Psychotic experiences and physical health conditions in the United States

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ABSTRACT

Aims: Psychotic experiences are associated with physical health conditions, though the associations have not always been consistent in the literature. The current study examines the associations between psychotic experiences and several physical health conditions across four racial groups in the United States.
Methods: We analyzed data from the Collaborative Psychiatric Epidemiology Surveys to examine the associations between psychotic experiences and physical health conditions across four racial groups (White, Black, Asian, Latino). We used multivariable logistic regression to calculated adjusted odds ratios and 95% Confidence Intervals.
Results: Psychotic experiences were significantly associated with several physical health conditions depending on the condition and the racial group being examined. Further, the number of physical health conditions was associated with increasingly greater risk for psychotic experiences in a linear fashion.
Conclusions: Psychotic experiences may serve as useful markers for physical health conditions and overall physical health status. Future studies should examine the underlying mechanisms between psychotic experiences and health, and explore the clinical utility of psychotic experiences for preventive interventions.
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1. Introduction

Psychosis is a condition where the perception of reality is affected, resulting in hallucinations, delusions, disorganized thoughts, and negative symptoms. While psychotic disorders are rare, a significant portion of the general population reports 'psychotic experiences', which are mild hallucinations and delusions that are not severe enough to constitute a clinical disorder [1]. In the United States, it has been estimated that 9.6% of Asians, 9.7% of Whites, 13.6% of Latinos, and 15.3% of Blacks will report psychotic experiences at some point in life [2]. While most of these individuals will not develop a psychotic disorder (e.g. schizophrenia), they do have elevated risk [3]. Whether or not this elevated risk is concerning enough to warrant preventive psychosis treatment is debatable [4]. Psychotic experiences have nonetheless become a public health concern because they are associated with a wide range of negative mental and physical health outcomes, including the occurrence of comorbid non-psychotic psychiatric disorders [5–7], suicidal thoughts and

behaviors [8,9], a perceived need for help and service utilization [4,10–13], disabilities [14,15], a poor perception of one's own mental and physical health [16], and a shorter life-span [17].

Notably, studies have started to show that psychotic experiences are associated with several physical health conditions [18–21]. Scott and colleagues [21], analyzed data from the World Mental Health Surveys (WMHS), and found that across 16 countries, psychotic experiences were associated with the subsequent onset of arthritis, back/neck pain, frequent/severe headaches, other chronic pain, heart disease, high blood pressure, diabetes, and peptic ulcer; only headache, other chronic pain, and asthma were significantly associated with subsequent onset of psychotic experiences. This study included a dataset from the United States (the National Comorbidity Survey Replication, NCS-R), but did not report country-wise estimates. Oh and DeVylder [20] analyzed data specific to the United States by combining the NCS-R and the National Latino and Asian American Survey (NLAAS), and found that psychotic experiences predicted arthritis, back/neck problems, headache, and heart disease in adjusted models among the entire pooled sample (not stratified by race/ethnicity). However, there has been notable heterogeneity of findings in this emerging literature, which may be attributable to the varying racial compositions across

the studies. Further, it is also important to examine whether comorbid health conditions are associated with cumulatively greater odds of psychotic experiences, which has been observed in other studies [21,22].

Given the vast and complex socio-economic landscape of the United States, we analyzed the Collaborative Psychiatric Epidemiology Surveys – a set of racially and ethnically diverse surveys that are frequently combined to offer a robust and nuanced portrait of the general population of the United States. First we aimed to examine the associations between psychotic experiences and several medical conditions in the United States. Second, we sought to examine the associations within White, Asian, Latino, and Black samples in order to explore the possibility of effect modification by race. Third, we focused on Black Americans, given that this population is characterized by a high prevalence of psychotic experiences [2], and tend to be on the disadvantaged end of most notable health disparities in the United States [23,24]. Among Black Americans, we tested whether psychotic experiences are associated with several medical conditions that have never been previously studied before with respect to psychotic experiences, such as kidney problems, liver problems, glaucoma, infertility, sickle cell disease, osteoporosis, fibroid tumors, and anemia. Finally, we examined whether a greater number of health conditions (i.e. multimorbidity) was associated with greater odds of reporting lifetime psychotic experiences.

