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# A SOCIAL ECOLOGY MODEL FOR SOCIAL DETERMINANTS OF HEALTH AS PSYCHOSIS RISK FACTORS

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# A SOCIAL ECOLOGY MODEL FOR SOCIAL DETERMINANTS OF HEALTH AS PSYCHOSIS RISK FACTORS

by

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## Dedication

This lengthy thesis is dedicated to my father, a man of few words.

**Acknowledgments**

I would like to express my appreciation to Dr. Tom Dinzeo for his guidance and support throughout this process. I would like to thank him for his patience above all else. Additionally, I would like to thank my committee members, Drs. Gotham and Simmons, for their guidance and feedback which have been invaluable.

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## Abstract

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Social determinants of health (SDOHs) significantly impact psychosis risk beyond heritability. However, there is a need for an organizing framework to observe how these diverse elements concurrently predict psychosis risk. This study examines SDOHs as psychosis risk factors using a four-level model, aligned with Bronfenbrenner's social ecology theory. The study aims to assess the proposed model's ability to predict psychosis risk. Specifically, it is hypothesized that each socioecological level of the model would predict psychosis risk with more proximal SDOHs (e.g., individual level vs community) exhibiting stronger predictive power, aligning with Social Ecology theory. College students (N = 210) completed self-report measures of schizotypy, childhood trauma, minority group position, social connectedness, urbanicity, health care access, and SES via online surveys. The overall model accounted for a significant amount of psychosis risk variance (34.8%) with each level contributing significantly. However, contrary to expectations, SDOH proximity did not correspond with predictive ability. Rather, social connectedness, childhood trauma, and healthcare access emerged as salient predictors. The current study provides evidence that a Social Ecology Model, despite limitations, may provide an advantageous framework for future research, risk measurement, and interventions. Current findings reinforce that many of these SDOHs, particularly social connectedness, may be worthwhile targets for interventions.

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# Chapter 1

## Introduction

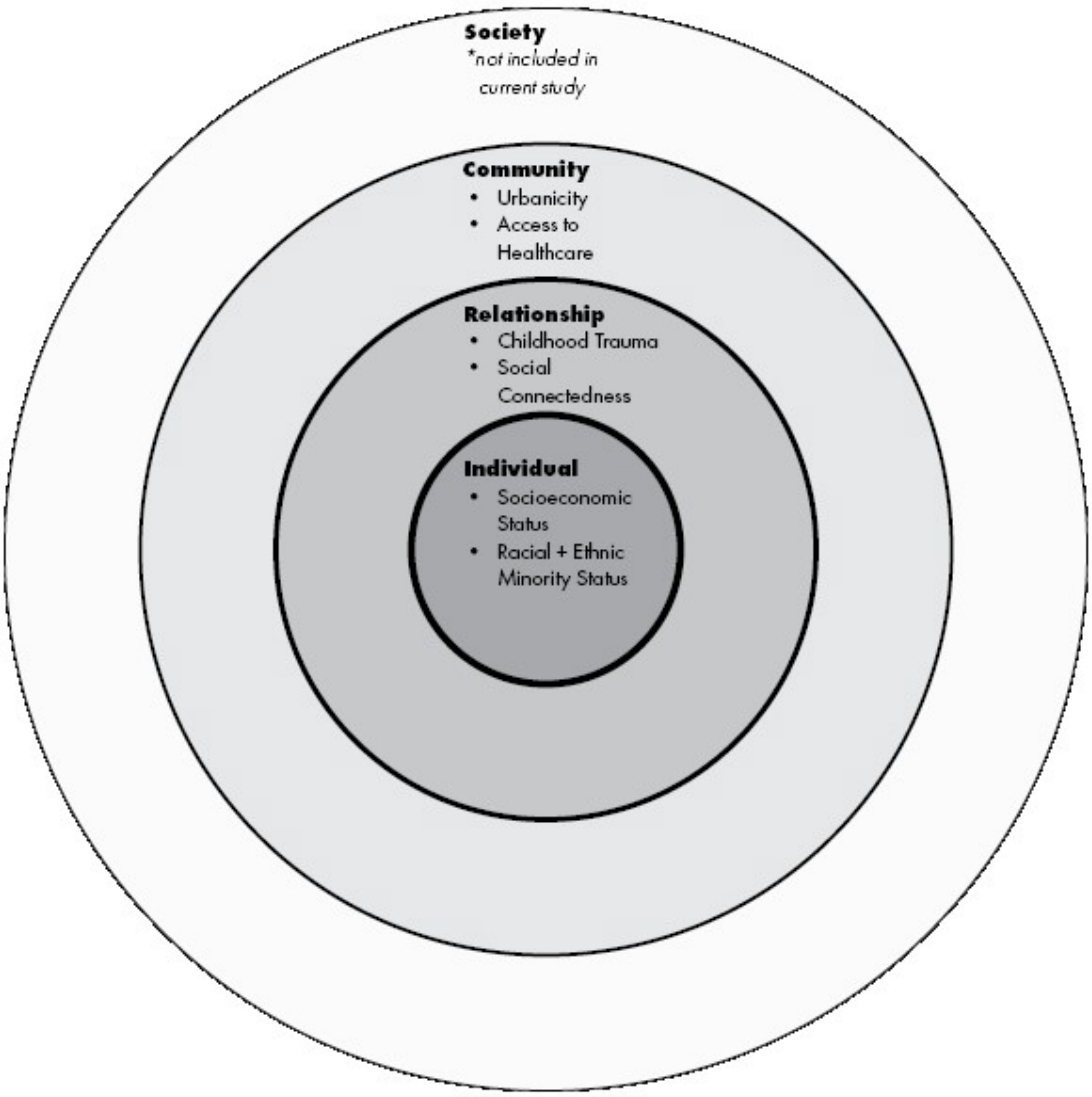
Psychosis is a multifaceted syndrome characterized by the presence of positive psychotic symptoms, notably delusions and hallucinations, often accompanied by an array of comorbidities encompassing negative symptoms, mood syndromes, personality disorders, substance use disorders, and medical conditions. Recognizing the importance of early identification for prevention and treatment, this research explores the clinical high-risk state for psychosis (CHR), also known as the "at-risk mental state", "prodromal" phase, and "ultra-high-risk" state. This CHR state has evolved to capture the pre-psychotic phase in individuals exhibiting potentially prodromal symptoms. Schizotypy refers to a set of traits characterized by unusual beliefs, behaviors, and perceptual experiences that resemble, to a milder degree, the symptoms of schizophrenia. While schizotypy is not a direct predictor of psychosis onset, individuals with high levels of schizotypy may be at an increased risk of developing psychosis or schizophrenia spectrum disorders (SSDs) compared to the general population. Schizotypy assessment tools have been demonstrated to predict psychosis in nonclinical populations, making them an important tool in assessing risk (Flückiger et al., 2016; Kwapil et al., 2020; Racioppi et al., 2018). These tools are used to aid early identification of those who may be at a heightened risk of developing psychosis. However, understanding what factors contributed to this elevated risk may enrich early identification as well as illuminate mechanisms and targets for intervention.

Traditionally, genetic and neurobiological factors have dominated discussions surrounding psychosis risk and etiology. However, decades of research on these factors have found a ceiling for how much variance genetics can explain in psychosis risk (Ripke et al., 2014; Tavares et al., 2023). Comprehensive polygenic risk scores have been found to explain only 9% of the variance in predictions of psychosis conversion, leaving a large proportion of the variance unaccounted for by genetics despite schizophrenia's high heritability estimated around 64% (Lichtenstein et al., 2009; Ripke et al., 2014; Santoro et al., 2016; Vassos et al., 2017). Therefore, social and environmental influences likely account for the remaining variance, playing important roles in individuals' susceptibility to and development of SSDs (Fusar-Poli et al., 2013; Lipner et al., 2023; Lund et al., 2018). Increasing attention is being drawn to various social determinants of health (SDOHs), the conditions in which people live, work, play, and age, which include factors such as economic stability, access to healthcare, and quality of social relationships (Braveman & Gottlieb, 2014; *Healthy People 2030*, 2023; WHO, 2023). Given the growing evidence that numerous SDOHs impact psychosis risk, many researchers in the field have emphasized focusing on social risk factors in research regarding psychosis risk and interventions (Anglin et al., 2020; Fortuna et al., 2022). Understanding the influence of SDOHs on psychosis risk can be pivotal in developing effective preventive measures and interventions, ultimately advancing the field of psychiatric care and improving the overall well-being of affected individuals. Critically, many SDOHs, such as social connectedness and healthcare access, are highly modifiable at relatively low costs and offer novel targets for early interventions.

Many environmental, social, and structural factors and their relationship with psychosis risk have been investigated independently, but an organized framework for considering various SDOHs is greatly needed (Jester et al., 2023). The CDC has used a four-level model guided by Bronfenbrenner's social ecology model as a framework to study similarly complicated biopsychosocial health concerns in recent years (Bronfenbrenner, 1981; CDC, 2007; CDC, 2011). This study will examine the utility of using this framework which includes nested interdependent levels (individual, relationship, community, and societal) of SDOHs to examine psychosis risk (*Figure 1*). The individual level encompasses SDOHs most proximal to the individual. On the other hand, the societal level includes variables most distal to the environment the effects of which are more diffuse than those at levels closer to the individual.

**Figure 1**

*Social Ecology Model*



# Chapter 2

# Literature Review

## 2.1 Individual

As a cornerstone of the broader social ecology model, the individual level stands as a pivotal domain through which various social determinants of health (SDOH) exert their influence on well-being and mental health. Factors such as socioeconomic status, race, and ethnicity have profound impacts on mental health outcomes, including risk of developing schizophrenia spectrum disorders (SSDs).

### *2.1.1 Socioeconomic Status*

Socioeconomic status (SES) is a multifaceted, hierarchical construct that encapsulates information about one's access to valued commodities such as wealth, education, and prestige (House, 1990; Mueller & Parcel, 1981). Low SES is associated with increased negative health outcomes such as cancer and heart disease (Lazzarino et al., 2013; Tawakol et al., 2019). Many studies have documented a similar relationship between low SES and psychosis risk despite there being a wide range of methods of assessing SES (Radua et al., 2018).

A Danish population-based study found SES, calculated using six factors such as parental income, education, and employment status, to be robustly associated with psychosis risk, attributing 45.8% of schizophrenia cases to low SES (Agerbo et al., 2015). Another large population-based, Israeli, cohort study defined SES as discreet classes based on parental education and occupation. The authors found individuals with fathers

in the lowest class had an increased risk of developing SSDs as compared to any of the other 4 classes even after controlling for other potentially confounding variables such as birthweight and paternal age (Corcoran et al., 2009). Using similar factors to determine SES, Werner et al. found lower individual SES, as well as poorer residential area SES, to be risk factors for SSDs (2007). A large review of studies that similarly determined SES by parental occupational prestige at birth provides additional support for a negative correlation between SES and risk for developing psychosis (Kwok, 2014).

