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Association between psychotic experiences and subsequent suicidal thoughts and behaviors: A cross-national analysis from the World Health Organization World Mental Health Surveys

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Footnote to acknowledge WMH collaborators

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Abstract

IMPORTANCE—Community-based studies have linked psychotic experiences (PEs) with increased risks of suicidal thoughts and behaviors (STBs). However, it is not known if these associations vary across the life-course or if mental disorders (antecedent to the STBs) contribute to these associations.

OBJECTIVE—To examine the temporal association between PEs and subsequent STBs across the life span as well as the influence of mental disorders (antecedent to the STBs) on these associations.

DESIGN, SETTING, AND PARTICIPANTS—A total of 33,370 adult respondents across 19 countries from the WHO World Mental Health (WMH) Surveys were assessed for PEs, STBs (ideation, plans, and attempts), and 21 DSM-IV mental disorders. Discrete-time survival analysis was used to investigate the associations of PEs with subsequent onsets of STBs.

MAIN OUTCOMES AND MEASURES—Prevalence and frequency of STBs with PEs, and odds ratios and 95%CIs.

Results—Of 33 370 included participants, among those with PEs (n = 2488), the lifetime prevalence (SE) of suicidal ideation, plans, and attempts was 28.5%(1.3), 10.8%(0.7), and 10.2%(0.7), respectively. Respondents with 1 or more PEs had 2-fold increased odds of subsequent STBs after adjusting for antecedent or intervening mental disorders (suicidal ideation: odds ratio, 2.2; 95%CI, 1.8-2.6; suicide plans: odds ratio, 2.1; 95%CI, 1.7-2.6; and suicide attempts: odds ratio, 1.9; 95%CI, 1.5-2.5). There were significant dose-response relationships of number of PE types with subsequent STBs that persisted after adjustment for mental disorders. Although PEs were significant predictors of subsequent STB onset across all life stages, associations were strongest in individuals 12 years and younger. After adjustment for antecedent mental disorders, the overall population attributable risk proportions for lifetime suicidal ideation, plans, and attempts associated with temporally prior PEs were 5.3%, 5.7%, and 4.8%, respectively.

Conclusions—PEs are associated with elevated odds of subsequent STBs across the life-course that cannot be explained by antecedent mental disorders. These results highlight the importance of including information about PEs in screening instruments designed to predict STBs.

Prior studies suggest that psychotic experiences (PEs) are associated with an elevated risk of suicidal thoughts and behaviors (STBs). A recent meta-analysis by Honings et al.[1] based on 21 studies reported a three-fold increased risk of STBs in people with PEs (OR=3.2, 95% CI=2.3-4.4). Other studies have documented a significant dose-response relationship between number of PEs and increased odds of STBs.[2–5] Worryingly, prospective studies of school-age children have reported strong associations between PEs and suicide attempts, with children with PEs having an approximately 11-fold increased odds of suicide attempts during the following 12 months (OR=11.3, 95% CI= 4.4-28.6) compared to those without.[6]

Despite the growing body of evidence linking the presence of PEs with STBs, several research questions warrant closer attention. First, there is considerable variation in effect size estimates for these associations across studies, likely due to methodological and analytic differences.[1,7,8] Thus, it would be informative to examine these association across different sites using similar methods. Second, prior studies have documented that most common mental disorders are associated with increased odds of both PEs[9] and STBs.[10–12] However, it is unclear whether the presence of mental disorders explains the associations of PEs with subsequent STBs.[13] Third, although it has generally been assumed that mental disorders could increase the risk of each of three main STB outcomes (i.e., ideation, plans, attempts), recent studies have shown that only a subset of those with ideation also have suicidal plans and attempts.[14,15] To date, studies have not yet examined the role of PEs with respect to the odds of transitioning between ideation, plans and attempts.

Fourth, there is evidence to suggest that the association between PEs and STBs may be stronger in samples based on children,[6] compared to estimates based on adult samples.[1] Thus, it would be of interest to examine if the strength of the association between PEs and STBs differed across age groups within one study. If children and/or adolescents with PEs are differentially prone to STBs compared to older age groups, this could have important clinical implications for screening in pediatric and adolescent settings.[6] Fifth, there is

considerable uncertainty about the population attributable risk proportions (PARPs) for STBs that are associated with PEs. For example, Kelleher et al.[6] have suggested that 56-75% of suicide attempts among 13-16 year old were attributable to PEs, whereas DeVylder et al.[16] reported that about 29% of suicide attempts were attributable to PEs among US adults. Accurate and age range specific estimates of these PARPs are important for policy-making and prevention purposes.

