Organization World Mental Health Survey Initiative. *Epidemiol Psichiatr Soc*. 2006;15(3):161-166.

32. Kessler RC, Üstün TB. The World Health Organization Composite International Diagnostic Interview. In: Kessler RC, Üstün TB, eds. *The WHO World Mental Health Surveys: Global Perspectives on the Epidemiology of Mental Disorders*. New York, NY: Cambridge University Press; 2008:58-90.

33. Kessler RC, Ustün 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(2):93-121.

34. American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders*. ed 4. Washington, DC: American Psychiatric Association; 1994.

35. Wolter KM. *Introduction to Variance Estimation*. New York, NY: Springer-Verlag; 1985.

36. Armitage P. Tests for linear trend in proportions and frequencies. *Biometrics*. 1955;11(3):375-386.

37. Moffitt TE, Caspi A, Taylor A, et al. How common are common mental disorders? evidence that lifetime prevalence rates are doubled by prospective versus retrospective ascertainment. *Psychol Med*. 2010;40(6):899-909.

38. Kelleher I, Cannon M. Whither the psychosis-neurosis borderline. *Schizophr Bull*. 2014;40(2):266-268.