Two prominent theories explaining this relationship between low SES and increased risk of psychosis exist in the literature: social causation and social drift. The social drift theory posits that individuals with early signs of psychosis may experience impaired cognitive and social functioning, making it more difficult for them to attain higher socioeconomic positions. As a result, they may "drift" down the socioeconomic ladder over time due to their symptoms, reinforcing the observed association between low SES and psychosis risk. Studies using parental, rather than individual SES, suggest that social drift cannot entirely explain the association of low SES with psychosis. The social causation theory suggests that adverse environmental conditions associated with low SES, such as limited access to quality healthcare, education, and social support, can lead to chronic stress, increased vulnerability to psychosocial stressors, and ultimately contribute to the development of psychotic disorders. These theories together highlight the intricate interplay between socioeconomic factors and mental health outcomes, shedding light on the complex nature of this relationship (Saraceno et al., 2005).

Importantly, research suggests that SES continues to interact with psychosis risk through the prodromal and early phases of SSDs, impacting symptom severity and

trajectory as well as overall functioning. A longitudinal study found evidence that lower parental SES may have disadvantageous effects on the prognosis of individuals identified to be at high risk for developing psychosis (Hur et al., 2015). In this study, those from the lowest SES households exhibited a delayed recovery pattern from the initial emergence of subthreshold symptoms of psychosis to remission of symptoms. Relatedly, a large multi-national Latin American study showed participants with SSDs and low SES performed worse on cognitive assessments than their higher SES counterparts, a pattern not observed in healthy control participants (Czepielewski et al., 2021). Yeo et al. found a similar relationship between low SES and executive functioning in an SSD sample as compared to healthy controls (2014). These findings are important as cognition and executive functioning have been found to be predictive of functional and clinical outcomes over the course of the disorder (Bowie & Harvey, 2006; Herrero et al., 2020; Leeson et al., 2010; Reed et al., 2002).

Low SES, characterized by limited access to essential resources and opportunities, has been consistently linked to an increased vulnerability to the development of psychotic disorders. Various studies, utilizing different methods to assess SES, consistently point to this association, underscoring its robustness across diverse populations. Importantly, research indicates that the impact of SES on psychosis risk extends beyond its initial onset, influencing symptom severity, trajectory, and cognitive functioning throughout the course of the disorder. Understanding the intricate dynamics between socioeconomic factors and psychosis not only contributes to a deeper comprehension of the disorder's origins but also underscores the imperative of addressing socioeconomic disparities to promote mental health and well-being.

### *2.1.2 Racial & Ethnic Minority Status*

Increasing attention is being paid to the difference in mental and physical health outcomes for individuals from racial and ethnic minority groups. In the United States, the CDC, NIH, and other prominent and respected institutes report overwhelming data that racial and ethnic minority groups experience significantly higher rates of morbidity and mortality across a plethora of health conditions, especially diabetes, hypertension, cardiovascular disease, and asthma, despite overall improvements in the nation's health (2022 National Healthcare Quality and Disparities Report, 2023; CDC, 2021; Institute of Medicine, 2003; National Academies of Sciences et al., 2017). Emerging evidence suggests that individuals from racial and ethnic minority groups, who are often marginalized and exposed to chronic social stressors, may face an elevated risk of developing psychosis compared to their majority counterparts.

Results of a recent meta-analysis suggest that both ethnic minority and migrant status may increase the risk of developing threshold and subthreshold psychotic symptoms (Leaune et al., 2019). For migrant groups, the increased stress of the migration, whether chosen or forced (refugee status), likely contributes to their increased psychosis risk (Dykxhoorn & Kirkbride, 2018; Kirkbride et al., 2017; Pedersen & Cantor-Graae, 2012; Veling et al., 2011). A Swedish cohort study found refugees to be at a higher risk of developing psychosis than migrants and, in turn, white, native-born Swedes (Hollander et al., 2016). A register study from Sweden supported these findings, calculating higher psychosis risk ratios for both international adoptees and former child refugees, with a gradual increase in risk with age of adoption (Hjern et al., 2023). However, several studies have found similarly increased risk in second-generation

immigrants as in first-generation immigrants even after controlling for SES, indicating that the stress of migrancy is not the only mechanism responsible for the increased risk in migrant groups (Berg et al., 2014; Cantor-Graae & Selten, 2005; Selten et al., 2020).

Rather, many of these studies found even higher psychosis risk amongst migrants from developing nations and migrants with darker skin complexions (Berg et al., 2014; Cantor-Graae & Selten, 2005; Hollander et al., 2016; Jongsma et al., 2021; Selten et al., 2020). These studies provide compelling evidence that minority status exerts a pronounced influence on psychosis risk beyond that of the stress of migrancy, even though these two factors are frequently interconnected. Even after adjusting for age, sex, SES, and neighborhood-level deprivation, Kirkbride et al. found increased incidence rates of first-episode psychosis (FEP) in most ethnic minority groups (people of black African, black Caribbean, and Pakistani origin) compared to white individuals in Britain (2017). A US birth cohort study found black Americans to be significantly more likely to be diagnosed with SSDs (Bresnahan et al., 2007). Māori, an indigenous group of New Zealand historically racially discriminated against, are found to be at a higher risk for psychosis than other New Zealanders (Tapsell et al., 2018).

To this effect, there is robust evidence that psychosis risk among racial and ethnic minority groups is inversely linked to the proportion of these groups present in their neighborhoods (Bécares et al., 2018; Boydell et al., 2001; Kirkbride et al., 2007, 2008; Richardson et al., 2018; Schofield et al., 2011, 2017, 2018; Veling, 2013; Veling et al., 2008). A recent meta-analysis supports a dose-response relationship between own-ethnic density of one's neighborhood and psychosis risk (Bécares et al., 2018). This observed effect is not likely due to differing abilities or propensities to move neighborhoods during

the prodromal phase as a Danish study found own-ethnicity neighborhood density during adolescence strongly modified adult-age psychosis risk (Schofield et al., 2017). Rather, these findings point to the need to view ethnicity as a complex factor that impacts the social context of how individuals live their lives. Being surrounded by one's own ethnic group could provide social support networks and reduce discrimination, thus reducing stress and acting as a protective effect from risk of psychosis (Bécares et al., 2018; Fett et al., 2019; Veling, 2013). This is supported by a UK study that found a positive relationship between perceived levels of discrimination and severity of psychotic symptoms (Veling, 2013).

Taken together, the evidence suggests that the marginalization and discrimination faced by minority groups may increase stress levels, consequently contributing to overall vulnerability to psychosis, as posited by the allostatic load model, in conjunction with other social determinants of health. Recognizing the effect of the interaction between one's unchangeable identity and the social context in which they exist on psychosis risk allows for more targeted approaches to providing additional resources for the identification and care allocation to those at higher risk due to these interactions.

### 2.2 Relationship

While individual-level factors such as SES and race/ethnicity have significant implications for overall psychosis risk, how individuals relate and interact with others likely also influences risk. The family environment and friendships during the developmental period of childhood, adolescence, and even early adulthood inarguably

mold individuals, shaping predispositions to any number of outcomes from substance use to career choice to, likely, the development of SSDs.

### *2.2.1 Childhood Trauma*

A substantial body of research evidences a heightened likelihood that individuals with SSDs have undergone traumatic experiences during their lifetimes, especially during their childhoods, than their "healthy" peers (Arseneault et al., 2011; Baudin et al., 2017; Bentall et al., 2012; Kelleher et al., 2013; Matheson et al., 2013; Misiak et al., 2022; Varese et al., 2012; Wickham & Bentall, 2016). A meta-analysis calculated that individuals with SSDs are 2.72 times as likely to have experienced adverse events in their childhood (Varese et al., 2012). This finding has been replicated in studies conducted with individuals at clinical high risk (CHR) of developing psychosis (Fisher et al., 2010; Loewy et al., 2019). Furthermore, a study assessing CHR individuals' risk of developing first episode psychosis (FEP) found childhood trauma, specifically sexual and physical abuse and separation from mother before age 4, to be predictive of conversion from CHR to full threshold psychosis (Baudin et al., 2017). Moreover, trauma exposure during childhood has been linked to earlier onset of full threshold psychosis, more hospitalizations, greater severity of negative (Rosenthal et al., 2020) and positive symptoms (Falukozi & Addington, 2012; Kline et al., 2016; Kraan et al., 2015; Sahin et al., 2013; J. L. Thompson et al., 2009; Velthorst et al., 2013), affective symptoms (Kraan et al., 2015; A. Thompson et al., 2016), increased likelihood of engaging in suicidal behavior (Rosenthal et al., 2020), and neuropsychological battery performance (Loewy et al., 2019; Vargas et al., 2019). Therefore, childhood trauma appears to be a significant risk factor for the development of subthreshold and threshold psychotic symptoms.

Theories regarding the mechanism behind the association between childhood trauma and psychosis risk center largely around the concept of allostatic load which refers to the cumulative physiological toll that repeated and chronic exposures to stressors can have on the body over time (Lipner et al., 2023; Raymond et al., 2018; Veling et al., 2016). The body's attempts to maintain homeostasis through mechanisms such as the release of cortisol and adrenaline as well as changes in heart rate, blood pressure, immune system function, etc. are adaptive, but chronic activation of these stress responses without adequate periods of recovery can lead to negative mental and physical health outcomes. Allostatic load is a term used to describe the cumulative physiological wear and tear on the body over time due to repeated and/or chronic stressors. Misiak et al. calculated allostatic load using a range of biomarkers and found evidence for a relationship between earlier and greater number of adverse childhood experiences and allostatic load in patients with psychosis (Misiak et al., 2022). Other studies have investigated the cumulative effects of adverse childhood experiences and risk for psychosis and have found a dose-response relationship that lends support to the allostatic load model (Kelleher et al., 2013; Larkin & Read, 2008; Shevlin et al., 2007). This early life stress leads to dysregulation of the bodily stress response, which has deleterious effects on cognition and neurodevelopment globally, increasing risk for psychosis (Loewy et al., 2019; Vargas et al., 2019).

An extensive body of research supports that childhood trauma is an important social determinant of health that profoundly impacts individuals' risk of developing psychosis and SSDs. The theoretical framework of allostatic load provides valuable insights into the mechanistic underpinnings of this association, shedding light on the

physiological toll that chronic stressors take on the body, ultimately affecting neurodevelopment and increasing vulnerability to psychosis. Recognizing and addressing childhood trauma as a critical factor in psychosis risk is essential for comprehensive mental health care and prevention efforts.

