IMPORTANCE  Suicide is a leading cause of preventable death, especially among individuals with psychotic disorders, and may also be common among nonclinical populations of adults with subthreshold psychotic experiences. Understanding this association has the potential to critically bolster suicide prevention efforts.

OBJECTIVES  To examine the association between 12-month suicidality and 12-month psychotic experiences and to test the hypotheses that psychotic experiences are associated with increased prevalence of suicidal ideation and suicide attempts during the concurrent period and with greater severity of suicidal behavior.

DESIGN, SETTING, AND PARTICIPANTS  Cross-sectional survey data were drawn from a large general population-based sample of households in the United States identified through the Collaborative Psychiatric Epidemiology Surveys (2001-2003). Adult household residents (n = 11,716) were selected using a clustered multistage sampling design with oversampling of racial/ethnic minority groups. Logistic regression models were adjusted for potential demographic confounders and co-occurring DSM-IV mental health conditions.

EXPOSURES  Twelve-month psychotic experiences assessed with the Composite International Diagnostic Interview, version 3.0 psychosis screen.

MAIN OUTCOMES AND MEASURES  Twelve-month suicidal ideation and suicide attempts.

RESULTS  Respondents reporting psychotic experiences were more likely to report concurrent suicidal ideation (odds ratio [OR], 5.24; 95% CI, 2.85-9.62) and suicide attempts (OR, 9.48; 95% CI, 3.98-22.62). Most respondents with psychotic experiences (mean [SE], 65.2% [4.2%]) met criteria for a DSM-IV depressive, anxiety, or substance use disorder. Among respondents with suicidal ideation, those with psychotic experiences were likely to make an attempt during the concurrent 12-month period (OR, 3.49; 95% CI, 1.05-11.58) when adjusting for co-occurring psychiatric disorders. In contrast, depressive (OR, 1.67; 95% CI, 0.62-4.52), anxiety (OR, 1.57; 95% CI, 0.40-5.52), and substance use disorders (OR, 1.64; 95% CI, 0.24-11.17) did not reliably identify those at risk for attempts among respondents with suicidal ideation. The mean (SE) 12-month prevalence of suicide attempts among individuals reporting ideation and psychotic experiences and meeting criteria for any psychiatric disorder was 47.4% (10.9%) compared with 18.9% (4.8%) among those with just ideation and a disorder. Psychotic experiences were especially prevalent among individuals reporting severe attempts and may account for nearly one-third of attempts with intent to die (population attributable risk, 29.01%) in the United States annually.

CONCLUSIONS AND RELEVANCE  Assessment of psychotic experiences among individuals with suicidal ideation has potential clinical and public health utility in reducing the prevalence of suicide attempts, particularly attempts with intent to die.
Suicide is a leading cause of preventable death, with schizophrenia accounting for approximately 14% of completed suicides worldwide. Approximately 5% of people with schizophrenia die of suicide. Vulnerability to suicide may extend beyond categorical diagnostic boundaries to broader pathologic phenotypes.

One population-based study of adolescents in Ireland found that psychotic experiences were associated with approximately 10-fold odds of any suicidal behavior, including ideation, plans, or attempts, and were further associated with greatly increased odds of suicide plans or attempts among those with suicidal ideation. Similar associations were identified between psychotic experiences and suicidal ideation and self-harm behaviors among adolescents in Japan. Cross-sectional associations have been confirmed through 2 prospective cohort studies that found that adolescent psychotic experiences predict suicide attempts during the following year and into adulthood. One study that examined suicidal ideation among adults with delusion-like experiences suggested that this association may extend beyond adolescence.