2. Methods

2.1. Sample

We analyzed the Collaborative Psychiatric Epidemiology Surveys (CPES), which comprises three cross-sectional household surveys: (1) the National Comorbidity Survey Replication (NCS-R; [25]), (2) the National Latino and Asian American Study (NLAAS; [26]), and (3) the National Survey of American Life (NSAL; [27]). All of the surveys were conducted between 2001 and 2003. The surveys used a common core instrument, and similar multi-stage probability sampling strategies to achieve nationally representative samples of adults in the general population of the United States. The NCS-R is a nationally representative survey of 9282 adults (over the age of 17, predominantly White, reflecting the general population of the US), of which a random subsample (n = 2322) completed the psychosis screen. Non-White respondents were dropped in order to allow racial comparisons across the other samples, resulting in an analytic sample of 1675. The NLAAS is a nationally representative sample of Latino American (n = 2554) and Asian American (n = 2095) adults. The NSAL is a nationally representative sample of African-American adults (n = 3570), with a Caribbean Black supplement (n = 1621); a smaller sample of White respondents (n = 891) were drawn from the same source neighborhoods, but were excluded because they did not complete the psychosis screen. The sampling methodology of the CPES is described in detail elsewhere [28,29]. Socio-demographic comparisons across the three surveys can be found in prior studies (see [5]). While all three surveys used a common core instrument, we analyzed each sample separately because problems arise from the CPES weights and psychosis screen when examining racial/ethnic groups across the combined data (see [30]).

Since this study focused on sub-threshold psychotic experiences, we excluded 23 individuals who self-reported ever having received a diagnosis of schizophrenia from a medical professional. Further, participants were excluded from the analysis who were missing data for any of the variables of interest, resulting in smaller analytic samples, which were 1675 in the NCS-R; 2082 in the NLAAS – Asian; 2543 in the NLAAS Latino; and 4930 in the NSAL.

2.2. Measures

2.2.1. Psychosis

Psychotic experiences were assessed using the WHO-CIDI 3.0 Psychosis Screen [43], which is a validated measure used internationally (see [31,32]). Respondents were asked to report the lifetime occurrence of six psychotic experiences, including: (1) visual hallucinations, (2) auditory hallucinations, (3) thought insertion, (4) thought control, (5) telepathy, and (6) delusions of persecution. Endorsing at least one of these experiences constituted a positive endorsement of lifetime psychotic experiences. Responses were not considered a psychotic experience when occurring in the context of falling asleep, dreaming, or substance use.

2.2.2. Physical health conditions

Two types of self-reported outcomes were used for physical health conditions, which asked (1) whether the person had a condition, and (2) whether the person ever received a diagnosis of a condition from a health professional. In the NCS-R and NLAAS, respondents were asked "Did a doctor or health professional ever tell you that you had…?" The list of conditions included ulcers, cancer, high blood pressure, diabetes, asthma, chronic lung disease, heart trouble, and epilepsy. Respondents were also asked, "Have you ever had any of the following…?" The list of conditions included arthritis, stroke, frequent/severe headaches, seasonal allergies, chronic back/neck problems, heart disease, and other chronic pain. A total of 15 conditions were assessed in the NCS-R and NLAAS. Similarly in the NSAL, respondents were asked "Did a doctor or health professional ever tell you that you have…" However, the list conditions was longer and included arthritis, ulcers, cancer, high blood pressure, diabetes, liver problems, kidney problems, stroke, asthma, chronic lung disease, blood circulation problems, sickle cell disease, heart trouble, glaucoma, fertility problems, osteoporosis, fibroid tumors, anemia, and an eating disorder. Additionally, NSAL respondents were asked, "In the past year, have you ever had…" The conditions included bad headaches, hearing problems, vision problems, allergies and/or infections, and back problems. A total of 24 conditions were assessed in the NSAL.