### *2.2.2 Social Connectedness*

Social connectedness refers to the intricate web of relationships and interactions that individuals maintain with others within their social networks. It encompasses the sense of belonging, emotional closeness, and mutual support that bind people together in various spheres of life, such as family, friends, communities, and even online networks (Bel et al., 2009; Haslam et al., 2015; Lund et al., 2018). While there is no consensus as to how social connectedness should be measured, different methods involve the assessment of the quality and quantity of social connections from either a subjective or objective perspective. For example, measures of loneliness provide qualitative and subjective information about social connectedness.

Social connectedness is widely acknowledged as an important social determinant of health, significantly impacting morbidity and mortality as well as mental health outcomes (Haslam et al., 2015; Lund et al., 2018). A recent review, focusing on longitudinal and cohort studies to establish temporal ordering, found social support to be a protective factor for depression while social isolation and loneliness likely contribute to the development of mood disorders across the lifespan (Wickramaratne et al., 2022).

A wealth of literature evidences an association between psychosis and loneliness (Michalska da Rocha et al., 2018), social network sizes (Gayer-Anderson & Morgan,

2013; Macdonald et al., 2000), and frequency of social interactions (Granholm et al., 2019). Furthermore, social functioning appears to predict symptom severity (Degnan et al., 2018) and long-term outcomes (O'Keeffe et al., 2019) for individuals with psychosis according to meta-analyses and a 20-year prospective study respectively. Satisfaction with social connectedness has been found to be negatively associated with both positive and negative symptom scores (Vogel et al., 2021).

As with many factors, social relationships are critical during adolescence in particular, impacting neurodevelopment and influencing risk for mental illnesses (Lamblin et al., 2017; Olsson et al., 2013). Withdrawal and isolation are commonly observed prior to the emergence of psychotic symptoms and have been found to be predictive of the development of SSDs (Matheson et al., 2013; Tarbox-Berry & Pogue-Geile, 2008; Velthorst & Meijer, 2012; Wiles et al., 2006). Loneliness, in particular, has been often identified as a significant risk factor for psychosis (Gizdic et al., 2022, 2023; Michalska da Rocha et al., 2018; Vogel et al., 2021).

Historically, the network crisis theory has been offered as an explanation for the association between various aspects of social connectedness and psychosis symptoms. The theory posits that the size and quality of social networks deteriorate as a consequence of psychotic symptoms (Beels, 1979; Lipton et al., 1981). However, a considerable body of literature suggests that the relationship between social connectedness and psychosis symptoms may be more complex and nonlinear (Degnan et al., 2018; Gayer-Anderson & Morgan, 2013; Horan et al., 2006). Rather, greater social connectedness may act as a buffer against the deleterious effects of trauma on mental health (Brugha, 2010; Degnan et al., 2018). Furthermore, it may serve to prevent or break the vicious cycle of exclusion

that is observed in individuals developing psychosis. Social anhedonia precedes and predicts development of SSDs (Kwapil, 1998). This results in isolation which limits buffers against psychosis risk. In turn, symptoms increase, spurring increased isolation, and so on (Gayer-Anderson & Morgan, 2013). Furthermore, psychotic symptoms are more likely to occur when individuals are alone, further exacerbating the cycle (Myin-Germeys et al., 2001).

The link between psychosis risk and social connectedness is multifaceted, with studies revealing associations between withdrawal, isolation, and increased risk of psychotic symptoms. Notably, the complex interplay between social connectedness and psychosis challenges simplistic theories, such as the network crisis theory, which suggests a linear decline in network quality and size with psychotic symptoms. Instead, emerging evidence suggests that greater social connectedness could act as a safeguard against the adverse impact of trauma and exclusion, potentially breaking the cycle of isolation and vulnerability observed in psychosis development. Ultimately, as highlighted by diverse findings, the presence or absence of social connections exerts a significant influence on mental health outcomes, making it a social determinant of health essential to understanding psychosis risk holistically.

### 2.3 Community

Social determinants of health at the community level encompass a wide array of interconnected factors that profoundly shape the well-being of individuals within a specific geographic area. These determinants go beyond traditional healthcare considerations and extend into the social, economic, and environmental realms. Elements

such as access to quality education, stable employment opportunities, affordable housing, clean air and water, safe neighborhoods, and social support networks significantly influence the health outcomes and overall quality of life for community members. Disparities in these determinants can lead to unequal health outcomes, perpetuating cycles of inequity and impacting vulnerable populations disproportionately. Addressing social determinants of health at the community level requires comprehensive and collaborative efforts involving healthcare providers, policymakers, community organizations, and stakeholders to create environments that promote equitable access to resources and opportunities, ultimately fostering healthier communities for all.

### *2.3.1 Urbanicity*

Community-level factors, such as urbanicity, have been associated with psychosis and psychosis risk (Fett et al., 2019; Krabbendam & van Os, 2005). Urbanicity refers to the degree of urban or metropolitan characteristics exhibited by a geographic area, typically a city or town, as opposed to rural or less densely populated regions. It encompasses various aspects of urban living, including population density, infrastructure development, land use patterns, economic activities, cultural amenities, and social interactions. Decades of literature since the relationship was initially suggested (Faris & Dunham, 1939) lend support to an association between psychosis and urbanicity with significantly more incidences of SSDs observed in individuals in urban settings (Kelly et al., 2010; March et al., 2008; McGrath et al., 2004; Van Os et al., 2010). Not only is incidence of SSDs greater in urban environments, but ample research suggests growing up in urban settings increases risk of developing psychosis multifold even controlling for SES, ethnicity, family psychiatric history, and other individual and relationship level

factors (Fett et al., 2019; Heinz et al., 2013; Jablensky et al., 2010; Kirkbride et al., 2012, 2017; Newbury et al., 2016; Takei et al., 1995; Vassos et al., 2012; Zammit et al., 2010).

While there is currently no available direct evidence establishing a causal link, the literature provides evidence of a dose-response relationship between urban upbringing and psychosis risk (Haddad et al., 2015; Van Os et al., 2004). Additionally, studies show a statistical variation of risk after relocation while controlling for potential confounds (Krabbendam & van Os, 2005). These findings taken together suggest urbanicity likely plays an etiological role in the development of SSDs (Haddad et al., 2015; Krabbendam & van Os, 2005; Van Os et al., 2004). The mechanisms driving this association are still under investigation, but several hypotheses point to potential contributing factors unique to or concentrated in urban environments. For example, urbanicity exposes individuals to increased pollution which has been linked to worse health outcomes (Braithwaite et al., 2019; WHO, 2016). A few recent studies have found that short-term increases in air pollutants exacerbated psychosis as measured by psychosis-related hospitalizations (Gao et al., 2017; W. Lee et al., 2022; Newbury et al., 2021; Tong et al., 2016). However, fewer studies provide empirical support for pollution increasing risk (McGrath & Scott, 2006; Newbury et al., 2019). Emerging evidence suggests that exposure to green space during childhood, independent of urbanicity, may have a protective effect on psychosis risk (Engemann et al., 2018; Fett et al., 2019). Therefore, pollution, or lack thereof, may contribute to psychosis risk but other factors certainly contribute to relationship between urbanicity and psychosis risk. Other studies point to social stressors inherent in urbanicity such as social fragmentation (Zammit et al., 2010), low social cohesion, and crime (Ku et al., 2020; Newbury et al., 2016). Others yet indicate urban upbringing may increase risk

due to the associated stress and its effects on neurodevelopment. Experimental studies found evidence that urban upbringing changes the reactivity of the HPA axis though this finding has yet to be replicated in the context of psychosis risk (Steinheuser et al., 2014). Other studies found associations between early-life urbanicity and gray matter volume reductions globally and specifically in the dorsolateral prefrontal cortex, an anatomical alteration identified in those with SSDs and high-risk individuals (Frissen et al., 2018; Haddad et al., 2015; Meyer-Lindenberg & Tost, 2012)

A substantial body of research underscores the intricate relationship between urbanicity and psychosis risk at the community level. Urbanicity has consistently shown associations with an increased incidence of severe mental disorders, particularly schizophrenia spectrum disorders (SSDs). While a definitive causal link remains elusive, potential mechanisms driving this relationship are multifaceted. Environmental factors, such as air pollution, have been explored as contributors, with some studies indicating exacerbation of psychosis symptoms, albeit with varying results. Additionally, the social landscape of urban environments, marked by social fragmentation, low social cohesion, and stressors related to urban living, may contribute to the observed risk elevation. The protective influence of childhood exposure to green spaces offers another intriguing avenue for investigation as well as a novel target for preventative strategies. As research continues, a more comprehensive understanding of the complex interplay between urbanicity and psychosis risk will provide crucial insights for designing effective interventions, policy strategies, and community-based initiatives to address this significant public health concern.

### *2.3.2 Access to Healthcare*

Access to healthcare plays a pivotal role in shaping an individual's overall well-being and is increasingly recognized as a crucial social determinant of health. Availability of or proximity to healthcare services that provide psychosis prevention, identification, and intervention are critical community-level resources that impact prognosis for individuals who may be at heightened risk of developing SSDs.

Timely access to appropriate interventions and support is shown to make a substantial difference in preventing the onset or progression of SSDs. Frequent assessment of symptom progression, provision of safety planning, supportive therapy, psychoeducation, and liaison services are all important components of Early Psychosis Interventions (International Early Psychosis Association Writing Group, 2005; Kulhara et al., 2008). Attempts at preventing the onset of psychosis in individuals at risk have shown promising results. Schimmelmann (2011) emphasizes the challenge of accurately measuring the number of people at risk. However, various studies have reported transition rates to full psychosis ranging from 30% to 40% over 2-3 years of follow-up (Gee & Cannon, 2011). Preventive interventions, such as cognitive behavioral therapy, family therapy, and low doses of antipsychotic medications, have demonstrated utility in reducing transition rates and attenuating psychotic symptoms even up to four years post-intervention (Addington et al., 2012, 2019; Fusar-Poli et al., 2013; Ising et al., 2016; McGlashan et al., 2006; McGorry et al., 2013; Mei et al., 2021; Stafford et al., 2013, 2013; Zheng et al., 2022). This highlights the importance of equitable access to preventative treatment for those at an elevated risk of developing SSDs.

Reducing duration of untreated psychosis (DUP) is also a crucial factor in improving outcomes for individuals with psychosis risk presenting subthreshold psychotic symptoms. The gap between the onset of symptoms and treatment initiation significantly affects overall prognosis. Specialized care for those at high risk has been proven more effective than general mental health services (Fusar-Poli et al., 2016). Early intervention programs (EIP) have been successful in delaying transition to psychosis, reducing DUP, preventing relapses, and improving overall outcomes (Anderson et al., 2018; Burke et al., 2022; Correll et al., 2019; Ricciardi et al., 2008). Longer DUP is associated with poorer clinical outcomes, making access to timely care essential (Kane et al., 2016; Killackey & Yung, 2007; Marshall et al., 2005; Perkins et al., 2005).