The specific aims of this study were to examine: (a) the temporal association between PEs and subsequent STBs in a large cross-national study; (b) the relationships of number of PE types and annualized frequency of PEs with subsequent STBs; (c) the influence of mental disorders (antecedent to the STBs) on these associations; (d) variations in the associations across the life span; (e) the association of PEs with suicidal ideation and with the occurrence of plans and attempts among ideators; and finally (f) the PARPs of various STBs.

METHOD

Samples

The data derived from the WHO World Mental Health (WMH) surveys, a coordinated set of community surveys administered in probability samples of adult respondents (18+) in countries throughout the world.[17] We included the 19 WMH surveys that administered both the Psychosis and Suicidality Modules STBs (N=33,370). These surveys are distributed across North and South America (Argentina, Colombia, Mexico, Peru, Sao Paulo in Brazil, 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, Spain). The majority of these surveys were based on multi-stage, clustered area probability household sampling designs, the exceptions being Belgium, Germany and Italy, which used municipal resident registries to select respondents (Supplementary table S1). The weighted (by sample size) average response rate across the 19 surveys was 72.3%.

In order to focus on the correlates of PEs in those without psychotic disorders, 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. Thus, in keeping with previous studies of PEs,[3,9,18,19] we excluded respondents who (a) 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 (b) those who ever took an antipsychotic medication for these symptoms. This resulted in the exclusion of 146 respondents (0.4% of all respondents), leaving 33,370 respondents for this study.

Procedures

All WMH interviews were conducted in the homes of respondents by trained lay interviewers. Informed consent was obtained before beginning interviews in all countries. Procedures for obtaining informed consent and protecting individuals (ethical approvals) were approved and monitored for compliance by the institutional review boards of the collaborating organizations in each country. Standardized interviewer training and quality

control procedures were used consistently in the surveys. Full details of these procedures are described elsewhere.[20,21]

Interviews were administered face to face in two parts.[20] Part 1, which assessed a core set of mental disorders, was administered to all respondents. Part 2, which assessed additional mental disorders, STBs, and PEs, was administered to respondents who met lifetime criteria for any Part I disorder, and a random proportion of respondents without any Part 1 disorder. Part 2 respondents were weighted by the inverse of their probability of selection to adjust for differential sampling, and therefore provide representative data on the target adult general population. Details about sampling methods are available elsewhere.[17] Additional weights were used to adjust for differential probabilities of selection within households, nonresponse, and to match the samples to population socio-demographic distributions.

Measures

The WMH surveys administered the WHO Composite International Diagnostic Interview (CIDI),[21] 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 both DSM-IV and ICD-10. Translation, back-translation, and harmonisation 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 and four related to delusional experiences. We excluded PEs experienced while dreaming, half-asleep or under the influence of alcohol or drugs (Supplementary tables S2a and S2b). In this paper, we present estimates of STBs for "Any PEs" only (i.e., not individual types of PEs). In addition, we included two key PE variables: (a) number of PE types; and (b) an annualized frequency metric based on the frequency of PE episodes (i.e., the count of PE occurrences per year). We derived the latter by dividing the total number of PE episodes by the time since onset of the first PE (age at interview minus age of onset plus 1 in order to avoid zero as a denominator). Age-of-onset of PEs was also assessed.

Suicidality—Lifetime STBs were assessed using the CIDI Suicidality Module.[17] Separate questions were asked about the lifetime occurrence of suicidal ideation *("Have you ever seriously thought about committing suicide?"*), suicide plans *("Have you ever made a plan for committing suicide?"*) and suicide attempt ("*Have you ever attempted suicide?*"). Information on the age at first occurrence for each of these outcomes was obtained. Consistent with our goals of examining relationships of PE with a continuum of suicidal behaviors, we considered each of these three primary outcomes in the total sample. In addition, we examined three secondary nested STB outcomes: (1) suicide plans among respondents with ideation, (2) suicide attempts among those with both ideation and a plan (i.e. planned attempts); and (3) suicide attempts among respondents with ideation but without a plan (i.e. unplanned attempts).