This study examines the association between 12-month psychotic experiences and concurrent suicidal ideation and suicide attempts among a large general population sample of adults living in the United States identified through the Collaborative Psychiatric Epidemiology Surveys (CPES). Understanding this association at the population level requires a large national database given the relatively low prevalence of suicidal behavior and psychotic experiences, making the population from the CPES the ideal and perhaps only data set available with the characteristics needed to assess this association in the United States. Prevalence of suicidal ideation and suicide attempts was compared between those with and without psychotic experiences, with the hypothesis that there would be a positive association between psychotic experiences and suicidality suggested by prior studies. We then examined the association between psychotic experiences and severity of suicidality, testing for risk of suicide attempts in the subgroup endorsing ideation and for intent to die in the subgroup endorsing attempts. Given that threshold psychosis is associated with severe suicide attempts, it was predicted that psychotic experiences would likewise be associated with severity of suicidal behavior.

Methods
Participants
The CPES are lay-administered national household surveys of 20,013 adults (aged ≥18 years). The CPES are assembled from 3 constituent surveys conducted in the United States that use similar methods and identical questions for all variables of interest: National Comorbidity Survey Replication (NCS-R), a nationally representative sample; National Latino and Asian American Study, a national area probability sample with supplements for adults of Latino and Asian national origin; and National Survey of American Life, a nationally representative sample of African Americans, with Afro-Caribbean and non-Hispanic white adults drawn from the same source population and of similar socioeconomic status. All surveys used multistage clustered sampling designs. Respondents were included if they completed the nonaffective psychosis screen, which was administered to a random subsample of NCS-R respondents (n = 2322), all National Latino and Asian American Study respondents (n = 4644), and all respondents of races other than white of the National Survey of American Life (n = 4995). Participants were excluded if they had a lifetime psychotic disorder (n = 180), defined as a self-reported lifetime diagnosis of schizophrenia or meeting World Health Organization (WHO) Composite International Diagnostic Interview (CIDI) criteria for lifetime bipolar disorder, or if they were missing data for any variables of interest (n = 65). The final sample consisted of 11,716 respondents. This study was approved by the institutional review board of Columbia University. Because this was a secondary analysis of deidentified data, participant consent was not required.

Measures
Demographic information (age, sex, race, educational level, employment status, and marital status) was self-reported in response to interviewer prompts.

Psychotic Experiences
Psychotic experiences were assessed using the WHO-CIDI, version 3.0 psychosis screen, which improved on previous epidemiologic psychosis assessments by reducing the frequency of false-positive results. Respondents reported the lifetime presence of 6 specific psychotic experiences, including 2 types of hallucinations (visual and auditory hallucinations) and 4 types of delusion-like experiences (thought insertion, thought control, telepathy, and feelings of persecution). Responses were excluded if the experience took place in the context of falling asleep, dreaming, or substance use. Those with any lifetime experiences were asked whether the psychotic experiences had occurred in the past 12 months.

Suicidality
Suicidality was assessed through a written self-report module for respondents literate in English (mean [SD], 81.4% [1.4%]), which facilitates accurate reporting of socially undesirable behaviors. The remaining respondents (mean [SD], 17.4% [1.4%]) were asked the suicidality questions orally in the respondents’ primary language when applicable. Suicidality variables were collapsed across response type because prevalence did not vary by mode of response. Respondents reported whether they had ever seriously thought about committing suicide, whether they had ever attempted suicide, and whether each of these events had ever occurred during the 12-month period before the interview, recorded as dichotomous (present or absent) variables. Positive responses were confirmed through follow-up questions that assessed the timing, frequency, and subjective seriousness of thoughts or attempts. Intent to die was assessed by asking respondents whether their most recent attempt was best described as “a serious attempt to kill myself and it was only luck that I did not succeed,” classified as severe attempts with intent to die, in contrast to “I tried to kill myself, but I knew the method was
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Results

Statistical Analyses

All analyses were conducted using the complex sample features of SPSS statistical software, version 21 (SPSS Inc). Analyses were 2-tailed with \( \alpha = .05 \). Design-based analyses with Taylor series linearization were used to estimate SEs that accounted for the complex multistage clustered design of the CPES sample, with US metropolitan statistical areas or counties as the primary sampling units. All statistical estimates were weighted using CPES sampling weights to account for individual-level sampling factors, including nonresponse and unequal probabilities of selection. Modified weights were created for the purpose of this study, in which NCS-R respondents were additionally weighted proportionately to the inverse of their odds of being randomly selected from the NCS-R pool to receive the psychosis screen (ie, \( 5692/2322 = 2.4513 \)). Subsequent analyses revealed negligible differences in results regardless of which weight variable was used. Therefore, all results are presented using the original CPES weight included in the data set.