2.2.3. Mental health problems

Psychiatric disorders were based on the DSM IV, and included lifetime anxiety disorders (generalized anxiety disorder, panic disorder, panic attacks, social phobia, agoraphobia with and without panic attacks, posttraumatic stress disorder), mood disorders (major depressive disorder, depressive episode, dysthymia), substance use disorder (abuse and dependence), and alcohol use disorder (abuse and dependence). A single dichotomous variable was created to indicate the presence of any one of these psychiatric disorders over the course of one's lifetime.

2.2.4. Tobacco use

In the NCS-R and the NLAAS, smoking status was measured by the categorical item: "Are you a current smoker, former smoker, or have you never smoked?" The item was dichotomized to reflect current/former smoker vs. never smoked. The survey considered respondents who only smoked 'a few times' to have never smoked. The smoking measure in the NSAL differed slightly such that smoking status was measured by an item: current smoker, smoked >100 cigarettes in lifetime but not current smoker, and smoked fewer than 100 cigarettes in one's lifetime. The item was dichotomized to reflect current smokers and >100 cigarettes in one's lifetime vs. fewer than 100 cigarettes.

2.2.5. Health insurance status

Health insurance status was represented by a dichotomous variable equal to 1 if respondents reported being covered by any type of health insurance. In the NCS-R and NLAAS, the possible options for health insurance included military health insurance, health insurance obtained through an employer or union, health insurance purchased directly from an insurance company, Medicare, Medicaid (name varies by state), other state health insurance for uninsured people, or other health insurances not mentioned. In the NSAL, the options included employer health insurance, direct purchase of health insurance, any federal

government health insurance programs, or health insurance through a family member's employer or union.

2.2.6. Socio-demographics

Self-reported socio-demographic variables that had the potential to confound the analyses were included as covariates. In the NLAAS Latino sample, ethnicity adjustments included Puerto Rican, Mexican, Cuban, and other Latino. In the NLAAS Asian sample, ethnicity adjustments included Chinese, Vietnamese, Filipino, and other Asian. In the NSAL, ethnicity adjustments included Caribbean Black and African American. Other covariates included sex (ref: male), age (18–29, 30–44, 45–59, 60), education level (less than high school, high school, some college, college and beyond), and income-poverty ratio, which is defined relative to the federal poverty line (0 = poor, 1–2 = near poor, 3 + =non-poor).

2.3. Analyses

Standard errors were estimated through design-based analyses that used the Taylor series linearization method to account for the complex multistage clustered design, with US metropolitan statistical areas or counties as the primary sampling units. Sampling weights were used for all statistical analyses to account for individual-level sampling factors (i.e. non-response and unequal probabilities of selection). All analyses were performed using STATA SE 13. Multivariable logistic regression models were used to examine the relation between psychotic experiences and each medical condition in separate models, adjusting for potential socio-demographic confounders, lifetime psychiatric disorders, tobacco use, and health insurance status. Multivariable logistic regression models were also used to examine the count of health conditions (0, 1, 2–3, 4+) and psychotic experiences. By using a continuous variable of the number of health conditions in the fully adjusted models, linear trend tests were conducted to examine whether the increasing number of health conditions were related to increasing odds of reporting lifetime psychotic experiences. For all analyses, significance was set at $a = 0.05$, two-tailed.

3. Results

Tables S1 and S2 contain the descriptive statistics of all four racial samples. Tables 1 through 3 contain the multivariable logistic regression

Table 2
Associations between physical health conditions and lifetime psychotic experiences among Black Americans.

