

Housing as a Social Determinant of Health: A Closer Examination of Mental and
Physical Health and Housing Affordability

by

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ABSTRACT

Canada is among the wealthiest nations in the world, yet despite its wealth, many low-to-moderate-income households struggle to afford basic needs such as housing and food. Subsidized housing is offered for renters who struggle with housing unaffordability; however, the demand for this housing is high and growing, which results in long wait times for access to subsidized housing. These waitlists are long and differ in socioeconomic status, stability, and health and supportive services needs and include households who are unhoused and those who are housed in unaffordable and/or precarious accommodations. Despite the varied economic, social, and housing statuses of households on subsidized housing waitlists, there is a dearth of evidence that comprehensively characterizes their particular challenges and needs. Furthermore, the impacts of subsidized housing as a social determinant of health are still being debated and additional research on mechanisms that connect housing to physical and mental health is needed.

This dissertation presents a series of manuscripts summarize existing evidence on the relationship between subsidized housing and depression and anxiety, and subsidized housing and physical health. The final paper addresses the question: is being unhoused associated with different scores of depression and psychological distress than being precariously housed? My analysis indicates that both precarious renters and unhoused individuals experience comparably high levels of depression, whereas the unhoused group had higher levels of distress ($p = .004$).

The findings indicate that unstable and unaffordable housing is associated with depression in both renters and unhoused individuals. Further, they display that both groups experience social and economic precarity, which, from a social determinants of health perspective, may be improved through access to affordable and adequate housing. Ultimately, the findings lend support to human rights-based arguments on the state of affordable housing provision in Canada, in that the current nature of housing policies do not provide access to affordable housing for all those who are in need. Hence, I conclude with a call to reimagine systems that are designed to address housing affordability pressures with the goal of providing affordable housing for all those in need.

DEDICATION

This thesis is dedicated to my wife, Ruba, and all of the family members who supported and encouraged me throughout graduate school.

PREFACE

The present study functions as an adjunct to an ongoing research project under the leadership of Dr. Julia Woodhall-Melnik: The Maritime Community Health and Housing Initiative: An Investigation into the Effects of Publicly Subsidized Rental Housing, referred to as “subsidized housing” on Mental Health and Healthcare Utilization Among Low-Income Households in New Brunswick, which is often shortened to “the NB Housing Study.”

This dissertation uses an article-based format to synthesize existing knowledge and generate new evidence that contributes to the body of knowledge on the mental and physical health of low-income households experiencing unaffordable housing who are registered on the waiting list for publicly subsidized rental housing in New Brunswick. This thesis serves as a broad recognition of the relationship between the current housing crisis and health and informs a reappraisal of housing policy and programs.

Study Rationale

Housing unaffordability is a concern that is no longer limited to extremely low-income groups (August, 2022; Morrissey, 2023; Whitzman, 2023). Unsubsidized renters in both low- and moderate-income groups now face the mounting concern of housing unaffordability. Although housing unaffordability is viewed as a problem within larger and urban contexts, small and mid-sized jurisdictions in Canada are becoming increasingly unaffordable places to live (August, 2022; Morrissey, 2023; Silberman, 2024; Woodhall-Melnik, et al., 2022). This thesis introduces the connections between physical and mental health and housing unaffordability, reviews the evidence base on

physical and mental health in people who have access to subsidized housing, and presents a method for investigating mental and physical health in individuals who wait for and later receive access to subsidized accommodations. This thesis ends with an analysis of the physical and mental health of individuals who currently reside on a waitlist for access to affordable housing in New Brunswick, a province comprised of rural areas, mid-sized and one large city.

At present, no research exists that seeks to explain the health of waitlist applicants in a distinct context of a mixed rural and urban settings. Housing is an important social determinant of health and the understanding of health and wellbeing of individuals who wait for access to subsidized housing in both urban and rural contexts is essential to comprehensively understand the impact of housing affordability and insecurity on health and wellbeing. This research contributes an understanding of the health consequences of unaffordable housing in the literature and builds on this to fill a gap in the understanding of health consequences on individuals awaiting subsidized housing in the province of New Brunswick.

Definitions & Explanations of Key Terms

Part I: Definitions & Explanations of Key Housing Terminology

This section provides an overview of the definitions of key terms and concepts that are central to the thesis. It also elucidates the connections and distinctions between homelessness, unhoused individuals, precarious renters, and housing unaffordability.

Forms of Housing Instability & Homelessness: Definitions

Homelessness in Canada is defined as “the situation of an individual, family or community without stable, safe, permanent, appropriate housing, or the immediate prospect, means and ability of acquiring it,” (Canadian Observatory on Homelessness, 2021, para. 1).

The various experiences associated with homelessness can be classified into four categories: unsheltered, emergency sheltered, provisionally accommodated, and at risk of homelessness (Gaetz et al.,2012). *Unsheltered or absolute homelessness* refers to individuals lacking housing or access to emergency shelters. This includes people living on sidewalks, parks, vacant buildings, and in places not meant for permanent habitation (e.g., cars, garages, attics, shacks, or tents). *Emergency sheltered* refers to individuals that are staying in shelters or temporary accommodations that are specifically designed by social services agencies to temporarily accommodate people who are homeless. *The provisionally accommodated* category of homelessness, often termed the "hidden homeless," includes individuals without permanent or stable housing who are temporarily staying in insecure situations. This includes those in emergency shelters, temporarily staying with friends or family (couch-surfing), in congregate living arrangements (e.g. boarding houses), or in transitional housing facilities. The last category includes those who, while not yet homeless, are at risk of being homeless, dangerously lacking security or stability.

Despite the adoption of a broad definition of homelessness, prevalence reports often conceptualize homelessness to include people without a permanent address,

who sleep on the streets, or reside in emergency shelters (Echenberg & Munn-Rivard, 2020; O’Neill, 2022; Ruby, 2023). In other words, being precariously housed and at risk of homelessness is often viewed as different than homelessness. While individuals on the brink of homelessness live in substandard and unaffordable housing, precarious housing is perceived as a less pressing issue when it comes to funding allocation and eligibility for housing services (Sullivan, 2023). For instance, Housing First programs are targeted toward people who experience homelessness (Woodhall-Melnik & Dunn, 2016), as are rapid housing initiatives (Canadian Mortgage and Housing Corporation [CMHC], 2023b), and local policies that prioritize the needs of those who are unhoused (National Housing Council, 2023). This raises a critical question about the federal government’s commitment to upholding access to adequate housing as a fundamental human right.

The final paper in my dissertation, “Disparity in a Failing System: An Examination of the Impact of Housing Status on Depression and Psychological Distress in Individuals on New Brunswick’s Subsidized Housing Waitlist adopts the Canadian definition of homelessness. In doing so, I designate one group of individuals as unhoused. This group includes people who experience households in which individuals lack stable, safe, and adequate housing, often residing on the streets, in shelters, staying with friends or family (couch-surfing), in congregate living arrangements (e.g. boarding houses), or in provisionally accommodated settings. The second group includes low-income renters who are precariously housed at risk of homelessness, and lacking security or stability. The health outcomes of the “unhoused group” are assessed

separately from those who are at risk of homelessness, but currently have housing and are on New Brunswick's waitlist for subsidized housing, referred to as "precarious renters." Research suggests that both renters in precarious situations and those who are unhoused face challenges related to housing affordability, quality, and stability (Bassuk et al., 1996; Hock et al., 2023; Listerborn, 2023; Serchen et al. 2024).

These groups, analyzed in my final paper, are categorized based on each individual's initial status at the start of a longitudinal investigation of the contributions of subsidized housing to physical and mental health. However, housing status is not static, and individuals may transition into or out of the unhoused group. This fluidity in housing status is closely linked to the distinct challenges faced by precariously housed and unhoused individuals. Researchers find that housing status varies over time and lower-income households are prone to transitions between various forms of unstable housing and homelessness (Chamberlain & Johnson, 2013; Nilsson et al., 2019; Stonehouse et al., 2021; Wright & Rubin, 1991; Woodhall-Melnik et al., 2018). For example, low-income renters are vulnerable to temporary or episodic homelessness as a result of changing circumstances, such as employment status, family structure shifts, income losses, or sudden housing changes (Canadian observatory on homelessness, 2014). Additionally, research on housing instability consistently shows that households are more likely to experience various forms of instability rather than progressing towards the ideal of single-family homeownership (Chamberlain & Johnson, 2013; Stonehouse et al., 2021; Woodhall-Melnik et al., 2018).

Fluidity into and out of pathways of homelessness is influenced by diverse experiences and risk factors (e.g., mental health status and substance abuse), that contribute to housing stability (Piat et al., 2015; Pophaim & Peacock, 2021). Although fluid housing trajectories lead to movement between these two groups (i.e., precariously housed and unhoused individuals), research does find that individuals who are unhoused typically experience more financial strain (Bassuk et al., 1996), lower levels of social support (Bassuk et al., 1996; Letiecq et al., 1998; Omerov, 2020), greater health inequalities (Omerov, 2020), and complex underlying causes of housing instability, such as severe mental health issues and addiction (Grinman et al., 2010; Richards & Kuhn, 2022). These factors contribute to chronic homelessness and longer durations of instability (Bassuk, 1996; Institute of Medicine, 1988; Echenberg and Munn-Rivard, 2020).

Compared to precarious renters, those who are unhoused often face numerous challenges, including higher risks of sexually transmitted and other communicable diseases (Zhang, 2018; Williams et al., 2018), and increased injuries and disabilities (Bernstein et al., 2015). This group also encounter limited access to preventive and long-term healthcare services and medications to address their distinct and multidimensional needs (Berenbaum, 2019; Hwang, 2010; Roche, 2018; Zhang, 2018). As such, chronic homelessness is influenced by complex interactions of socioeconomic factors, structural factors, and rising housing costs (Amore et al., 2011; O'Sullivan & Decker, 2007), which makes finding and maintaining adequate housing challenging.

Furthermore, according to Caton et al. (2005), there are notable differences in the risk factors associated with long-term and short-term homelessness. The study used an 18-month follow-up period, which began with the baseline interview conducted within 30 days of the subject's first admission to the shelter system. Individuals who experienced short bouts of homelessness (defined as returning to conventional housing during this period) were less likely to have histories of substance abuse or arrests. Their return to stable housing was often facilitated by factors such as younger age, current or recent employment, earned income, good coping skills, and adequate family support. In contrast, those who experienced longer durations of homelessness were more likely to be characterized by older age, history of arrests and substance abuse, lack of earned income, poor coping skills, and inadequate family support. These individuals often required more specialized and intensive services to facilitate their re-entry into stable housing. Therefore, the differentiation between individuals who experience short-term and chronic homelessness is important for proper triage and the provision of specialized support services to facilitate their transition into stable housing.

Definitions of Housing Affordability & Core Housing Need

Households are considered affordably housed when their shelter costs do not exceed 30% of their before-tax incomes (CMHC, 2022a; National Housing Council, 2023). The 30% benchmark is used across Canada with the exception of Quebec. In Quebec, households with shelter costs below 25% of their before-tax household incomes are considered affordably housed (Chisholm, 2003). Households who are not

housed affordably experience financial strain and difficulties meeting other basic needs, such as food and essential healthcare, which contribute to worsened physical and mental health outcomes (Jones, 2023; Krieger & Higgins, 2002).

The Canadian Mortgage and Housing Corporation (CMHC, 2022c) defines core housing need as the condition experienced by households who spend 30% or more of their before-tax household income on shelter costs (e.g. rent, utilities, etc.) and live in housing that is inadequate and/or unsuitable. In Canada, housing is considered inadequate when it is in need of major repairs. Major repairs include defective plumbing or electrical wiring, or structural repairs to walls, floors, or ceilings (CMHC, 2019). Housing is considered unsuitable when there are not enough bedrooms for the size and make-up of resident households, according to the National Occupancy Standards calculation (CMHC, 2022b; CMHC, 2019). In the present study, I focus on housing affordability as the key concept. This is because access to the subsidized housing waitlist in New Brunswick is income-tested and does not rely on measures of suitability or adequacy.

Types of Housing Assistance in New Brunswick

New Brunswick, like other Canadian jurisdictions, employs three main strategies to address housing unaffordability. A fourth mechanism, the Direct to Tenant Benefit (DTT), emerged after the present research as a pilot program which only applies to specific groups (e.g., Individuals leaving situations of domestic violence). If the pilot proves successful, DTT programs may be extended to others who require affordable housing assistance; however, to date, these benefits—used to offset the costs of

market rents—are not widespread and are not discussed within the context of this dissertation. The three main types of assistance discussed in this section are public housing, rent supplements, and housing benefits.

Public housing and rent supplements are assigned to households on the waiting list; however, households who receive the housing benefit must simply meet program criteria and do not necessarily have to be on the waitlist. Households who are on the waitlist but receive the housing benefit are removed from the waitlist for subsidized housing (Government of New Brunswick, 2023a). However, the benefit is not rent-gated-to-income (RGI) and does not produce the same conditions of affordability as public housing or rent supplements (Levitan-Ried et al., 2024). Levitan-Ried et al. (2024) argue that that current benefits fail to provide affordable, quality, and secure housing for low-income tenants in Canada, calling for a rights-based approach to housing and greater investment in public housing to better meet the needs of those eligible for support.

Public housing (referred to as social housing in many other jurisdictions) is comprised of housing units that are owned by provincial or local governments (Government of Canada, 2018 a; 2018b). In New Brunswick, these units are owned and managed by the New Brunswick Housing Corporation and are colloquially referred to as “NB Housing” (Government of New Brunswick, 2023a; 2023b). These units are RGI and households pay 30% of their before-tax incomes as rent. The remainder of the rent costs are subsidized by the province. Historically, the Federal government owned and managed RGI public housing. However, in the 1990s the Federal government removed

itself as public housing providers and shifted the oversight and management of public housing to its provinces and territories. As a result, waitlists for access to public housing have become lengthy and therefore, often fail to address immediate financial and housing need (Suttor, 2016). This is especially problematic in Canada, where governments rely on the private sector for housing provision (August, 2022; Findeisen, 2022; Hulchanski, 2021; National Housing Council, 2023; Suttor, 2016), which is done at market rates, and ignores the need for a robust public housing sector.

Rent supplements are provided from the government to non-profit or private market providers to subsidize their units (CMHC; 1993; Steele, 2007). Tenants qualifying for assistance through this program have their rents reduced to 30% of their before-tax household income (for rent and utilities). Landlords receive the difference between the rent paid by the tenant and the agreed upon market rent from the provincial government (Government of New Brunswick, 2023a). In rare cases, rent supplements can be assigned to an individual household instead of a landlord and the household can use the rent supplement to find housing that is suitable to them. This is done through **Portable Rent Supplements**. In these cases, a household's supplement will be provided directly to the landlord of the unit they choose. Tenants will pay 30% of their before-tax household income to their landlords and the provincial government will pay the difference between the 30% and market rent. They are allowed to move and maintain their supplement; however, the new unit of their choice must offer market rents as determined by the Government of New Brunswick. These are referred to as "portable rent supplements" (Leviton-Reid et al., 2024).

Housing benefits are used to address housing precarity (Blueprint, 2022; Leviten-Reid et al., 2024), and entail providing financial support directly to tenants to acquire housing in the private market. Upon successful application to the government, households receive a monthly payment, which is intended to offset the costs of renting in the private market. At present, the Canada-NB Housing Benefit is time limited to three years (CMHC, 2022d). Recent work by Leviten-Reid et al. (2024) finds that this benefit is insufficient, as it does not reduce the cost of rent to the level of affordability that is achieved by rent subsidies or public housing. Further, the adequacy and suitability of housing is not assessed or considered as tenants choose their own housing. These benefits act as cash supplements for tenant households with low-to-moderate incomes.

The Rural and Native Housing Program is another targeted initiative designed to help eligible off-reserve Indigenous households and rural households who qualify for assistance to secure affordable, adequate, and suitable housing. Tenants who qualify for this assistance pay 30% of their household incomes toward rent and the remainder of rent is subsidized by the provincial government (Government of New Brunswick, n.d.).

Housing Financialization

Housing financialization refers to the growing dominance of financial institutions such as private equity firms, real estate companies, real estate investment trusts (REITs), asset managers, and institutional investors, in the housing market (August, 2022). This process involves the acquisition of both residential properties and

rental housing, which are then transformed into financial products, with the goal of maximizing profits for investors and shareholders. Housing scholars argue that housing financialization is indicative of a housing system that views housing as a commodity—a means for wealth and investment—rather than a fundamental human right and a social good for individuals and communities (August, 2022). Housing is no longer solely a place of human residence, but a tradable investment asset that generates profit. Consequently, this shift toward housing financialization poses challenges for low and moderate-income individuals seeking affordable and appropriate housing options for either renting or homeownership (August, 2022; Canadian Centre for Human Rights, 2023; Hayes, 2023). Ultimately, the financialization of housing is acknowledged as a trend that hampers the achievement of the right to adequate housing by driving up housing prices, reducing the availability of affordable housing, and contributing to gentrification and the displacement of vulnerable communities (August, 2022; Hayes, 2023; Morrissey, 2023).

Part II: Mental and physical health definitions

This section defines mental health and physical health, the outcome variables used in the literature reviews, associated challenges, and in the final paper of my dissertation.

According to the World Health Organization Constitution of 1946, **health** is defined as a “state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity” (p.1). Available evidence on housing as a social determinant of health acknowledges that mental and physical health are affected by

housing stability, quality, and affordability (Bentley et al., 2011; Meltzer & Schwartz, 2016).

The World Health Organization (WHO, 1946) definition of health is quite broad and encompasses both physical and mental health. A more specific definition of mental health is provided by the Public Health Agency of Canada [PHAC], 2020: para. 2): “The state of your psychological and emotional well-being. It is a necessary resource for living a healthy life and a main factor in overall health.” In contrast, mental illness is described as the reduced ability for a person to function effectively over a prolonged period of time because of significant levels of distress, sadness, feelings of isolation, loneliness and changes in thinking, mood or behaviour (PHAC, 2017). These definitions imply that mental health and mental illness are distinct but interdependent concepts. Persistence of poor housing conditions leads to poor mental health (Pevalin, 2017), which can lead to both mental and physical illness (Gautam et al., 2024; Leighton & Dogra, 2009). This understanding is supported by evidence suggesting that chronic stress from financial strain and poor housing conditions can lead to psychological distress which is an underlying component of anxiety and depression (Phillips, 2009), the focus of literature review and last research paper. In turn, these mental illnesses can further contribute to homelessness through functional impairment, productivity loss, and difficulty affording essential living expenses (Anombem et al., 2023; Beck et al., 2011; Garcia et al., 2024).

In studies of access to subsidized housing and mental health, mental health is usually conceptualized the presence or absence of depressive symptomology (Chambers et al.,

2015; Kalousova & Evangelist, 2019), anxiety symptoms (Casciano & Massey, 2011) psychological distress (Bentley et al., 2018; Fenelon, et al., 2017), emotional difficulties (Fenelon et al., 2018), wellbeing dividends which include stress, depression and anxiety (Beer et al., 2011), and the presence of diagnosed (Fertig & Reingold, 2007) or suspected (Garg et al., 2013) mental illness.

Common tools used to measure mental health in these studies include the Anxiety Symptom Scale (Casciano & Massey, 2012), Mental Health Short-Form summary measure of the SF-36 (MH), Kessler Psychological Distress Scale (K10) (Bentley et al., 2011), the Kessler 6 (Fenelon et al., 2017), the Center for Epidemiologic Studies Depression (CES-D) Scale (Chambers et al., 2015), the Strengths and Difficulties Questionnaire (SDQ) Symptom score (Fenelon et al., 2018), the five-item version of the Mental Health Index (Garg et al., 2013), the Composite International Diagnostic Interview-Short Form (CIDI-SF) (Fertig & Reingold, 2007), and the Patient Health Questionnaire (PHQ) (Kalousová & Evangelist, 2019).

Although definitions and measurements do not explicitly differentiate between mental health and mental illness, the majority of studies measure specific symptoms of mental illness (e.g. anxiety, depression, etc.) and/or capture the presence and absence of mental health diagnoses, such as (Fertig & Reingold, 2007), which indicates that they are focused more on mental illness than mental health. However, the considerable heterogeneity in the definitions and measurements of mental health makes it difficult to draw universal conclusions and synthesise the findings of smaller bodies of research that assess mental health (Dweik et al., 2022).

In relation to this dissertation, the baseline survey in the NB Housing Study measures mental health using the CESD-10 (depression), the Kessler 6 (distress/anxious symptomology). The measurements employed to capture mental health in the NB Housing Study are discussed in the fourth article of this dissertation titled "NB housing study protocol: investigating the relationship between subsidized housing, mental health, physical health and healthcare use in New Brunswick, Canada". Later iterations of this survey ask about diagnoses mental illnesses and other chronic conditions. Further, the data collected in this study will be linked with administrative data at the New Brunswick Institute for Research, Data and Training (NB-IRDT) to generate a more fulsome understanding of the objective health outcomes associated with housing insecurity. However, at the time of writing this dissertation, the baseline data from the study are the only data available.

My research investigates distress, anxiety, and depression, as these are the most prevalent mental health conditions in Canada (Stephenson, 2023). These conditions are highly correlated with stress, financial stress, and material deprivation (Alegría et al., 2018; Guan et al., 2022). In order to qualify for the housing waitlist in New Brunswick, households must make less than \$37,000 to \$50,500 a year (Government of New Brunswick, 2024). The exact figure varies depending on the household size, number of bedrooms needed, and rural or urban residency (Government of New Brunswick, 2024). These income thresholds suggest that these households are likely to experience financial stress and material deprivation. The co-occurrence of chronic distress, anxiety, and depression are common health conditions

that produce negative public health, social, and economic consequences (König, 2019; Kessler et al., 2003); elevated morbidity and mortality (Kessler et al., 1999; Surtees et al., 2003); lost productivity (Beck et al., 2011; Stewart, 2003); and increased use of health and social resources (Armbrecht et al., 2021; Linder et al., 2020; Padgett, 2020; Ridley et al., 2020).

Physical health encompasses multiple dimensions, including life expectancy at birth, the presence and severity of chronic illnesses, and self-reported health (Parrish, 2010). The relationship between housing and health suggests that health is impacted by housing stability, quality, and affordability (Meltzer & Schwartz, 2016; Taylor, 2018). Improved housing affordability and conditions can reduce poverty, prevent disease, and increase quality of life (WHO, 2018). Improvement in rental housing affordability could potentially decrease the financial stress of low-income families, and free up more financial resources which can be used to access other health promoting resources (e.g. healthy food, physical activities, etc.), consequently, improving their physical health (Osborn et al., 2016). The association between financial resources and health is often explained by an income gradient in health, whereby rising income is predicted to improve both the quantity (e.g. increased life expectancy) and quality (e.g. reduced morbidity) of health, through various clinical, behavioural, social, and environmental mechanisms (Chokshi, 2018; Lynch et al., 2004).

Researchers typically investigate the presence or occurrence of chronic diseases among low-income individuals on waitlists for subsidized housing or study housing and health disparities without proper definition or typology. For example, Mehta et al.

(2018) find that, relative to homeowners who are eligible for subsidies, the probability of asthma is higher among adults in public housing or receiving rental assistance, and this finding persists even after controlling for factors such as income, the presence of second-hand smoke, and obesity status. However, in studying a medical condition like “asthma,” it becomes crucial to consider its different subtypes such as adult-onset asthma, allergic asthma, occupational asthma, and exercise-induced asthma. Each subtype of asthma may have distinct underlying causes, triggers, and treatment approaches. For example, the factors contributing to asthma related to chronic obstructive pulmonary diseases differ significantly from those associated with mold-induced asthma triggered by indoor environmental hazard such as mold and dampness. Therefore, employing a generic term such as “asthma” without specifying the subtype can result in confusion and misinterpretation in housing-related research (Dweik et al., 2022).

Further, research on housing and physical health focuses on a dichotomous outcome, which does not capture severity. The bulk of reviewed articles focus on logistic regression methods, which characterize health at the extensive margin (Dweik et al., 2022). Ordinal analyses may be especially relevant to differentiate mild-to-moderate risk-levels from those which are severe (James et al., 2014a; Nguyen et al., 2010). For example, Chambers and Rosenbaum (2014) explored the prevalence of blood pressure using a cut-off point (systolic >140 mmHg and diastolic >90 mmHg). This measure assesses prevalence, while proper screening dictates further classification by stage and type (Guirguis-Blake et al., 2021). With this limited

information, it is not possible to determine the severity of hypertension, possible causes, and how changes in affordability and housing conditions affect prevention and management. This is especially relevant when examining the effect of housing subsidies on mild to moderate essential or primary hypertension (Guirguis-Blake et al., 2021). Affordable and stable housing can facilitate stress management, promote healthy lifestyle, and access to essential care services (Kottke et al., 2018; Maqboo et al., 2015), thereby positively impacting hypertension management and health outcomes (Charchar et al., 2024; James et al., 2014; Nguyen et al., 2010). Therefore, these studies present insufficient evidence to conclude whether housing interventions themselves have direct positive impacts on physical health (Dweik et al., 2022).