Primary Analyses

The prevalence of each 12-month suicidality outcome was assessed among those with and without 12-month psychotic experiences. Odds ratios (ORs) were calculated using blocked logistic regression. Bivariate logistic regression analyses were used to determine whether those with psychotic experiences were at increased risk for both measures of suicidality. Logistic regression analyses were then performed again with adjustments for potential demographic confounders, given that the prevalence of psychotic experiences and suicidality is known to vary across demographic groups in the population, particularly racial/ethnic minority groups that were oversampled in these data.4–5,25 Demographic factors were included as potential confounders if they were significantly associated in bivariate analyses with both 12-month psychotic experiences and either suicidality variable at least at the trend level (\( \alpha = .10 \)). In the another block, clinical variables were added as predictors to determine whether associations with psychotic experiences were independent of other mental health conditions, which frequently co-occur with psychotic experiences.26–28

Progression Along the Continuum of Suicidal Behavior

Within a subsample composed of respondents reporting 12-month suicidal ideation, logistic regression was used to determine whether individuals with suicidal ideation who also reported psychotic experiences were at increased odds of making a suicide attempt compared with those with suicidal ideation alone, adjusted for all potential confounders. Within another subsample, restricted only to respondents who reported 12-month suicide attempts, logistic regression was used to determine whether individuals with severe attempts with intent to die were more likely to endorse 12-month psychotic experiences, without adjustment for confounders to maximize statistical power due to the low frequency of severe attempts.

Population Attributable Risk

The population attributable risk was calculated from the OR as \( \frac{(OR - 1)}{OR} \times \text{prevalence of psychotic experience exposure} \) among those with any attempts and specifically for severe attempts. This calculation provided an estimate of the percentage of attempts that could be prevented if psychotic experiences were removed from the population, assuming a causal relationship.

Descriptive and Demographic Characteristics

Descriptive data are provided in Table 1. The mean (SE) 12-month prevalence of psychotic experiences was 2.6% (0.2%). Potential confounders identified through bivariate analyses included race, marital status, age, and all 4 subtypes of disorders (all of which were more prevalent among respondents with psychotic experiences, suicidal ideation, and suicide attempts). Of the respondents reporting psychotic experiences, a mean (SE) of 65.2% (4.2%) met the criteria for a DSM-IV disorder.

Psychotic Experiences and Suicidality

Individuals reporting psychotic experiences were approximately 5-fold more likely to report suicidal ideation and nearly 10-fold more likely to report a suicide attempt during the corresponding 12-month period. This pattern was consistent across the entire age range (Figure 1). Associations between psychotic experiences and suicidal ideation and suicide attempts remained significant when adjusting for demographic factors and co-occurring clinical conditions (Table 2). The fully adjusted association with suicidal ideation was no longer significant when considering isolated ideation, excluding respondents with suicide attempts (OR, 2.14; 95% CI, 0.72–6.41; Wald \( \chi^2 = 1.88, P = .17 \)).
Severity of Suicidality