Despite the potential benefits of early intervention, barriers to EIP access persist. Stigma, psychiatric symptoms, and comorbidities often deter individuals from seeking help (Ho & Andreasen, 2001). Limited mental health literacy, particularly among younger populations, contributes to delayed care-seeking (Spear, 2000). Moreover, the physical proximity of specialized care services plays a crucial role, with each additional mile between a patient's home and clinic resulting in a one-month increase in DUP (Breitborde et al., 2017). Therefore, the physical environment at the community level influences access to EIPs and, indirectly, prognosis. To mitigate these barriers, it is essential to establish accessible care services within communities. CHR-P (Clinical High Risk for Psychosis) clinics should be conveniently located and designed to cater to the needs of the population they serve. Academic medical centers, where many of these clinics are housed, need to foster trust and minimize perceptions of inaccessibility (DeLuca et al., 2022; Lynch et al., 2016). The integration of early intervention programs

and specialized care into the larger healthcare system can improve outcomes and reduce the burden on patients and families.

Healthcare access is a critical social determinant of health that significantly influences the risk of developing psychosis and the outcomes for those at risk. Prevention efforts and early interventions have demonstrated efficacy in reducing transition rates and improving clinical outcomes. Addressing barriers to access, including geographic proximity and stigma, is essential to ensure that vulnerable populations can access timely and appropriate care. By integrating specialized care into the broader healthcare system, we can improve the trajectory of individuals at risk of psychosis and enhance overall mental health outcomes.

### 2.4 Societal

At the societal level of the social ecology model, social determinants of health encompass broad factors such as economic policies, cultural norms, and social inequality that collectively influence individuals' overall health and well-being. Both culture and country can significantly influence the risk of developing psychosis.

A large study conducted by the World Health Organization demonstrated a wide range in the prevalence of psychotic symptoms across nations (Nuevo et al., 2012). Some patterns observed include higher rates of SSDs in more developed nations (Saha et al., 2005) and the greatest prevalence in East Asia and South Asia (He et al., 2020). The present study is conducted in the United States where the prevalence rate of SSDs is estimated to be between 0.25% and 0.64% (Desai et al., 2013; Kessler & Wang, 2008; Wu et al., 2006). Furthermore, a large epidemiological study found that over a quarter

(26.69%) of the 34,653 civilian participants reported experiencing psychotic-like experiences (Bourgin et al., 2020).

Cultural factors play a substantial role in shaping how individuals perceive and interpret their experiences, which can affect the expression of psychotic symptoms. Cultural norms and beliefs may determine whether certain experiences are considered normal variations of human consciousness or signs of psychosis (Marcolin, 1991; Vermeiden et al., 2019). For instance, some cultures may have spiritual or religious interpretations of hallucinations or altered states of mind, which could lead to a reduced likelihood of seeking psychiatric help for such experiences.

Countries, on the other hand, provide the infrastructure and enact policies for mental healthcare services, access to education, economic opportunities, and overall social support systems. Disparities in these aspects can contribute to differences in psychosis risk. Developed countries often have infrastructure for mental health care whereas developing nations may lag in developing standardized prevention and treatment efforts for mental health issues. Socioeconomic factors also play a role, as individuals facing poverty, discrimination, or unstable living conditions are generally more vulnerable to mental health challenges, including psychosis. Understanding the particular disparities extant in the United States has informed the variables explored in the current study.

The global COVID-19 pandemic offers yet another complicated societal factor. Though every individual was impacted in some way over the past few years, cultural

attitudes towards contagion and vaccination as well as national policies and resources critically influenced the impact the virus had on each of us.

In conclusion, the risk of psychosis is a result of a dynamic interplay between cultural influences and the context provided by the country's healthcare and socioeconomic systems. Understanding these complex interactions is crucial for the development of effective mental health policies and interventions that can address the diverse needs of individuals across different cultures and countries.

Specific societal-level factors are not included in the current study as they do not vary among the sample which is comprised of participants from the same geographical and broad cultural context. Importantly, the tools used to assess psychosis risk symptomology in the sample of this study are normed to the population from which the sample is derived and, thus, tailored to the broad culture of the nation. Of note, this study was conducted during the pandemic, virtually, with participants from the same geographical area of the United States. Significant variance across this sample would not be expected in terms of the impact of COVID-19 on various SDOHs or psychosis risk.

# Chapter 3

## Aims

While SDOHs have individually been determined to contribute to psychosis risk, these have not been additively evaluated in a cohesive model. This study aims to

1. Explore the relationship between SDOHs and psychosis risk by examining SDOH variables at different ecological levels as proposed by Bronfenbrenner's social ecology theory.

2. Determine whether all ecological levels of SDOH variables significantly predict psychosis risk.

3. Assess whether SDOHs at more proximal levels are more predictive of psychosis risk compared to SDOHs at more distal levels, thus lending support to the use of the social ecology model as an organizing framework.

# Chapter 4

## Hypotheses

1. Psychosis risk, as measured by schizotypy total score, is predicted by all ecological levels of social determinants of health variables.
    a. Positive schizotypy is predicted by all ecological levels of social determinants of health variables.
        i. Minority status will predict high positive schizotypy (Anglin et al., 2014; Oluwoye et al., 2018).
        ii. Low social connectedness will predict high positive schizotypy (Vogel et al., 2021).
        iii. High childhood trauma will predict high positive schizotypy (Loewy et al., 2019; J. L. Thompson et al., 2009).
        iv. Urbanicity will predict high positive schizotypy (Fett et al., 2019; van Os et al., 2002).
    b. Negative schizotypy is predicted by all ecological levels of social determinants of health variables.
        i. Low SES will predict high negative schizotypy (Hao et al., 2022; Pogue-Geile & Harrow, 1985).
        ii. Low social connectedness will predict high negative schizotypy (Vogel et al., 2021).

iii. High childhood trauma will predict high negative schizotypy (Pruessner et al., 2021).

c. Disorganized schizotypy is predicted by all ecological levels of social determinants of health variables.

i. This relationship is not adequately described in the literature, and thus, directional sub-hypotheses are not provided.

2. More proximal levels will be more robustly associated with psychosis risk than distal levels.

# Chapter 5

# Methods

## 5.1 Participants

The participant sample is comprised of students at both the undergraduate and graduate levels enrolled in a large public university located in the American Great Plains region. The methods for enlisting participants were developed with the intent of (1) utilizing regular channels used to recruit research subjects as part of obligatory coursework, and (2) broadening the reach beyond course-associated methods to encompass a more diverse and inclusive representation of university students. The process involved sending emails to students who had previously engaged in the university's psychology department research participant pool and had shown an interest in other research opportunities, sending a series of recruitment emails through various university listservs targeting different student groups, and featuring a recruitment notice in the university honors program newsletter. Compensation was offered in the form of course credits, Amazon e-gift cards, or a combination of both. Participants who successfully completed all stages of data collection were entered into a drawing for a chance to win one of four Amazon Fire Tablets.

Participant inclusion criteria were (1) age between 18 and 35, (2) current residence in the United States, (3) ability to read and speak English, and (4) computer access to the online questionnaires. Participants responded to the IRB-approved consent form presented at the beginning of the first set of questionnaires to confirm their consent

online. 213 individuals completed the study protocol, with missing data being randomly distributed.

### 5.2 Research Design

Data for this study was collected as part of the initial stage, baseline wave, of a large-scale longitudinal research project. The entire project has been reviewed by and is under the oversight of the Institutional Review Board at University of Nebraska—Lincoln. The full longitudinal project includes a series of seven batteries of surveys administered over five waves of data collection. Data collection for the full longitudinal project is ongoing and currently underway.

### 5.3 Data Integrity

The study ensured the integrity of its data through built-in mechanisms in the data collection protocol designed to identify participant inattention or random responses. For instance, a participant attention check item reads, “Please choose ‘3’ (Applied to me very much or most of the time) so we know you are still following along.” Participant data was excluded if the respondent (a) missed more than one attention check item, signaling inattentiveness or random responses, or (b) missed one attention check item and completed the survey in under 70% of the average survey completion time. Data from 7 participants were removed prior to the current study’s initiation as a result of these data integrity protocol. Data from 3 study completionists were removed due to missing responses to the measures included in the current analyses, resulting in a sample size of 210.

## 5.4 Measures

### *5.4.1 Individual-Level Variable Measures*

**5.4.1.1 Socioeconomic Status.** A basic demographics survey collected information about participants' parental education levels and average household income during participants' childhood. Discrete option choices were provided (see Appendix A).

Mirroring common and accepted practices across the literature, average household income during childhood and highest parental education level were used to represent socioeconomic status in analyses. Average childhood household income was stratified as described above. To account for varying family dynamics, the highest education level across caregivers was used. The response order for this variable was modified to reflect educational attainment prestige, transforming it into an ordinal variable.

**5.4.1.2 Racial & Ethnic Minority Status.** A basic demographics survey collected information about participants' race, ethnicity, and country of birth (see Appendix A).

A binary variable to identify majority status versus minority status individuals was created by recoding responses to these questions and creating a summed variable such that individuals who answered that they were born outside of the United States and/or identified with a racial group other than "white" were coded as 1, "minority status".

### *5.4.2 Relationship-Level Variable Measures*

**5.4.2.1 Childhood Trauma.** The 28-item self-reported Childhood Trauma Questionnaire (CTQ)(Berstein & Fink, 1998) was used to assess history of physical, sexual, and emotional abuse throughout childhood. Participants were asked to rate how often each statement applies to them on a scale from "1" (never true) to "5" (very often true). Total scores ranged from 28 to 140 with higher scores reflecting higher experiences of childhood trauma. The CTQ has demonstrated good test–retest reliability and convergence and discrimination across studies sampling community and undergraduate populations (Bernstein et al., 1995; Paivio & Cramer, 2004).

CTQ total scores represented childhood trauma in the current study.

**5.4.2.2 Social Connectedness.** The 20-item self-reported Social Connectedness Scale-Revised (SCS-R, Lee & Robbins, 1995) was used to assess general sense of belonging and interpersonal closeness with others in their social world. Participants are asked to rate their agreement with items on a 6-point Likert-type scale. The total scores range from 20 to 120 with a higher total score being reflective of a greater degree of social connectedness. Example items include "Even among my friends, there is no sense of brother/sisterhood" and "I don't feel related to anyone." The SCS-R demonstrates internal consistency as well as good convergent and divergent validity across numerous studies  using populations of college students and workers (Lee & Robbins, 1995).

SCS-R total scores represented social connectedness in the current study.

### *5.4.3 Community-Level Variable Measures*

**5.4.3.1 Urbanicity.** A basic demographics survey collected information about participants' childhood environmental urbanicity including the question: "Select the area that best describes where you were raised: Rural, Suburban, Urban".

This categorical variable represented urbanicity in the current study.