My research focuses on self-rated health because of its validity and reliability as a general health measure (Bombak, 2013). Self-rated health is widely used in epidemiological, social and health research to predict mortality (Bombak, 2013; 7; Kananen et al., 2021; Mossey & Shapiro, 1982). Subjective assessments of health status tied to individuals' experiences correlate well with clinical assessments (Bombak, 2013; Kananen et al., 2021; Klimek et al., 2017; Strawbridge & Wallhagen, 1999). The use of self-rated health, rather than specific diagnoses, is also considered suitable for measuring multiple dimensions of personal health status, and are proven effective in predicting physical, functional, and mental health components (Chung, 2020; Jacobs, 2011; Ware et al., 1981).

My research assesses individual self-rated health using the EQ VAS, a vertical visual analogue scale, where the endpoints are labelled '*The best health you can image*'

and *'The worst health you can image'* (Feng et al., 2021). This scale assesses five dimensions: mobility, self-care, usual activities, pain/discomfort, and distress/depression. The connection between these dimensions and housing affordability and conditions is established in other studies (e.g. Chung, 2020; Jacobs, 2011). Each dimension has 5 levels: no problems, slight problems, moderate problems, severe problems and extreme problems. This measure is discussed further in the fourth article in this dissertation.

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CHAPTER ONE: INTRODUCTION

This dissertation engages with the Social Determinants of Health (SDOH) as a framework for understanding the contributions of structural determinants, such as socioeconomic status, housing and employment, to physical and mental health. Hence, I begin my dissertation with a discussion of the SDOH as a guiding framework that relates to all the papers contained within this manuscript. The SDOH include the social and economic conditions that influence physical and mental health status (Barrett, 2022; Boseley, 2008; Chen et al., 2022; Wilkinson & Marmot, 2003).

Housing quality, affordability, security, and stability are prominent risk factors cited in the literature on determinants of health promotion, disease prevention, and health outcomes (Barrett, 2022; Chen et al., 2022; Kinser & Lyon, 2014; Singh, 2020). These factors are highlighted in several conceptual frameworks that present the association of these risk factors with depression and/or distress (see Chung, 2020; Kinser & Lyon, 2014; Singh, 2020; Solar & Irwin, 2010; Swope & Hernández, 2019).

Housing as a Social Determinant of Physical & Mental Health

The World Health Organization's (WHO, 2005: p. 1) Commission on Social Determinants of Health in 2005 defined the SDOH as "the conditions in which people are born, grow, live, work, and age and the fundamental drivers of these conditions." The description alludes to the importance of safe and affordable housing as an environment wherein conditions shape health. This reinforces the importance of access to safe and affordable housing for physical and mental health.

The importance of social determinants to population health was first presented in the early 2000s by the WHO's Commission on Social Determinants of Health (Wilkinson & Marmot, 2003), which was commissioned by Michael Marmot, former director of the WHO (Boseley, 2008; Marmot, 2009). The objective of this report was to better understand the complex interrelationships between the social, environmental, economic, and political factors that contribute to population health. This review is synthesized into a single conceptual framework for action on the SDOH (WHO, 2010), which highlights complementary pathways and mechanisms underscore the intricate interplay of social determinants on individual health outcomes. These factors encompass biological, physical, and environmental factors, material and behavioral choices, and the broader socioeconomic and political landscape (Solar & Irwin, 2010).

In Canada, federal policies promote the financialization of Canada's housing sector, which prioritizes investor interests over affordable housing, contribute to high housing costs, limited affordable options, and increased poverty (August, 2022; Findeisen, 2022; Morrissey, 2023). Households enduring the circumstances created by financialization of housing often experience material deprivation and poor quality housing conditions, which can have detrimental effects on their mental and physical health (Asmundson, 2011; Hong et al., 2011; Kyle & Dunn, 2008; McRae et al., 2016; Mawani & Gilmour, 2010; Mirowsky & Ross, 2017; Pollack et al., 2010; Shaw, 2004). Low income and unaffordable housing, as social determinants of physical and mental health, are mediated through intricate pathways and mediators, mainly: (i) Financial strain associated with housing costs and limited budget, forcing trade-offs with other

essentials such as food and essential health care services (Baker et al., 2020a; 2020b; Bentley et al., 2011; Botha et al., 2024; Singh et al., 2020); (ii) Housing instability and insecurity as a result of frequent moves, threat of eviction and homelessness (Fowler et al., 2015; Kim & Burgard, 2022; Suglia et al., 2011; Talmatzky, 2023); and (iii) Substandard housing conditions, such as the presence of mold, pests, and hazardous or unsafe environments (Singe Rautio et al., 2018; Rolfe et al., 2020; Singh et al., 2019). Understanding this relationship in NB is crucial for developing effective housing policies and supportive interventions to improve population health. In 2021, approximately 6% (21,000) of NB households faced core housing needs, while 12% (41,000) lived in unaffordable housing (Statistics Canada, 2021a). This is likely an underestimate of true core housing need, as it only assesses affordability, not suitability or adequacy, and the income used to assess affordability is based off of 2020 measures, wherein some low-waged households had access to significantly higher incomes through the COVID-19 Canadian Emergency Response Benefit (Statistics Canada, 2022).

Renters in NB are dealing with rising shelter costs—average rent increased by 40% over the past decade, compared to a 10.2% rise in provincial income (CMHC, 2021; Statistics Canada, 2021b; Woodhall-Melnik et al., 2022). Furthermore, in 2023, New Brunswick experienced the highest rent increases in the country west of Alberta (Statistics Canada, 2024a). These trends drive growing housing unaffordability and longer housing waitlists (National Advisory Council on Poverty, 2022; Silberman, 2024).

The income data collected through NB housing study survey presented in the last chapter of this dissertation, highlights extreme poverty, with precarious renters

reporting a median household income (after-tax) of \$11,750 and unhoused households at \$7,272—both notably lower than the median income of renters in New Brunswick (\$37,000; Canadian Housing Survey, 2021). Collected data also shows an alarming unemployment rate of around 74% among the unhoused and precarious renters, compared to the provincial rate of 7.8% (Statistics Canada, 2024b).

These socioeconomic indicators are closely linked to a household's housing status and their ability to access adequate residency or achieve homeownership (Baker et al., 2016; Bentley et al., 2011; Fletcher et al., 2009; Raphael, 2020; Raphael et al., 2008). Further, like housing, the main measures of socioeconomic status—income—is predictive of health status, human development and quality of life (Raphael, 2007, pp. 205-238; Raphael, 2009). Research shows that low-to-moderate income households that spend more than 30% of their income on housing costs are limited in their ability to purchase other essential goods and services (Bentley et al., 2011; Fletcher et al., 2009), which has an impact on both physical and mental health. (Maqbool et al., 2015; Swope & Hernández, 2019).

In simple terms, at a population level, housing, poverty, and low-income are all interrelated and contribute to poor health outcomes. These effects are not limited to individual health-related behaviors (e.g., quality of diet, physical activity, and psychological functioning), but also impact housing stability, security, and social integration (Raphael, 2020; Raphael et al., 2008).

Individuals facing financial stressors often experience negative impacts on mental health, leading to increased risk of distress, anxiety, and depression (Coley et

al., 2013; Leventhal & Newman, 2010; Meltzer & Schwartz, 2016; Robison et al., 2009). The link between low income and distress, depression or anxiety symptomology is well explained by financial strain, housing instability and insecurity, material deprivation, and poor living conditions (Asmundson, 2011; Desmond & Kimbro, 2015; Hong et al., 2011; Kyle & Dunn, 2008; McRae et al., 2016; Mirowsky & Ross, 2017; Pollack et al., 2010; Shaw, 2004). For example, more discretionary income allows individuals to purchase more health services while allowing for increased consumption of nutritious food and improved housing, all of which are necessities for good health (Marmot, 2002).

Housing insecurity is a prominent and widespread precursor to homelessness that disproportionately affects low-income households and renders them more vulnerable to housing loss (Beer et al., 2011; Bentley et al., 2011; Blanch, 2023; Coley et al., 2013; Hock et al., 2023; Meltzer & Schwartz, 2016). Living in emergency shelters by itself could present exposure to an insecure and hazardous environment, social isolation, and higher emotional stress that further deteriorates mental status (Aubry et al., 2020; Beharie et al., 2017; Moffa et al., 2019). Precarious renters often experience constant worry or stress about having sufficient funds to cover rent and utility bills. This financial insecurity and instability, coupled with the fear of potential eviction, can elevate stress levels and increase vulnerability to distress, anxiety, and depression (Chamberlain & Johnson, 2013; Stonehouse et al., 2021; Woodhall-Melnik et al., 2018).

The psychological toll of housing precariousness can have far-reaching consequences on an individual's overall quality of life. As McKee et al. (2017) & Clair et

al. (2019) define it, precarious housing is "A state of uncertainty which increases a person's real or perceived likelihood of experiencing an adverse event, caused (at least in part) by their relationship with their housing provider, the physical qualities, affordability, security of their home, and access to essential services" (p. 16). The inherent uncertainty, instability, and fear of eviction tenant households face in precarious housing situations can elevate stress, anxiety, worsen existing health conditions, hinder healthcare access, and disrupt an individual's capacity to sustain stable employment and social connections (Alley et al., 2011; Desmond & Gershenson, 2017; Marçal et al., 2023). Conversely, individuals experiencing distress, anxiety, and/or depression are more likely to seek healthcare services and take prescription medications compared to the general population (Arts et al., 2018; Katon, 2011; Roehrig, 2016). Additionally, research indicates that recovery from mental illness is particularly challenging for individuals with low incomes (Greenwood, et al., 2020; Corrigan, et al., 2004; Ramon, 2018; Weich & Lewis, 1998).

Studies also indicate that stress and residential instability result in frequent household moves (Baker et al., 2016; Cheung & Wong, 2022), which lead to worsened mental health among precarious renters (Cheung & Wong, 2022; Talmatzky et al., 2023). Housing instability consistently shows that households are more likely to experience various forms of instability rather than progressing towards the ideal of single-family homeownership (Chamberlain & Johnson, 2013; Stonehouse et al., 2021). This is problematic, and inhumane, as individuals who experience housing instability often endure financial strain, poor living conditions, and are required to make trade-

offs between purchasing health promoting resources (e.g. sufficient variety and quantity of food, warm clothing, transportation, etc.) and paying rent (Baker et al., 2017; Bentley et al., 2011; Chung et al., 2020; Mason, 2013; Singh et al., 2019; Solar & Irwin, 2010).

In addition to the impacts of housing affordability on mental health, research explores the impacts of housing affordability on physical health. The literature shows that children of low-income families experience increased exposure to environmental risks (Ahrens et al., 2016; Braubach & Fairburn, 2010), and higher rates of underweight (Cutts et al., 2011; Meyers et al., 2005) and asthma than peers living in higher income households that are stably housed (Bryant-Stephens et al., 2021; Krieger & Higgins, 2002; Maqbool et al., 2005). Also cost-burdened adults are more likely to experience cardiovascular diseases and hypertension compared to adults who live in stable and affordable homes (Gu et al., 2023). The link between housing and poor physical health is well explained by financial strain, housing instability and insecurity, and material and physical impacts of housing on health (e.g. exposure to dampness, cold, mold, and heat) (Maqbool et al., 2015; Pollack et al., 2010; Shaw, 2004; Swope et al., 2019; Taylor, 2018).

Families spending more than 30% of their income on housing face trade-offs, often lacking sufficient funds for essentials like food, medical insurance, and healthcare (Maqbool et al., 2005; Pollack et al., 2010; Shaw, 2004). The threat of eviction impacts chronic diseases and contributes to higher all-cause mortality rates associated with serious medical conditions such as depression, cardiovascular disease, and suicidal

attempts (Hock & Boen, 2021; Vásquez-Vera et al., 2017). Further, housing insecurity are inextricably linked to crowding, poor housing quality, and frequent moves, leading to negative consequences for food security (Cutts et al., 2011; Kushel et al., 2006), access to medical care (Meltzer & Schwartz, 2016), injuries (Delgado et al., 2002; Hock et al., 2023); and physical health issues such as elevated blood pressure (Evans et al., 2006) and asthma (Gabby et al., 2024).

Inadequate housing quality and safety, including factors such as mold, dampness, and improper ventilation and sanitation facilities, can contribute to negative physical health outcomes. These environmental hazards are particularly prevalent in precarious rental situations, where individuals often reside in overcrowded, deteriorating housing with poor maintenance, leading to increased exposure to noise pollution, air pollutants and various hazards (Kingsbury et al., 2018; Pevalin et al., 2017; Rautio et al., 2018; Rollings et al., 2017; Suglia et al., 2011). These environmental factors can exacerbate respiratory conditions such as asthma and elevate the risk of infectious diseases (Krieger & Higgins, 2002). For instance, children with asthma who are exposed to old and dirty carpeting or mold and damp environments face an increased risk of hospitalization (Rosenstreich et al., 1997). Additionally, poor housing quality can contribute to the development of chronic diseases, injuries, disabilities, and increased morbidity rates independent of other measures of deprivation (Krieger & Higgins, 2002; WHO housing and health guidelines, 2018). For example, crowded housing conditions are linked to tuberculosis and increased respiratory infection morbidity rates (Burridge & Ormandy, 1993; Conway, 2005). Exposure to indoor

temperatures beyond a healthy range, especially cold indoor temperatures, is associated with elevated risks of cardiovascular disease, diminished overall health status, and heightened healthcare service utilization (Collins et al., 1986; Evans et al., 2000).

As displayed in Figure 1, the relationship between health and stress related to socioeconomic disadvantage is multifaceted and complex. Limited investment in public housing, and poor housing affordability in Canada contribute to an increase in poverty and housing precariousness for low-income renters (August, 2022; Canadian Centre for Housing Rights, 2023; Hulchanski, 2021), and play a pivotal role in the manifestation of distress, anxiety, and depressive symptomology. The proposed framework in Figure 1 summarizes the above-described housing pathways, potential mediators, and associated health outcomes. The link between low-income status, and depression and distress is well explained by experiences of financial strain, material deprivation, unaffordable housing, poor living conditions, housing instability, and insecurity (Alegria et al., 2018; Hong et al., 2011; Kyle & Dunn, 2007; Leventhal & Newman, 2010; Mirowsky & Ross, 2017; Pollack et al., 2010; Shaw, 2004).

Persistent and overwhelming stressors may lead to poor health outcomes and social dysfunction (Hettama et al., 2006; Kinser & Lyon, 2014). Stress vulnerabilities, which are defined as chronic or acute burden from life events, illness, or low socioeconomic status, can either trigger the onset of the psychological distress, or increase vulnerability to distress, anxiety, and depression (Hammen, 2005; Kendler, 1999; Kinser & Lyon, 2014).

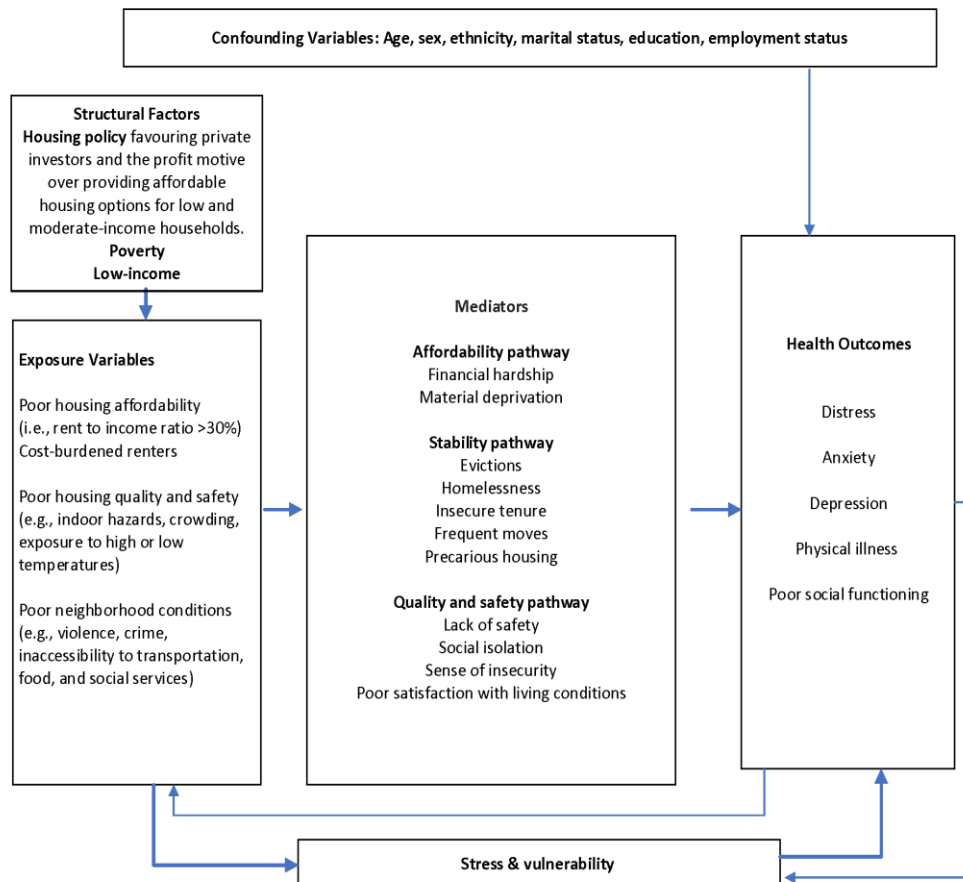
The nature of the relationship shown between low-income status and mental health can be direct, but can also operate through more complex and varied pathways (Baker et al., 2014; Braveman & Gottlieb, 2014; Kinser & Lyon, 2014). For example, low-income households are often live in neighborhoods with higher crime rates, limited educational and employment opportunities, and reduced opportunities to build strong social networks (National Center for Chronic Disease Prevention and Health Promotion, 2021; Thompson et al., 2024). These risk factors can increase chronic stress, leading to participation in health limiting behaviours, which contribute to poor mental health and physical health (Chrisinger et al., 2022, Ruiz et al, 2021; Warren Andersen et al., 2018). The negative impacts of growing up in low-income households and associated childhood adversities can perpetuate intergenerational cycles of health disparity and socioeconomic disadvantage, which can persist into adulthood and lead to poor adult health outcomes (Cheng et al., 2016; Kirkbride et al., 2024).

Poverty and vulnerability not only contribute to mental health and physical health problems, but individuals also experience negative consequences associated with living with these problems (Baker et al., 2014; Knifton & Inglis, 2020). For example, an individual who lives unaffordably may experience stress, which is associated with higher risk of cancer (Thompson et al., 2024), which may limit working hours and further contribute to financial insecurity (Lawrence et al., 2024). Furthermore, experiencing distress, depression, and anxiety may increase an individual's likelihood of encountering stressful episodes, perpetuating the cycle (Kinser & Lyon, 2014) of mental illnesses and the intergenerational effects of poverty (Kirkbride et al., 2024). The

severity of mental illness or other related outcomes such as social dysfunction or cognitive impairment, can vary based on the duration of exposure to financial distress or unaffordable and unstable housing (Baker et al., 2020; Bentley et al., 2012; Mason et al., 2013; Solar & Irwin, 2010).

The relationship between housing affordability and physical and mental health—particularly depression and distress—are the focus of this dissertation. Insights from this research are crucial for advocating for additional resources and policies that tackle health disparities and promote equity in health and access to housing services among those with limited income.

Figure 1: The conceptual framework illustrates stress vulnerability, distress, anxiety, and depression among low-income individuals in New Brunswick who are on the waitlist for subsidized housing.¹



Therefore, the premise underlying access to publicly subsidized housing as a determinant of good health is based on: (i) preventing the onset of new illness and injuries; (ii) improving access to health care and other necessary health services; and

¹ This conceptual framework is adapted from Singh et al., 2020. “Do Financial Hardship and Social Support Mediate the Effect of Unaffordable Housing on Mental Health?” *Social Psychiatry and Psychiatric Epidemiology*, 55(6), 711; and Solar & Irwin. (2010). “A conceptual framework for action on the social determinants of health. World Health Organization”.

(iii) reducing undernutrition and promoting a healthy lifestyle that leads to good health (Gubits et al., 2016; Kottke et al., 2018; Krieger & Higgins, 2002; Shaw, 2004).

However, despite the recognition that access to affordable housing positively influences mental health outcomes (Baker et al., 2020a; 2020b; Bentley et al., 2011; Mason et al., 2013), significant research gaps persist in understanding this contribution. Addressing this gap is crucial, given that housing policies in many countries, including Canada, the US, Australia, and the UK, are designed to provide access to subsidized housing as their main affordability interventions (OCED, 2020).

To investigate the relationship between access to publicly subsidized housing subsidized housing and mental health outcomes, I conducted a systematic review synthesizing and assessing the available evidence, which is presented in **Chapter Two**. This systematic review synthesizes studies that examined the effects of moving into publicly subsidized housing on mental health indicators, such as symptom of anxiety and depression. **Chapter Three** presents a literature review exploring the existing evidence on the association between access to publicly subsidized housing and physical health outcomes. This review critically analyzes studies that have investigated the impact of accessing publicly subsidized housing on various aspects of physical health, including chronic conditions, health care use, health behaviours. **Chapter Four** presents a study protocol for the NB Housing study. The data used for the empirical analysis in Chapter Five are derived from this study. In presenting this protocol, I demonstrate a method for assessing the impacts of subsidized housing on physical and mental health in New Brunswick. This study is currently underway, and the intervention data are not

yet available to determine the impacts of subsidized housing on mental or physical health. The empirical research presented in **Chapter Five** of this dissertation focuses on the impacts of housing status, specifically being precariously housed or unhoused, on mental health, as defined earlier in the preface section.

Housing unaffordability is a global trend, not unique to Canada

Canada's current affordable housing crisis is not unique; however, it is one of the largest examples of the consequences of the financialized approach to housing worldwide (August, 2022). Globally, housing affordability strain is increasing, driven by housing market inflation and the financialization and commodification of housing (August, 2021; Findeisen, 2022). The current approach to housing heavily relies on the private sector to meet the housing needs of renters (August, 2021; Findeisen, 2022). Critical housing scholars argue that this approach exacerbates housing inequality, by overlooking the needs of low-income individuals or marginalized communities who struggle to afford decent housing (Findeisen, 2022; August, 2022). According to the UN, by 2030, three billion people (i.e., 40% of the world's population) will be impacted by a global shortage of affordable housing (World Bank, 2021). As the housing crisis deepens globally, better understandings of the consequences of housing unaffordability, the systems and policies that contribute to it, and promising solutions become more critical.

Canada's approach to housing affordability challenges

In New Brunswick, as in all other Canadian provinces and territories, programs designed to respond to housing need are too limited to provide adequate and

affordable housing to all (Government of Canada, 2024). While Canada is experiencing an increasing need for adequate housing as well as a growth in mental health problems (Canadian Institute for Health Information, 2024). Canada's approach to housing households who experience housing inadequacy or instability is representative of a residual approach to social welfare, wherein individuals and households are offered emergency shelter access and temporary accommodations once they lose their housing. Few households can access subsidized housing, as investments in public housing have not kept pace with demands over the past 40 to 50 years (Government of Canada, 2024). Deeply affordable housing access is supplemented through government provided rent subsidies in the private and non-profit sectors; however, when applied to the public sector, these subsidies do nothing to facilitate federal and provincial capacity to provide affordable housing and instead reinforce the commodification of housing as private sector investors and landlords continue to benefit from the collection of market rents (August, 2022; Findeisen, 2022; Hayes, 2023). This approach seems to benefit the private market, as private landlords and developers receive subsidies and tax-breaks to create and offer housing private rental housing, while the government overlooks the need for public housing (Canadian Centre for Housing Rights, 2023; Government of Canada, 2024)

In recognition of the current housing challenges, the federal government re-committed to their role in the provision of affordable housing through the introduction of the National Housing Strategy in 2017 (CMHC, 2018a). This strategy aims to remove 530,000 households from core housing need (CMHC, 2018b), with a focus on nine

specific equity deserving groups. Despite the introduction of this strategy, which largely exists to provide funding to provincial and municipal entities who oversee housing, unaffordability and homelessness continue to grow across the nation (CMHC, 2022; The Housing Policy and Research Exchange, 2021). This raises a critical question about the federal government's commitment to upholding housing as a fundamental human right. Furthermore, New Brunswick operates by-name lists, wherein individuals who experience longer-term homelessness are prioritized for rent-geared-to-income housing. This is appropriate, as they require housing; however, with limited housing stock available, low- and moderate-income households typically wait on the housing list for long periods of time, relegating them to long-term housing unaffordability. In other words, their need for affordable, decent, and suitable housing often remains unmet (Brown, 2023; Government of Canada, 2022; Statistics Canada, 2021a).