Mental disorders—The WMH version of the CIDI assessed lifetime history of 21 mental disorders broadly classified into *mood disorders*; *anxiety disorders; behavior disorders*;

eating disorders and *substance use disorders* (see supplementary table S2c). Full details are given in several WMH publications including two recent papers on PEs.[9,22] Clinical reappraisal studies indicate that lifetime diagnoses based on the CIDI have good concordance with diagnoses based on blinded clinical interviews.[23] In keeping with our previous research, standardised diagnostic hierarchy rules among the disorders assessed were applied where appropriate.[9]

Statistical Analysis

Lifetime prevalences of PEs, STBs, and STBs among respondents with and without PEs were analysed using descriptive statistics. The predictive associations of temporally prior PEs with each STB outcome were estimated using discrete-time survival models with person-year as the unit of analysis. A person-year dataset was constructed where each year in the life of each respondent (up to and including the age of STB onset or age at interview, whichever came first) was treated as a separate observational record, with the year of STB onset coded 1 and earlier years coded 0. PEs were coded 1 a year after the first PE onset to ensure that a PE occurring in the same year as STBs did not count as a predictor. We estimated models of PE and subsequent STBs adjusting for: (a) respondent's age at interview, gender, person-year dummies, and country, and (b) additionally for 21 antecedent mental disorders (i.e., mental disorders that had onsets prior to the STBs) to examine the influence of mental disorders on the association between PEs and STBs.

Next, we re-estimated the associations between PEs and subsequent STBs after stratifying the sample into 4 life-course stages: childhood (≤12 years); adolescence (13-19 years); young adulthood (20-29 years); and later adulthood (30+ years). This allowed us to examine whether the associations of PEs with onset of STB varied across the life-course (e.g., among the four age strata; between ≤12 years versus 13 years or older), and the strength of association (with and without adjustment for mental disorders) in early versus later years of life, given previous findings of large effects sizes among adolescents (odds ratios above 10).[6,24] Finally, population attributable risk proportions were calculated. PARPs can be interpreted as the expected proportion of reduction in the STBs if PEs were eliminated, based on the assumption that the survival coefficients represent causal effects.[25]

As the WMH data are both clustered and weighted, the design based Taylor series linearization implemented in SUDAAN software was used to estimate the standard errors and evaluate the statistical significance of the coefficients. Survival coefficients and their standard errors were exponentiated to generate ORs and 95% confidence intervals. All significance tests were evaluated using 0.05-level two-sided tests.

RESULTS

Prevalence of STBs

The lifetime prevalence (SE) of suicidal ideation, plans, and attempts in all respondents was 9.2% (0.2), 3.1% (0.1), and 2.8% (0.1), respectively (Table 1). Among suicide ideators (n = 5,106), 33.6% (SE = 0.9) reported a suicide plan. Among the subset of suicide ideators with a plan (n = 2,000), the prevalence of suicide attempts was 55.5% (1.5). Among the subset of

suicide ideators without a plan (n = 3,106), the prevalence of suicide attempts was 17.0% (0.9). (Note: the proportions for the nested suicide outcomes reflect different denominators - see Supplementary Table S3). The lifetime prevalence of STBs was substantially higher among those with PEs compared to those without PEs (Table 1). Specifically, among respondents with PEs, the prevalence of suicidal ideation, plans and attempts were 28.5% (1.3), 10.8% (0.7), and 10.2% (0.7) respectively, compared with 8.0% (0.2), 2.6% (0.1), and 2.3% (0.1) for respondents without PEs.

Associations between lifetime PEs and subsequent onset of STBs

Compared to those without PEs, those with any PEs had three times the odds of a subsequent first onset of each STB outcome adjusting for demographic factors (Table 2), with adjusted odds ratios (95% CI) for suicidal ideation, plans and attempts of 3.0 (2.6-3.6), 3.4 (2.8-4.1), and 3.1 (2.4-3.9), respectively. There was also a significant dose-response relationship between the two PE metrics and the three STBs, (χ^2 ranged between 137.5 and 256.2, p <.001). The ORs for STBs among those experiencing ≥3 PE types ranged from 7.1 for ideation (4.9-10.3) to 11.1 for plans (7.1-17.4). There was also a three- to four-fold increased odds of various STBs in those with more frequent annualized PEs (> 0.3 episodes/year) compared to those with less frequent annualized PEs (≤ 0.3 episodes/year), with ORs ranging from 3.0 for attempts (2.3-4.1) to 3.8 for plans (2.9-5.1).