**5.4.3.2. Access to Healthcare**. A basic demographics survey collected information about participants' access to healthcare. Relevant questions included, "Was there a time in the past 12 months when you needed to see a doctor but could not because of cost?" and "Other than cost, have you delayed getting medical care for one of the following reasons in the past 12 months? Was it because.... (Select all that apply): No, I did not delay getting medical care/did not need medical care, You couldn't get through on the telephone, You couldn't get an appointment soon enough, Once you got there, you had to wait too long to see the doctor, The clinic or doctor's office wasn't open when you got there, You didn't have transportation, Other".

A numeric variable was created by counting the barriers to healthcare access endorsed in the responses to the above questions. This variable represented access to healthcare in the current study with higher values indicating lower access.

### *5.4.4 Outcome Variable Measures*

The 77-item Multidimensional Schizotypy Scale (MSS; Kwapil et al., 2018) was used to assess levels of schizotypy. The MSS is comprised of three subscales: positive schizotypy (26 items), negative schizotypy (26 items), and disorganized schizotypy (25

items). Participants were asked to rate each item that accurately represented them as true. Subscale scores were calculated by summing the number of items on each subscale answered in the schizotypal direction as indicated in the scoring manual. Examples of statements include, “I have felt that there were messages for me in the way things were arranged, like furniture in a room,” and “People find my conversations to be confusing or hard to follow.” The MSS has demonstrated good-to-excellent internal consistency and reliability. The psychometric properties and intercorrelations of the MSS subscales support the construct validity of the MSS in a large community and student sample (Kwapil et al., 2018).

MSS total scores represented schizotypy in the current study. Subscale total scores represented positive, negative, and disorganized dimensions of schizotypy.

### 5.5 Analyses

Prior to analyses the data was evaluated for completeness. Participant data was removed if there is missing data from any included measures. This resulted in the removal of 3 datapoints, reducing the sample size to 210 participants. Preliminary exploration involved conducting descriptive statistics and correlation analysis to identify potential relationships and multicollinearity among variables. Demographic variables, such as sex and age, were assessed for confounding effects on all study indices via mean comparison tests for categorical data (e.g., sex) or bivariate correlation for continuous data (e.g., age). Distributions were examined to check assumptions regarding the normalcy of the data with non-parametric statistics (or other corrections) used when

excessive skew was indicated. All descriptive statistics and evidence of possible confounds/non-normality are described in the Results section of this document.

In order to test the first hypothesis, the stepwise multiple regression procedure was conducted within IBM SPSS Statistics 28.0.0.0 placing variables for each level of the social ecology model in sequential steps. When indicated, demographic variables were controlled for by placing it into the first step of the regression preceding the steps of SDOH variables. Individual-level variables were entered into the second step of the regression. These included ethnic and racial minority status and SES. Relationship-level variables including total scores of the Childhood Trauma Questionnaire and total scores of the Social Connectedness Scale were entered into the third step of the regression. The final step of the regression includes the community-level variables of urbanicity and access to healthcare. The outcome variable was schizotypy as measured by the Multidimensional Schizotypy Scale total score. The sub-hypotheses were investigated by running three additional regressions with the same steps but each with a different outcome variable for each of the schizotypy dimensions: positive, negative, and disorganized.

A power analysis was conducted in consultation with Dr. Thayasivam, Professor of Mathematics at Rowan University, using G*Power 3.1.9.7 to confirm that the described regressions would be adequately powered prior to analyses (Faul et al., 2007). The software indicated that a minimum sample size of 62 was necessary to find a moderate effect size (0.428) from 8 predictors with an $\alpha$ error probability of 0.05. In order to detect a more conservative effect size (0.15), the software indicated that a total

sample size of 160 was necessary. Therefore, the current sample of n = 210 was determined to be adequate for the analyses described above.

F change and R-square change were used to determine the contribution of each level of social ecological variables. Beta weights were used to determine the significance of each SDOH as a predictor of schizotypy when all variables were inserted into the model. Interpretation of significant predictors shed light on the nuanced relationships between social determinants of health and psychosis risk across varying ecological levels.

Hypothesis 2 was assessed by comparing the direction and strengths of the predictive power of each SDOH in the relevant models. It was expected that more proximal variables would have greater R-square changes in the models predicting schizotypy than more distal variables, highlighting the importance of organizing SDOHs using the social ecology model.

# Chapter 6

# Results

## 6.1 Sample Characteristics & Descriptive Statistics

The sample consisted primarily of young (*M*=20.53, *SD*=2.80), White (83.1%) individuals, 81.2% of whom identified as female. Additional sample characteristics are presented in Table 1.

**Table 1**

*Sample Characteristics*

| | *n* | *%* | *M* | *SD* |
|---|---|---|---|---|
| Age (years) | | | 20.41 | 2.63 |
| Sex | | | | |
| Female | 170 | 81.0 | | |
| Male | 40 | 19.0 | | |
| Race | | | | |
| White or European American | 174 | 82.9 | | |
| Black or African American | 4 | 1.9 | | |
| Asian American | 18 | 8.6 | | |
| Native American | 2 | 1.0 | | |
| Native Hawaiian/Pacific Islander | 2 | 0.9 | | |
| Other | 10 | 4.8 | | |
| Ethnicity | | | | |
| Hispanic/Latinx | 16 | 7.6 | | |
| Non-Hispanic/Latinx | 194 | 92.4 | | |

Socioeconomic status factors, average household income during childhood and highest parental education level, were normally distributed across the sample. A majority of the sample reported growing up in suburban environments (57.3%). Ratings of childhood trauma were positively skewed, indicating lower average reporting of trauma experience, as expected in a nonclinical sample (*M*=47.20, *SD*=10.03). Social connectedness followed an inverse pattern, with a negative skew indicated higher average ratings of connectedness in this college student sample (*M*=82.85, *SD*=18.26). Measures of schizotypy indicated low rates of endorsement of symptoms (*M*=11.23, *SD*=10.84). Means, standard deviations, and skewness are reported for each variable in Table 2.

**Table 2**

*Descriptive Statistics*

| | *n* | *%* | *M* | *SD* | *Skew* | *Kurt* |
|---|---|---|---|---|---|---|
| Socioeconomic Status | | | | | | |
| Average Childhood Household Income | | | | | -.63 | -.38 |
| >$25,000 | 12 | 5.7 | | | | |
| $25,000-$34,999 | 8 | 3.8 | | | | |
| $35,000-$49,999 | 21 | 10.0 | | | | |
| $50,000-$74,999 | 38 | 18.1 | | | | |
| $75,000-$99,999 | 38 | 18.1 | | | | |
| $100,000-$149,999 | 47 | 22.4 | | | | |
| >$150,000 | 46 | 21.9 | | | | |
| Highest Parental Education Level | | | | | -1.06 | .194 |
| some high school, no diploma | 7 | 3.3 | | | | |
| high school graduate, diploma, or GED | 17 | 8.1 | | | | |

| | *n* | *%* | *M* | *SD* | *Skew* | *Kurt* |
|---|---|---|---|---|---|---|
| Some college credit, no degree | 13 | 6.2 | | | | |
| Trade/Technical/Vocational Training | 4 | 1.9 | | | | |
| Associate degree | 18 | 8.6 | | | | |
| Bachelor's Degree | 66 | 31.4 | | | | |
| Master's Degree | 58 | 27.6 | | | | |
| Terminal/Professional Degree | 27 | 12.9 | | | | |
| Racial and Ethnic Minority Status | | | | | 1.34 | -.22 |
| White, Born in U.S. | 163 | 77.6 | | | | |
| Racial or Ethnic Minority | 47 | 22.4 | | | | |
| Childhood Trauma | | | 47.20 | 10.03 | 1.20 | 1.20 |
| Social Connectedness | | | 83.09 | 18.22 | -.41 | -.43 |
| Urbanicity | | | | | | |
| Urban | 42 | 20.0 | | | | |
| Suburban | 122 | 58.1 | | | | |
| Rural | 46 | 21.9 | | | | |
| Access to Healthcare | | | .53 | .86 | 1.60 | 1.85 |
| Schizotypy | | | 11.21 | 10.89 | 1.64 | 2.56 |
| Positive | | | 3.00 | 4.02 | | |
| Negative | | | 4.00 | 4.13 | | |
| Disorganized | | | 4.20 | 5.77 | | |

Note. Skew=skewness, Kurt=kurtosis.

### 6.2 Bivariate Relationships

Preliminary analyses were conducted to assess assumptions and potential multicollinearity issues. Mean comparisons highlighted sex differences across SES variables, indicating a need to control for sex. Bivariate relationships between independent variables in the final model were assessed (see Appendix B). While a number of statistically significant relationships surfaced, these were not unexpected, and

no correlations surpassed the range of 0.7-0.8, a threshold that could have suggested the presence of multicollinearity.

### 6.3 Hierarchical Regressions

Four hierarchical regressions were employed to predict total schizotypy and each of the three schizotypy subscales (positive, negative, disorganized). These models involved the systematic incorporation of social ecology model-level variables into successive steps of the regression process. Informed by preliminary analyses, sex was inputted into the first step of each regression to control for its effects. As detailed in the Analytic Strategy, individual-level variables were inputted into the second step, relationship-level variables into the third step, and community level variables into the final step. Steps were identical for each of the four hierarchical regressions.

All steps of the model predicting total schizotypy were significant except the initial Control Variable level. In particular, the Individual Level ($R2\Delta = .079$, $F(3, 205) = 4.427$, $p=.002$) and Relationship Level ($R2\Delta = .242$, $F(2, 203) = 16.046$, $p<.001$), significantly contributed to the prediction. Across all levels of the model, Social Connectedness appears to be the strongest variable predictor (ß=-.438, $p<.001$) followed by Healthcare Access (ß=.177, $p=.005$) and Childhood Trauma (ß=.165, $p=.016$) as shown in Table 3.

All steps of the model predicting positive schizotypy were significant except the initial Control Variable level. Notably, R2Δs did not exceed 0.062 for any levels, indicating poorer predictive quality of the overall model for positive schizotypy as compared to total schizotypy. Social Connectedness (ß=-.169, $p=.025$) and Healthcare

access (ß=.216, p=.003) were less powerful predictors for positive schizotypy than total scores. Childhood Trauma was not a significant variable predictor in this model (ß=.057, p=.472). Additional output from this model is shown in Table 3.

Only the Individual (R2Δ= .041, F(3, 205) = 2.797, p=.027) and Relationship (R2Δ= .254, F(2, 203) = 14.868, p<.001) Levels of the model predicting negative schizotypy were significant. Social Connectedness significantly contributed to the predictive power of the model above all other individual variables (ß=-.530, p<.001). Additional output from this model is shown in Table 3.

All steps of the model predicting disorganized schizotypy were significant except the initial Control Variable level. In particular, the Individual Level (R2Δ= .049, F(3, 205) = 2.735, p=.03) and Relationship Level (R2Δ= .219, F(2, 203) = 12.467, p<.001), significantly contributed to the prediction. Across all levels of the model, Social Connectedness appears to be the strongest variable predictor (ß=-.329, p<.001) followed by Childhood Trauma (ß=.277, p<.001) and Healthcare Access (ß=.176, p=.007) as shown in Table 3.