The sample was then limited to respondents reporting 12-month suicidal ideation to test whether psychotic experiences were associated with attempts among those with suicidal thoughts. Among this group, psychotic experiences were associated with more than 3-fold greater odds of making an attempt when adjusting for demographic and clinical covariates (OR, 3.49; 95% CI, 1.05-11.58; Wald $\chi^2$ test = 4.22; $P = .04$). By comparison, depressive disorders (OR, 1.67; 95% CI, 0.62-4.52), anxiety disorders (OR, 1.57; 95% CI, 0.40-6.09), alcohol use disorders (OR, 2.10; 95% CI, 0.58-7.59), and drug use disorders (OR, 1.64; 95% CI, 0.24-11.17) were not predictive of suicide attempts among those with suicidal ideation (Figure 2). The mean (SE) prevalence of suicide attempts among respondents with suicidal ideation was 47.4% (10.9%) (OR, 26.33; 95% CI, 5.09-136.14; Wald $\chi^2$ test = 15.45; $P < .001$) for respondents who reported psychotic experiences and met the criteria for a DSM-IV disorder compared with 18.9% (4.8%) (OR, 4.73; 95% CI, 1.12-20.06; Wald $\chi^2$ test = 4.51; $P = .03$) for those with a DSM-IV disorder alone (Figure 3).

The sample was then further limited to those with a 12-month suicide attempt. Most respondents with psychotic experiences who made attempts specifically made attempts with intent to die (weighted mean [SE], 76.8 [21.0]). Psychotic experiences were associated with numerically greater odds of reporting an intent to die during the most recent suicide attempt (OR, 5.09; 95% CI, 0.51-50.73; Wald $\chi^2$ test = 2.00; $P = .16$), although this association was not statistically significant.

Measured as the population attributable risk, 17.53% of total suicide attempts and 29.01% of severe suicide attempts annually could be attributed to the presence of psychotic experiences during the concurrent period, assuming a causal relationship.

Discussion

In support of the primary hypotheses, 12-month psychotic experiences were associated with more than 3-fold greater odds of suicide attempts during the concurrent period in a general population sample of adults and a more than 2-fold greater odds of suicidal ideation, even when controlling for potential demographic and clinical confounders. This finding is consistent with prior studies of suicidality among individuals with psychotic experiences, which have found cross-sectional associations between psychotic experiences and suicidal ideation, plans, attempts, and deliberate self-harm in adolescents7,8 and adults9 and longitudinally in adolescence6 and from childhood into...
The association between psychotic experiences and suicidal acts was similar in magnitude to that identified in 2 cross-sectional cohorts by Kelleher and colleagues (unadjusted OR, 9.48 in this study; OR, 9.0 and 8.5 in the 2 samples of Kelleher et al) despite the older age group of our sample (adults rather than adolescents) and lower prevalence of psychotic experiences. Of note, the association between psychotic experiences and suicidal ideation was no longer significant when excluding respondents who had made attempts (ie, isolated ideation), suggesting that psychosis is related to suicidal behavior but not ideation itself, consistent with prior findings in adolescents.

Respondents with psychotic experiences reported greater severity of suicidal behavior in additional tests. Specifically, they were at 3.5 times the odds of a suicide attempt among those who reported suicidal ideation. In contrast, clinical diagnoses, including depressive, anxiety, and substance use disorders, were not associated with increased severity of suicidal behavior, suggesting that psychotic experiences may uniquely serve as indicators of risk for attempts among respondents with suicidal ideation. Psychotic experiences were particularly predictive of attempts when occurring in the context of any DSM-IV disorder. Those with psychotic experiences were also at nearly 5 times the odds of a severe attempt with intent to die among those who made an attempt, although this was not statistically significant, likely because of lack of power. This finding was consistent with findings from the original National Comorbidity Survey that nonaffective psychotic disorder was associated with intent to die among respondents reporting suicide attempts. No prior studies have specifically examined intent to die among people with psychotic experiences, although intent is associated with more lethal behaviors and the greater likelihood of a subsequent completed suicide.