When we adjusted for 21 antecedent mental disorders, the effect sizes attenuated but remained statistically significant. After adjustment, those with any PEs had twice the odds of subsequent onset of all three STBs. The significant dose-response relationship between higher PE frequency metrics and STBs also persisted.

When we restricted the analysis to the subset with suicidal ideation, the associations of any PEs with suicide plans and suicide attempts were not significant, indicating that PEs are associated with increased odds of suicidal ideation, but not with an increased odds of planning or attempting suicide among those reporting suicide ideation (Supplementary table S4).

Associations between lifetime PEs and subsequent onset of STBs across four life-course stages

Table 3 shows the associations between PEs and subsequent onset of STBs in four life-course stages. In the basic demographic adjustment models, we found strong and significant associations between occurrence of PEs and subsequent onset of STBs in all four life-course stages (childhood, adolescence, early adulthood and later adulthood). The effect sizes were significantly higher in childhood (≤12years) compared with 13 years or older (ideation: χ^2 = 14.7, p<.001; plans: χ^2 = 17.6, p<.001; attempts: χ^2= 8.8, p = 0.003). The ORs (95% CI) for suicidal ideation, plans and attempts in childhood were 4.0 (2.3-6.8), 7.8 (3.4-17.9), and 5.4 (2.6-11.3), respectively. When adjusted for antecedent mental disorders, the pattern of associations remained significant though the effect sizes were attenuated.

Population attributable risk proportions between PEs and STBs

The overall PARPs for suicidal ideation, plans and attempts ranged between 8.4 and 11.0% (Table 4) in the basic demographic adjustment models. After adjustments for antecedent mental disorders, the overall PARPs were smaller, ranging from 4.8-5.7%. When examined across the life course, compared with older age groups, children aged ≤12 years consistently had the highest PARPs (9.0%, 20.0% and 11.1% for suicidal ideation, plans and attempts, respectively) after adjustment for mental disorders.

DISCUSSION

The results reported here are based on the largest (n = 33,370) and most detailed study of PEs and STBs reported to date. We found that community respondents who reported PEs had a two-fold increased odds of subsequent suicidal ideation, plans and attempts after adjustment for antecedent mental disorders. These estimates are broadly consistent with several longitudinal studies,[1,5,13,26] but slightly lower than the pooled estimate from a recent meta-analysis.[1] We also found a dose-response relationship between: (a) higher numbers of PE types (in keeping with previous literature)[2–5] and (b) higher annualized PE frequency with subsequent STBs. Additionally, these results shed new light on four issues. First, the association between PEs and STBs persisted after adjustment for antecedent mental disorders. Second, among the subset of respondents reporting suicidal ideation, PEs did not contribute significantly to increased odds of subsequent suicide plans or attempts. Third, the association between PEs and STBs was most prominent in children aged ≤12 years. Fourth, PEs accounted for an appreciable proportion of STBs (9-20%), even when adjusted for mental disorders. We discuss each of these in turn.

First, although the association between PEs and STBs were attenuated after adjustment for 21 antecedent mental disorders, appreciable ORs (at least two-fold) were still found between PEs and STBs. These finding are consistent with previous studies.[13,27] and lend weight to the hypothesis that the experience of PEs even in the absence of mental disorders may be sufficient to influence the subsequent onset of STBs. This is an important finding from a clinical point of view because it suggests that PEs may be a predictor of subsequent STBs even in individuals who do not meet criteria for mental disorders. In keeping with a recent commentary,[28] we do not propose that the presence of isolated PEs is sufficient to identified individuals with an ultra-high risk of later transition to psychotic disorder; however these individuals do have an increased risk of a range of other adverse outcomes, including STBs. We hypothesize that as PEs are associated with both psychological distress[29] and disability,[30,31] these factors may be sufficient to contribute to the emergence of subsequent STBs. We note, however, that it is conceivable that PEs and STBs may both emerge during a prodromal phase of a later mental disorder (i.e., a disorder with an age of onset after prior STBs). Although this analysis is beyond the scope of the current paper, such research could further reinforce the clinical utility of routine monitoring of PEs in at risk samples.