**Table 3**

*Hierarchical Regressions*

| Outcome Variable | Level | Predictor Variables | R | $R^2$ | $R^2\Delta$ | F$\Delta$ | B | SE | $\beta$ |
|---|---|---|---|---|---|---|---|---|---|
| Total Schizotypy | Control | Sex | .004 | .000 | .000 | .003 | .104 | 1.918 | .004 |
| | Individual | Minority Status | .282 | .080 | .079 | 5.901*** | 3.220 | 1.860 | .124 |
| | | SES – Income | | | | | -.766 | .527 | -.121 |
| | | SES – Par. Edu | | | | | -.721 | .479 | -.125 |
| | Relationship | Childhood Trauma | .567 | .322 | .242 | 36.24*** | .180 | .074 | .165* |
| | | Social Connectedness | | | | | -.262 | .039 | -.438*** |
| | Community | Urbanicity | .590 | .348 | .026 | 4.010* | -.267 | .990 | -.016 |
| | | Healthcare Access | | | | | 2.223 | .785 | .177** |
| Positive Schizotypy | Control | Sex | .064 | .004 | .004 | .858 | .654 | .706 | .064 |
| | Individual | Minority Status | .258 | .067 | .062 | 4.573** | 1.099 | .691 | .114 |
| | | SES – Income | | | | | -.276 | .196 | -.118 |
| | | SES – Par. Edu | | | | | -.203 | .178 | -.096 |
| | Relationship | Childhood Trauma | .318 | .101 | .035 | 3.906* | .023 | .031 | .057 |
| | | Social Connectedness | | | | | -.037 | .017 | -.169* |
| | Community | Urbanicity | .381 | .145 | .044 | 5.211** | .371 | .418 | .060 |
| | | Healthcare Access | | | | | 1.003 | .332 | .216** |

| Outcome Variable | Level | Predictor Variables | R | $R^2$ | $R^2\Delta$ | F$\Delta$ | B | SE | $\beta$ |
|---|---|---|---|---|---|---|---|---|---|
| Negative Schizotypy | Control | Sex | .106 | .011 | .011 | 2.361 | -1.112 | .724 | -.106 |
| | Individual | Minority Status | .228 | .052 | .041 | 2.921* | .976 | .716 | .099 |
| | | SES – Income | | | | | -.303 | .203 | -.126 |
| | | SES – Par. Edu | | | | | -.074 | .185 | -.034 |
| | Relationship | Childhood Trauma | .553 | .305 | .254 | 37.043*** | -.003 | .028 | -.006 |
| | | Social Connectedness | | | | | -.120 | .015 | -.530*** |
| | Community | Urbanicity | .553 | .305 | .000 | .014 | .030 | .388 | .005 |
| | | Healthcare Access | | | | | .044 | .307 | .009 |
| Disorganized Schizotypy | Control | Sex | .038 | .001 | .001 | .305 | .562 | 1.016 | .038 |
| | Individual | Minority Status | .225 | .051 | .049 | 3.541* | 1.144 | 1.002 | .083 |
| | | SES – Income | | | | | -.187 | .284 | -.055 |
| | | SES – Par. Edu | | | | | -.444 | .258 | -.146 |
| | Relationship | Childhood Trauma | .519 | .269 | .219 | 30.365*** | .160 | .041 | .277*** |
| | | Social Connectedness | | | | | -.104 | .021 | -.329*** |
| | Community | Urbanicity | .547 | .299 | .030 | 4.229* | -.668 | .545 | -.075 |
| | | Healthcare Access | | | | | 1.176 | .432 | .176** |

Note. Beta weights are taken from the final step of the regression.

### 6.4 Post-Hoc Analyses

Upon the request of the Thesis Committee, post-hoc analysis considered the inclusion of politics and religion as societal-level variables in the comprehensive social-ecology model. However, there was a substantial amount of missing data for these variables, resulting in a considerable reduction in the sample size from 210 to 86 participants. Further, when analyses were conducted with the available data, the new variables failed to significantly enhance the predictive capacity of the models (see Appendix C). Consequently, given their limited contribution to the overall predictive value and the substantial decrease in sample size, it was concluded that the inclusion of politics and religion in the final analyses would not substantially enhance the study's main objectives. Therefore, a decision was made to omit these variables from further consideration in the current project.

# Chapter 7

# Discussion

The present study examined the potential contributions of various social determinants of health (SDOH) within a multi-level model guided by Bronfenbrenner's social ecology theory which includes nested interdependent levels of factors hypothesized to influence psychosis risk: 1) individual; 2) relationship; 3) community; and 4) societal (excluded from analyses; see Post-Hoc Analyses section)(*Figure 1*)(Bronfenbrenner, 1981; CDC, 2007). Using online surveys, self-reported SDOHs were examined among 210 college students as a large midwestern university. The study yielded mixed support for two main hypotheses. In the interest of parsimony, this section addresses individual hypotheses with a subsequent synthesis at its culmination.

## 7.1 Hypothesis 1

Hypothesis 1 aimed to explore the predictive relationship between various ecological levels of social determinants of health (SDOH) variables on psychosis risk, as measured by self-reported schizotypy. The overall model predicted 34.8% of the variance in total schizotypy. This finding indicates support for the primary hypothesis and aligns with decades of prior literature evidencing that social and environmental variables confer risk for the development of psychosis (Fusar-Poli et al., 2013; Lipner et al., 2023; Lund et al., 2018). Interestingly, each socioecological level of the model contributed meaningfully to the prediction of total schizotypy, but not all individual variables' beta weights carried statistical significance. Potential explanation for this may lie in the measurement methods for each of these variables; the current measures may have only

assessed a portion of the overall construct. For example, socioeconomic status (SES) was assessed using self-report data regarding average household income during childhood and highest parental education attained. While prior research has used these metrics to measure the construct of SES, other factors such as parental occupational prestige and free/reduced lunch status are absent (Dickinson & Adelson, 2014). It is unknown whether inclusion of these factors would have added additional variance and significantly impacted the model.

The sub-hypotheses (Hypotheses 1a-1c) addressed the predictive value of the model applied to each schizotypy dimension: positive, negative, and disorganized. Specific directional hypotheses were made at the variable-level based on findings supported across relevant literature. The examination of sub-hypotheses within the context of this study has provided valuable insights into the complex interplay of various factors influencing schizotypy. The following discussion addresses each sub-hypothesis individually, shedding light on their implications for the findings and their alignment with existing literature.

### *7.1.1 Hypothesis 1a: Positive Schizotypy*

Hypothesis 1a postulated that positive schizotypy scores are predicted by all socioecological levels of SDOHs. The model demonstrated an overall ability to predict 14.5% of the variance in positive schizotypy. Individual Level variables accounted for 6.2% of the observed variance. Relationship Level variables contributed 3.5%, and Community Level variables explained 4.4%. Notably, social connectedness, a strong predictor of total schizotypy, was a significant but comparatively less substantial

predictor of positive schizotypy than the negative and disorganized domains. While prior literature indicates positive symptoms may impact social relationships, this relationship may not be as prominent at lower ends of the schizotypy spectrum (Kwapil et al., 2012).

In terms of directional sub-hypotheses, the analysis partially supported the sub-hypothesis proposing that minority status would predict high positive schizotypy. While the direction of the relationship between minority status and positive schizotypy was as expected, minority status did not significantly contribute to the prediction of positive schizotypy within the model tested in the parent Hypothesis 1a. Consistent with the expectations outlined in the second directional sub-hypothesis, the findings revealed that low social connectedness predicted high positive schizotypy. This underscores the significance of social connectedness as a crucial factor in the development and manifestation of positive schizotypal traits highlighted in previous research (Vogel et al., 2021). Additionally, the third sub-hypothesis was partially supported, with the direction of the relationship between childhood trauma and negative schizotypy being as expected but not significant within the overall model tested in the parent Hypothesis 1a. Similarly, the fourth sub-hypothesis, positing that urbanicity predicts high positive schizotypy, was also only partially supported by the data. The relationship between urban environment and positive schizotypal traits was as expected, but urbanicity was not a statistically significant contributor to the prediction of positive schizotypy in the model tested in the parent Hypothesis 1a.

### *7.1.2 Hypothesis 1b: Negative Schizotypy*

Hypothesis 1b suggested that negative schizotypy scores are predicted by all socioecological levels of SDOHs. Overall, the model accounts for 30.5% of the variance in negative schizotypy, indicating a greater ability to predict negative symptoms than positive. Individual Level variables account for 4.1% of the observed variance in negative schizotypy scores. Relationship Level variables account for 25.4% which was largely driven by Social Connectedness ($\beta$=-.530, $p<.001$). Community Level variables does not meaningfully contribute to the model's predictive ability.

The noteworthy similarity between the Social Connectedness Scale-Revised (SCS-R) and the negative schizotypy subscale items of the Multidimensional Schizotypy Scale (MSS) plays a pivotal role in understanding and interpreting this finding. Both the SCS-R and the negative schizotypy subscale items of the MSS capture essential facets of interpersonal experiences and relationships. The convergence of items across these scales implies a shared conceptualization of social connectedness and certain aspects of negative schizotypy. For instance, items on both scales may assess feelings of alienation, difficulties in forming and maintaining relationships, and a sense of social detachment. Negative symptoms such as social anhedonia and lack of motivation to engage in social activities may negatively impact social connectedness (Dodell-Feder et al., 2020). On the other hand, deterioration of social connectedness has been shown to increase psychotic experiences and symptoms (Dodell-Feder et al., 2020; Monsonet et al., 2023). The dynamic interplay of these assessments enhances the validity of the results, emphasizing the robust association between social connectedness and the specific dimensions of negative schizotypy.

The data partially support the first directional sub-hypothesis, indicating that low socioeconomic status (SES) predicts high negative schizotypy. While the direction of the relationship between SES and negative schizotypy was as expected, neither SES variable meaningfully contributed to the prediction of negative schizotypy within the model tested in the parent Hypothesis 1b. The second directional sub-hypothesis, proposing that low social connectedness predicts high negative schizotypy, was substantiated by the findings. This underscores the previously highlighted significance of social connectedness as a key contributor to the development and expression of negative schizotypal traits (Vogel et al., 2021). The study did not provide evidence supporting the third directional sub-hypothesis which predicted that high childhood trauma contributes to the prediction of high negative schizotypy.