	N = 4930
Did a doctor or health professional ever tell you that you had…	
Arthritis	1.43* (1.03–1.97)
Ulcers	1.69** (1.19–2.40)
Cancer	0.96 (0.55–1.68)
High blood pressure	1.48** (1.16–1.88)
Diabetes	1.31 (0.92–1.88)
Liver problem	1.25 (0.70–2.24)
Kidney problem	1.31 (0.81–2.14)
Stroke	2.55** (1.51–4.30)
Asthma	1.42 (0.97–2.08)
Chronic lung disease	1.93 (0.97–3.87)
Blood circulation problem	1.26 (0.84–1.87)
Sickle cell disease	1.15 (0.49–2.66)
Heart trouble	1.63** (1.18–2.26)
Glaucoma	1.17 (0.61–2.26)
Fertility problems	1.88* (1.12–3.16)
Osteoporosis	0.83 (0.35–1.95)
Fibroid tumors	1.04 (0.66–1.62)
Anemia	1.25 (0.87–1.80)
Eating disorder	1.69* (1.04–2.76)
In the past year, have you ever had…	
Bad headaches	1.65** (1.25–2.18)
Hearing problems	2.32** (1.33–4.04)
Vision problems	1.78** (1.33–2.37)
Allergies/infections	1.40* (1.05–1.86)
Back problems	1.45** (1.11–1.88)

OR (95% CI).
Adjusted for sex, age, income, education, ethnicity, psychiatric disorders, tobacco use, and health insurance.
Fibroid tumors: N = 3111.
Anemia: N = 3110.
* p < 0.05.
** p < 0.01.

Table 1
Associations between physical health conditions and lifetime psychotic experiences.

	NCS-R (Whites)[b] N = 1675	NLAAS (Asians) N = 2082	NLAAS (Latinos) N = 2543
Have you ever had…			
Arthritis	1.71** (1.16–2.52)	1.53 (0.82–2.86)	2.02** (1.37–2.95)
Stroke	1.96 (0.76–5.00)	4.40* (1.35–14.37)	0.47 (0.13–1.77)
Frequent/severe headaches	2.10** (1.41–3.11)	1.47 (0.88–2.44)	2.57** (1.59–4.15)
Seasonal allergies	1.18 (0.77–1.79)	1.11 (0.66–1.86)	1.65* (1.03–2.64)
Chronic back/neck problems	1.92** (1.34–2.76)	1.53 (0.88–2.63)	1.81** (1.39–2.35)
Heart disease	1.75 (0.73–4.15)	2.15 (0.71–6.53)	1.04 (0.29–3.74)
Other chronic pain	1.62* (1.03–2.55)	1.08 (0.51–2.30)	2.50** (1.44–4.33)
Did a doctor or health professional ever tell you that you had…			
Ulcers	1.12 (0.67–1.88)	1.48 (0.78–2.81)	1.42 (0.88–2.30)
Cancer	1.09 (0.59–2.00)	0.18 (0.03–1.02)	0.61 (0.18–2.10)
High blood pressure	1.03 (0.59–1.79)	0.70 (0.33–1.51)	1.73* (1.10–2.72)
Diabetes	0.89 (0.48–1.67)	1.07 (0.52–2.22)	1.38 (0.82–2.33)
Asthma	1.02 (0.63–1.63)	1.30 (0.59–2.90)	1.95** (1.25–3.05)
Chronic lung disease	1.02 (0.26–4.05)	–[c]	2.81 (0.71–11.13)
Heart trouble	1.31 (0.59–2.94)	1.28 (0.40–4.12)	0.90 (0.47–1.73)
Epilepsy	3.35** (1.60–6.99)	10.02** (2.45–41.08)	1.07 (0.25–4.49)

OR (95% CI).
Adjusted for sex, age, income, education, race/ethnicity, psychiatric disorders, tobacco use, and health insurance.
* p < 0.05.
** p < 0.01.
[b] In the NCS-R, the sample for the self-rated health was N = 705 (Whites).
[c] Unstable estimates due to small cell count.

Table 3

Associations between count of physical health conditions and lifetime psychotic experiences.