Second, we demonstrated for the first time that although PEs were associated with an overall increase in STBs, among those with suicidal ideation, they did not make an additional contribution to the subsequent transition to suicide plans or planned/unplanned attempts. In other words, while those with PEs had an increased odds of each of the three STB outcomes

(i.e. suicidal ideation, suicide plans, suicide attempts), our findings suggest that the presence of PEs did not alter the odds of transitions from suicidal ideation to planned or unplanned attempts. This general pattern is consistent with previous research that explored the associations of mental disorders and these nested STB outcomes.[11]

Third, we found that PEs were associated with the subsequent onset of STBs in each of the four life course stages and that this pattern of associations persisted after adjustment for antecedent mental disorders. Mindful that PEs have a wide age-of-onset distribution (median and interquartile range: 26, 17-41 years),[32] our findings support the hypothesis that PEs are associated with an increased odds of subsequent STBs regardless of age. However, we confirmed that the association between PEs and STBs was indeed more prominent in childhood (≤12 years), consistent with previous findings based on longitudinal studies.[5,6,26,33] While our study was based on adult respondents (18 years and older), it is reassuring to note that the strong association between childhood onset PEs and STBs has been confirmed in both broad cross-sectionally ascertained samples like the WMH and prospectively followed adolescent cohorts.

Finally, we showed that after adjustment for mental disorders, the overall PARP estimates (between 4.8% and 5.7%) were smaller than previously reported.[6,16] However, in children (≤12 years) the adjusted PARPs (between 9-20%) were similar to previously reported PARPs. These findings lend weight to the recommendation by Kelleher and colleagues that clinicians should include PEs when assessing risk of STBs in young people, and that future clinical and epidemiologic studies of STBs should include PE-related items in their risk factor battery.[6]

The current study has several strengths (large sample size, range of countries, uniform methodology for data collection, temporally-ordered variables, etc.). However, it is important to note the study limitations. First, although we excluded people who were screened positive for possible psychotic disorders, the WMH surveys were administered by lay interviewers, and clinical validation of self-reported diagnoses of psychosis or mania was not available. We also used retrospective reports of age-of-onset of the PEs, STBs and mental disorders, which although rigorously obtained,[34] would be subject to some level of recall bias. However, we note that five prospective studies have confirmed the association between PEs and subsequent STBs.[5,6,26,33,35] Third, the surveys were cross-sectional, and without additional follow-up, we were unable to examine the association between PEs and completed suicide. We are aware of two prospective community-based studies that explored this question, but both lacked sufficient power (i.e., small number of completed suicides) to confidently estimate the influence of PEs on this outcome.[26,36] Fourth, it will be of interest to explore if particular types of PEs (e.g. hallucinations, delusions) are differentially associated with STBs. We plan to examine this issue in future analyses.

In conclusion, we found that PEs were independently associated with subsequent STBs regardless of antecedent mental disorders. There were significant dose dependent relationship between both number of PE types and annualized frequency of PEs with subsequent STBs. The association was found at all ages with a stronger effect at younger ages, and were associated with appreciable PARPs. Our study lends additional weight to the

call for the routine inclusion of PEs items when assessing STBs in both research and clinical settings.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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A complete list of all within-country and cross-national WMH publications can be found at http://www.hcp.med.harvard.edu/wmh/.