### *7.1.3 Hypothesis 1c: Disorganized Schizotypy*

Hypothesis 1c proposed that disorganized schizotypy scores are predicted by all socioecological levels of (SDOHs). The model demonstrated an overall ability to predict 29.9% of the variance in the disorganized subscale. Analysis of the data revealed distinct contributions from each level to the prediction of disorganized schizotypy scores. At the Individual Level, variables accounted for 4.9% of the observed variance in disorganized schizotypy scores. Notably, Relationship Level variables had a more substantial impact, explaining 21.9% of the variance. Community Level variables contribute 3%. Interestingly, the findings indicate that the model's ability to predict disorganized schizotypy surpasses its capacity to predict positive schizotypy. This heightened predictive power is particularly attributed to Relationship Level variables, with Social Connectedness ($\beta$=-.329, $p$<.001) and Childhood Trauma ($\beta$=.277, $p$<.001) playing

pivotal roles. These results reinforce the significance of relationship factors in understanding and forecasting disorganized schizotypal traits.

### 7.2 Hypothesis 2

The second hypothesis sought to investigate the applicability of examining social determinants of health (SDOH) within the social ecology model, positing that more proximal variables exert greater influence compared to more distal ones. In assessing the predictive strength of each level, the R2Δ values were directly compared. Surprisingly, analysis consistently revealed that the more proximal or initial levels in the analysis, which encompassed Individual Level variables such as minority status and socioeconomic status (SES), did not yield greater predictive power for schizotypy relative to more distal Relationship Level variables. This pattern persisted across all subscales and total schizotypy.

Explanation for this relative weakness in the predictive ability of these individual-level variables may lie in the measurement methods for each of these variables. Potentially, the measures used to assess each SDOH may have only assessed a portion of the overall construct, as elaborated upon in previous sections. Furthermore, the current sample may not provide data spanning the complete spectrum of SES. It is well established that students of a 4-year university generally have more resources that individuals unable to pay tuition or lacking institutional knowledge to navigate financial aid systems (IES, 2022; Reber & Smith, 2023). Similarly, the current sample underrepresents individuals that identify with racial and ethnic minority groups relative to population demographics as recorded by the US Census (Henrich et al., 2010; United

States Census Bureau, 2023). Without further study, these possible explanations for the limited ability of individual-level variables to predict psychosis risk cannot be confirmed but are important considerations when using the findings to judge the utility of the proposed model.

On the other hand, more distal variables including social connectedness, healthcare access, and childhood trauma, emerged as significant contributors to the prediction of total schizotypy. There may be a few reasons for the unexpected strength of these predictors relative to more proximal variables. As previously stated, a conceptual overlap seemingly exists between the Social Connectedness Scale-Revised (SCS-R) and the negative schizotypy subscale of the Multidimensional Schizotypy Scale (MSS); both measures capture important aspects of interpersonal experiences and relationships, feelings of alienation, challenges in forming and maintaining relationships, and a sense of social detachment. The two are distinct constructs, not exceeding thresholds for multicollinearity, but this conceptual relationship may translate to increased contribution to prediction to overall schizotypy. Interestingly, social connectedness is also a significant contributor to the prediction of both other subscales, positive and disorganized, indicating that its predictive ability does not hinge exclusively on its conceptual overlap with negative schizotypy. As for childhood trauma, its measurement may not suffer from the problems potentially associated with the Individual Level variables as the Childhood Trauma Questionnaire is a widely used and well-validated measure (Bernstein et al., 1995, 1998). Healthcare access, occupying the most distal level of the model, also significantly contributed predictive power beyond the more proximal variables inputted into the hierarchical regression earlier. Measurement of this variable

took the form of self-report items inquiring about barriers to access to medical care, including cost, availability, etc. Given the lack of available psychometrics for this measure, interpretations are limited. However, within the given sample, this variable was significantly correlated with average household income during childhood. This variable may be capturing variance associated with SES not already captured by the intended measures. Of course, Bronfenbrenner's original conception of the social ecology model illustrated the interrelatedness of all of the compositive variables (Bronfenbrenner, 1981).

While the use of a social ecology model for examining SDOHs as risk factors for psychosis is not fully supported by the current data, factors such as sample size, measurement accuracy, and the complexity of social interactions within the dataset may have contributed to the apparent lack of support. Specifically, the current sample likely does not encompass the full spectrum of SES, particularly individuals at the lower end who are unable to attend university. This limitation may have weakened the predictive power of these individual-level variables in the model. Additionally, the similarities between the Social Connectedness Scale – Revised and the negative schizotypy subscale items of the Multidimensional Schizotypy Scale (MSS) may have influenced the predictive power of the relationship level of the overall model. Therefore, further research utilizing refined methodologies and larger, more diverse datasets may elucidate the role of social determinants of health in psychosis onset more effectively.

### 7.3 Theoretical & Practical Implications

The current study contributes to an extant body of literature providing evidence that suggests several social and environmental factors, overlapping with social

determinants of health (SDOH), confer significant risk for developing psychosis and schizophrenia spectrum disorders (SSDs). Additionally, the study assessed the utility of using a multi-level model, inspired by Bronfenbrenner's social ecology model, for organizing these SDOHs as psychosis risk factors. Given the mixed support found for the model in this sample, further research is necessary to endorse the widespread use of this model clinically. However, the impressive ability of the model to predict psychosis risk as well as growing utilization of this framework in public health spheres inspires continued investigation of its application in both science and practice.

Decades of accumulated evidence for these SDOHs as psychosis risk factors impel their collective investigation. These SDOHs were intuitively organized within the social ecology model, following established examples in other fields. Additionally, the model proved easily translated into familiar and broadly used statistical design, hierarchical regression, marking an ease of use within future research. Overall, use of this framework facilitated ease of study of psychosis risk factors and may be a helpful tool in future investigations.

Beyond this study, this socioecological model may prove advantageous in the development of psychosis risk measurement tools. The variance in psychosis risk explained by this model in the current study (34.8%) offers compelling initial support for the ability of the investigated SDOHs to cumulatively predict risk. Current methods for calculating psychosis risk involve time-intensive and invasive procedures including structured interviews, genetic risk scoring, neurocognitive testing, as well as assessment of some, but not all, of the SDOH risk factors identified in the current study (Agerbo et al., 2015; Cannon et al., 2016; Fusar-Poli et al., 2017; T. Lee et al., 2022; Oliver et al.,

2019; Perkins et al., 2020; Vassos et al., 2017; Zhang et al., 2019). While these have established utility in predicting conversion from clinical high-risk (CHR) state to diagnosis of a SSD, the intensity of these methods precludes them from being widely disseminated. Rather, CHR state is assessed for in individuals with known familial risk and/or recognized sub-threshold symptoms. A simple, minimally invasive screening tool, such as the self-report assessment of SDOHs may be useful for identifying individuals appropriate for these more intensive psychosis risk calculations.

It should be noted that the current model explained considerably less of the variance in positive schizotypy (14.5%) compared to negative (30.5%) and disorganized (29.9%) subscales. The previously discussed conceptual overlap between negative symptoms and lack of social connection offers some insight into the discrepancy. Additionally, negative symptom subscales have been found to have some overlap with depressive symptoms while being a distinct construct from depression with the inclusion of motivation and pleasure symptoms, blunted emotionality, and other schizotypy specific symptoms (Barrantes-Vidal et al., 2013; Campellone et al., 2016; Kemp et al., 2018). In the current sample, negative schizotypy was found to be significantly positively correlated with the depression subscale of the Depress Anxiety Stress Scales ($\rho$=.305, p<.001)(Crawford & Henry, 2003). The overlap between negative symptoms and depressive features underscores the complex interplay between mood disorders and psychosis spectrum conditions, highlighting the necessity for nuanced evaluation approaches. Similarly, disorganized symptoms may overlap with other psychopathologies affecting executive functioning such as autism spectrum disorders and attention-deficit disorders (Cicero & Kerns, 2010; Gadow, 2012, 2013; Kwapil, Gross, Silvia, et al., 2018;

Louise et al., 2015). Again, a similar pattern was found in the current study; a significant difference in mean disorganized symptoms between those with and without self-reported ADHD diagnoses ($t=4.782$, $df=204$, $p<.001$). Similarly, recognizing the potential confounding factors such as executive dysfunction in disorganized symptoms emphasizes the importance of comprehensive assessment frameworks. Despite the variance explained in positive schizotypy being relatively lower, the model still captured considerable variance, especially in negative and disorganized symptoms. While the model may lack specificity for specific schizophrenia spectrum disorders (SSDs), its utility lies in its ability to flag individuals for further evaluation and intervention, thereby facilitating early detection and preventive strategies.

Following the accrual of additional evidence, a socioecological model may be used to inform intervention design, targeting SDOHs more proximal to CHR individuals. However, the strong association of social connectedness with psychosis risk found in the current data indicates social connectedness should be further investigated as a potential target for intervention in CHR populations, especially as it serves as a highly modifiable risk factor compared to heritable risk or SES. In particular, both in-person and remote interventions involving scheduled interpersonal contact, activity and discussion groups, interpersonal skills groups, etc. have been shown to promote social connectedness in older adults (Ibarra et al., 2020; O'Rourke et al., 2018). Evidence has been found to support similar interventions as well as more creative interventions in youth including outdoor physical group activity, table-top games, youth leadership and community mentorship programs (Abbott et al., 2022; Henderson & McClinton, 2016; King et al., 2018; McCay et al., 2011; Thomas, 2019; Wray et al., 2020). Adaptation of these

interventions may prove similarly effective in promoting social connectedness in CHR populations and potential reduce risk of psychosis.

### 7.4 Limitations

A number of limitations of the study should be considered. All data collection was conducted remotely, online, and via self-report. Therefore, the data were vulnerable to multiple biases (social desirability, memory, response, sampling) as well as the potential for participants to misinterpret prompts and/or satisfice. While participant data were excluded if inattentiveness or random was suspected, data integrity methods are not infallible. Additionally, the cross-sectional nature of the study restricted the ability to establish causality or examine temporal relationships between variables.

The findings' generalizability is limited by the use of an undergraduate sample. A variety of recruitment efforts were used to ensure a more diverse sample beyond the Psychology Department, but the sample was still disproportionately female (81%) and white (82.9%). Though an undergraduate sample does capture much of the age range at which schizotypy tends to emerge, younger and older individuals were not captured in the current sample. Additionally, the participants' status as undergraduates distinguishes them amongst their peer population as they have received more education and are less likely to have been raised in lower income households (IES, 2022; Reber & Smith, 2023).

The measures used may also be identified as limitations in the study. While the use of schizotypy as a measure of psychosis risk is supported in the literature, the current model may prove a better or worse predictor of a more comprehensive outcome measure to represent psychosis risk (Flückiger et al., 2016; Kwapil et al., 2020; Racioppi et al.,

2018). Furthermore, the complex nature of social determinants of health involves numerous interacting variables, and the analysis may not capture the full spectrum of these influences.

### 7.5 Future Directions

Replication of the current study with refinement may further elucidate the fit the social ecology model for investigating social determinants of the health (SDOHs) as psychosis risk factors. This might include addressing the various limitations outlined above such as inadequate variation in socioeconomic status (SES) and racial/ethnic minority status within the sample, possibly by expanding recruitment efforts to include a more diverse population. Moreover, extending recruitment efforts to individuals spanning the entire identified age range of increased risk might similarly capture greater variance across variables as well as provide rich lifespan information as variables may confer greater or less risk at different developmental timepoints.