Gaps in Research

Studies that investigate the relationship between housing affordability and mental health are largely focused on populations experiencing chronic homelessness (Bentley et al., 2011; Sleet & Francescutti, 2021). While research indicates a high need for mental health care among individuals experiencing chronic homelessness (Hodgson et al., 2013; Onapa et al., 2022), little is known about the mental health status of individuals experiencing hidden homelessness and/or those who are precarious renters in market rental units. As mentioned earlier, individuals who experience homelessness share the need for affordable housing with those who are unaffordably or precariously housed; however, the challenges that they experience are often greater. For example,

studies indicate that individuals experiencing homelessness have complex histories of trauma (Woodhall-Melnik et al., 2018), higher rates of tri-morbidity (e.g. co-occurrence of psychiatric disorders, substance use, and chronic illness (Berenbaum, 2019; Martens, 2001), and higher rates of deep poverty and economic hardship (Johnsen & Watts, 2014). Women who experience homelessness often do so because of Intimate Partner Violence (Sharam & Hulse, 2014; Tabassum, 2023). Furthermore, individuals who experience homelessness are often less healthy to begin with when they lose housing, and ongoing financial hardship, combined with the experience of being unsheltered, perpetuates cycles of insecurity, which leads to diminished health and the inability to participate in employment (Krieger & Higgins, 2002; Rolfe, 2020). Therefore, individuals who become homeless require an unconventional approach to meet their specific health care needs, which often include specialized mental health, rehabilitation, and social integration services (Kiser & Hulton, 2018).

The health impacts of homelessness are well-established and understood. In comparison, studies that assess health impacts such as anxiety and depression in precariously and unaffordably housed individuals are sparse (Talmatzky et al., 2023). Research on low-income groups finds that the uncertainty surrounding housing, income, and stability exacerbates mental health concerns (Bentley et al., 2011; Desmond & Kimbro, 2015; Johnson & Chamberlain, 2011; Lund et al., 2011; Mason et al., 2013); however, research on this topic lacks specific focus on those who wait for, and those who receive subsidized housing. We need to understand the health of subsidized housing applicants, not just low-income households in general.

Understanding the health of subsidized housing applicants enables targeted policy-making, better resource allocation, and tailored support services to address their unique health challenges. Furthermore, it helps to assess housing program effectiveness, prioritize eligibility, and enhance public health planning.

Examining mental health within the same waitlist population, with a focus on outcomes in sub-populations that experience differences in housing status, can offer a more nuanced understanding of mental health outcomes for individuals on waitlists for subsidized housing. Based on the search results, we can draw important insights about this population in New Brunswick, allowing us to develop targeted interventions and support services that address their unique circumstances. By comparing risk factors and mental health outcomes, we can gain a better understanding of the priorities and needs of each housing status group. This research will inform evidence-based policy changes that will address the multiple economic, psychosocial, and physical health needs faced by both groups.

This dissertation adds to the understanding of the health realities of individuals who are precariously housed while waiting for access to subsidized housing. As noted, research on the association between housing insecurity and affordability and depression, anxiety, and distress is limited (Cline, 2021; Desmond & Kimbro, 2015; Rolfe et al., 2020; Suglia et al., 2011). Further, despite the recognition that access to affordable housing positively influences mental health outcomes (Baker et al., 2020; Bentley et al., 2011; Mason et al., 2013), significant research gaps persist in understanding this contribution. Addressing this gap is crucial, given that housing

policies in many countries, including Canada, the US, Australia, and the UK, are designed to provide access to publicly subsidized housing as their main affordability interventions (OCED, 2020). Understanding the health consequences, challenges, and needs of both unhoused and precariously housed populations in the rural province of New Brunswick is crucial for guiding policymakers in developing evidence-based support systems tailored to the particular circumstances of this population.

Research Purpose & Scope

The objective of this article-based dissertation is to:

- Examine and thematically synthesize the literature on the relationship between publicly subsidized housing and physical and mental health status (i.e., distress and depression) and identify gaps in knowledge.
- Present a research design for assessing the contribution of publicly subsidized housing to physical and mental health.
- Assess differences in sociodemographic, housing, and health indicators between individuals who are precariously housed and those who are unhoused.
- Determine whether being unhoused correlates with higher rates of depression and psychological distress than being precariously housed.

In meeting these objectives, the following research questions are addressed:

1. What is currently known about the contribution of subsidized housing to anxiety and depressive symptomology?
2. What is currently known about the contribution of subsidized housing to physical health?

3. Which method can be proposed for studying the impacts of subsidized housing on physical and mental health in New Brunswick, Canada?
4. How does housing status (e.g. being unhoused vs. precariously housed) impact mental health (i.e., distress and depression symptomology) in those who are waiting for access to subsidized housing in New Brunswick, Canada?

OVERVIEW of ARTICLES AND SCOPE

The following section highlights my contributions to the co-authored papers included in my dissertation. This provides a frame to establish this body of evidence as a comprehensive and unified project that strives to build to an assessment of the contribution of publicly subsidized housing to mental and physical health in New Brunswick. This assessment will use longitudinal data collected through the NB Housing Study which is not yet available for analysis. As such, I offer insights into the state of the literature on moving into publicly subsidized housing and physical and mental health and research design. This is followed an analysis of physical and mental health in two distinct groups on the waitlist (those who are unhoused and those who are precariously housed), whose baseline health is not well-understood.

From a human rights perspective, I strongly advocate that it is the responsibility of governments to provide all citizens with the right to adequate housing, which encompasses security of tenure, affordability, accessibility, and suitability, as highlighted in works by Agrawal (2021), Heffernan et al. (2015), and Leckie (2021).

Therefore, in the first and second articles, my literature research focus is specifically narrowed to accessing publicly subsidized housing rather than encompassing rental supplements and housing assistance provided by the private or non-profit sectors. Investigating publicly affordable housing over other housing assistance options resonates with importance of affordability, security and stability as key mediators in the relationship with mental health (Singh et al., 2020; Solar & Irwin, 2010) because other forms of housing support (e.g. the new Canada-New Brunswick Housing Benefit) offset the cost of housing, but do not ensure that housing is affordable at the CMHC defined rate of 30% of a household's before tax income (Leviten-Reid et al., 2024). Further, rent subsidies do not work well in all housing markets, particularly in those with very high rents or limited rental stock (Brackertz et al., 2015; Bratt, 1985; Hartman, 1983; Steele, 2001), like New Brunswick, which has a vacancy rate of 1.5% (CMHC, 2023a). Further, rent subsidies are often criticized for inflating rental prices (Brackertz et al., 2015; Grislain-Letrémy & Trevien, 2022; Susin, 2002), and being associated with discrimination and limitations on mobility (Bratt, 1985; Varady, 2010). Therefore, these reviews focus specifically on moving into publicly subsidized housing as a specific and place-based for providing deeply affordable housing that is regulated by the government.

In addition, the Government of Canada's increased attention to housing issues, as demonstrated through initiatives like the National Housing Strategy, underscores the need for re-evaluating evidence concerning subsidized housing and its impacts on both physical and mental health. The reviews fill this gap, providing valuable insights for

future impact studies in both urban and rural contexts. The first article in this dissertation, which is presented in **Chapter two**, presents the results of a systematic review of peer reviewed studies that focus on the contribution of publicly subsidized housing to mental health. This article is published in a special edition of the *International Journal of Housing Policy* (Dweik & Woodhall-Melnik, 2023). I led this article and was supported by my supervisor, Dr. Julia Woodhall-Melnik. This review finds some evidence that subsidized housing positively contributes to mental health. However, this was largely dependent on the on the specific housing subsidy programme, housing stability, and neighbourhood quality. This review identifies a need for more rigorous studies that use experimental and quasi-experimental designs to better understand the direct contributions of subsidized housing to mental health.

The second article, presented in **Chapter Three** of this dissertation, is a literature review on the relationship between publicly subsidized housing and physical health. The decision to adopt a literature review approach instead of a systematic review was influenced by several factors. This assignment was undertaken as adjunct work to my qualifying exam, which encompassed a broad scope and multiple research questions. The goal was to explore, synthesize, and critically analyze existing literature on the topic rather than focusing on a tightly-defined research question. Consequently, this work did not necessitate registration in Prospero, an International database of prospectively registered systematic reviews, and hence was viewed by reviewers as a literature review, rather than a formal systematic review. This review is published in *Housing Studies* (Dweik et al., 2022). I led this paper and was supported by my

committee member, Dr. Barry Watson, and my supervisor, Dr. Julia Woodhall-Melnik. Although reviews exist that investigate the impacts on housing in general on health (e.g., Kyle & Dunn, 2007), this study is the first to review the impacts of subsidized housing specifically on physical health outcomes, behaviours and healthcare use. Similar to findings presented in the review on mental health, this review finds some evidence that moving into publicly subsidized housing is associated with improved health; however, the results of the reviewed literature are mixed and the impacts of housing vary based on the type of subsidized housing received, the characteristics of the groups that are studied, and neighbourhood quality. This review finds a particular need for future research that analyzes causal relationships across a large and varied geographic space using a robust set of physical health outcomes. Further, both reviews in this dissertation indicate a need to conduct more rigorous research using experimental, quasi-experimental, and longitudinal research designs.

The third article included in **Chapter Four** of this dissertation is a research protocol which is published in *BMC Public Health* (Woodhall-Melnik et al., 2022). This article is led by Dr. Julia Woodhall-Melnik, project PI for the NB Housing Study, and I play a supporting author role in this article, alongside ten students and co-investigators who contribute to the larger research project. As the third author, I reviewed the protocol prior to publication and contributed to the section on study measures. This article is an in-depth presentation of the methods for data collected that are employed in the NB Housing Study and is important to the present dissertation because it provides context on how the data used in my final paper are collected. It also proposes

a method for systematically examining the mental and physical health of individuals who receive subsidized housing.

The protocol proposes the use of a longitudinal, prospective matched cohort design to fill the gaps in knowledge that are identified in my two review articles. The investigation of changes in physical and mental health as study participants wait for, and then receive, subsidized housing should provide researchers with a better understanding of the direct impacts of subsidized housing on physical and mental health.

The fourth and final article in this dissertation, which is presented in **Chapter Five** is an investigation of the impact of housing status (i.e., being precariously housed in market rentals and being unhoused) on mental health. This article will be submitted for consideration for publication in a peer-reviewed journal. This paper is led by me and supported by co-author and my doctoral thesis committee member, Dr. Connie Stewart. The senior author on this paper is my supervisor and PI of the NB Housing Study Dr. Julia Woodhall-Melnik. This final paper uses the data collected from the NB Housing Study. As noted above, the longitudinal data that fill the gaps presented in the two review articles are not yet available. However, interesting observations on housing status and health are made from the baseline data. Further, this paper allows for a unique discussion of the differences in housing status and their association with health as individuals wait for access to subsidized housing,

In the larger group of individuals who are waiting for access to subsidized housing, there are individuals who are housed unaffordably and precariously in market

rental units and individuals who are unhoused (e.g. those who live in single room occupancies, sleep in cars or completely unsheltered, couch surf, and those who stay in emergency shelters). This assessment allows for research on the association between type of housing instability (e.g. absolute vs. precarious) on health. Specifically, this paper presents the characteristics of individuals who rent precariously and those who are unhoused and assesses the association between these two realities and depression and psychological distress. This is important as many waitlists for subsidized housing across Canada use triaged approaches to assign access to subsidized housing, whereby individuals who are unhoused are prioritized for quicker access to subsidized housing than those who qualify for access but have housing. The empirical work in this paper is framed using literature on housing as a human right and social determinants of health. The realities faced by waitlist applicants are described within the context of austere approaches to social welfare. These approaches are characterized by reduced federal government involvement in housing, the devolution of responsibility to provinces and municipalities, and a reliance on private investors for housing supply (August, 2022; Findeisen, 2022; Morrissey, 2023; National Housing Council, 2023; Suttor, 2016). Consequently, underfunded systems that cannot meet the needs of all who qualify must prioritize the needs of those who are the most vulnerable. This leaves individuals who also experience vulnerability at risk of continued adverse outcomes, such as high rates of depression and distress.

Following the presentation of these four articles, this dissertation concludes with a synthesis and conclusion section that restates the common threads woven

throughout the articles. Further, it discusses the future work which will directly address the gaps presented through the two review articles, using the methods presented in the protocol paper, and describes the substantive contribution of this collection of articles to the field of housing studies.

CHAPTER TWO: Systematic Review of the Literature on Subsidized Housing, Anxiety and Depression

The following manuscript is published in the International Journal of Housing Policy. This article is open access and can be found at:

<https://doi.org/10.1080/19491247.2022.2037175>. The citation for this paper is as follows: Dweik, I., & Woodhall-Melnik, J. (2023). A systematic review of the relationship between publicly subsidised housing, depression, and anxiety among low-income households. *International Journal of Housing Policy*, 23(2), 201-231.

A Systematic Review of the Relationship Between Publicly Subsidized Housing, Depression and Anxiety Among Low-and Middle-Income Households

Abstract

Background Housing affordability is a pervasive social determinant of mental health. Publicly subsidized housing is used as a mechanism to increase affordability in many parts of the world. Anxiety and depression are the most common mental health problems among low-income individuals who experience housing affordability concerns. Financial strain is associated with increased anxiety and depression.

Objective: This review assesses the relationship between publicly subsidized housing and anxiety and depression. In doing so, it summarizes current evidence, and identifies gaps in knowledge, which provides guidance for future research, policies, and programs.

Method: This paper provides findings from a systematic review of articles that measure the impact of publicly subsidized housing on anxiety and depression. Inclusion criteria are: peer-reviewed journal articles, published prior to May 10th, 2021, written in English, that quantitatively measure the relationship between moving into publicly subsidized housing and anxiety and/or depression symptoms.

Results: 9 studies met the inclusion criteria for this review. Evidence on mental health benefits from publicly subsidized housing was inconsistent and depended on the specific type of housing assistance, housing stability, and neighbourhood quality. The mechanisms and connection between subsidized housing, and mental health outcomes related to increased affordability remain unaddressed.

Conclusion This review identifies a need for more investigation to better understand the conditions under which publicly subsidized housing may contribute to the reduction of anxiety and depression symptoms. The effects of subsidized housing on individuals' quality of life, financial strain, and social and material deprivation needs further investigation.

Keywords: Housing, Affordability, Publicly subsidized housing, Mental health, Anxiety, Depression

Introduction

Housing affordability is an important determinant of mental health (Mason et al., 2013; Maqbool et al., 2015; Kottke et al., 2018). People that experience low income

and housing instability are more likely than stably housed, higher income populations to experience poor mental health and diminished wellbeing (Bentley et al., 2011; Gaetz et al., 2013). Research shows that low-to-moderate income households that spend more than 30% of their income on housing costs are limited in their ability to purchase other essential goods and services (Bentley et al., 2011; Fletcher et al., 2009).

Individuals who live with financial stressors often concurrently experience negative impacts on mental health and are at increased risk of anxiety and depression (Coley et al., 2013; Leventhal & Newman, 2010; Meltzer & Schwartz, 2016; Robison et al., 2009).

The most cited conditions associated with housing as a social determinant of mental health are anxiety and depression (Hong et al., 2011; Kessler, 2012; Mawani & Gilmour, 2010; McRae et al., 2016). Individuals with anxiety and/or depression are more likely to access health care and take prescription medications than general population (Arts et al., 2018; Katon, 2011; Roehrig, 2016). Further, research indicates that recovery from mental illness is extremely difficult for low-income individuals (Ramon, 2018; Weich & Lewis, 1998).

Access to stable and affordable housing should improve mental health outcomes, as it decreases stress related to financial burden, housing insecurity, and frequent moves (Bentley et al., 2011; Kyle & Dunn, 2008; Maqbool et al., 2015). In many countries, housing affordability, access to safe, good quality housing, and financial security continue to rapidly decline as income inequality and poverty increase (Herbert et al., 2018; Krieger et al. 2020; Moore & Skaburskis, 2004; Wetzstein, 2017). These social determinants are associated with mental health disparities within and

across populations (Corporation for Supportive Housing [CSH], 2014; Krieger et al. 2020; Wilkinson & Pickett, 2009). Despite awareness that access to affordable housing positively contributes to mental health outcomes (Baker et al., 2020; Bentley et al., 2011; Mason et al., 2013), significant gaps in research on this contribution persist. Current reviews investigate the connections between physical health and publicly subsidized housing (Gibson et al., 2011a; Ige et al., 2019; Singh et al., 2019; Slopen et al., 2018; Thomson et al., 2009). However, the present authors were unable to find systematic reviews of the impacts of publicly subsidized housing on mental health. This gap is important to fill, as housing policies in many countries, including Canada, the US, Australia, and the UK, are designed to provide access to publicly subsidized housing as their main affordability interventions (OCED, 2020).

This review is particularly timely in the current context of COVID-19, as lockdowns and economic uncertainty have shone light on the importance of stable, affordable housing. A review study of available evidence from a variety of different countries is vital to policymakers' and academics' knowledge of the current state of public housing and mental health research. This knowledge guides research and policy formation and is critical to improving mental health outcomes in economically marginalized populations. The objective of this study is to examine the state of the literature on publicly subsidized housing affordability and its impacts on anxiety and depression.

Background

Affordability & Publicly Subsidized Housing

The term *housing affordability* typically refers to the relationship between expenditure on housing (mortgage payments, rents, essential utilities, property taxes, etc.) and household income (Bieri, 2014; Herbert, 2018; Thomas & Hall, 2016). It refers to the ability to pay primary housing costs without financial stress. This simple definition is often operationalized as the percentage of income used for primary housing expenses, which provides an estimate of the amount of household income that remains, after satisfying housing expenses, for the purchase of other goods and services (Maqbool et al., 2015; Nepal et al., 2010).

Typical measures of housing affordability note that strain exists when housing costs comprise more than 30% of income in low to moderate income households (Bentley et al., 2011; Daniel et al., 2018; Herbert, 2018). However, defining housing affordability is a complex and contentious task. Variations in definitions are important to note in the present review, as housing affordability is a primary variable and variations in its operationalization impact the outcomes of the studies reviewed. Housing scholars argue that variations in operational definitions of income, housing costs, and affordability limit the reliability and validity of comparisons of affordability across studies (Bentley et al., 2011; Herbert et al., 2018). However, more thorough discussions of definitions of affordability are found elsewhere in the literature (see Affordable Housing Commission, 2019; Daniel et al., 2018; Herbert et al., 2018). This review includes studies with various conceptualizations and operationalizations of affordability; however, these variations and their implications are discussed in the presentation of the results and findings.

To address housing affordability concerns, many industrialized nations use publicly offered “social” or “public” housing programs and subsidies. Governments have adopted various policies to improve housing affordability (e.g., affordable home ownership programs, tax credits, etc.); however, in the present study, *publicly subsidized housing* refers to the provision of physical rental housing units that are managed by public, non-profit, cooperative or private entities whose rents are offset by government subsidies (Australian Institute of Health and Welfare, 2020; Canada Mortgage and Housing Corporation, 2018; Congressional Budget Office, 2015; Congressional Research Service, 2019; U.S. Department of Housing and Urban Development, 2016). Widely found examples of these are:

1. **Subsidized Housing:** provides low-income households with an affordable rental property that is usually owned and operated by a government authority or privately owned and operated (e.g., non-profit, housing cooperative, private landlord). Private operators receive payments directly from the government to offset the cost of rents. Rents are typically geared-to-income;
2. **Housing Subsidies & Vouchers:** provides low-income households with money that allows them to offset the cost of a rental unit of their choice in the private market. These programs do not always require that households move, as subsidies can be used in situ to offset the cost of current rents.

The present review investigates the impact of relocation to publicly subsidized housing through access to rent-geared-to-income housing (i.e., traditional publicly subsidized housing) and housing subsidies and vouchers. Housing subsidies and

vouchers are widely used in large countries, such as the United States, and excluding moves related to vouchers would unnecessarily limit the scope of this review.

However, studies that focused on in situ subsidies, which are designed for households to maintain their current residences, were removed as the experience of households who achieve in situ affordability are qualitatively different from those who move to access affordable accommodations (Ontario Ministry of Municipal Affairs and Housing, 2004; U.S. Department of Housing and Urban Development, 2016). For example, the United States' Voucher 8 program requires that units that are subsidized by vouchers meet certain quality and suitability standards (Barbara, 2001). Further, the act of moving itself can have immediate impacts on mental health and wellbeing (Gibson et al., 2011a; Gibson et al, 2011b; Thomson et al., 2013). Baker et al. (2019) find that residential instability negatively impacts children's psycho-social health. As in situ households do not move, the literature suggests that they may have greater housing permanency which is associated with better mental health outcomes (Baker et al., 2014; Suglia, 2011). The differences in mental health status that are attributed to permanency, mobility, and stability indicate the need to explore the mental health effects of publicly subsidized housing in isolation from in situ housing.

Mental Health & Publicly Subsidized Housing

Definitions of mental health, much like those of housing affordability, are diverse in their conceptualization and operationalization. The World Health Organization (WHO) defines mental health as:

[A] state of wellbeing in which the individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to his or her community (WHO, 2001, 2004).

The WHO definition is quite broad; however, quantitative researchers typically use narrower measures of mental health, such as depressive symptomology (Chambers et al., 2015), anxiety symptoms (Casciano & Massey, 2011), and psychological distress (Bentley et al., 2018; Fenelon, et al., 2017). Broader definitions, such as the one presented by the WHO, stress the importance of mental health to overall health and indicate that mental health involves aspects of wellness, social functioning, and productivity that are not achieved through the mere clinical absence of mental illness. They are progressive, as they focus on the importance of the ability to cope with the stressors of daily living, freedom from anxiety, and emotional, social, and psychological wellbeing.

The present review focuses on anxiety and depression as the most common mental health conditions that correlate highly with stress, financial stress, and material deprivation (Alegría et al., 2018; Silva et al., 2016). Symptoms of anxiety and depression are largely impacted by socioeconomic conditions (Meltzer & Schwartz, 2016; Molarius, 2009; Reiss, 2019), whereas substance/medication-induced mental illness and medical conditions associated with motor, neurological, psychotic, behavioural or learning disorders are considered more complex in etiology (Kelly & Daley, 2013; Üstün, & Ho, 2017). Many of these conditions require long-term pharmaceutical and therapeutic

management, and outcomes are less likely to change because of housing affordability alone (American Psychiatric Association, 2021).

Methods

Eligibility Criteria

This study included peer reviewed journal articles that quantitatively measured the relationship between mental health and publicly subsidized housing interventions. Qualitative studies, methods papers, literature reviews, non-peer reviewed material, and studies published in languages other than English were excluded from this review². Eligible studies were those that focused specifically on publicly subsidized housing as an intervention and those that investigated general housing affordability or in situ rental assistance were excluded. In other words, this review focused on low- or middle-income households' uptake of publicly subsidized housing as an intervention. Papers that focused on mechanisms for rehousing populations who experienced absolute homelessness or special groups that experience severe mental illness, HIV-AIDS, addiction, or disabilities were excluded from the study, as these programs tend to offer special housing arrangements in combination with health and social supports that are not commonly offered as a part of public housing interventions (Aubry, 2015; Dickson-Gomez, 2011; National Academies of Sciences, Engineering, and Medicine, 2017; SAMHSA; Rosenheck, 2001; Substance Abuse and Mental Health Services Administration, 2021). Further, the present review excluded studies of neighborhood

² This study follows the PRISMA 2020 Statement published in 2021 to improve the reporting of systematic reviews (Page et al., 2021)

mobility interventions (e.g., Moving to Opportunity) that were designed to examine the effect of altering neighbourhood characteristics, internal housing conditions, or housing tenure type on mental health. Rather, this review focuses on articles that investigate movement into affordable housing in general.