NCS-R (Whites)	
0 conditions	1.0
1 condition	1.49 (0.61–3.64)
2–3 conditions	1.44 (0.82–2.53)
4 or more	2.54 (1.61–3.98)**
NLAAS Asian	
0 conditions	1.0
1 condition	1.43 (0.63–3.23)
2–3 conditions	1.20 (0.73–1.99)
4 or more	1.71 (0.93–3.16)
NLAAS Latino	
0 conditions	1.0
1 condition	1.03 (0.57–1.86)
2–3 conditions	1.47 (0.96–2.26)
4 or more	3.00 (2.06–4.36)**
NSAL	
0 conditions	1.0
1 condition	1.04 (0.43–2.56)
2–3 conditions	1.34 (0.52–3.48)
4 or more	2.65 (1.02–6.93)*

Adjusted for sex, age, income, education, race/ethnicity, psychiatric disorders, tobacco use, and health insurance.

　* $p < 0.05$.

　** $p < 0.01$.

models showing the relation between psychotic experiences and health conditions. In the NCS-R White sample (Table 1), psychotic experiences were associated with greater odds of self-reporting arthritis, frequent/severe headaches, seasonal allergies, chronic back/neck problems, and other chronic pain. People with psychotic experiences were more than three times as likely to report receiving a diagnosis of epilepsy from a doctor or health professional, when compared with people who did not report psychotic experiences.

In the NLAAS Asian sample (Table 1), psychotic experiences were associated with nearly four and a half-fold greater odds of self-reporting stroke, and ten-fold greater odds of receiving a diagnosis of epilepsy from a doctor or health professional (though confidence intervals were wide). In the NLAAS Latino sample (Table 1), psychotic experiences were associated with greater odds of reporting arthritis, frequent/severe headaches, seasonal allergies, chronic back/neck problems, other chronic pain, and greater odds of receiving a diagnosis of high blood pressure, and asthma from a doctor of health care professional.

Table 2 contains the associations between psychotic experiences and health conditions among Black Americans. In the NSAL, psychotic experiences were associated with receiving a diagnosis from a doctor for the following conditions: arthritis, ulcers, high blood pressure, stroke, heart trouble, fertility problems, and eating disorder. Psychotic experiences were also associated with self-reported conditions over the past 12 months, including bad headaches, hearing problems, vision problems, allergies/infections, and back problems.

For the NCS-R and the NLAAS, there were more significant associations when the respondents were asked if they had ever had a particular condition, versus when respondents were asked if a doctor/health professional had ever given them a diagnosis (Table 1), which was not the case in the NSAL (Table 2). Across all four racial samples, reporting a greater number of health conditions was associated with greater odds of reporting psychotic experiences in a linear fashion (Table 3). All linear trends were significant at the $p < 0.05$ level.

4. Discussion

In this study, we found evidence to suggest that several physical health conditions were associated with psychotic experiences, which both corroborates and complicates the somewhat inconsistent body of existing literature on the topic. In our study, we found that the strength

and significance of the associations depended on the health condition and the racial group being examined. In addition, we found that regardless of race, having a greater number of physical health conditions (multimorbidity) was associated with greater odds of reporting psychotic experiences in a linear fashion.

Psychotic experiences were significantly associated with stroke and epilepsy among Asian-Americans. The absence of statistically significant associations for the other health conditions may have been due to the relatively low prevalence of psychotic experiences within this population. Still, strokes (which are caused by a lack of blood circulation to the brain) are related to seizures (which are caused by chaotic electrical activity in the brain) [33], and so the finding that they are both related to psychotic experiences is not entirely surprising. Psychotic experience may be associated with epilepsy by way of structural brain abnormalities, including brain lesions and cortical dysgenesis [34].

For Whites, psychotic experiences appeared to signal chronic pain (arthritis, headaches, back/neck pain), raising the question of whether medications for pain management may be contributing to an organic cause of hallucinations in some way. Psychotic experiences were related to epilepsy among Whites as well, but it is unclear why this association is only significant for Whites and Asians, but not Blacks or Latinos.