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Table 1

Lifetime prevalence of suicidal ideation, plans, and attempts

	Ideation			Plan			Attempt		
	n[a]	%[b]	SE	n[a]	%[b]	SE	n[a]	%[b]	SE
STB prevalence	5106	**9.2**	0.2	2000	**3.1**	0.1	1771	**2.8**	0.1
(Denominator N)[c]					(33370)				
PE status									
No PE	4165	**8.0**	0.2	1583	**2.6**	0.1	1388	**2.3**	0.1
(Denominator N)[c]					(30882)				
Any PE	941	**28.5**	1.3	417	**10.8**	0.7	383	**10.2**	0.7
(Denominator N)[c]					(2488)				
Number of PEs (in those with PEs)									
Exactly 1 PE type	571	**23.8**	1.4	236	**8.6**	0.7	219	**8.0**	0.7
(Denominator N)[c]					(1706)				
Exactly 2 PE types	247	**35.4**	3.4	111	**12.8**	1.6	98	**12.1**	1.6
(Denominator N)[c]					(566)				
3 or more PE types	123	**57.5**	4.9	70	**28.8**	4.2	66	**27.9**	4.4
(Denominator N)[c]					(216)				
PE annualized frequency metric[d](in those with PEs)									
≤ 0.3 episodes/year	425	**25.7**	1.9	183	**9.6**	1.0	167	**9.0**	1.0
(Denominator N)[c]					(1259)				
> 0.3 episodes/year	516	**31.7**	1.8	234	**12.2**	1.1	216	**11.5**	1.0

	Ideation			Plan			Attempt		
	n[a]	%[b]	SE	n[a]	%[b]	SE	n[a]	%[b]	SE
(Denominator N)[c]	(1229)								

STB, Suicidal thoughts and behaviors; PE, Psychotic experiences; SE, Standard error

[a] Numerator N refers to the number of cases with each suicidal outcome.

[b] Estimates are based on weighted data.

[c] Denominator N refers to the number of cases in the total sample or in the sample of those with/without PEs.

[d] $$\text{Annualized PE (Frequency of PE per year)} = \frac{\text{Frequency of PE occurrences}}{(\text{age at interview} - \text{age of onset of PE} + 1)}$$

Table 2

Associations between lifetime psychotic experiences and subsequent onset of suicidal ideation, plans, and attempts

	Ideation				Plan				Attempt			
	Basic demographic adjustment[a]		Adjusted for temporally-ordered mental disorders[b]		Basic demographic adjustment[a]		Adjusted for temporally-ordered mental disorders[b]		Basic demographic adjustment[a]		Adjusted for temporally-ordered mental disorders[b]	
	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
PE status												
Any PE	**3.0** *	(2.6–3.6)	**2.2** *	(1.8–2.6)	**3.4** *	(2.8–4.1)	**2.1** *	(1.7–2.6)	**3.1** *	(2.4–3.9)	**1.9** *	(1.5–2.5)
Number of PEs												
Exactly 1 PE type	**2.5** *	(2.0–3.1)	**1.9** *	(1.5–2.3)	**2.6** *	(2.0–3.3)	**1.8** *	(1.4–2.3)	**2.3** *	(1.7–3.2)	**1.6** *	(1.1–2.2)
Exactly 2 PE types	**3.7** *	(2.7–4.9)	**2.5** *	(1.8–3.3)	**3.6** *	(2.5–5.2)	**2.1** *	(1.5–3.1)	**3.3** *	(2.2–5.0)	**1.9** *	(1.2–3.0)
3 or more PE types	**7.1** *	(4.9–10.3)	**4.1** *	(2.9–5.9)	**11.1** *	(7.1–17.4)	**5.2** *	(3.1–8.7)	**10.3** *	(6.2–17.2)	**4.0** *	(2.2–7.3)
Joint significance of the 3 number-of-PE type measures	**χ^2_3 = 256.2** *, **P <.001**		**χ^2_3 = 112.9** *, **P <.001**		**χ^2_3 = 203.1** *, **P <.001**		**χ^2_3 = 63.7** *, **P <.001**		**χ^2_3 = 137.5** *, **P <.001**		**χ^2_3 = 30.5** *, **P <.001**	
Difference in the ORs of the 3 number-of-PE type measures	**χ^2_2 = 24.3** *, **P <.001**		**χ^2_2 = 14.7** *, **P = 0.001**		**χ^2_2 = 32.4** *, **P <.001**		**χ^2_2 = 15.0** *, **P = 0.001**		**χ^2_2 = 26.0** *, **P <.001**		**χ^2_2 = 7.6** *, **P = 0.022**	
PE frequency metric												
> 0.3 episodes/year	**3.5** *	(2.8–4.3)	**2.4** *	(2.0–3.0)	**3.8** *	(2.9–5.1)	**2.3** *	(1.7–3.0)	**3.0** *	(2.3–4.1)	**1.8** *	(1.3–2.5)

PE, Psychotic experiences; OR, Odds ratio; CI, Confidence interval

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

[a]PE (any PE, number of PE type and frequency metric) was used as a predictor of STB outcomes in separate discrete-time survival models. These models control for age-cohorts, gender, person-year dummies and country.