The effect variable in this review is mental health, defined as anxiety and/or depression. Systematic searching returned additional articles that focused on the effect of publicly subsidized housing on violent behaviour, substance abuse, aggression, crime, child development, alcohol use, general wellness, physical health outcomes, cognitive performance, behavioural problems, access to health care, cognitive skills, and emotional, and behavioral problems. In cases where articles included multiple outcomes, only those eligible for this review were included. Individuals who live with financial stressors are at increased risk of anxiety and depression (Coley et al., 2013; Leventhal & Newman, 2010; Meltzer & Schwartz, 2016; Robison et al., 2009). Thus, in theory, publicly subsidized housing should have a positive impact on mental health, and this should translate into decreases in anxious and depressive symptomology. Further, the etiology and determinants of behavioral and cognitive concerns (e.g., psychosis, violent behaviour, substance and alcohol abuse, neurocognitive disorders) are more complex in nature, and are often related to a combination of biological, psychiatric and cognitive diseases (Alozai & Sharma, 2021, Liu et al., 2013, Volavka & Swanson, 2010; Wu et al., 2018), and socioeconomic and childhood experiences (Glantz, 1999; Liu et al., 2013; Shaver, 2011; Staub, 2003). Thus, the presence or severity of behavioural and cognitive concerns is less likely to change because of housing affordability alone. In

addition, housing arrangements for individuals with such complexities usually include access to community care and medical and social services that are not typically available through publicly subsidized housing programs that target households with low-income.

Studies that measured physical health only were also excluded from the present study. Physical health consists of multiple dimensions, such as mortality, chronic illness, functional limitation, and self-rated health (Parrish, 2010). The use of publicly subsidized housing for improving physical health outcomes is designed to: (i) Prevent the onset of new illness and injuries (ii) Improve access to health care and other necessary health services (iii) Promote participation in health affirming behaviours (Gubits et al., 2016; Kottke et al., 2018; Krieger & Higgins, 2002). Thus, physical health outcomes can be determined through various clinical, behavioral, social, and environmental mechanisms (Chokshi, 2018; Lynch et al., 2004). Therefore, the authors determined that physical health was outside the scope of the present review.

Access to and use of health care services should also be investigated separately, as they may be related to housing; however, they are also impacted by epidemiological profile (Fisher et al., 2021; Institute of Medicine (US) Committee on Assuring the Health of the Public in the 21st Century, 2002), regional availability of medical services (Gabrani et al., 2020; National Academies of Sciences, Engineering, and Medicine, Health and Medicine, 2018), access to health insurance (Cantarero-Prieto et al., 2017; Farrell & Gottlieb, 2020; Kiil & Arendt, 2017),

transportation (Arcury, 2005; Wolfe, 2020), and health literacy (Levy & Janke, 2016; Sentell, 2012), among a variety of other sociopolitical and economic factors (Bailie et al. 2015; Masiye & Kaonga, 2016).

The articles were found through systematic searches of the Scopus (Elsevier), Medline (Pubmed), APA PsycINFO (EBSCO), and Sociological Abstracts (Proquest) databases. The selection of these databases was informed by the interdisciplinary nature of housing research. Thus, databases that include publications in disciplines that frequently publish housing and health research (e.g., medicine, sociology, psychology, human geography, social work, etc.) were selected. An initial limited search was undertaken to identify the databases and relevant keywords and index terms. This limited search informed the development of a search strategy. An academic librarian was consulted and a search using all identified keywords and index terms was undertaken across all included databases. Truncation was used on various keywords to help broaden the search to include various word endings and spelling. Search terms were limited by title and abstract in all databases, and no other database limits were used on the searches. The reference lists of all identified manuscripts and review articles were searched for additional studies that could have been missed during the initial searches. The search was originally conducted on October 1st, 2019, and then updated on May 10, 2021. The search strategies are detailed in Appendix I.

Search Results

The titles and abstracts of the articles found in the searches (n=4217) were uploaded into Covidence software (www.covidence.org; see Figure 2 for a visual

account of the steps in the review process). Covidence detected and removed duplicate titles and abstracts from the search findings and placed the remaining titles and abstracts (n=3611) in a separate screening area. The title and abstract of each of the remaining articles were reviewed by each author. Those that definitively failed to meet inclusion criteria were excluded (n=3561). Abstracts and titles that indicated an article may meet study inclusion criteria (n=50) were moved to the next screening stage, wherein the authors reviewed the full text manuscripts for alignment with the study inclusion criteria. Three additional studies that appeared on the reference lists of the included studies and the excluded literature reviews were identified as potentially relevant and were also included in the full text review (n=52). The two authors completed the full text reviews independently and any disagreements were discussed before final decisions were reached. 44 studies were excluded during the full-text review of the studies (see Figure 2). A total of 9 studies were included in our final review and narrative synthesis.

Study Selection

The two authors completed these reviews independently, assessed the relevance of studies identified in the database searches based on title, abstract, and full text reviews. Relevant articles were obtained and reviewed for inclusion criteria, and disagreements were resolved through discussion.

Data Extraction

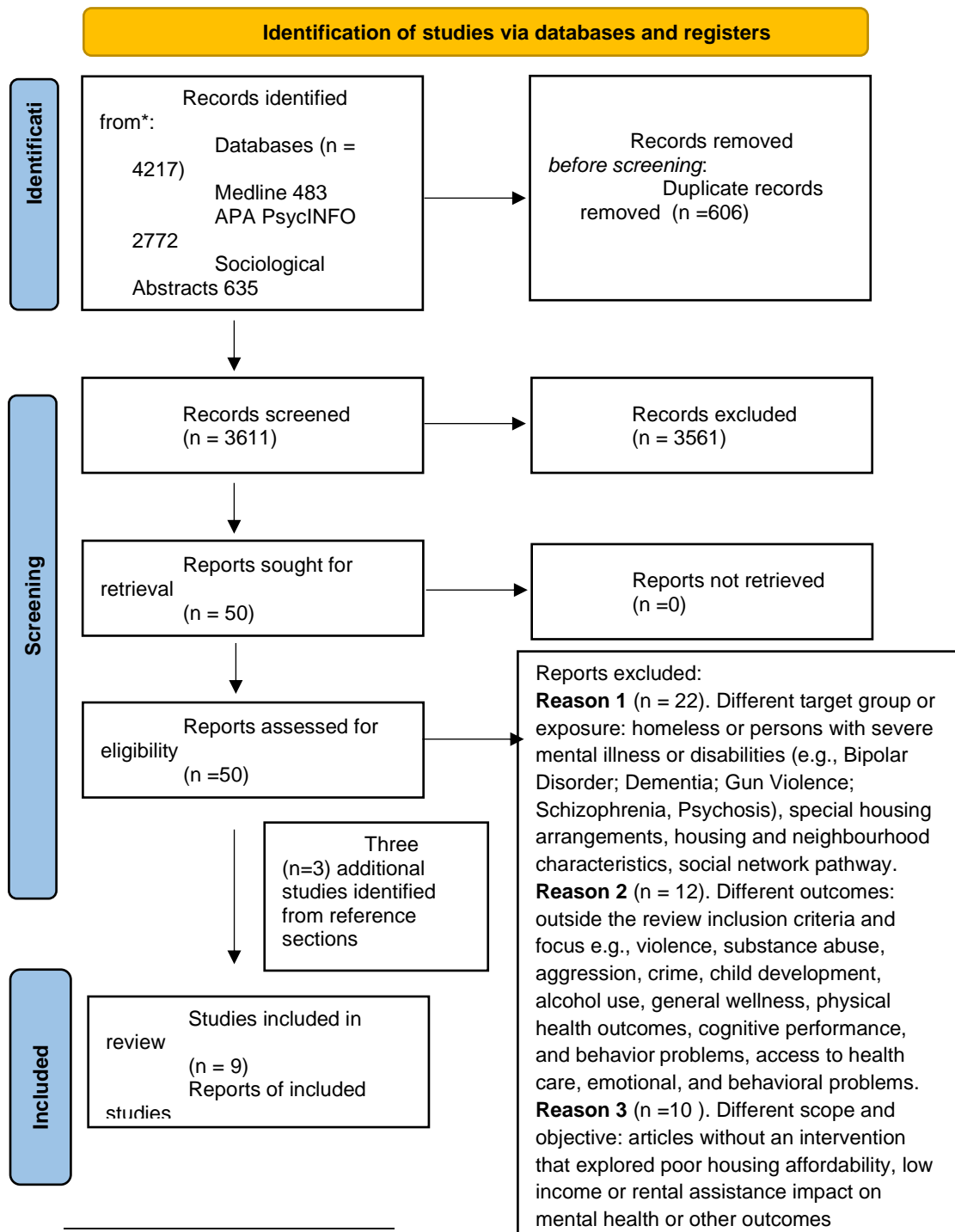
The study authors independently reviewed the methods and evidence from each study and built the summary of strengths and limitations provided in the results

section and in Table 1. For each identified article, data were extracted for the following: study design, sample size, age, location, data sources, health outcomes, measures of affordability, measurement of mental health outcomes, housing type, housing assistance program comparisons, and findings.

Data Synthesis

Given the heterogeneity in the study design, study populations, measurements, and outcomes, and the limited number of articles that met the inclusion criteria (n=9), the authors developed a narrative synthesis of the results. For each study, the authors summarized the design characteristics and described the associations observed between publicly subsidized housing and the outcomes. Information is synthesized on mental health and affordability measures which describe changes to mental health that are attributed to decreased housing costs and increased financial wellbeing, type of housing, neighbourhood characteristics and residential environments.

Figure 2: Search results and study selection and inclusion process³



³ Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., McGuinness, L. A., ... Moher, D. (2021). The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ (Clinical research ed.)*, 372, n71.

Results

This section provides an overview of the main characteristics of the included studies. Comparisons are made between studies where appropriate and general trends across the studies are discussed. Results of the data extraction are displayed in Table 1.

Types of Housing Assistance

All of the included studies (n=9) used comparison groups to determine differences in mental health outcomes based on housing type. The majority (n=7) compared renters of publicly subsidized housing units with other groups (Beer et al., 2011; Bentley et al., 2018; Casciano & Massey, 2011; Chambers et al., 2015; Fenelon et al., 2017; Fenelon et al., 2018; Fertig & Reingold, 2017). Comparison groups included renters who were subsidized to rent in the private sector (Bentley et al., 2018; Beer et al., 2011; Chambers et al., 2015; Fenelon et al., 2017; Fenelon et al., 2018; Garg et al., 2013; Kalousova & Evangelist, 2019), home owners (Bentley et al., 2018), those who receive homeownership assistance (Beer et al., 2011); and waitlists (Casciano & Massey, 2011; Chambers et al., 2015; Fenelon et al., 2018; Fertig & Reingold, 2017; Garg et al., 2013; Kalousova & Evangelist, 2019).

Measures of Affordability

There was considerable variation in the conceptualization and operationalization of affordability across studies. For instance, Casciano & Massey (2011) and Garg et al., (2013) defined households living in unaffordable housing as those with incomes under 80% of the regional median income, that spend more than 30% of their income on rent and utilities. In contrast, Bentley et al. (2018) applied the

concept of affordability to households in the lowest 40% of the income distribution to avoid including study participants that could have chosen to live in housing that consumes more than 30% of their incomes. Chambers et al. (2015) used income limits, specific to household size, that were established by the U.S. federal government. Kalousova & Evangelist (2019) considered households to be eligible for assistance if annual household income does not exceed 50 % of the local area median. Instead of explicitly defining housing affordability, Fertig & Reingold (2007) use local criteria for access to publicly subsidized housing to indicate potential affordability challenges. They note that in cities of more than 200,000, this is defined as households with incomes at or below 80% of the median family income.

Variations in measures of affordability create a challenge for those who wish to compare improvements in mental health associated with subsidized housing across studies. The differences in household rent-cost-to-income ratios mean that participants were under various levels of housing affordability stress prior to entering publicly subsidized housing. It also means that there was limited ability to generalize findings across populations and contexts. Wide variations in operationalization of affordability restricts the reliability and validity of comparisons across studies with the same or different designs.

Measures of Mental Health

Although each of the studies included a measure of anxiety and/or depression, the conceptualization and operationalization of these definitions widely varied. The mental health outcome measures used were depressive symptomology (Chambers et

al., 2015; Kalousova & Evangelist, 2019), anxiety symptoms (Casciano & Massey, 2011), psychological distress (Bentley et al., 2018; Fenelon et al., 2017), emotional difficulties (Fenelon et al., 2018), wellbeing dividends which included stress, depression and anxiety (Beer et al., 2011), mental health disorders and depression (Fertig & Reingold, 2007), and depression and anxiety (Garg et al., 2013). Some of the measures used are vague and could describe a range of disorders and conditions. For instance, the expression of “psychological distress” used by Bentley et al. (2018) and Fenelon et al. (2017) is often applied to undifferentiated combinations of symptoms ranging from depression and general anxiety symptoms to personality traits, functional disabilities and behavioural problems (Drapeau et al., 2012). Emotional difficulties/socioemotional problems measured by Fenelon et al. (2018) expressed in many ways included reporting on worry and unhappiness; behaviors and symptoms often seen in children with depression and anxiety (Lonigan, 1994; Rood et al., 2010).

Additionally, the reviewed papers were not able to distinguish mental health polysemic nature and its origins. A simple question about feelings during the previous week(s) (Casciano & Massey, 2011; Fertig & Reingold, 2007; Garg, 2013; Kalousova & Evangelist, 2019) may not be sufficient to provide in depth insight about the context and reasons behind the respondents’ answers. For instance, depression can be further classified into postpartum depression, major depression, and persistent depressive disorder (Malt, 1983; National Collaborating Centre for Mental Health (UK), 2010; The National Institute of Mental Health, 2018). Therefore, further investigation is required to understand whether the symptoms are related to socioeconomic problems,

psychological or physical trauma, other stressful life events (e.g., divorce, job loss, death of a family member), or if they are genetically linked. This presents a challenge for determining the actual effect of publicly subsidized housing on mental health and for drawing conclusions about the reliability and comparability of results.

The reviewed studies used a variety of validated scales to measure mental health outcomes, such as the Anxiety Symptom Scale (Casciano & Massey, 2011), Mental Health Short-Form summary measure of the SF-36 (MH), and Kessler Psychological Distress Scale (K10) (Bentley et al., 2011), the Kessler 6 (Fenelon et al., 2017), the Center for Epidemiologic Studies Depression (CES-D) Scale (Chambers et al., 2015), the Strengths and Difficulties Questionnaire (SDQ) Symptom score (Fenelon et al., 2018), the five-item version of the Mental Health Index (Garg et al., 2013), the Composite International Diagnostic Interview-Short Form (CIDI-SF) (Fertig & Reingold, 2007), and Patient Health Questionnaire (PHQ) (Kalousova & Evangelist, 2019). These measures detect clinically significant changes in mental health status within a population; however, they do not appear to adequately characterize social functioning within specific populations, such as those who live with various forms of disabilities (Matcham et al., 2016).

Data Sources and Study Populations

All the studies used data that were drawn from households in the United States and Australia. Two of the U.S. based studies linked data from the National Health Interview Survey (1999–2012) to data from the US Department of Housing and Urban Development's (HUD) administrative records (1999– 2014) (Fenelon et al., 2017;

Fenelon et al., 2018). Bentley et al.'s (2018) longitudinal prospective cohort study used the Household, Income and Labour Dynamics in Australia (HILDA) Survey, which is a multi-year, panel study of Australian households. Beer et al. (2011) used data from a survey administered via-postal mail to 1700 low- and moderate-income households in Australia who received government assistance between 2003 and 2009. Casciano and Massey's (2011) cross-sectional study used data from the Monitoring Mt. Laurel Study, which used surveys to compare residents living in an affordable housing project in a middle-class New Jersey suburb to a comparable group of non-residents. Chambers et al.'s, (2015) cross-sectional study used data from the Affordable Housing as an Obesity Mediating Environment study, which investigated the relationship between rental assistance, housing and neighborhood conditions, and the risk of depressive symptomology and hostile behaviour among low-income Latino/Latina adults living in the Bronx in New York. Fertig & Reingold's (2007) follow-up study used data from the U.S. Fragile Families and Child Wellbeing Study (1998-2000) that compared the mental health status (feeling sad or depressed or unable to enjoy usually pleasurable activities, trouble sleeping) of mothers who received public housing with those who remained on publicly subsidized housing waiting lists. Garg et al.'s. (2013) longitudinal study used data from Hawaii's Healthy Start Program, (2004) that compared substance-use disorders, depression, schizophrenia, anxiety, eating disorders, antisocial personality disorders in mothers who resided in housing subsidized by Section 8 vouchers to non-recipients. Kalousova & Evangelist (2019) longitudinal study used data from Michigan Recession and Recovery Study (2009-2013) that compared chronic physical health

conditions, depressive symptomology, alcohol use, smoking behaviour, and body mass index in rental assistance eligible working-age adults who received housing vouchers or project-based resident area with those who were income eligible on the waiting list and income ineligible not receiving rental assistance.

Study Design and Characteristics

The evidence on publicly subsidized housing and mental health is largely cross-sectional (Beer et al., 2011; Casciano & Massey, 2011; Chambers et al., 2015; Fenelon et al., 2017; Fenelon et al., 2018). The observations of significant associations between the effect (access to publicly subsidized housing) and outcome (depression and anxiety) variables are insufficient to draw causal inferences (Ejima et al., 2016). By design, cross-sectional studies can not determine sequence of events, temporal relationship, and gradient effect (Carlson & Morrison, 2009; Wang, 2020). The studies that use longitudinal data (Bentley et al., 2011; Fertig & Reingold, 2007; Garg et al., 2013; Kalousova & Evangelist, 2019). Except for the later study, the other three studies are missing data on changes in housing affordability, neighbourhood characteristics, physical health, and housing quality over time. These factors are important to consider as they are associated with wellbeing (Burgard et al., 2012; Evans, 2003; Ige et al., 2019; Meltzer & Schwartz, 2016). However, considerable strengths were highlighted across the studies reviewed. For example, they used high quality datasets and compared public housing recipients with non-recipeints.

Discussion

Affordability Pathway: The literature that directly assesses the relationship between publicly subsidized housing and anxiety and depression resulting from improved affordability is limited. The findings reveal that the affordability/rent-to-income ratio and the associated impact on depression or anxiety among publicly subsidized housing recipients are only tangentially explored. Whether households living in affordable housing achieve and use significant additional income for products and services that contribute to the mental health of household members requires investigation. Studies that explore the existence and use of residual income in low to moderate-income households may provide evidence for establishing the correlation between subsidized housing programs, financial strain, material deprivation and mental health. Other dimensions that warrant further investigation are reductions in stress levels, cortisol, and allostatic load, changes to family violence associated with increased affordability, and the use of residual income for the purchase of mental health promoting medications, products, and services.

Type of Housing Assistance: The evidence on mental health and publicly subsidized housing indicates that the type of public assistance (e.g., vouchers vs. subsidized housing units) that households receive may be important to mental health (Bentley et al., 2018; Beer et al., 2011; Fertig & Reingold, 2007; Garg, 2013; Kalousova & Evangelist (2019). However, the findings on which types of housing assistance are most beneficial are contradictory. Bentley et al.'s (2018) results suggest that those with continuous exposure to publicly subsidized housing units have worse mental health, on

average, than people who continuously occupy other market and voucher assisted rental units. Fenelon et al. (2017; 2018) find that publicly subsidized rental housing has positive impacts on the mental health of children and adults. These results are not seen in those with voucher supports. They argue that this may be related to the density of social supports in neighbourhoods with high concentrations of public housing (Fenelon et al., 2017). Similar results obtained by Kalousova & Evangelist (2019) which suggests no difference with respect to mental health between eligible recipients who lived in housing vouchers or project-based rental assistance and eligible non-recipients. However, Garg et al's (2013), investigation contradicts this, as they find that receipt of the vouchers is associated with better mental health. Fenelon et al., (2017) argue that there is a need for further exploration of mitigating factors that may include access to healthy nutrition, physical activity, lowered familial stress, health coverage and services, and social opportunities. Chambers et al. (2015) find that Section 8 Voucher recipients, publicly subsidized housing tenants, and those without public assistance experience similar levels of depressive symptomology. These findings contradict those of Beer et al. (2011), Bentley et al. (2018), and Fenelon et al. (2017; 2018), which indicate that housing assistance type impacts mental health. The contradictory findings indicate a need for deeper investigation.

When comparing Fenelon et al.'s (2017; 2018) and Bentley et al.'s (2018) findings, it is important to note that HILDA uses very stringent criteria to determine participants' ability to qualify for publicly subsidized housing in Australia. This suggests that those who qualify experience complex social realities in addition to financial

hardship. Thus, Bentley et al.'s (2018) findings may not be comparable to Fenelon et al.'s (2017; 2018), as the study populations may experience different challenges).

Publicly sponsored affordable homeownership programs are not as widely available as subsidized housing units or housing subsidies/vouchers. However, Beer et al. (2011) compares the mental health of those who receive publicly subsidized housing units with that of privately subsidized renters and individuals enrolled in affordable homeownership programs. They find that individuals who receive affordable homeownership assistance experience the greatest mental health and wellbeing advantages and the lowest level of housing stress (Beer et al., 2011). However, they note that the precise mechanisms linked with public affordable homeownership's association with positive health and wellbeing impacts need to be explored in future research. This may be explained by contribution of homeownership to residents' perceptions of stability, financial wellbeing, sense of control, and investment in the future (Cairney & Boyle, 2004; Elsinga & Hoekstra, 2005; Manturuk, 2012; McCarthy et al., 2001). The notion that stability positively impacts mental health is reinforced by Bentley et al.'s (2018) study which finds that the worst mental health outcomes are observed for people who make multiple transitions into social housing. The literature suggests that it may be beneficial to investigate the investment of more public resources into programs that facilitate affordable homeownership.

Neighbourhood Characteristics and Residential Environments: In addition to stability and type of subsidized housing, the literature indicates that neighbourhood environment may also impact mental health (Evans, 2003; Graif et al., 2016; Leventhal

et al., 2003a; Leventhal et al., 2003b. Chambers et al. (2015) argue that neighbourhood characteristics and residential environments contribute to mental health in low-income households. They find that maintenance deficiencies and low social cohesion are associated with increased depressive symptomology, which suggests that housing and neighbourhood environments contribute to depression. The positive effect of higher neighborhood quality on depression is confirmed by Kalousova & Evangelist, (2019). Casciano and Massey's (2012) findings also indicate the importance of neighbourhood characteristics. They note that residents who live in a publicly subsidized housing in middle-class neighbourhoods are less likely to experience anxiety than non-residents in a comparison group. These differences are explained by variations in neighbourhood exposure to disorder and violence.

The desire to provide households with choice of neighbourhoods and housing environments to improve wellbeing is a driving force behind the United States' introduction of portable Section 8 vouchers. These vouchers are designed to be portable, which theoretically allows households to move to higher quality housing in more affluent neighbourhoods (Freeman & Li, 2014). However, this review finds that the evidence on the mental health benefits of housing subsidies/vouchers is inconclusive. Further, evidence suggests that the discriminatory practices of some landlords prohibit voucher recipients from renting desired housing units or units in their desired neighbourhoods (Freeman & Li, 2014; Moore, 2018). Discrimination may be an important factor that contributes to mental health in housing subsidy/voucher recipients, and this should be investigated further in future studies.

Future Research

The present review finds that the construction of social policies to provide publicly sponsored access to affordable housing is reliant on a very small body of evidence. More substantive work is needed to better understand the associations between mental health and publicly funded affordable housing initiatives. The findings of this review illustrate the importance of affordable housing for low-income families; however, affordability alone may not sufficiently improve mental health. Future programs and research studies should simultaneously explore the role of housing quality, neighbourhood characteristics, social cohesion, stability, stigma and discrimination, and rent-to-income ratios as contributors to mental health. There is a need to simultaneously delineate their unique associations and interactions with depression and anxiety symptoms.

Financial stress and housing affordability are conceptualized differently across the reviewed studies. Affordability measures should account for family size and regional living costs to capture geographic variations in residual income needed for essential goods and services (e.g. food, healthcare, education, clothing, etc.) (Affordable Housing Commission, 2019; Meen, 2018; Padley & Marshall, 2018; Sliogeris, Crabtree, Phibbs, Johnston). Using a common formula that assesses affordability in relation to other basic needs could generate a body of evidence that can be consolidated to illicit more evidence-informed decisions about the impacts of housing affordability on mental health. This review also highlights the need for

objective and consistent measures of mental health for subsidized housing-related effects, which would also increase comparability among studies.