For Latinos, psychotic experiences were related to most self-report conditions except for stroke and heart disease, and was related to a diagnosis of high blood pressure and asthma. We cannot ascertain why psychotic experiences were not associated with these circulatory system diseases for this racial group, other than to say Latino-Americans tend to have stroke at a much earlier age than their White counterparts [35] and have an overall lower prevalence of cardiovascular diseases [36].

Among Black Americans, psychotic experiences were associated with a lifetime diagnosis of arthritis, ulcers, high blood pressure, stroke, heart trouble, fertility problems, and eating disorder at any point in life, as well as self-reported headaches, hearing problems, vision problems, allergies/infections, and back problems over the past 12 months. To our knowledge, this is the first study to find psychotic experiences are associated with fertility problems, which aligns with literature that finds individuals with psychotic disorders have been known to have reduced fertility [37].

The link between psychotic experiences and health conditions is still unclear, but may be explained by an underlying stress process and chronic activation of the hypothalamic-pituitary-adrenal axis, which regulates the inflammatory reactions in the body and can impact both mental and physical health. It is unknown why heterogeneity of associations exists across racial groups, though one possible explanation may be barriers to healthcare. People of color have been known to encounter prejudice and discrimination when attempting to use the healthcare system, and may be less willing to use it [38–40]. If health problems can give rise to the occurrence of psychotic experiences, then the poor management of these health conditions may result in heightened severity of symptoms, along with psychological distress, sleep disturbances, and other problems, resulting in stronger associations.

Our findings should be interpreted bearing in mind a number of potential limitations. The data we used were cross-sectional, preventing us from describing the associations between health conditions and psychotic experiences over time, limiting our ability to make causal inferences. Also, while we were able to examine distinct racial groups, there is considerable within-group differences that we were unable to examine because we lacked statistical power. Future studies can examine the associations between psychotic experiences and health conditions within specific ethnic groups. Also, all health conditions were self-reported, and were thus subject to recall and social desirability biases. The exact relation between psychotic experiences and physical health problems needs to be examined more closely, with particular attention to potential mediating mechanisms.

Still, our findings have a number of practical implications. First, psychotic experiences are associated with several specific health conditions, and may serve as a potentially useful clinical indicator for

preventive health interventions. The onset of psychotic experiences often predates the onset of many physical health conditions [21], often manifesting in young adulthood [41], which is years if not decades before certain health conditions start to surface (e.g. heart disease, diabetes, arthritis). Thus, psychotic experiences may be novel risk factors for long-term risk calculation for specific conditions [42]. But our findings also seem to suggest that it may be more fruitful to look at the count of conditions rather than specific diagnoses. It is possible that psychotic experiences simply reflect one's general health status, such that being very unhealthy (that is, endorsing four or more comorbid health conditions) is very strongly associated with risk for psychotic experiences, thereby explaining the mixed results when looking at individual health diagnoses.

Future research should situate our findings within the larger literature that shows the tremendous health disparities that African Americans face in the United States. Nearly half of all African Americans will have some form of heart disease at some point in life, and are disproportionately affected by obesity, diabetes, and high blood pressure [36], contributing to much higher mortality rates when compared with other racial groups [23]. Psychotic experiences are most prevalent among African Americans [2], and so future studies can focus on the clinical utility of psychotic experiences among African Americans in particular.

More research Is needed to explore how to translate psychotic experiences into meaningful clinical screening tools in primary care and community settings. Psychotic experiences are relatively easy to detect in screenings, and serve as useful indicators for a wide range of problems, thus carrying the potential to enhance prevention and early intervention of physical diseases. Given the diverse and evolving racial composition of the United States, race-specific examinations of psychotic experiences and health conditions may support the translation of epidemiological findings into more culturally tailored interventions.

All data from the Collaborative Psychiatric Epidemiology Surveys have been made publicly available:

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.comppsych.2018.12.007.

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