[b]These models additionally control for 21 other temporally-ordered mental disorders.

Table 3

Associations between lifetime psychotic experiences and subsequent onset of suicidal ideation, plans, and attempts in each of four life-course stages, with and without adjustment for antecedent mental disorders

	Childhood, Age ≤ 12 years		Adolescence, Age 13–19 years		Young adulthood, Age 20–29 years		Later adulthood, Age 30+ years		Test for the significance of the slope differences across 4 life course stages		Test for significant differences between age ≤ 12 versus age 13+	
	OR	**(95% CI)**	**OR**	**(95% CI)**	**OR**	**(95% CI)**	**OR**	**(95% CI)**	χ^2_3	**[p-value]**	χ^2_1	**[p-value]**
Basic demographic adjustments[a]												
Ideation	**4.0***	(2.3–6.8)	**3.3***	(2.6–4.2)	**3.0***	(2.3–3.9)	**2.7***	(2.0–3.6)	$\chi^2_3 = 16.4$*	[0.001]	$\chi^2_1 = 14.7$*	[<.001]
Plan	**7.8***	(3.4–17.9)	**3.9***	(2.9–5.3)	**3.2***	(2.3–4.5)	**2.7***	(1.8–3.9)	$\chi^2_3 = 20.6$*	[<.001]	$\chi^2_1 = 17.6$*	[<.001]
Attempt	**5.4***	(2.6–11.3)	**3.0***	(2.1–4.3)	**3.1***	(2.1–4.6)	**3.1***	(1.9–5.1)	$\chi^2_3 = 10.8$*	[0.013]	$\chi^2_1 = 8.8$*	[0.003]
Adjusted for temporally-ordered mental disorders[b]												
Ideation	**2.8***	(1.5–5.0)	**2.4***	(1.8–3.1)	**2.3***	(1.8–3.0)	**1.9***	(1.4–2.6)	$\chi^2_3 = 21.2$*	[<.001]	$\chi^2_1 = 19.2$*	[<.001]
Plan	**5.5***	(2.2–13.8)	**2.5***	(1.8–3.5)	**2.2***	(1.6–3.1)	**1.7***	(1.1–2.5)	$\chi^2_3 = 26.1$*	[<.001]	$\chi^2_1 = 22.2$*	[<.001]
Attempt	**3.2***	(1.4–7.6)	**1.9***	(1.3–2.9)	**2.0***	(1.3–3.1)	**1.8***	(1.0–3.2)	$\chi^2_3 = 16.5$*	[0.001]	$X^2_1 = 14.0$*	[<.001]

PE, Psychotic experiences; OR, Odds ratio; CI, Confidence interval

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

[a]Any PE was used as a predictor of STB outcomes in a discrete-time survival model controlling for age-cohorts, gender, person-year dummies and country.

[b]These models additionally control for 21 other temporally-ordered mental disorders.

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Table 4

Population attributable risk proportions (PARPs)[a] of suicidal ideation, plans, and attempts outcomes due to psychotic experiences in each of four life-course stages

	Population attributable risk proportions (PARPs), %				
	Childhood, Age ≤ 12 years	**Adolescence, Age 13–19 years**	**Young adulthood, Age 20–29 years**	**Later adulthood, Age 30+ years**	**Overall**
Basic demographic adjustments					
Ideation	14.1%	10.6%	9.7%	8.2%	8.4%
Plan	27.6%	13.6%	11.0%	8.5%	11.0%
Attempt	19.9%	10.0%	10.7%	10.8%	10.0%
Adjusted for temporally-ordered mental disorders					
Ideation	9.0%	6.9%	6.5%	4.6%	5.3%
Plan	20.0%	7.6%	6.3%	3.6%	5.7%
Attempt	11.1%	4.8%	5.5%	4.3%	4.8%

[a] $\text{PARPs} = \frac{p * (\text{relative risk} - 1)}{p * (\text{relative risk} - 1) + 1}$ where p = proportion of respondents in the sample with PEs