Findings (Fenelon et al. 2017; 2018) contradict previously published evidence that demonstrates that relocation to areas with lower levels of poverty, via housing choice vouchers, leads to less mental distress and overall better psychological well-being (Chambers et al., 2015; Fauth et al., 2008; Katz et al., 1999; Leventhal & Brooks-Gunn, 2003a; Leventhal & Brooks-Gunn 2003b). This indicates a need to better understand the role of social supports as a contributor to mental health in low-income neighbourhoods. It also indicates a need to understand the utility of housing subsidies/vouchers as mechanisms to promote social mobility in housing. In addition to gaining a more nuanced understanding of subsidies/vouchers, more work should be done to better understand the potentially promising contribution of public affordable homeownership programs to mental health and wellbeing. Specifically, future work should focus on the mechanisms and contextual factors that connect individual empowerment and residential stability to mental health improvements.

To address the identified gaps in evidence, studies that employ rigorous experimental or quasi-experimental designs are necessary. These studies should strive to determine the temporal relationship between moving to publicly subsidized housing and changes in mental health outcomes. In doing so, researchers should remain aware that mental health measurement requires a comprehensive approach to evaluation that captures psychological health, quality of life, and emotional, psychological, and social well-being (Alegría et al., 2018; Allen et al., 2014; Fisher & Baum, 2010). Rigorous

comparative studies are also required across various geographic areas including suburbs, urban environments, and rural neighbourhoods, to determine place- and context-specific mechanisms that ultimately lead to positive impacts on mental health. Further, future research requires a simultaneous study of intercorrelations between affordability, housing and neighborhood conditions, and tenure stability across different types of publicly subsidized housing. These findings should be used to inform the design of publicly funded, affordable housing policies and interventions for low-income households.

Review Limitations

This review has several limitations. One of the limitations is that the topic appears to be so understudied. Affordability was tangibly investigated, and the mechanisms associated with mental health outcomes were not established. Therefore, it was difficult to confidently assert which of the dimensions were most integral to mental health. This review is also limited by the authors' need to only review articles published in English; therefore, relevant studies published in other languages could have been missed. Across the studies, there was considerable heterogeneity in methodological approaches, target populations, and measurements. This heterogeneity makes it difficult to draw universal conclusions, and only allows a few descriptive findings.

Conclusion

This review highlights the need for more research on the relationship between publicly subsidized housing and mental health. It concludes that there is indication that

publicly subsidized housing positively contributes to mental health; however, additional methodologically rigorous studies are necessary to confidently assert this association. Although public housing has been offered in a variety of forms for decades, the literature on publicly subsidized housing and mental health is sparse. Studies that focus on this relationship will contribute to knowledge on the efficacy of these interventions in improving quality of life, mental health, and wellbeing in populations that systematically experience socioeconomic deprivation and inequity. The question of whether, and in which contexts, publicly subsidized housing improves mental health in low-income populations remains. However, the studies in the present review provide a wealth of factors that can and should be considered in future research. The potential for future research in this area is promising, as it is liable to contribute to improved mental health in low-income populations.

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Table 1: Characteristics of the peer reviewed studies used to assess the relationship between publicly subsidized housing and mental health (n=9)

Lead author, location	Title	Study type	Data source and period	Sample size	Control group	Comparison groups	Sample characteristics	Strengths	Limitations
Bentley et al. (2018)	The impact of social housing on mental health: longitudinal analyses using marginal structural models and machine learning-generated weights	Prospective cohort	Panel survey- Income and Labour Dynamics in Australia survey (2001-2013)	N = 14,330	No	Publicly subsidized renters; private renters; owner occupiers	Low-income cohort of Australians, in the lowest 40% of the income distribution; average age: ~48 years old, 55% female	The largest study to examine cumulative exposure to social housing and the number of transitions; nationally representative panel data and marginal structural models, accounting for time-varying confounding, and causal inference; adjustment for baseline covariates to reduce residual confounding; adjustment for previous social housing exposure and baseline mental health to address selection bias	Time-invariant confounders, self-reported health outcomes, and heterogeneity in reference group Limited generalizability of findings due to differences in the condition of social housing across jurisdictions. Considers social housing transitions, while the comparative impact of transitions between other tenures on mental health and psychological distress is unknown

Lead author, location	Title	Study type	Data source and period	Sample size	Control group	Comparison groups	Sample characteristics	Strengths	Limitations
Beer et al. (2011)	Housing Policy, Housing Assistance and the Wellbeing Dividend: Developing an Evidence Base for Post-GFC Economies. Housing Studies	Cross sectional	Cross sectional survey, 2008	N = 1736	No	Publicly subsidized renters; households receiving home-ownership assistance; private rental subsidies	Low and moderate-income households who received government assistance between 2003 and 2009 in Australia.	Housing assistance benefits expressed in terms of social relationships, employment, mental and physical health, and education and financial sustainability	The design cannot be used to make causal inferences; self-report questions; controlling in the analysis of variance was limited to age; bias and systematic error and internal validity issues from other potential confounders can not be excluded
Casciano et al. (2011)	Neighborhood Disorder and Anxiety Symptoms: New Evidence from a Quasi-Experimental Study	Cross sectional	Monitoring Mt. Laurel Study--survey-based November 19, 2009 to March 3, 2010	N = 224	Yes	Publicly subsidized renters; non-residents (waiting list)	Middle-class New Jersey suburb, U.S., average age ~ 43 years ~ 90% female	Propensity score matching to address the problem of unmeasured confounding matched samples of residents and non-residents on measures that influenced entry into the project; controlled for multiple demographic variables (e.g., age,	Difficult to make a causal inference; susceptible to biases such as nonresponse bias and recall bias; inability to investigate the temporal relation and incidence

Lead author, location	Title	Study type	Data source and period	Sample size	Control group	Comparison groups	Sample characteristics	Strengths	Limitations
								sex, race, education level, marital status)	
Chambers et al. (2015)	Depressive Symptomology and Hostile Affect among Latinos Using Housing Rental Assistance: the AHOME Study	Cross sectional	Obesity Mediating Environment (AHOME) study (2010–2012)	N=385	Yes	Publicly subsidized renters; Section 8 voucher recipients; private renters with no housing assistance	Low-income Latino/Latina adults living in the Bronx, NY, U.S. average age ~ 46 years, 74% female	Used a unique measure of perceived crowding that captures feelings of overcrowding as opposed to more commonly used objective measures of household density using people per room	Difficult to make causal inference; results could be biased with endogeneity, selection bias, and unobserved variables; inability to investigate the temporal relation and incidence
Fenelon et al. (2017)	Housing Assistance Programs and Adult Health in the United States	cross-sectional	HUD administrative records (1999 to 2014) linked to NHIS survey respondents (1999 to 2012)	N = 26,403	Yes	Publicly subsidized renters; Section 8 voucher recipients; subsidized housing; persons who will eventually be housed in publicly subsidized	Mean age between 39-52 years old, > 70% female	Data linking to create a waitlist to account for unobserved factors; the first nationally representative study to explore the heterogeneous effects of major housing assistance programs on health; large national sample; considers	Do not capture changes in health over time as a function of housing assistance; results may not be generalizable to the broader population who might be eligible for assistance

Lead author, location	Title	Study type	Data source and period	Sample size	Control group	Comparison groups	Sample characteristics	Strengths	Limitations
						housing (data linking to create a pseudo-waitlist)		the role of neighborhood-level characteristics; accounts for unobserved differences between individuals who obtained housing assistance and future recipients (e.g., selection bias)	
Fenelon et al. (2018)	The Impact of Housing Assistance on the Mental Health of Children in the United States. Journal of Health and Social Behavior	Cross-sectional	HUD administrative records (1999 to 2014) linked to NHIS survey respondents (2001 to 2012)	N = 1,967	Yes	Publicly subsidized renters; Section 8 Voucher recipients; persons who will eventually be housed in publicly subsidized housing (data linking to create a pseudo-waitlist)	Children ages 2 to 17	The first nationally representative analysis of children's mental health that compares the effects of HUD's major assistance programs; accounts for unobserved time invariant and time-varying factors between the groups; isolates the causal effects on children's outcomes; regression models adjusted for individual and family characteristics;	Data preclude analysis of changes in individual mental health over time; no random assignment; possible selection bias (families that are able to obtain assistance may themselves be relatively select); measures of child mental health do not include clinical assessments; could not explain the specific

Lead author, location	Title	Study type	Data source and period	Sample size	Control group	Comparison groups	Sample characteristics	Strengths	Limitations
								tested for multiplicative interactions between housing assistance status and program type, and age	mechanisms that link housing assistance to improvements in children's outcomes

Lead author, location	Title	Study type	Data source and period	Sample size	Control group	Comparison groups	Sample characteristics	Strengths	Limitations
Fertig & Reingold, (2007)	Public Housing, Health, and Health Behaviors: Is There a Connection?	Prospective study with follow-up at 1 and 3 years	Fragile Families and Child Wellbeing Study (1998-2000)	N = 2477	Yes	Publicly subsidized renters; households on waitlists for publicly subsidized housing	Mothers enrolled in Fragile Families with a birth cohort of approximately 5,000 children born in 20 U.S. cities; households with income below 80% of their city's median family income	Nationally representative survey; large sample; longitudinal data; counting for household size and gender composition; combines two quasi-experimental approaches (i) linear fixed effects estimation and instrumental variables estimation to improve causal inference; adjusted for time-varying and time-invariant confounding, and reverse causation	Samples were heterogeneous in exposure to public housing and treatment effect; possible bias (a threat to internal validity) from unobserved characteristics in public housing residents and non-residents
Garg et al. (2013)	Maternal Mental Health During Children's First Year of Life: Association	Prospective study with follow-up at 1 year	Hawaii Healthy Start Program, 2004	N = 643	Yes	Section 8 rental assistance/vouchers	Mothers with multiple children; live below the poverty level; majority Native Hawaiian/	The first study to demonstrate a positive impact of rental assistance programs on mothers with young children	Results may not be generalizable to other study populations; small sample size, limiting the ability to control for all potential

Lead author, location	Title	Study type	Data source and period	Sample size	Control group	Comparison groups	Sample characteristics	Strengths	Limitations
	With Receipt of Section 8 Rental Assistance						Pacific Islander; mean age is 23.5 years		confounders; insufficient power to adequately test multiple categories for variables, such as poverty and education; risk of endogeneity bias, self-report, recall and social desirability biases; could not account for the neighbourhood effect ; possible measurement error from time-varying exposure to Section 8 housing
Kalousov á, et al. (2019)	Rent Assistance and Health: Findings from Detroit	Longitudinal, 4 years follow-up	Michigan Recession and Recovery Study, 2009 & 2013	N=400	Yes	Rental assistance eligible receiving rental assistance; Rental assistance eligible not receiving	English-speaking working-age adults, 19 to 64 years old living in the Detroit area; majority African American and women	A rich set of health outcomes measured at three points over a four-year period; longitudinal data; population-representative sample; analyses on HCV and PBRA renters	Small sample size; results may not be generalizable to the broader population who might be eligible for assistance; lack of specific housing type information; self-reported

Lead author, location	Title	Study type	Data source and period	Sample size	Control group	Comparison groups	Sample characteristics	Strengths	Limitations
						rental assistance; Rent assistance income ineligible/not receiving at all waives			income; relatively short period of follow up

Appendix I: Search Strategies

Medline (Pubmed) – Originally searched October 2019, re-ran search on May 10, 2021

1	hous* assistance[Title/Abstract]	3,841
2	public housing[Title/Abstract]	854
3	affordab* hous*[Title/Abstract]	1,993
4	social hous*[Title/Abstract]	497
5	rent-gearred-to-income[Title/Abstract]	1
6	hous* affordab*[Title/Abstract]	2,335
7	subsid* hous*[Title/Abstract]	1,411
8	hous* subsid*[Title/Abstract]	1,595
9	rent* subsid*[Title/Abstract]	16
10	low-income hous*[Title/Abstract]	1,096
11	community hous*[Title/Abstract]	330
12	non-market hous*[Title/Abstract]	33
13	rent* assistance[Title/Abstract]	139
14	public housing[MeSH Terms]	1,485
15	#1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14	10,787
16	depression[MeSH Terms]	226,454
17	depressive disorder[MeSH Terms]	112,359
18	anxiety[MeSH Terms]	91,261
19	anxiety disorders[MeSH Terms]	81,657
20	anxiety[Title/Abstract]	210,371
21	depression[Title/Abstract]	361,670
22	depressive disorder[Title/Abstract]	31,408
23	#16 OR #17 OR #18 or #19 or #20 or #21 OR #22	596,471
24	#15 AND #23	483

APA PsycINFO (EBSCO) – Originally searched October 2019, re-ran search May 10, 2021

1	(DE "Housing") AND (DE "Lower Income Level")	228
2	TI hous* assistance OR AB hous* assistance	1,891
3	TI public housing OR AB public housing	2,715
4	TI affordab* hous* OR AB affordab* hous*	822
5	TI social hous* OR AB social hous*	21,061
6	TI rent-gearred-to-income OR AB rent-gearred-to-income	153

7	TI hous* affordab* OR AB hous* affordab*	822
8	TI subsid* hous* OR AB subsid* hous*	550
9	TI hous* subsid* OR AB hous* subsid*	550
10	TI rent* subsid* OR AB rent* subsid*	89
11	TI low-income hous* OR AB low-income hous*	2,742
12	TI community hous* OR AB community hous*	12,305
13	TI non-market hous* OR AB non-market hous*	24
14	TI rent* assistance OR AB rent* assistance	85
15	S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7 OR S8 OR S9 OR S10 OR S11 OR S12 OR S13 OR S14	32,077
16	DE "Depression (Emotion)"	26,017
17	DE "Major Depression" OR DE "Anaclitic Depression" OR DE "Dysthymic Disorder" OR DE "Endogenous Depression" OR DE "Late Life Depression" OR DE "Postpartum Depression" OR DE "Reactive Depression" OR DE "Recurrent Depression" OR DE "Treatment Resistant Depression"	138,703
18	DE "Anxiety"	84,694
19	TI anxiety OR AB anxiety	212,977
20	TI depression OR AB depression	253,596
21	TI depressive disorder OR AB depressive disorder	54,298
22	S15 OR S16 OR S17 OR S18 OR S19 OR S20 OR S21	433,155
23	S15 AND S22	2,772

Sociological Abstracts (Proquest) - Originally searched October 2019, re-ran search May 10, 2021

1	MAINSUBJECT.EXACT.EXPLODE("Public Housing")	2071
2	ab(hous* assistance) OR ti(hous* assistance)	1689
3	ab(public housing) OR ti(public housing)	4606
4	ab(affordab* hous*) OR ti(affordab* hous*)	1277
5	ab(social hous*) OR ti(social hous*)	21204
6	ab(rent-geared-to-income) OR ti(rent-geared-to-income)	

7	ab(hous* affordab*) OR ti(hous* affordab*)	277
8	ab(subsid* hous*) OR ti(subsid* hous*)	050
9	ab(hous* subsid*) OR ti(hous* subsid*)	050
10	ab(rent* subsid*) OR ti(rent* subsid*)	84
11	ab(low-income hous*) OR ti(low-income hous*)	412
12	ab(community hous*) OR ti(community hous*)	1113
13	ab(non-market hous*) OR ti(non-market hous*)	9
14	ab(rent* assistance) OR ti(rent* assistance)	64
15	S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7 OR S8 OR S9 OR S10 OR S11 OR S12 OR S13 OR S14	2143
16	MAINSUBJECT.EXACT.EXPLO DE("Depression (Psychology)")	263
17	MAINSUBJECT.EXACT.EXPLO DE("Anxiety")	105
18	ab(anxiety) OR ti(anxiety)	4644
19	ab(depression) OR ti(depression)	5925
20	S16 OR S17 OR S18 OR S19	8676
21	S15 AND S20	35

Scopus (Elsevier) - Originally searched October 2019, re-ran search May 10, 2021

	(TITLE ("Subsidized Housing") OR ABS ("Subsidized Housing"))	611
	(TITLE ("housing AND assistance") OR ABS ("housing AND assistance"))	2,640
	(TITLE ("Housing Affordability") OR ABS ("Housing Affordability"))	1,017
	(TITLE ("Public Housing") OR ABS ("Public Housing"))	4,501
	(TITLE ("Affordable Housing") OR ABS ("Affordable Housing"))	3,289

	(TITLE ("Social housing") OR ABS ("Social housing"))	3,733
	(TITLE ("Rent-Geared-to-Income") OR ABS ("Rent-Geared-to-Income"))	3
	(TITLE ("Housing Subsidy") OR ABS ("Housing Subsidy"))	426
	(TITLE ("Rent Subsidy") OR ABS ("Rent Subsidy"))	73
0	(TITLE (" AND low-income AND housing") OR ABS (" AND low-income AND housing"))	5,413
1	(TITLE ("Community Housing") OR ABS ("Community Housing"))	375
2	(TITLE ("Non-Market Housing") OR ABS ("Non-Market Housing"))	16
3	(TITLE ("Rental Assistance") OR ABS ("Rental Assistance"))	106
4	#1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13	18,314
5	(TITLE (anxiety) OR ABS (anxiety))	294,771
6	(TITLE (depression) OR ABS (depression))	497,975
7	(TITLE ("depressive disorder") OR ABS ("depressive disorder"))	43,815
8	#15 OR #16 OR #17	691,486
9	#14 AND #18	327

CHAPTER THREE: A Literature Review of Subsidized Housing and Physical Health

The following manuscript is published in Housing Studies. This article is not open access, however, permission was granted by Taylor & Taylor & Francis Group to include this article in my dissertation with the inclusion of the following: Article Title: Publicly Subsidized Housing and Physical Health: A literature review. Dweik, Imad, Watson, Barry, & Woodhall-Melnik, Julia. Housing Studies © copyright 2022, reprinted with permission of Informa UK Limited, trading as Taylor & Taylor & Francis Group. [See: Appendix C: Taylor & Francis Journal Permissions.](#)

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Publicly Subsidized Housing and Physical Health: A Literature Review

[Abstract](#)

This study is among the first to review current evidence on the association between public subsidized housing and physical health (i.e., health outcomes, health behaviours, and health care use) in low-income households and provides direction for future research and policy. A systematic search of four databases (Scopus, Medline, Embase, and Sociological Abstract) produced 125 articles. Among quantitative peer-reviewed articles published within the past 28 years (1995-2022), 24

examine this particular relationship, suggesting that there is a modest amount of research on this topic. Additionally, the bulk of this work is cross-sectional and limited primarily to the US. Although there is some degree of evidence that subsidized housing is associated with improved health, inconsistent results prevent a robust conclusion. The specific type of intervention, targeted group, along with the quality of the neighbourhood and housing all contribute to this heterogeneous mix of findings. This review underscores a need for future research that analyzes causal relationships across a large and varied geographic space using a robust set of physical health outcomes. Lastly, the mechanisms through which health improvement occurs should also be further examined.

Keywords: Housing Affordability; Physical Health; Subsidized housing; Public Housing; Low-Income

Introduction

Housing is a ubiquitous social determinant of health. Studies consistently find that those who are housing insecure, typically defined as households who spend more than 30 percent of their income on housing costs, are at a higher risk of experiencing poor health outcomes than their stably housed counterparts (Cannuscio et al., 2012; Cutts et al, 2011; Meltzer & Schwartz, 2015; Nettleton & Burrows, 1998; Shaw, 2004; Stahre et al., 2015; Vega & Wallace, 2016). Given such financial strain, this population is less likely to afford necessities such as nutritious food, medicine, health insurance, and private health care services (D'Alessandro & Appolloni, 2020; Fletcher et al., 2009;

Meltzer & Schwartz, 2015; Sandal & Desmond, 2017). Hence, subsidized housing which seeks to minimize insecurity and increase affordability may also contribute to improved health among low-income households.

However, to date, little attention has been given to summarizing the current state of knowledge on the association between subsidized housing and physical health outcomes. One exception, Slopen et al. (2018), performed a systematic review of the relationship between housing assistance and child health in the United States. While some of their identified papers overlap with this review, we extend the literature by examining the impacts of subsidized housing on the physical health of the general population within an international context. Our findings corroborate the key arguments put forth by Slopen et al. (2018), namely, that the evidence to date is inconclusive and there is a dearth of research employing precise identification strategies, which would otherwise allow for a more causal understanding of the potential underlying relationship.

Why care about the health implications of interventions which seek to improve upon housing affordability? As argued by Jacob Hacker (2006a), governments and firms have moved away from institutional risk-pooling, which increasingly shifts economic risk from public and private markets to households on the premise that market liberation leads to efficiency gains. However, these gains are not equally distributed. For instance, economic insecurity has been rising in the US since the 1980s (Hacker, 2006b), and the bulk of US employment growth since the Great Recession has been

precarious (Katz & Krueger, 2018). This economic insecurity has manifested in worsening health conditions, such as rising rates of obesity (Rohde et al., 2017), increased tobacco use (Barnes & Smith, 2009), and psychological distress (Watson & Osberg, 2018). Further, the shift toward reliance on private and non-profit housing providers has impaired governments' abilities to quickly and adequately respond to households in need of affordable housing (Suttor, 2016).

Housing is a large expense for many households; therefore, affordability interventions could plausibly help obviate such reductions in health. Housing prices in many parts of the world are rising, which increases the cost burden for many households (Moore & Skaburskis, 2004; Rowley & Ong, 2012; Wetzstein, 2017). Cox & He (2016) note that from 2000-2015, the price of an average Canadian home increased by 158 percent; well out-pacing the 55 percent growth in average household income. Global wealth has also grown over the past two decades, however its distribution per capita demonstrates increased inequality (World Bank, 2018). Although most industrialized countries have observed a persistent rise in the average wage, low-income households have not reaped the benefits of these increases. Among renters in the US, the bottom income quintile has experienced a 6 percent decline in average real earnings over the past 30 years, and those earning less than 15,000 US dollars per year in 2018 had approximately 400 dollars left over each month to cover basic needs such as food and transportation (Joint Center for Housing Studies of Harvard University, 2020). In Australia, minimum wage fell from nearly 70 percent of the median wage in 1983 to around 55 percent in 2017. In contrast, there was a 51 percent increase in

average housing costs for renters (adjusted for inflation) over the past two decades (Australian Bureau of Statistics, 2018; McKenzie, 2018).

Despite this rising burden, most jurisdictions are plagued with a shortage of subsidized housing options, which reflects the trend of market liberalization (Suttor, 2016). Moreover, many policy makers argue that policy interventions, such as rent control or stabilization, produce a myriad of inefficiencies which negate the proliferation of such offerings. While a sizeable literature exists on the negative externalities of subsidized housing (Diamond et al., 2019), less is known about the positive externalities, which would otherwise support such initiatives. Certainly, one domain of consideration is that of potential health benefits, which Maqbool et al. (2015) argue is plausible through a series of channels, including: (i) a budget for healthy living, (ii) reduced stress as a result of increased stability, and (iii) the ability to reside in cleaner and safer homes and/or neighbourhoods. Thus, if we are to consider a fulsome cost-benefit examination of market interventions, aspects such as improved health need to be weighed against the historical arguments of rising inefficiencies.

Stress related to housing affordability negatively impacts household health. For example, children of low-income families experience higher rates of asthma relative to their peers living in stable, high income households (Federico et al., 2020). Also, cost burdened adults are more likely to experience cardiovascular diseases and hypertension compared to adults who live in affordable dwellings (Matthews, et al., 2002; Sims, et al., 2020). Further, given concerns over housing affordability are

seemingly a permanent rather than transitory worry, such chronic insecurity may, as Watson and Osberg (2017) note, push individuals to a mental breaking-point.

Finally, Link & Phelan (1995) note that ‘the evidence reviewed to this point clearly establishes a strong and pervasive association between social conditions and disease’ (p. 82). More specifically, as socioeconomic status rises, health is predicted to increase. This is often referred to as the social gradient of health (Donkin, 2014). It is therefore not entirely biological factors which determine disease. Social factors, like housing, make significant contributions. Consequently, if it is possible to improve upon health equity by making housing more affordable through subsidies, housing policy becomes an important equity-based mechanism for improving health outcomes.

The objective of this study is to synthesize the current evidence on the association between publicly subsidized housing and physical health (i.e., health outcomes, health behaviour, and health care use). As discussed in the following section, such relocation typically occurs through housing subsidies and allowances. Hence, this examination seeks to understand whether housing interventions, which strive to reduce conditions of economic vulnerability, by extension, also serve as a mechanism for improving population health.