Causality and Mechanisms

The association between psychotic experiences and suicidality may reflect a causal relationship, supported by recent prospective studies, or shared underlying risk factors. Psychotic experiences and suicidality may serve as non–diagnosis-specific indicators of severe psychopathologic disease and may relate to shared genetic vulnerability or socioenvironmental risk factors, such as childhood trauma or victimization. However, 2 prior studies have tested associations between psychotic experiences and suicidality while controlling for trauma and victimization, which did not explain the association in either case. Other untested common causes may include traumatic brain injury or emotional reactivity to stress. Mechanisms underlying a causal relationship between psychotic experiences and suicidal behavior may include psychological distress related to the symptoms themselves or involve more complex pathways. For example, psychotic experiences may alter people’s conception of reality such that they feel threatened or that their behaviors are beyond control, similar to mechanisms underlying violent behavior in psychotic disorders. Future studies can explore these putative mechanisms through more precise measurement of the characteristics of psychotic experiences and their associated distress.
Public Health and Clinical Implications

Psychotic experiences frequently co-occur with suicide attempts, particularly suicide attempts with intent and expectation to die, with population attributable risks of 17.53% and 29.01%, respectively. No other clinical variable reliably distinguished those who made attempts from those who did not among respondents with 12-month suicidal ideation. Clinical contact is common immediately preceding completed suicides, making it feasible to intervene successfully with suicide if those at greatest risk can be identified. Psychosis screens in the context of broader mental health screening may prove to be a key facet of detecting risk for attempts among those with suicidal ideation, allowing the development of effective interventions tailored toward this high-risk group. Such approaches can draw from known efficacious interventions for suicidality, including cognitive behavior therapy for suicide prevention.²³

Conclusions

Strengths of this study include the large population-level sample, multiple measures of suicidality (including intent to die), and data on clinical diagnoses and potentially confounding demographic variables. Furthermore, to our knowledge, this is only the second study to directly assess the population attributable risk for suicide attempts among respondents with psychotic experiences and the first to do so in adults, which is highly valuable in assessing the utility of screening for psychotic experiences as a means to identify individuals at clinical risk for suicide.

There are potential limitations as well. The CPES did not sample individuals who were institutionalized or homeless, who may have greater prevalences of psychotic experiences and suicidality. The use of in-person interviews rather than a national registry or interviews with family informants, for example, also precluded the detection of completed suicides. This potential ascertainment bias likely led to an underestimate of results rather than spurious findings, given known associations between psychosis and completed suicide.²³⁻²⁴ Psychotic experiences, suicidality, and clinical diagnoses were assessed through trained lay interviewers rather than by experienced health care professionals. Psychotic experiences in particular were assessed with a conservative instrument that yielded lower prevalence rates than some prior research.²⁻³ The use of 12-month rather than lifetime measures biases the measures toward more severe cases of psychotic experiences, suicidality, and diagnoses yet allowed analysis of concurrent associations among clinical phenomena. In addition, despite exclusion of people with psychotic disorders, it is possible that some threshold cases nonetheless were included in our subthreshold group, although this is unlikely to explain associations of this effect size. It is also a potential limitation that qualitative aspects of psychotic experiences were not assessed. Hallucinations vary in their relation to suicidality depending on whether they are persecutory commands or otherwise,²⁶ and case reports suggest that content may be as important as severity.²⁷ However, one prior study²⁸ found that command hallucinations only explain a small number of suicidal cases among those with psychotic experiences. Finally, our study did not assess violence toward others, which may share substrates with suicidal behavior and should be examined in future studies.

Having established a cross-sectional association between suicidal behavior and subthreshold psychosis, the next step would be to examine the clinical utility of screening for subthreshold psychosis among help-seeking adults who report suicidal ideation to determine whether such screens would be practical tools for identifying individuals at high risk for subsequent suicide attempts. Seeking treatment is common among individuals with psychotic experiences,²⁹ making screening feasible if health care and mental health care professionals are trained and attuned to need and value. Future studies also should build on existing evidence of a causal relationship between psychotic experiences and suicidality.⁰⁻¹⁰ If the relationship is causal, then interventions can address psychotic experiences directly, thereby reducing distress associated with these symptoms and risk of suicidal behavior. If the relationship is not causal, then psychotic experiences are nonetheless useful indicators of severe suicidal behavior that can be screened clinically. Either approach, properly implemented, has great potential public health benefits in reducing risk of death or disability associated with severe suicide attempts and other suicidal behavior.

REFERENCES


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Original Investigation Research

a prospective cohort study.