Additionally, use of more comprehensive measures for variables like SES may allow for more complete assessment of the construct within the model. For example, parental occupation and free/reduced lunch receipt may enrich assessment of SES. Additionally, requesting the city and state in which participants spent the majority of their childhood would allow for more granular investigation of the urbanicity of childhood environments. Measurement of healthcare access would similarly benefit from collecting greater detail of information such as distance between childhood home and nearest healthcare facility, frequency of pediatrician visits, and insurance status and type. The level of detail of information collected in the current study was limited by the nature of

secondary data analysis. Therefore, there is ample opportunity to improve on the current study with enriched measures.

Expanding assessment to additional SDOHs may also improve future replications of the current study. For example, the current study lacks societal level variables such as religious and political affiliations due to lack of quality data related to these constructs. Fleshing out this level would provide a more comprehensive illustration of the model. Additionally, the CDC incorporates education access and quality into their SDOH evaluations; this information may contribute the community level of the current model (CDC, 2022). At the relationship level, quantity of relationships may supplement the subjective information provided by the current social connectedness measure. Finally, gender and sexuality identities may contribute additional variance to the individual level of the model. These suggestions are some of many potential amendments that may be made to optimize the current model as it exists in its fledging state.

Further refinement and replication of the current study holds promise for enhancing the social ecology model's applicability in investigating SDOHs as psychosis risk factors. Addressing limitations, incorporating more comprehensive measures, and expanding assessment to include additional SDOHs, may offer a more nuanced understanding of the model. These proposed amendments represent opportunities to optimize the current model and advance its utility in future research.

### 7.6 Conclusions

The current study contributes to the growing body of literature by shedding light on the role of social determinants of health (SDOHs) in predicting psychosis risk. While

analyses reveal only partial support for the use of a social ecology model to organize and prioritize these risk factors, valuable conclusions can be drawn from the findings. Social connectedness, above all other SDOHs investigated in this study, strongly predicted psychosis risk as measured by schizotypy, particularly negative schizotypy. While this may be influenced by an overlap in symptoms assessed by the Social Connectedness Scale and the negative subscale of the Multidimensional Schizotypy Scale, this strong predictive relationship still indicates a potential target for intervention and prevention of schizophrenia spectrum disorder (SSD) development.

While some other significant predictors of schizotypy in the model, such as minority status and childhood trauma, do not appear to be modifiable, healthcare access stands out as a potential intervention target as well. Healthcare access in this study was assessed via self-report questions regarding barriers to medical care such as cost, availability, and transportation. While these barriers require systemic, rather than individual or group, solutions, the robustness of their impact on the predictions of total schizotypy beyond that of more proximal variables points to the critical demand for these solutions.

Despite limitations of the current study, the findings provide compelling support for the collective predictive capacity of SDOHs in assessing psychosis risk. The adoption of a social ecology model as an organizing framework for these SDOHs as psychosis factors warrants further scrutiny as it is unclear from this data that more proximal risk factors confer greater risk than distal factors. In the meantime, interventions targeting social connectedness, such as community-building initiatives and peer support networks, may offer a crucial avenue for mitigating psychosis risk. Additionally, public policies

increasing healthcare accessibility and affordability may be worthwhile strategies in the prevention and management of SSDs. By focusing on these modifiable risk factors through targeted interventions and policy initiatives, we can strive towards fostering healthier communities and mitigating the burden of psychosis on individuals, their health, and society at large.

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## Appendix A

## Demographics Questionnaire Items

What is the highest degree or level of education your FATHER or PRIMARY CAREGIVER #1 received? A primary caregiver is someone who provided for and/or took care of you during your childhood (e.g. parent, foster parent, sibling, other relative, or legal guardian)

- Some high school, no diploma
- High school graduate, diploma, or GED
- Some college credit, no degree
- Associate degree
- Bachelor's degree
- Master's degree
- Professional degree
- Trade/technical/vocational training
- Ph.D., medical or law degree

What is the highest degree or level of education your MOTHER or PRIMARY CAREGIVER #2 received? A primary caregiver is someone who provided for and/or took care of you during your childhood (e.g. parent, foster parent, sibling, other relative, or legal guardian)

- Some high school, no diploma
- High school graduate, diploma, or GED

- Some college credit, no degree
- Associate degree
- Bachelor's degree
- Master's degree
- Professional degree
- Trade/technical/vocational training
- Ph.D., medical or law degree
- Not Applicable

What was your AVERAGE childhood household (i.e. joint-parent or caregiver) income before taxes?

- Less than $25,000
- $25,000 to $34,999
- $35,000 to $49,999
- $50,000 to $74,999
- $75,000 to $99,999
- $100,000 to $149,999
- $150,000 or more

Were you born in the United States?

- Yes
- No

Which one of these groups would you say best represents your race?

- White
- Black or African American
- American Indian or Alaska Native
- Asian
- Pacific Islander
- Other

Are you Hispanic, Latinx, or of Spanish origin?

- Yes
- No

## Appendix B

## Correlations & Mean Comparisons Tables

The following tables hold partial information due to the nature of the included variables.

**Table B1**

*Correlations (nonparametric tests – Spearman)*

| | MIN | SES_inc | SES_edu | CTQ | SCRS | URB | HLTH | SEX |
|---|---|---|---|---|---|---|---|---|
| MIN | -- | | | | | | | |
| SES_inc | | -- | | | | | | |
| SES_edu | | | -- | | | | | |
| CTQ | | | | -- | -.435*** | | .342*** | |
| SCRS | | | | | -- | | -.322*** | |
| URB | | | | | | -- | | |
| HLTH | | | | | | | -- | |
| SEX | | | | | | | | -- |

Note. *p<.05, **p<.01, ***p<.001; MIN=Racial & Ethnic Minority Status, SES_inc=Socioeconomic Status: Average Childhood Household Income, SES_edu=Socioeconomic Status: Highest Attained Parental Education, CTQ=Childhood Trauma Questionnaire, SCRS=Social Connectedness Scale-Revised, URB=Urbanicity, HLTH=Healthcare Access, SEX=Assigned Sex at Birth.

**Table B2**

*T-Tests (equal variances assumed; T reported)*

| | MIN | SES_inc | SES_edu | CTQ | SCRS | URB | HLTH | SEX |
|---|---|---|---|---|---|---|---|---|
| MIN | -- | | | -4.953*** | 2.484** | | -.752 | |
| SES_inc | | -- | | | | | | |
| SES_edu | | | -- | | | | | |
| CTQ | | | | -- | | | | -1.622 |
| SCRS | | | | | -- | | | .236 |
| URB | | | | | | -- | | |
| HLTH | | | | | | | -- | -1.084 |
| SEX | | | | | | | | -- |

Note. *p<.05, **p<.01, ***p<.001; MIN = Racial & Ethnic Minority Status. SES_inc = Socioeconomic Status: Average Childhood Household Income. SES_edu = Socioeconomic Status: Highest Attained Parental Education. CTQ = Childhood Trauma Questionnaire. SCRS = Social Connectedness Scale-Revised. URB = Urbanicity. HLTH = Healthcare Access. SEX = Assigned Sex at Birth.

**Table B3**

*ANOVAs (F reported)*

| | MIN | SES_inc | SES_edu | CTQ | SCRS | URB | HLTH | SEX |
|---|---|---|---|---|---|---|---|---|
| MIN | -- | | | | | | | |
| SES_inc | | -- | | 4.552*** | 3.419** | | 2.544* | |
| SES_edu | | | -- | 2.629* | 2.017 | | 1.010 | |
| CTQ | | | | -- | | 3.417* | | |
| SCRS | | | | | -- | .718 | | |
| URB | | | | | | -- | 1.126 | |
| HLTH | | | | | | | -- | |
| SEX | | | | | | | | -- |

Note. *p<.05, **p<.01, ***p<.001; MIN = Racial & Ethnic Minority Status. SES_inc = Socioeconomic Status: Average Childhood Household Income. SES_edu = Socioeconomic Status: Highest Attained Parental Education. CTQ = Childhood Trauma Questionnaire. SCRS = Social Connectedness Scale-Revised. URB = Urbanicity. HLTH = Healthcare Access. SEX = Assigned Sex at Birth.

**Table B4**

*Chi-Squared Tests (Pearson Chi-Square value reported, asymptotic significance (2-sided) indicated for significance)*

| | MIN | SES_inc | SES_edu | CTQ | SCRS | URB | HLTH | SEX |
|---|---|---|---|---|---|---|---|---|
| MIN | -- | 23.671*** | 33.931*** | | | 9.559** | | .195 |
| SES_inc | | -- | 123.751*** | | | 27.907** | | 6.412 |
| SES_edu | | | -- | | | 30.143** | | 11.548 |
| CTQ | | | | -- | | | | |
| SCRS | | | | | -- | | | |
| URB | | | | | | -- | | .239 |
| HLTH | | | | | | | -- | |
| SEX | | | | | | | | -- |

Note. *p<.05, **p<.01, ***p<.001; MIN = Racial & Ethnic Minority Status. SES_inc = Socioeconomic Status: Average Childhood Household Income. SES_edu = Socioeconomic Status: Highest Attained Parental Education. CTQ = Childhood Trauma Questionnaire. SCRS = Social Connectedness Scale-Revised. URB = Urbanicity. HLTH = Healthcare Access. SEX = Assigned Sex at Birth

## Appendix C

## Post-Hoc Analysis Regression Table

**Table C1**

*Hierarchical Regressions (n=86) including Societal Level variables (Politics & Religion) in a final step.*

| Outcome Variable | Level | Predictor Variables | R | $R^2$ | $R^2\Delta$ | F$\Delta$ | B | SE | $\beta$ |
|---|---|---|---|---|---|---|---|---|---|
| Total Schizotypy | Control | Sex | .002 | .000 | .000 | .000 | .053 | 2.652 | .002 |
| | Individual | Minority Status | .281 | .079 | .079 | 2.306 | 2.658 | 2.607 | .116 |
| | | SES – Income | | | | | -1.023 | .698 | -.184 |
| | | SES – Par. Edu | | | | | -.358 | .624 | -.071 |
| | Relationship | Childhood Trauma | .494 | .244 | .166 | 8.650*** | .144 | .107 | .158 |
| | | Social Connectedness | | | | | -.223 | .064 | -.366*** |
| | Community | Urbanicity | .555 | .308 | .064 | 3.566* | -.383 | 1.464 | -.027 |
| | | Healthcare Access | | | | | 2.928 | 1.097 | .283** |
| | Societal | Politics | .557 | .310 | .002 | .091 | -.446 | 1.065 | -.043 |
| | | Religion | | | | | -.294 | 1.637 | -.019 |