Definition and Scope

Publicly Subsidized Housing

Two commonly used interventions include: (i) subsidized housing (both publicly and privately owned and operated), and (ii) portable housing allowances and vouchers. Rental subsidies provide households with access to units that are affordable relative to

their incomes. This is often referred to as rent-geared-to-income housing and is typically owned and maintained by governments, non-profit organizations, housing cooperatives, and in some cases, private landlords. Such programs target low-income households whereby rent is determined based on a percentage of that household's income (typically 30 percent), referred to as the housing expenditure-to-income ratio (Hulchanski, 1995). However, waitlists for access to subsidized rentals are usually lengthy and therefore, often fail to address immediate financial need (Suttor, 2016). This is especially problematic in North American suburbs where developers often build single family homes, overlooking the need for public housing and rental units (Nahiduzzaman, 2017).

Housing allowances, in the form of cheques or vouchers provided to renters to acquire private market accommodations, or to landlords on behalf of households, are a potential solution to the diminishing role of the public sector as a supplier of affordable housing. These programs can offset the cost of housing when public units are unavailable; however, they reinforce the neoliberal ideological shift away from public responsibility toward increased reliance on the private sector (Guyadeen, 2011; Hodkinson et al., 2013; Suttor, 2016). Proponents of housing allowances argue that they promote residential mobility, as they provide recipients with the freedom to choose the housing type and location that best meets their needs (Devine et al., 2003; Galvez, 2010; Reece et al., 2010). Perhaps the most well known of such programs is the Section 8 Housing Choice Voucher, which according to Kalousová and Evangelist (2019), has assisted 2.2 million US households. However, tenants can experience problems

finding housing once they are granted allowances. Bell et al. (2018) argue that this is the case in some parts of the United States where tenants experience discrimination from landlords who avoid renting to voucher recipients.

The need for more robust systems that promote public responsibility for the provision of housing as an undeniable human right is arguably more apparent today than it has ever been. Explorations concerning the positive externalities that result from public housing interventions may serve to increase renewed public investment in housing as a mechanism for not only alleviating the affliction of poverty, but also for improving social, economic, and health outcomes.

Physical Health

According to the World Health Organization Constitution of 1946, health is defined as a 'state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity' (2001, p.1). This definition implies an affiliation between housing and health as it extends to factors beyond the basic needs of disease prevention. Additionally, the relationship between housing and health suggests that health is impacted by housing stability, quality, and affordability (Meltzer & Schwartz, 2015; Taylor, 2018).

This correlation could also be explained by an income gradient in health, whereby rising income is predicted to improve both the quantity (e.g., increased life expectancy) and quality (e.g., reduced morbidity) of health, through various clinical, behavioural, social, and environmental mechanisms (Chokshi, 2018; Lynch et al., 2004). For instance, more discretionary income allows individuals to purchase more health

services while allowing for increased consumption of nutritious food and improved housing, all of which are necessities for good health (Marmot, 2002). Ideally, programs that offset housing costs should result in additional discretionary income; however, the effects on health need to be explored as these increases may still not provide households with sufficient economic resources to purchase many of the above necessities. This assumption is particularly relevant where the recipients of housing subsidies continue to live near the poverty line, which has important consequences for levels of realized health improvement.

The premise underlying subsidized housing as a determinant of good health is based on: (i) preventing the onset of new illness and injuries; (ii) improving access to health care and other necessary health services; and (iii) reducing undernutrition and promoting a healthy lifestyle that leads to good health (Kottke et al., 2018; Krieger & Higgins, 2002; Shaw, 2004). Measurement of physical health consists of multiple dimensions including life expectancy at birth, the presence and severity of chronic illnesses, and self-reported health (Parrish, 2010). Higher levels of physical health are well-acknowledged to be positively associated with affordability and access to an adequate diet, the consumption of necessary health care goods and services, improved health behaviour, and increased access to health promoting resources (Osborn et al., 2016). Improvement in rental housing affordability could potentially decrease the financial stress of low-income families, and free up more resources for these essential health determinants, consequently, improving their physical health.

Methods

Literature Search and Selection Criteria

Eligible studies investigate the association between publicly subsidized housing (i.e., rent-geared-to-income housing, housing allowances, and vouchers) and physical health (i.e., health outcomes, health behaviour, and health care use). Additionally, papers must have been quantitative, peer-reviewed, written in English, and published within the past 28 years (1995-2022). Studies were retrieved from a structured search of four databases: Scopus (Elsevier), Medline (Ovid), Embase (Elsevier), and Sociological Abstracts (Proquest).

The selection of these databases was informed by the interdisciplinary nature of housing research. Thus, databases that include publications in disciplines that frequently publish housing and health research (e.g., medicine, sociology, human geography, social work, etc.) were selected. An initial limited search was undertaken to identify the databases and relevant keywords and index terms. This limited search informed the development of a search strategy. An academic librarian was consulted and a search using all identified keywords and index terms was undertaken across all included databases. Truncation was used on various keywords to help broaden the search to include various word endings and spelling. Search terms were limited by title and abstract in all databases.

As we were interested in the relationship between subsidized housing and physical health, articles that discuss interventions to improve health outcomes or behaviours were not included. Additionally, studies that investigated general housing affordability and those studies that focused on *in situ* subsidies, which are designed for households to maintain their current residences, were removed as the experience of

households who achieve *in situ* affordability are qualitatively different from those who move into affordable accommodations (Manzo et al., 2008). Papers which examined the effect of housing mobility interventions on health were excluded as these programs tend to concentrate on housing and neighbourhood quality, rather than the effects of rental assistance. Likewise, studies targeting homelessness, those experiencing severe or chronic mental illness, and persons living with HIV-AIDS were excluded, as these populations are often rehoused through targeted supportive housing programs paired with counselling, case management, and health and social services. In addition, studies that explored the association between housing interventions and mental health or outcomes outside the inclusion criteria (e.g., violence, child development, cognitive performance, emotional and behavioural problems) were eliminated. Given the multi-faceted nature of mental health, which includes the domains of well-being and happiness, in addition to clinical concerns of depression and anxiety, we recommend that a review concerning this very extensive topic be separately examined.

Study Selection

The effect of publicly subsidized housing on physical health outcomes, health behaviours and health care use was investigated on July 28, 2022 and the specific search terms are detailed in a supplementary online appendix. The database search identified 10,154 articles, which were uploaded into Covidence software for sorting and analysis. Covidence detected and removed duplicate manuscripts from the search findings, resulting in 7,796 studies for screening. Two investigators managed the screening process of the titles, abstracts, and full-article review, reaching an agreement

on the final list for inclusion (disagreements on inclusion and exclusion were resolved through discussion).

Titles and abstracts that met the inclusion criteria, or those that did not provide enough information, were moved to a separate area of Covidence for full-text screening. A total of 125 studies were imported for full-text review. This phase resulted in 24 studies that met the inclusion criteria and their bibliographies were reviewed for additional references that could have been missed in the original search. No additional papers were identified. Figure 2 details the steps of the review process and reasons for exclusion.

Data Synthesis

To characterize the existing body of quantitative research, we constructed a summary of the reviewed studies (see Appendix Table A1) to complement the proceeding section where findings are reviewed in-depth. For each study, the summary table includes information on the location, target group, sample size, data source, time period, outcomes measured, and the main findings. In what follows, we develop a narrative synthesis of the results presented in the reviewed studies. For each study, we summarize the design characteristics and describe the associations observed between subsidized housing and health.

Results

The 24 studies include 16 that are cross-sectional and eight that are longitudinal (although Boudreaux et al. (2020), Fenelon (2022), and Fenelon et al. (2017, 2021) merged pooled cross-sectional health data with longitudinal housing data in order to develop a quasi-experimental analysis based on public housing waiting lists). Twelve

studies focus on the health of adults, while ten studies focus on children (the remaining two examine families). While the majority of studies (19) are American, two studies were conducted in Singapore, and the remaining three separately took place in Australia, Canada, and China.

Health Outcomes

Asthma. While Northridge et al. (2010) find that prevalence of asthma is higher among children in public housing, Fenelon (2022) argues that this result may be due to factors that predict both the need for public housing and poor health – i.e., public housing itself does not worsen child health outcomes. Further, both Boudreaux et al. (2020) and Fenelon et al. (2021) suggest that, relative to those waitlisted, participation in a rental assistance program is associated with a reduction in asthma-related emergency department visits among children (a common measure of uncontrolled asthma symptoms). In contrast, Mehta et al. (2018) find that, relative to homeowners who are eligible for subsidies, the probability of asthma is higher among public housing and rental assistance adults, and this finding persists even after controlling for factors such as income, the presence of second-hand smoke, and obesity status.

Future research should explore how certain psychological and social stressors, such as anxiety, depression, and exposure to violence (Adler & Snibbe, 2003; Wright, 2006; Wright, 2007; Wright et al., 2005) moderate this relationship. Further, certain occupational and educational environments are known to increase asthma symptomology (Dao & Bernstein, 2018; Eagan et al., 2002; Tortolero et al., 2002) and these could be correlated with housing type. Finally, to expand the knowledge base on

subsidized housing and asthma, diagnosis of asthma types (e.g., allergic, occupation, exercise-induced) should be considered in future work. For instance, the underlying causes and triggers of COPD-related asthma are very different from asthma related to indoor biological agents - hence, not all types of asthma may be impacted by housing subsidies.

Nutritional Status. Two cross-sectional studies examine the impact of subsidized housing on children's nutritional status in low-income families (Meyers et al., 1995; 2005). Both studies confirm a positive association between subsidized housing and nutritional status, independent of participation in other public benefit programs. In cases where a child's family receives public housing subsidies, there is a reduction in the likelihood of undernutrition, relative to those in low-income households that have not received such subsidies. Meyers et al. (1995; 2005) argue that subsidies decrease risk of undernutrition in children, as households can dedicate more resources to purchasing adequate food.

While the protective effect of housing subsidies against childhood undernutrition among low-income families is based on objective measurements, future examinations may wish to consider using data that includes information on diet and food expenditures. For example, family dietary practices could further help remove potential biases related to spurious outcomes. Although such data can be hard to locate, surveys such as the Canadian Community Health Survey proxy for such controls using questions on fruit and vegetable consumption, along with the presence of household food insecurity (Mohamadpour et al., 2012, Mutisya et al., 2015).

Hypertension and Cardiovascular Diseases. In a cross-sectional study, Chambers & Rosenbaum (2014) find that among those in public housing, there is a significantly higher probability of heart attacks, strokes, and/or high blood pressure, relative to both housing voucher recipients and low-income unassisted renters. Disparities in these medical conditions are independent of income and health-related behaviours. However, reference was made to the potential mediating role of different aspects of housing and neighbourhood quality. For instance, relative to voucher recipients, public housing residents tend to live in neighbourhoods with more concentrated poverty, safety concerns, and fewer places to be physically active. This interpretation corroborates previous findings that demonstrate a positive link between neighbourhood socioeconomic status and low-income renters' health (Estabrooks et al., 2003; Fauth et al., 2004; Harrison et al., 2007; Ludwig et al., 2011; Sanbonmatsu et al., 2012).

Obesity is a well-known predictor of hypertension and cardiovascular disease and is associated with low-income, low educational attainment, and poor housing conditions (Fruh, 2017; Hruby & Hu, 2015; Kim & Knesebeck, 2018; Lincoln et al., 2014). Additionally, tobacco use tends to be higher among low-income individuals (Casetta et al., 2017), which may also contribute to this vulnerable group's heightened health risks. Lastly, there is uncertainty as to whether these individuals were prone to even worsened health outcomes had they not received public housing. Said differently, this exposure-outcome relationship could potentially be biased by pre-existing medical conditions - i.e., poor health predicts a rising need for housing intervention.

Additionally, the above study focuses on a dichotomous outcome, which does not capture severity. Ordinal analyses may be especially relevant to differentiate mild-to-moderate risk-levels from those which are severe (James et al., 2014a; Nguyen et al., 2010).

Obesity. Three longitudinal studies examine obesity. Antonakos & Colabianchi (2018) find that subsidized housing is associated with an increased probability of obesity for adults. Likewise, Fertig & Reingold, (2007) corroborate the previous result, suggesting that among mothers who moved into subsidized public housing (over a 3-year period), the likelihood of obesity increased. Lastly, Kalousová & Evangelist (2019) argue that, over a four-year period, there was no body weight difference among adults who moved into subsidized housing, relative to eligible non-recipients. Collectively, these findings imply that public housing subsidies do not reduce the prevalence of obesity – hence, other interventions, such as improved health literacy, nutritional supports, and access to primary health care are likely warranted in curbing the obesity epidemic.

Future work could examine consumption allocations associated with the additional financial resources resulting from subsidized housing. Because many that receive subsidized housing continue to experience economic deprivation, it is entirely possible that these households continue to operate without the resources needed to purchase healthy food; rather, they increase the family's access to unhealthy food, increasing the risk of obesity. Additionally, location matters as fast-food operations tend to cluster in economically vulnerable areas (Burgoine et al., 2018; James et al.,

2014b; Woodhall-Melnik et al., 2015a). Thus, new public housing developments could be placed in areas with accessible fresh food sources. Indeed, planners often advocate for the incorporation of subsidized housing into suburban neighbourhoods (Perrin & Grant, 2014), and this may promote access to a wider variety of grocery stores (however, access to public transportation may be limited and walkability may not be feasible).

Health Status. Ten studies explore the relationship between housing interventions and self-reported health status, and although five of the papers present evidence that associates housing interventions with improved overall health status, three articles find no relationship, and another two find the reverse to be true. Three cross-sectional studies, Beer et al. (2011), Fenelon et al. (2017), and Keene et al. (2020), note that adults who receive housing assistance are expected to have a lower likelihood of reporting poor/fair health compared to individuals on waiting lists. These results also align with longitudinal studies by Pfeiffer (2018) and Kalousová and Evangelist (2019), who suggest that assisted housing predicts improved health status, while also buffering against health declines. However, using longitudinal data, Newman et al. (2017) find that relative to eligible but unassisted renters, housing assistance is not associated with child health; a finding, that is supported by Fenelon (2022) and Meyers et al. (2005). Additionally, Fertig & Reingold (2007) argue that, for mothers who moved into public housing, self-reported health worsened. Likewise, Seng et al. (2019) report that all-cause mortality is higher among those in public housing, but their

comparison group pertains to all respondents who do not reside in public housing – i.e., they do not examine a comparable control group.

A notable limitation among these studies concerns intervention comparability with the control groups. For example, Pfeiffer (2018) notes that 25 percent of unassisted renters report a disability; a level much lower than the 50 percent of those who moved into public housing or received a housing voucher. Assisted renters also have a reduced probability of employment and consequently their level of household income tends to be lower. Additionally, Fenelon et al. (2017) report that relative to future recipients, current assisted renters tend to be older, have a lower income, a higher probability of joblessness, and are more likely to have public health insurance. Thus, one could argue that subsidized renters have a unique set of characteristics which could reduce the magnitude of reported health benefits.

Health Behaviours

Smoking. Three papers, using longitudinal data, examine tobacco use. Both Antonakos & Colabianchi (2018) and Kalousová, et al. (2019) find that rental assistance is associated with higher rates of smoking (relative to those eligible for assistance). In turn, Fertig & Reingold (2007) find no relationship between public housing receipt and the probability of the mother being a smoker. In all three studies, tobacco use was examined on the extensive margin (i.e., does the respondent smoke); thus, future research may wish to examine smoking on the intensive margin (i.e., does the respondent smoke less/more). This may be particularly important to investigate, as it is indeed possible that additional funds may be used toward increasing tobacco use,

thereby perhaps warranting additional public health campaigns on the negative effects of smoking. Another avenue of future research could also incorporate the probability of smoking cessation among those receiving subsidized housing.

Alcohol & Substance Use. While the three papers noted above also examine the impact of housing subsidies on alcohol use among adults, Leech (2012) and Williams et al. (2010) observe this relationship with respect to children using cross-sectional data. Further, two of these studies, one regarding adults (Fertig & Reingold, 2007) and one regarding children (Leech, 2012), also examine the association between housing assistance and substance use. Concerning adults, there appears to be no association between rental assistance and alcohol/substance use. However, Leech (2012) finds that for children in public housing, alcohol/substance use does not differ from those in unassisted housing (but with a similar likelihood of receiving assistance); a finding which is also supported by Williams et al. (2010) when comparing against children in “conventional housing”. Additionally, Leech (2012) also finds that rental subsidies are associated with lower rates of alcohol/substance use among children.

Interestingly, Osypuk et al. (2019) find that, among those moving from public housing to housing vouchers, there is a degree of heterogeneity in terms of how it affects adolescent alcohol use. The move is associated with a decline in binge drinking among girls, and a rise among boys. Additionally, Williams et al. (2010) note the complex set of predictors of alcohol use and possible interactions with assisted housing (e.g., race, ethnicity, self-reported grades, and perceived availability of alcohol). For instance, Williams et al. (2010) find that while alcohol use does not differ

between children in public and unassisted housing, the effect of alcohol availability on alcohol use is reported to be lower for those in public housing. Such findings point to the need for further research investigating the complex influences on drinking behaviour across various housing subsidy programs.

Physical Activity. The three studies concerning physical activity present mixed results. Antonakos & Colabianchi (2018) argue that, like alcohol use, physical activity is not associated with the receipt of housing assistance. However, in a cross-sectional study, Wong et al. (2018) find that non-senior adults that receive housing assistance are more likely to be active relative to those who are waitlisted; a result which is not found when examining the entire adult sample. Finally, using cross-sectional data from Hong Kong, Zhang et al. (2022) suggest that although public housing is associated with an unhealthy diet, it is also associated with a lower rate of physical inactivity.

This latter finding is posited to be the result of Hong Kong providing public sports facilities in public housing areas. This is further supported by Garland et al. (2018) and Tannis et al. (2019), who suggest that ‘active design’ programs increase the physical activity of those in low-income neighbourhoods. Thus, access to physical activity centres and/or programs appears to be an avenue that policy makers should consider incorporating into public housing designs. However, to complement potential physical activity gains, healthy eating habits and access to such food may also need to be explored. Fleischhacker et al. (2011) find that fast food restaurants tend to be more prevalent in low-income areas and Han et al. (2020) argue that proximity to such

establishments is a predictor of childhood obesity, which reinforces the importance of neighbourhood food environments to health outcomes.

Health Care Use

Seven papers examine the association between subsidized housing and health care use, typically focussing on outcomes such as emergency care visits and hospitalizations. As previously noted, both Fenelon et al. (2021) and Boudreaux et al. (2020) find that, relative to those waitlisted, there are fewer predicted asthma-related emergency room visits for children in assisted housing. However, exploiting a randomized lottery, Jacob et al. (2015) suggest that housing vouchers are not associated with emergency room visits among children, and Meyers et al. (2005) argue that for children in public housing, hospitalization rates are not predicted to differ from those of low-income children not receiving such subsidies.

With respect to adults, using a longitudinal dataset, Hinds et al. (2018) do not find a relationship between a suite of health care outcomes (e.g., hospitalizations, emergency room visits, prescription drugs dispensed) and the onset of public housing in healthy adults. In a cross-sectional study, Seng et al. (2019) note that those in public housing tend to experience more emergency room visits, along with higher rates of hospitalization. However, as is the case with their 2018 paper, which is noted above, the control group consists of those not receiving public housing, without necessarily providing a similar control group in terms of socioeconomic status. Hence, this result may indeed be the result of a socioeconomic effect; not the impact of public housing.

In contrast, Pfeiffer (2018) argues that housing interventions (relative to other low-income renters) reduce the expected level of health care spending.

Given the mixed set of results, further research on this topic is warranted. Additionally, other avenues of health care, such as receiving a vaccination, along with dentist and optometrist visits should be examined. Concerning adults, neither study matched public housing recipients with a socioeconomically comparable control group. Thus, future research may wish to consider methods akin to Fenelon et al. (2021) and Boudreaux et al. (2020) (among others), whereby rental assistance recipients are compared with those who are waitlisted, thus improving upon the comparability of the two groups and removing potential selection bias.

Cross-Cutting Challenge: Eligibility & Subsidies

There is a substantial amount of heterogeneity across studies which may contribute to the current mix of findings. Although most studies address concerns over comparison group identification, methods are not consistent across studies. Antonakos & Colabianchi (2018) and Fertig & Reingold (2007) both regard households with incomes below 80 percent of the local median as the control group; a similar method is employed by Mehta et al. (2018). However, Kalousova & Evangelist (2019) use 50 percent of the local median to capture non-recipient eligibility. Chambers & Rosenbaum (2013), Meyers et al. (1995; 2005), and Williams et al. (2010) employ surveys that target low-income populations, while Pfeiffer (2018) restricts the sample to renters earning up to three times the poverty threshold (adjusted for household size). Jacob et al. (2015) exploit a lottery where income-eligible families were randomly assigned a housing voucher (treatment), or were informed that they would not be a

recipient (control). In other papers, those on housing subsidy waitlists serve as the comparison group in order to control for selection bias (Boudreaux et al., 2020; Fenelon et al., 2017; Fenelon et al., 2021; Fenelon et al., 2022; Keene et al., 2020; Wong et al., 2019). Other methods which address this bias include propensity score matching (Antonakos & Colabianchi, 2018; Leech, 2012; Newman & Holupka, 2017) and instrumental variables (Fertig & Reingold, 2007).

Likewise, the intervention under consideration differs across studies. Most of the papers examine the US, and there are two programs which receive considerable attention: public housing and housing vouchers. Although the programs differ substantially, some studies combined housing subsidies due to small sample sizes (Antonakos & Colabianchi, 2018; Kalousova & Evangelist, 2019; Keene et al., 2020; Meyers et al., 1995; 2005; Newman et al., 2010; Wong et al., 2018). In turn, Fertig & Reingold (2007), Northridge et al. (2010), and Williams et al. (2010) focus specifically on public housing, while Jacob et al. (2015) and Kalousova & Evangelist (2019) target vouchers. Otherwise, the remaining US papers separately test how public housing and housing vouchers are associated with health. The Australian paper (Beer et al., 2011) analyzes three different housing assistance programs (home purchase assistance, public housing, and rental assistance) based on how they impact the physical health of their respective participants. Finally, the remaining set of non-US papers exclusively focus on public housing.

Given the degree of heterogeneity, it is difficult to generalize these results, and it also reflects the need for further examinations of this potential relationship between

subsidized housing and physical health. That said, those papers which address selection bias by using those on a waitlist as the control group, tend to find health improvements among those receiving housing subsidies. However, with the exception of Leech (2012), studies which use propensity score matching and instrumental variables, find the opposite. Further, when differentiating between analyses based on type of subsidy, no clear story emerges. Boudreaux et al. (2020), Fenelon et al. (2017), and Pfieffer (2018) all find evidence that supports the efficacy of public housing initiatives, relative to housing vouchers. However, Fenelon et al. (2021) do not find that the programs have differential effects, and Chambers & Rosenbaum (2013) and Leech (2012) suggest that health benefits are more likely to exist for those receiving vouchers. These findings suggest that the examination of different housing subsidy programs in different geographical, political, and social contexts may not provide definitive conclusions on the relationship between subsidized housing and health.

Discussion and Conclusion

This paper reviews quantitative research over the past 28 years on the association between subsidized housing and physical health. A systematic search of four databases uncovered 24 articles. Most papers used cross-sectional datasets (16 articles) and geographical coverage was primarily limited to the US (19 articles).

Based on Maqbool et al. (2015), the hypothesis for the present review is that housing interventions which target the economically disadvantaged, predict better physical health as a result of: (i) increased discretionary funds, (ii) more stability, and (iii) cleaner/safer living conditions. The results partially align with this hypothesis. However, there is insufficient evidence to conclude that current housing interventions

have a direct positive impact on physical health. That is, a certain degree of heterogeneity is present given that studies vary on the type of subsidized housing, the groups targeted by the intervention, and neighbourhood quality. Although 13 of the 24 papers find at least some evidence that supports a positive association between subsidized housing and health, seven papers find the reverse to be true, and the remaining found either mixed evidence or no association. Among the papers that suggest worsening health conditions, there is rationale as to why this surprising result transpired (e.g., a higher proportion of disabled individuals in the treatment group, the use of dissimilar control groups). However, it would be naïve, and in poor practice, to merely ignore these findings, regardless of the plausibility of such conjecture.

In particular, the results of this review suggest that among children, housing subsidies help reduce both the probability of undernutrition and asthma-related hospital visits. Regarding the general population, most papers tend to argue that such interventions have a positive impact on health status. However, concerns over hypertension and cardiovascular diseases do not seem to improve, especially when comparing the worsened outcomes among public housing recipients relative to both unassisted renters and those receiving housing vouchers. This latter result may indeed corroborate the finding in this review – that subsidized housing may increase obesity rates. Thus, the health impacts of subsidized housing are mixed, even when examining studies which focus on specific programs.

This mixed set of findings may be rooted in the seminal contributions of Kahneman & Tversky (1979) concerning ‘prospect theory’. When individuals experience

an income change from their status quo reference point, there is a distinct shift in well-being such that losses are more damaging than gains are beneficial - thus implying that individuals are loss averse. Therefore, perhaps the negative impacts of housing unaffordability cannot be entirely undone by subsidies. Indeed, Watson and Osberg (2019) find that positive income anticipations do not offset prior negative income worries and Di Tella et al. (2010) suggest that there is a happiness adaptation to income gains. Consequently, research should examine instances where housing interventions are either relaxed or entirely removed.

Based on this review, there are evident paths to extend the knowledge base. Perhaps most glaring, is the need to conduct studies that provide causal evidence. However, in certain instances, methods were employed to differentiate between treatment and control, and self-selection biases were in some cases minimized with propensity score matching and wait list comparison groups. Accordingly, such strategies, along with those which exploit exogenous policy changes and/or apply sophisticated identification techniques, should be continued when examining the effect of housing interventions on health outcomes (Braveman & Gottlieb, 2014). Further, given the bulk of these findings are from cross-sectional datasets, future studies could use longitudinal surveys to identify both within and between variations in health, which would improve upon causal interpretation.

There is also some concern over external validity – i.e., to what extent are these findings generalizable across populations? As previously noted, only five studies were conducted outside of the United States. Additionally, many of these studies relied on

data from small geographic areas such as New Haven, Connecticut. Consequently, future research may wish to examine the link between health and housing interventions using large national datasets, while also examining this research question across nations. To our knowledge, this topic has not been examined in Africa, Europe, or Central/South America; and with only three studies having taken place in Asia, along with one in Oceania, there is certainly a need for more studies occurring outside the US. However, we do recognize that different social welfare structures and housing programs often impede the ability to do these types of comparative analyses.

Although 24 studies have recently examined this association, given the fact that: (i) multiple subsidized housing programs exist and (ii) health is a multi-faceted concept, there is certainly room to further explore this potential link. Moreover, the bulk of the examined articles focus on logistic regression methods, suggesting a characterization of health at the extensive margin. More specifically, these studies tend to examine dichotomous health outcomes such as the probability of having poor versus good health. Consequently, future research may wish to investigate health at the intensive margin as well. For instance, researchers may wish to measure changes to the waist-to-hip circumference ratio, alongside changes in the probability of being obese, when examining concerns over body weight and cardiovascular disease (Czernichow et al., 2011; Dalton et al., 2003; Welborn et al., 2003; Woodhall-Melnik et al., 2015b).

Finally, this review finds a gap in knowledge on the impact of increased discretionary income and reduced financial stress on physical health. Presumably subsidized housing frees up money that can be used to purchase material goods that

promote better health (e.g., healthy food, medications). However, subsidized renters remain in lower-income brackets and income is a pervasive social determinant of health (Wilkinson & Marmot, 1998). For instance, to what degree does increased discretionary income matter to the prevention, control, or management of hypertension and/or asthma in populations that continue to experience the negative impacts of income inequality? Interestingly, Kalousová and Evangelist (2019) argue that it is not the increase in discretionary income, but improved housing and neighbourhood quality, that increase health among rental assistance recipients - both of which are also well-established social determinants of health.

The current research on the association between subsidized housing and physical health, while not substantial, has gained some interest in recent years. Yet, the results thus far are inconclusive on the extent to which there is correlation, let alone causation. An improved understanding of this relationship provides policy makers with evidence on the potential flow-on benefits from subsidized housing. Therefore, to improve upon the current knowledge base and provide a more fulsome understanding of the relationship between publicly subsidized housing and physical health, future research should test for a causal relationship using a broad set of outcomes across a diverse set of geographic regions.

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CHAPTER FOUR: A Study Protocol for Systematically Measuring the Contribution of Subsidized Housing to Physical and Mental Health

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NB Housing Study Protocol: Investigating the Relationship Between Subsidized Housing, Mental Health, Physical Health and Healthcare Use in New Brunswick, Canada

Abstract

Background: Income and housing are pervasive social determinants of health. Subsidized housing is a prominent affordability mechanism in Canada; however, waitlists are lengthy. Subsidized rents should provide greater access to residual income, which theoretically may improve health outcomes. However, little is known about the health of tenants who wait for and receive subsidized housing. This is especially problematic for New Brunswick, a Canadian province with low population density, whose inhabitants experience income inequality, social exclusion, and challenges with healthcare access.

Methods: This study will use a longitudinal, prospective matched cohort design. All 4,750 households on New Brunswick's subsidized housing wait list will be approached to participate. The survey measures various demographic, social and health indicators at six-month intervals for up to 18 months as they wait for subsidized housing. Those who receive housing will join an intervention group and receive surveys for an additional 18 months post-move date. With consent, participants will have their data linked to a provincial administrative database of medical records.

Discussion: Knowledge of housing and health is sparse in Canada. This study will provide stakeholders with a wealth of health information on a population that is historically under-researched and underserved.

Keywords: subsidized housing; mental health; physical health; healthcare use; housing affordability; prospective matched cohort design.

Strengths & Limitations

- This study uses a strong longitudinal, prospective, matched cohort design to investigate a growing group of households that has yet to be studied
- Administrative data linking will be used to follow health outcomes, using provincial health data after primary data collection is complete
- All members of the waitlist were invited to participate. Therefore, some self-selection bias may exist. However, this cannot be avoided as participation in the research is voluntary

- Potential for attrition is offset using strategic methods for follow-up, contact information sharing with the Department of Social Development, recording multiple contact methods, and the use of incentives

Background

Socioeconomic factors are widely accepted as fundamentally linked to health (Braveman & Gottlieb, 2014; López-Casasnovas & Soley-Bori, 2014; Marmot & Allen, 2014). Of these factors, income and housing are two of the most pervasive social determinants of health (Raphael, 2008; WHO, 2014). The World Health Organization argues for access to stable, affordable, and adequate housing to decrease health inequities (WHO, 2018]. Further, the Universal Declaration of Human Rights recognizes the right to housing as part of the right to an adequate standard of healthy living (UN General Assembly, 1948). Canada's first National Housing Strategy (2018) aims to remove 530,000 households from housing need, defined as spending 30% or more of income on housing costs (Government of Canada, 2018). With renewed Federal commitment to affordable housing, it is imperative to investigate the impact of publicly subsidized rental housing, referred to as subsidized housing, on the health of a population that experiences multiple inequities. Although public housing increases affordability, there is limited understanding of the contribution of subsidized housing to health. The primary objectives of this study are to investigate the impact of subsidized housing on 1) mental health; 2) physical health; and 3) health care utilization. The secondary objective of this study is to understand factors related to the wellbeing of renters as they wait for subsidized housing.

Housing and health outcome studies often focus on the built environment (Burton et al., 2011; Durand et al., 2011; Shirley et al., 2012) and rehousing programs for persons with severe mental illness (Hwang et al., 2011; Nelson et al., 2012; Wolitski et al., 2009, Woodhall-Melnik et al., 2015). Studies that do investigate relationships between subsidized housing and health focus on jurisdictions outside of Canada (Bentley et al., 2011; Hall et al., 2010; Jacobs et al., 2014). To date, any studies that systematically investigate the impact of public housing on healthcare use could not be located.

In cross-sectional studies, housing unaffordability is associated with distress (Kutty, 2005; Pierse et al., 2016), lower self-perceived mental health (Bentley et al., 2011), poor physical health and increased healthcare use (e.g., emergency care, hospitalization, and walk-in clinic use) (Kyle & Dunn, 2007; Pollack et al., 2010; Shubert & Bernstine, 2007). Increasing housing affordability through subsidized housing, in principle, should improve residents' mental and physical health and decrease avoidable healthcare use; however, there is no longitudinal or quasi-experimental evidence to determine whether commonly used housing affordability programs, such as publicly subsidized housing, are directly associated with improvements in mental health, physical health and healthcare use outcomes.

Although the link between housing affordability and health is established, recent studies indicate that subsidized housing alone may not contribute to health improvements. For example, research from Australia indicates that multiple transitions into subsidized housing are associated with poorer mental health (Bentley et al., 2018).

These findings suggest that, despite increased affordability, a lack of permanency in subsidized housing could produce negative impacts on mental health. Further, evidence from subsidized housing in Chicago indicates that low perceived neighbourhood and housing quality have negative impacts on physical health, despite increased affordability (Roman et al., 2009).

Renters in New Brunswick experience high rates of housing unaffordability (Employment and Social Development Canada, 2021). In the last decade, the average rent across New Brunswick has increased approximately 40% (CMHC, 2021). Despite large increases in rents, the average provincial income has only increased by 10.2% (Statistics Canada, 2021). Low income and housing unaffordability are the main contributors to housing instability and episodes of homelessness in Canada, which are associated with poor mental and physical health outcomes and higher use of emergency healthcare services (Gaetz et al., 2013; Kneebone & Wilkins, 2016; Kyle & Dunn, 2007; Pollack et al., 2010; Shubert & Bernstine, 2007).

Access to subsidized housing increases residual income, which could positively contribute to mental and physical health and changes in rates of hospitalization, walk-in clinic use, and primary care appointments. However, it is unclear as to whether the subsidies are enough to significantly decrease stress in a population that experiences low-income. Further, the act of moving into subsidized housing may produce stress that may negatively impact health and healthcare use (Bentley et al., 2018). The present study will fill a significant knowledge gap on the relationship between access to subsidized housing, mental health, physical health, and healthcare use.

Study Objectives

The study objectives are as follows:

- 1) To determine the impact of publicly subsidized housing on mental health
[Is subsidized housing associated with changes in mental health symptomology?]
- 2) To determine the impact of subsidized housing on physical health *[Is subsidized housing associated with changes in physical health?]*
- 3) To determine pre- and post-move healthcare utilization patterns (hospitalizations, walk-in clinic use, and primary care appointments) in adults who receive subsidized housing *[Does healthcare use change with receipt of subsidized housing?]*
- 4) To explore physical health, mental health, and healthcare use in low-income adults who are waiting for access to subsidized housing *[What is the prevalence of physical health concerns, mental health concerns, and healthcare use in low-income adults who are waiting for access to subsidized housing in New Brunswick?]*

Methods

This study will use a longitudinal, prospective matched cohort design. Research advocates for the use of longitudinal studies to better assess the relationship between mental health and subsidized housing (Evans et al., 2003; Dweik & Woodhall-Melnik, 2022). This approach is also useful for understanding physical health and healthcare

use, as prospective cohort designs are particularly strong when used to relate an outcome (e.g. mental health, physical health and healthcare use) to an event (e.g. receipt of subsidized housing) (Caruana et al., 2015) In this case, the study design will allow the research team to associate changes in health to receipt of subsidized housing. Further, any potential cohort effects can be adjusted for by accounting for individual sociodemographic variations within the cohort of housing applicants (Caruana et al., 2015; Greenland, 1977).

Primary Data Collection

The sampling frame for this study is all public housing applicants in New Brunswick, which includes approximately 4750 households at the study start date. Each household will receive a letter mailed from the Department of Social Development (DSD), which will provide information about the study, a link to an online survey, an email, and a phone number for the study team. Online participation will be encouraged; however, participants may choose to complete the survey over the phone with a Research Assistant or via mail. New Brunswick is a bilingual province so all study materials will be available in French and English.

Email addresses, mailing addresses, and phone numbers will be recorded during each survey to prevent study attrition. Upon completion of each survey, participants will be mailed or emailed a \$10 gift card to Tim Horton's coffee shop. Their names will also be entered into a draw for one of three \$500 VISA gift cards. The draw for the gift cards will take place immediately after data collection concludes.

Study participants will enter the study as control group members while they wait for access to subsidized housing. During this time, participants will be asked to complete a baseline survey which asks questions on demographics, self-reported mental and physical health, and a variety of potentially confounding measures, which are described in detail below. After the baseline survey is complete, control group participants will be provided with shorter follow-up surveys at 6, 12, and 18 months following their initial baseline survey that assess changes to the main outcomes (physical and mental health) and variable factors (e.g., experiences of stigma, residential satisfaction, etc.).

The research team will ask participants for their consent to share their names with the provincial DSD. Those who consent will have their name sent to DSD via WatchDox (www.watchdox.com), which is used by the Provincial government to transfer confidential information. Program staff with DSD will check the names provided against offers for subsidized housing each month and will provide the research team with updated information and move dates for those who become housed during the study period. Not all participants will consent to sharing their names; therefore, each survey administered to the control group after baseline will ask participants if they have received subsidized housing. Participants who indicate that they have received subsidized housing will be asked when they moved or started to receive a subsidy and will be moved to the intervention group.

The intervention group will receive additional follow-up surveys at six, 12, and 18 months after they begin receiving subsidized housing. Participants who are not

subsidized within 18 months of their baseline participation date will not crossover into the intervention group and their study participation will be complete. At the start of the study, many of the households will have already been on the waitlist for months. Therefore, households at the top of the waitlist will move into housing quickly. Recruiting from the entire waitlist will ensure that households from the top, middle, and bottom of the waitlist are contacted for study participation.

It is possible that control group participants may remove their names from the waitlist during the study period. If this happens, the previous data collected from these participants will be kept and their study participation will be complete. It is also possible that participants in the intervention group may receive and then lose or leave subsidized housing. If this happens, the research team will note this, and their study participation will be considered complete. Their data prior to exiting subsidized housing will be included in analyses. Should a large enough portion of participants leave the wait list or subsidized housing, their data will be compared with others who either stayed on the wait list or continued to receive subsidized housing to see if any significant differences exist between the groups.

In the absence of any data reporting CESD-10 findings and data from the DAD in intervention studies similar to ours, we will estimate the power to compare pre- vs post-intervention CESD-10 total scores and healthcare use at the end of the study, using Cohen's *d* effect sizes for paired samples (PASS, 2019). Assuming that there will be 30% attrition by the end of the study, a sample size of 1,138 data pairs achieves 100% power to detect effect sizes ranging from 0.3 (moderate effect size) to 0.8 (large)

with a significance level equal to 0.05 using a two-sided paired t-test. As analyses will compare intervention and control periods, the researchers expect that the high power calculated using the paired t-test at the end of the study will approximately hold when we fit mixed models to the data.

Administrative Data Linking

This study also uses administrative dataset linking to measure differences in physical and mental healthcare use between the intervention and control groups. With each participant's consent, their name and date of birth will be used to link their survey results with their matched records in the New Brunswick Institute for Research Data and Training (NB-IRDT) database. The NB-IRDT is an organization that houses and links data with large, provincial administrative databases. It provides individual level data on education, health, social services use, and employment. The primary data collected through this study will be linked with participants' healthcare use data from the Discharge Abstract Database (DAD), which provides information on patient billing for hospitalizations, walk-in clinic use, and primary care appointments. The research team will use the date that housing subsidies were received to create a time variable that indicates their receipt of the intervention. The DAD and the time variable will then be used to compare individuals' hospitalizations, walk-in clinic use, and primary care appointments in the 18 months prior to and following their moves into housing. The same analyses will be performed for individuals in the control group to assess differences between the two groups.

Scales and Measures

The measures proposed for this survey are discussed below. Additional questions may be added into follow-up surveys if deemed necessary by the research team.

Primary Outcome Measures

The primary outcomes for this study are mental health, physical health and healthcare use. In this study mental health is conceptualized as the presence or absence of depressive, anxious, and distress symptoms. Depressive symptomology will be measured using the Centre for Epidemiological Studies Depression Scale Short Form (CESD-10) (Björgvinsson et al., 2013; Miller et al., 2008; Radloff, 1977). The CESD-10 is an abbreviated, validated version of the CESD-R. A scoring algorithm is applied to each of the 10 questions and the values from all the questions are summed to provide a score ranging from 0-30, with 10 points on the scale being the clinical cutoff that is used to indicate the presence of depression. However, the scores are also suitable for use as a continuous variable (Center for innovative Public Health Research, 2014; Eaton, 2004). The Kessler 6 (K-6) will be used to measure distress and anxious symptomatology. The K-6 was designed for the U.S. National Health Interview Survey and measures the presence of distress and anxious symptoms using a simple six item scale (Kessler et al., 2002). The K-6 is an abbreviated version of the K-10. It is quickly administered and is deemed highly reliable and valid (Cairney et al., 2007; Kessler et al., 2010; Tesfaye et al., 2010).

Participants will be asked if they have ever received a mental health diagnosis and will be provided with a list of common psychiatric conditions from which to choose. An option to specify a condition that is not listed will be provided.

To assess physical health, the EQ-5D-5L and EQ-VAS will be administered. The EQ-5D-5L is a validated measure comprised of five dimensions of health that relate to quality of life. It also includes the EQ-VAS, a visual analog scale to measure reported overall health (Herdman et al., 2011; Feng et al., 2021). Participants will also be asked to self-report any intellectual, developmental, or physical disabilities.

The DAD, which captures physician billing data on hospitalizations, walk-in clinic use, and primary care appointments, will be used to measure healthcare use. The NB-IRDT has yet to receive data on Emergency Department use, so this measure will not be included in the present study; however, once these data are available, a secondary analysis of Emergency Department use may be conducted.

Demographic and Potential Confounding Variables

Standard demographic information will be collected from each participant (e.g. gender/sexual identity, income, sources of income, work status, marital status, ethnicity, citizenship status, rural or urban residency, and household composition). The NB-IRDT will provide linked data from the Citizen Registry and Vital Stats, which will allow the researchers to account for chronic and comorbid conditions, and movement out of province or death.

New Brunswick's DSD has indicated that their subsidized housing tenants often feel stigmatized, and this negatively impacts their experiences of mental health and

wellbeing. Although there is no current data to confirm this, recent studies from other jurisdictions suggest that public housing tenants experience perceived or actual stigma which negatively impacts wellbeing (August, 2014; Scott et al., 2006; Suttor, 2015). To measure stigma, the Self-Stigma Short (SSS) will be administered. This is a 9-item validated scale, typically used to measure stigma of mental illness; however, it allows researchers to replace the condition of interest to meet their own research needs (Wu et al., 2015). For the purpose of this study, mental illness will be replaced with public housing applicant (control) and public housing resident (intervention). This will allow the research team to assess whether stigma contributes to mental health in the intervention and control groups.

Data on substance consumption will be collected using six adapted measures selected from the Canadian Tobacco and Drugs Survey (Statistics Canada, 2017). These questions will measure the frequency of alcohol, tobacco, and cannabis consumption over the six-month period preceding each survey. The research team only tracked use of legal substances, as illicit drug use is often associated with secrecy and stigma and the use of illicit substances was not critical to the study (Palamar, 2011). This will allow the research team to control for the impacts of any potential changes in substance use on mental and physical wellbeing.

Social support will be measured using the Oslo Social Support Scale (OSS-3). This scale was selected as it is widely used with a variety of populations; further, it is a brief measure of social support which is important to reduce participant fatigue (Kocalevent et al., 2018). The scale consists of three questions which are designed to measure the

level of social support that people perceive they have. We will include this measure as social support is highly correlated with physical and mental health (Bøen et al., 2012a; Bøen et al., 2012b, Olaya et al., 2017; Von et al., 2017).

Housing and Neighbourhood Measures

Previous studies indicate that housing and neighbourhood satisfaction and quality contribute to mental health (Bashir, 2002; Bissionnette et al., 2012; Bjork et al, 2008; Elliott et al., 1990; Pacione, 2003; Pearce, 2006; Van et al., 2003). The survey will use an abbreviated version of the Residential Environmental Satisfaction Scale (RESS), which is highly correlated with the total RESS scale (0.96) (Adriannse, 2007). This scale measures both housing and neighbourhood satisfaction. Participants will also be asked to indicate their housing type (e.g. detached, high rise apartment, etc.), housing tenure, and the number of individuals who live at their primary residence, as these are found to impact mental health (Dunn, 2015). This will allow the research team to determine if potential changes to health and healthcare use can be attributed to perceptions of living environment rather than just the affordability aspect of subsidized housing.

Preliminary Data Analysis

Random effects regression has the advantage of allowing researchers to explicitly account for within-person changes or unmeasured heterogeneity within individuals across time (Allison, 2009). Unmeasured heterogeneity can be described as the unmeasured consistencies in individuals that might influence mental health and healthcare use within each wave of data collection. The research team will first explore the longitudinal changes in primary and secondary outcomes using descriptive statistics

pre- and post-intervention, as well as spaghetti plots. To take advantage of the longitudinal nature of our data, we will estimate generalized linear mixed effects models that we predict will take the following form:

$$G(Y_{i,t}) = X_{i,t}\beta + Z_i u + \epsilon_{i,t}$$

$Y_{i,t}$ is our outcome variable (see main and secondary outcomes above) and G is an appropriate link function (i.e. logistic for dichotomous variables and identity for continuous variables). $X_{i,t}$ is a vector of variables that we will treat as having fixed effects (β), Z_i is a vector of variables and their estimated random effects (u), and $\epsilon_{i,t}$ is the remaining error. $X_{i,t}$ will include variables that can influence mental health or healthcare use and might not be orthogonal to housing status, like time on waitlist, age, etc. We will also explore whether seasonality (month) or interview wave (baseline, six month, 12 month, 18 month) are appropriate to include in our model. Z_i is a vector of random effects. We will start by including random intercepts in Z_i and their estimated coefficients (u), designed to consider whether individual-specific factors can influence outcomes over time, and potentially include random-slope estimates for variables (like sex) if our summary statistics indicate important differences by covariates.

We will explore the effects of gender, age, housing status and chronic disease morbidity at study entry, and interactions of selected key variables. Without observing the data, the research team cannot commit to more sophisticated modeling approaches, but we have a flexible estimation strategy that allows us to take advantage

of the longitudinal nature of the data. Interim analyses will be performed as data are collected.

Study Retention

New Brunswick's DSD will partner with the research team to provide access to the study population, recruitment assistance, and monthly updates on receipt of subsidized housing for participants who consent. Prior to obtaining consent at six months, and for individuals who do not consent, a screening tool will be used at regular survey intervals to assess whether a participant has received subsidized housing and should be transferred into the intervention group. DSD is committed to using the results of this study to improve the wellbeing of residents who are waiting for and receiving subsidized housing. This study will provide descriptive information on the wellbeing of those waiting for subsidized housing, which may point to the need for additional health supports.

Using a longitudinal study design is advantageous as it allows us to relate any observed mental and physical health effects to exposure to housing affordability concerns. Further, investigating change over time allows us to determine the impact of housing on mental health, physical health and healthcare use when participants move and as they become more settled in subsidized housing. However, a concern with longitudinal cohort studies is study retention.

Some attrition is expected in a longitudinal cohort study. To reduce attrition, Scott's Engagement, Verification, Maintenance and Confirmation (EVMC) Protocol will be used (Scott et al. 2006) Scott's use of this protocol resulted in a 95% retention rate

in their study of individuals who experience high residential instability. The ECVM Protocol involves training research assistants to properly motivate study participants by informing them of the social benefits of their research participation; collecting and updating contact information; scheduling follow-up surveys at the end of each survey; and providing reminder cards with a number for the participants to call should they need to update their contact information.

The social benefits of study participation will be clearly conveyed to participants by research assistants who administer phone surveys or in text through the electronic and mailed surveys. All participants will be asked to provide a mailing address, email address, and phone number each time they participate. Participants who are unhoused while waiting for public housing will be asked permission to contact them at a shelter, agency, or through another mechanism of their choice. All participants will be reminded at the end of each survey that they will be contacted in approximately six months for their next survey. If contact methods are not up to date at their follow-up dates (e.g. phone number is out of service or email bounce back), a reminder card will be mailed to let them know that it is time for their next survey. This letter will provide the research team's contact information and a request to contact the study team to update their information. DSD will update contact information monthly for all unreachable participants who agreed to have their information shared for the research.

Participation is incentivized with a draw at the end of the study and a gift card following each survey, which may motivate some participants to maintain up-to-date contact information. A systematic review of study retention methods finds that offering

participants incentives is an optimal practice to increase study retention (Booker et al., 2011).

Discussion

This research study has received Research Ethics Board certification (REB 2020-032) from the University of New Brunswick. Before each survey, participants will be asked to provide electronic (online surveys), written (mail surveys) or verbal (phone surveys) consent. They will be provided with or read a copy of the study information letter. Consent will be collected at each survey interval and consent to participation in the main study is mandatory.

At baseline, participants will be asked to provide consent for the research team to contact them for a qualitative follow-up study in the future. They will also be asked to consent to link their data with the NB-IRDT. At the six month follow-up period, participants will be asked for consent to share their names and addresses with the DSD so they may provide the research team updated information should they receive subsidized housing. Participants may complete the survey if they answer no to any of the optional consents.

Dissemination

The research team will regularly meet with DSD to discuss survey design, recruitment, data use, findings, dissemination, and recommendations arising from the research. For each round of surveys, a two-page plain language summary sheet with key findings will be produced. These sheets will be housed on the Principal Investigator's institutional website and provided to participants who request study feedback via mail or email. All deliverables will be available in French and English. Once

the data are analyzed, the research team will work in partnership with DSD to develop recommendations and design evidence-based interventions. Peer reviewed publication of study findings will be sought.

The research team will host community meetings to share the results with members of the public. A meeting will be hosted in each of the three largest cities in New Brunswick—Moncton, Saint John and Fredericton. Virtual and conference call options will be offered for those who live in remote areas or are unable to attend in person. DSD will co-host these meetings. The research team and DSD will send email invitations to public housing providers, study participants, persons residing in subsidized housing, members of local, provincial, and federal government, and members of non-profit organizations who focus on housing instability, health, and/or poverty reduction. During these meetings, the study team will provide all attendees with a copy of the community report and the plain language summary sheets. The study team will deliver a presentation on our research findings and ask the attendees to share their thoughts on or reactions to our findings. The research team will ask attendees to provide their email addresses if they wish to join a community of practice to collaborate on any interventions that arise from our findings.

ABBREVIATIONS

NBIRD: New Brunswick Institute for Research Data and Training

DSD: Department of Social Development

DAD: Discharge Abstracts Database

EVC: Engagement, Verification, Maintenance, and Confirmation

CESD-10/CESD-R: Center for Epidemiologic Studies Depression Scale 10/Revised

K-6: Kessler 6

EQ-5D-5L: European Quality of Life 5 Dimension

EQ-VAS: European Quality of Life Visual Analogue Scale

REB: Research Ethics Board

SSS: Self-Stigma Short

OSS-3: Oslo Social Support Scale

RESS: Residential Environmental Satisfaction Scale

DECLARATIONS

Ethics Approval and Consent to Participate

This research has been reviewed and approved by the Research Ethics Board at the University of New Brunswick (REB # 2020-32). All participants will be required to consent verbally (telephone surveys), through signing (mail surveys), or electronically (online surveys) to participate in the study.

Consent for Publication

Not applicable.

Availability of Data and Materials

Not Applicable

Competing Interests

The authors declare that they have no competing interests.

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Author's Contributions

JWM conceptualized, drafted, and edited the protocol. JRD participated significantly in developing the study design and provided feedback on the protocol draft. Research trainees ID, CM, EN, and JP assisted with manuscript editing and the construction of the measures section. DD, SD, AL, FIM, RN, VS, and CS contributed significantly to the protocol design and provided feedback on the protocol draft. DD and CS contributed to the analysis section. All authors read and approved the final manuscript.

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CHAPTER FIVE: Analysis of Data from the NB Housing Study's Baseline Survey

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Disparity in a Failing System: An examination of the impact of housing status on depression and psychological distress in individuals on New Brunswick's public housing waitlist

Abstract

Subsidized housing is the largest public mechanism for deeply affordable housing in Canada. However, the demand for subsidized housing outpaces availability, which results in a growing waitlist that is incapable of meeting the needs of all who qualify. The housing waitlist includes households who are unhoused and those who are precariously and/or unaffordably housed in the private market. Despite the varied economic, social, and housing statuses of households on subsidized housing waitlists, there is a dearth of evidence that comprehensively characterizes their particular challenges and needs. This gap in understanding represents a significant barrier to developing targeted interventions and support services tailored to the unique circumstances faced by inadequately housed households. This paper uses data collected from the baseline survey of a longitudinal study on subsidized housing applicants in New Brunswick, Canada to determine if unhoused applicants experience

different levels of depression and psychological distress than those who are precariously housed. Results indicate that both groups experience extreme poverty, high unemployment, moderate to high depression and distress levels, poor physical health status, and low social support. Precarious renters were older ($p < .001$), reported lower distress scores ($p < .01$), and had higher incomes ($p < .001$) than unhoused individuals. Social support and better perceived physical health status significantly mitigated distress and/or depression in both groups. Age, income, and employment were significantly associated with lower depression and distress solely among precarious renters. The findings have significant implications for health and social services, housing policies, and the administration of public housing waitlists.

Keywords: homelessness; housing affordability; subsidized housing; depression; distress.

Introduction

What are we studying and why?

Canada's capacity to provide affordable housing options to low-to-moderate income households has been stagnant since the 1990s (Suttor, 2016); however, the erosion of housing affordability in Canada's Atlantic region only recently gained national attention (August, 2022a; Leger, 2023). This region is unique, as it currently boasts more affordable housing than large urban metropolises such as Toronto, Montreal and Vancouver, but housing values and rents have risen quickly in recent years (Brown, 2023; Cline, 2021; Statistics Canada, 2022a). In 2023, New Brunswick

experienced the highest rent increases in the country, second to Alberta (Statistics Canada, 2024a). The ability to afford increased rents and shelter costs in New Brunswick is complicated by the fact that median household income in New Brunswick falls below that of the national average (Statistics Canada, 2022b). To put this in simple terms, housing and rent costs less in New Brunswick, but households also make less than in other places in Canada.

Canadian homelessness research and housing scholarship often focuses on the realities of larger cities and often ignores the realities of small cities, semi-urban and rural locales (Gaetz et al., 2016), which are common throughout New Brunswick. New Brunswick has two mid-sized cities—Fredericton and Saint John—and one large city—Moncton (Woodhall-Melnik, 2022; 2024). The remainder of the province is comprised of semi-urban, rural, and remote areas. Although some scholarship exists on rural areas and mid-sized cities (Haley et al., 2024; Pin & Haley, 2022; Woodhall-Melnik et al., 2024), there is an urgent need to investigate the realities of smaller locales because of their unique needs that are shaped by their socio-economic circumstances (Gkartzios & Ziebarth, 2016; Ryser et al., 2021). The housing affordability problem in NB is compounded by rapid population growth (Balzer et al., 2021; Brown, 2023; Canadian Broadcasting Corporation [CBC] News, 2022), and the country's lowest vacancy rate (Canadian Mortgage and Housing Corporation [CMHC], 2023). Renters in New Brunswick are dealing with rising shelter costs—average rent increased by 40% over the past decade, compared to a 10.2% rise in provincial income (CMHC, 2021; Statistics Canada, 2021b; Woodhall-Melnik et al., 2022). These trends drive growing

housing unaffordability and longer housing waitlists (Government of New Brunswick, 2023b; Government of Canada, 2023d; CMHC, 2023, National Advisory Council on Poverty, 2022; Silberman, 2024), and deepening housing insecurity for low- and middle-income renters (August, 2022; Morrissey, 2023). Unaffordable housing and financial strain contribute to social barriers and deprivation, and heighten mental health vulnerability (Chung, 2022; Santos et al., 2024). The length of the provincially administered subsidized housing wait has more than doubled in the past three years (Government of New Brunswick, 2023b; Pickrell, 2023; Woodhall-Melnik et al., 2022), resulting in significantly longer wait times for access to subsidized housing.

In New Brunswick, as in other places in Canada, the housing waitlist is not managed chronologically and some households with higher needs (e.g. those who are unhoused or those escaping intimate partner violence) are prioritized for quicker access to housing. However, as the waitlist continues to grow in New Brunswick, the challenge of housing all who qualify and apply for subsidized accommodations in a timely fashion is increasingly difficult. This leads to a triaged approach to providing subsidized housing that is representative of a true housing crisis, wherein the needs of the most vulnerable are prioritized.

What do we need to know? What are the gaps?

At present, no research exists that seeks to explain the health of waitlist applicants in a geographic context that includes both rural and urban communities. Little is known about the mental health status of individuals who rent in the private market and experience housing inadequacy (referred to as “precarious renters” in this

paper), as studies that assess mental and physical health in precariously and unaffordably housed individuals are sparse (Talmatzky et al., 2023). This research contributes to what is currently known on the health consequences of housing insecurity and builds on this to fill a gap in the understanding of health consequences on subsidized housing applicants in the province of New Brunswick.

Objective statement

The present study seeks to directly understand differences in mental health amongst two specific low-income groups, precarious renters and unhoused individuals, who reside the same geographical region and occupy the same waitlist for subsidized accommodations. The specific objective of this study is to investigate depression and psychological distress within individuals on New Brunswick's subsidized housing waitlist who are unhoused and precariously housed. We hypothesize that both groups experience depression and psychological distress. We also hypothesize that levels of depression and distress are higher in unhoused individuals. Our analyses provide a better understanding of the nuanced differences in mental health between unhoused and precariously housed groups.

Why is this important?

Understanding the health consequences, challenges, and needs of both unhoused and precariously housed populations in the rural province of New Brunswick is crucial for developing targeted interventions and support that are tailored to the unique circumstances faced by this population. This research addresses a critical gap as

one of the first studies to provide valuable insights into the social determinants of health that affect New Brunswickers' mental health. These insights are useful to policymakers who wish for guidance in developing evidence-based support systems. The implications of this study extend beyond NB to other jurisdictions that experience income inequality, rapid demographic change, rurality, and low vacancy rates. These implications are demonstrative of the broader relevance and impact of this research on housing policy and community health in general.

Background

Definitions of Housing Status

Homelessness in Canada is defined as the absence of "stable, safe, permanent, appropriate housing, or the immediate prospect, means, and ability of acquiring it" (Canadian Observatory on Homelessness, 2021, para. 1). This definition implies that homelessness is experienced by those who do not have access to affordable and good quality housing. Homelessness is further categorized into four main categories: unsheltered, emergency sheltered, provisionally accommodated, or at risk of homelessness (Gaetz et al., 2012). Despite the adoption of this broad definition, prevalence reports often conceptualize homelessness to include people without a permanent address, who sleep on the streets, or reside in emergency shelters (Echenberg & Munn-Rivard, 2020; O'Neill, 2022; Ruby, 2023). In other words, being precariously housed and at risk of homelessness is often viewed as different than homelessness. These nuances appear in housing programs, scholarship, and policies. For example, precarious renters are not recognized as homeless by most Housing First

programs (Woodhall-Melnik & Dunn, 2016), rapid housing initiatives (CMHC, 2022a), or by local policies that triage members of the waitlist to prioritize the needs of those who are unhoused (National Housing Council, 2023).

In our study the term "unhoused group" refers to households in which individuals lack access to housing. These individuals often reside on the streets, sleep in vehicles, stay in shelters, or are provisionally accommodated communal settings such as boarding houses (Echenberg & Munn-Rivard, 2020; O'Neill, 2022; Ruby, 2023). In contrast, "precarious renters" are low-income renters housed in market accommodations but face the risk of homelessness due to uncertainties about their housing situation stemming from unaffordability (i.e., pay 30% or more on housing and utilities), inadequacy (i.e. in need of major repairs such including defective plumbing or electrical wiring, or structural repairs to walls, floors, or ceilings (CMHC, 2019) and unsuitability (i.e. when there are not enough bedrooms for the size and make-up of resident households, according to the National Occupancy Standards calculation (CMHC, 2019; 2022c).

The literature suggests that both unhoused individuals and precarious renters face challenges related to housing affordability, quality, and stability (Bassuk et al., 1996; Hock et al., 2023; Listerborn, 2023; Serchen et al. 2024). Additionally, they share common experiences of poverty, social isolation and poor living conditions (Gaetz et al, 2012; Hock et al., 2023; Listerborn, 2023). Although there is some fluidity between being unhoused and renting precariously (e.g. housing loss leads to homelessness and finding new housing in new market housing often leads to continued precarity),

research does find that individuals who are unhoused individuals typically experience more financial strain (Bassuk et al., 1996), lower levels of social support (Bassuk et al., 1996; Letiecq et al., 1998; Omerov, 2020), and greater health inequalities (Omerov, 2020). These factors contribute to prolonged homelessness and instability (Bassuk, 1996; Institute of Medicine, 1988; Echenberg and Munn-Rivard, 2020).

Compared to housed individuals who are at risk of homelessness, those who are unhoused experience numerous challenges, including higher risks of sexually transmitted and other communicable diseases (Zhang, 2018; Williams et al., 2018), increased injuries and disabilities (Bernstein et al., 2015), and disproportionately high rates of substance use (Grinman et al., 2010). Additionally, unhoused individuals encounter limited access to preventive and long-term healthcare services and medications needed to address their distinct and multidimensional needs (Berenbaum, 2019; Hwang, 2010; Roche, 2018; Zhang, 2018).

Accordingly, experiences of fluidity into and out of pathways of homelessness are influenced by diverse risk factors (e.g., mental health status and substance abuse), one's ability to secure and maintain housing (Piat et al., 2015; Pophaim & Peacock, 2021). Research on housing instability consistently shows that households are more likely to experience various forms of instability rather than progressing towards the often stated ideal of single-family homeownership (Chamberlain & Johnson, 2013; Stonehouse et al., 2021). This dynamic is particularly evident among lower-income households, as they continue to transition between various forms of unstable housing over time (Chamberlain & Johnson, 2013; Nilsson et al., 2019; Stonehouse et al., 2021;

Wright & Rubin, 1991). In contrast, individuals who experience chronic homelessness are influenced by complex interactions of socioeconomic factors, structural factors, and rising housing costs (Amore et al., 2011; O'Sullivan & Decker, 2007), that makes their recovery and housing entry more challenging. Nonetheless, individuals experiencing homelessness are often placed on public housing waitlists and prioritized based on their housing status and level of urgency.

Housing and Mental Health

Housing as a social determinant of mental health: Amidst the escalating housing crisis, gaining insight into the mental health status of households awaiting access to affordable housing is crucial. This understanding forms the foundation for developing effective interventions to address the needs of individuals enduring prolonged waits for affordable accommodations. When housing is explored as a social determinant of mental health, prevalent conditions identified include anxiety and depression (Kessler, 2012; Mirowsky & Ross, 2017; McRae et al., 2016). Despite this, Canada's housing policy has yet to acknowledge the significant role of housing in mental health (Bryant et al., 2011; Mikkonen & Raphael, 2010; Moos, 2018; Ramage et al., 2021; Raphael et al., 2008, 2020).

Comparing mental health in unhoused versus precariously housed individuals:

Research that captures distinctions between experiences and outcomes associated with precarious renting and being unhoused is sparse. Work that is done focuses on education (Low et al., 2017), hunger (Wehler et al., 2004), and well-being (Bassuk, 1996). These studies find that unhoused individuals have lower educational

achievement and a comparable rate of food insecurity to precarious renters (Low et al., 2017; Wehler et al., 2004). Bassuk (1996) finds that mothers who are unhoused have lower incomes, increased social isolation, and are more likely to have experienced Intimate Partner Violence than mothers who are housed and are low-income. Nevertheless, both groups encounter significant adversity (e.g. prevalence of major depressive disorder, chronic health conditions, posttraumatic stress disorder, and substance use disorders) that affects family well-being (Bassuk, 1996). Examining mental health within the same waitlist population offers nuanced insights into the mental health outcomes of those awaiting subsidized housing, and is critical for addressing deficiencies in the existing housing system and informing targeted interventions and support strategies.

Mental health and being unhoused: A considerable body of research explores depression among those who are unhoused (Ayano et al., 2021; Bassuk et al., 2015; Duke & Searby, 2019; Spence et al., 2004). A recent random-effects meta-analysis of data from forty studies finds that rates of depression in unhoused youth and adults range from 38% to 56% (Ayano et al., 2021). The studies selected for this analysis are all written in English and the vast majority (92.5%) examine unhoused populations in high-income countries. These rates are much higher than CAMH's (2020) estimated national prevalence of depression, which is 20% in the general population.

Unhoused individuals face numerous factors that contribute to poor mental health, including social isolation, insecurity, inadequate housing, lowered self-esteem, and material deprivation (Anombem et al., 2023; Garcia et al., 2024; Padgett, 2020).

Furthermore, they experience heightened vulnerability to mental health issues stemming from their exposure to hazardous environments that contribute to trauma, substance abuse, victimization, safety and security concerns, as well as poor access to healthcare services (Institute of Medicine, 1988; Richards & Kuhn, 2022). Consequently, their psychological distress and mental health needs disproportionately worsen (Institute of Medicine, 1988; Padgett, 2020; Richards & Kuhn, 2022; Thorndike et al., 2022).

The literature suggests that depression exacerbates, leads to, and results from homelessness (Padgett, 2020), indicating that the relationship between mental health and homelessness is likely bi-directional. Individuals with severe depression often experience functional impairment, productivity loss, financial hardship, and difficulty affording essential living expenses (Beck et al., 2011). Literature also indicates that improving the mental health of homeless individuals requires a multidimensional approach, encompassing adequate housing, employment, social integration, and mental health care (Ayano et al., 2012; Kiser & Hulton, 2018, Moledina, 2021). This underscores the critical need for health and social services, as well as effective housing policies aimed at preventing, diagnosing, and treating psychiatric diagnoses among unhoused populations. Assessing the effectiveness of these measures will advance the understanding of the long-term impact on homelessness and mental health.

Mental health and precarious renting: Households living in unaffordable and unstable housing often endure financial stressors, frequent moves, and evictions that are linked to elevated stress levels and depression (Bentley et al., 2011; Lee, 2011; Maqbool et al., 2015; Meltzer & Schwartz, 2016). Furthermore, studies indicate that

stress (Cheung & Wong, 2022), and residential instability, operationalized as frequent household moves (Baker et al., 2016), leads to mental health problems among precarious renters (Talmatzky, 2023). In addition, those who are precariously renting often reside in poor quality environments marked by overcrowding, housing deterioration and poor maintenance, noise, air pollution and hazards, and unsafe neighbourhoods (Pevalin et al., 2017; Rautio et al., 2018; Rollings et al., 2017; Suglia et al., 2011). These conditions contribute to and exacerbate mental health concerns in precarious renters (Mallett et al., 2011).

Similar to individuals who are unhoused, a cyclical relationship exists between precarious housing and health (Baker et al., 2014; Kirkbride, 2024; National health care for the homeless council, 2019). Depression can significantly hinder an individual's ability to function and sustain employment (Thielen et al., 2014), thereby further diminishing their capacity to afford essential living expenses such as food and housing (Guan, 2022). Although the link between housing insecurity, affordability, and depression or distress is established (Cline, 2021; Desmond & Kimbro, 2015; Fowler et al., 2015; Rolfe et al., 2020; Suglia et al., 2011), we have yet to uncover a study that compares mental health between those who are unaffordably and unstably housed and those who experience homelessness.

Human Rights and Canada's Approach to Housing

The right to adequate housing is recognized by 99% of nations globally through the United Nations' Universal Declaration of Human Rights (Government of Canada, 2013; Kinley & Chambers, 2006; The United Nations, 1948). Specifically, this

declaration refers to the right to adequate housing through security of tenure, affordability, accessibility, and suitability (Agrawal, 2021; Heffernan et al., 2015; Leckie, 2021). Despite this, housing unaffordability, inadequacy, and unsuitability remain a global problem (UN-Habitat, 2019; World Bank, 2021). Canada's affordable housing crisis, while not unique, serves as a notable example of the repercussions stemming from a global financialized approach to housing (August, 2022a) and highlights the disconnect between housing as a human right and housing as a commodity (August, 2022b).

When subsidized units are available, individuals who are deemed to have the most complex health and social needs - often those who are unhoused - are prioritized (Government of Canada, 2018; National Housing Council, 2023). This is appropriate under a triage model, as the most pressing needs for shelter are met. However, in systems where subsidized housing is scarce, it does little to address the housing needs of low-to-moderate income renters who rent in the private market but do so precariously. Households that experience instability are fundamentally denied their right to what the National Housing Council (2023) refers to as the housing-related principles of non-discrimination, inclusion, participation, and accountability.

The National Housing Council's (2023) housing-related principles indicate that all households who are precariously housed or experiencing homelessness are defined the basic human right to adequate housing. The first principle of non-discrimination refers to that all individuals have equal access to housing without facing discrimination based on characteristics such as race, color, national origin, religion, sex, familial status,

or disability. The principle of inclusion refers to creating communities that accommodate diverse populations, including marginalized or vulnerable groups. Participation refers to engaging individuals and communities in the decision-making processes related to housing policy. It ensures that those affected by housing issues have a voice in shaping policies and strategies. The final principle of accountability refers to the governments and organizations responsibility for implementing housing strategies effectively and transparently. It involves monitoring and evaluating the outcomes of housing policies to ensure they meet their objectives and address the needs of the population (National Housing Council, 2023) .

In Canada, the vast majority of publicly owned housing construction occurred in the aftermath of WWII in response to the increased need for housing related to population growth (Statistics Canada, 2018; Suttor, 2016). The 1960s is often referred to as the heyday of social housing in Canada as the capacity to offer subsidized accommodations through public housing stock grew (Suttor, 2014; 2016). Hence, for a period in the 20th century, Canada actively worked toward the establishment of a robust system of affordable housing. In the 1970s, the Federal government began to rely increasingly on the non-profit sector for subsidized housing provision and builds of government owned housing units dwindled (August, 2022a). The 1990s ushered in a period of recession-driven austerity in Canada and the Federal government began to devolve responsibility for various public services, including housing, to provincial governments (Bacher & John, 1993; Hulchanski, 2021). Housing scholars refer to this as devolution (August, 2022a; Suttor, 2016). Devolution eroded affordable housing

provision in Canada, as provinces and territories were not financially resourced to sustainably invest in affordable housing (August, 2022a; The Housing Policy and Research Exchange, 2021). This continued throughout the 1990s and into the 2000s, with some provinces, such as Ontario, choosing to pass the responsibility for housing further down to their municipalities, who were even less equipped to adequately fund housing (Canadian Centre for Housing Rights, 2022). This was not the case in New Brunswick, a less populated province with three large-to-mid-sized cities (Saint John, Fredericton, Moncton), a handful of smaller cities and larger towns, and a host of rural areas (Government of New Brunswick, n.d.a). Only recently have New Brunswick municipalities begun to realize their role in housing through the creation of municipal housing strategies. Despite these strategies, they are still limited in their capacity to address the need for affordable housing (Haley et al., 2024).

At present, Canada largely relies on the private market to provide housing (August, 2022a; Hulchanski, 2021). However, this approach seems to benefit the private market, as private landlords and developers receive subsidies and tax-breaks to create and offer housing (Canadian Centre for Housing Rights, 2023; Government of New Brunswick, 2023b). The privatization of housing, coupled with reduced government investment in public housing, and rising rents have severely impacted housing affordability and security for low- and middle-income renters in Canada (August, 2022; Government of New Brunswick, 2023b; Government of Canada, 2023d; CMHC, 2023; Morrissey, 2023). This situation is underscored by a critical shortage of subsidized housing units. Whitzman (2023) estimates that Canada urgently needs to add 4.4

million affordable homes to the current housing stock. As a result, many Canadians face escalating housing costs, deteriorating affordability, housing insecurity, and precarious living conditions (Canadian center for human rights, 2024; National housing council, 2023, Statistics Canada, 2021a).

The Canadian Mortgage and Housing Corporation (CMHC, 2018a) describes households as being unaffordably housed when their shelter costs exceed 30% of their gross household income (CMHC, 2018a). For renters, shelter costs include rent and utility payments (Statistics Canada, 2022b). Core housing need in Canada refers to “a household housing that falls below at least one of the adequacy, affordability or suitability standards and would have to spend 30% or more of its total before-tax income to pay the median rent of alternative local housing that is acceptable (meets all three housing standards”, (CMHC, 2022b, para.8). In 2021, approximately 10% (1.5 million) of households in Canada, and roughly 6% (21,000) of households in New Brunswick, experienced core housing need (Statistics Canada, 2021a). Another 20% (3.2 million) of households in Canada, and 12% (41,000) of households in New Brunswick, are housed in unaffordable accommodations (Statistics Canada, 2021a)⁴.

⁴ These figures are likely an underestimate of true need, as income in the most recent National Housing Survey is derived from 2020, wherein many households received the Canada Emergency Response Benefit (CERB) to offset income loss from COVID. This inflates the income of many of Canada’s lowest income earners, albeit only temporarily (Statistics Canada, 2022b), which would produce a momentary reduction in housing need.

In recognition of the current housing challenges, the federal government re-committed to their role in the provision of affordable housing through the introduction of the National Housing Strategy in 2017 (CMHC, 2018a). This strategy aims to remove 530,000 households from core housing need (CMHC, 2018b), with a focus on nine specific equity deserving groups. This is followed by the parliamentary passing of the 2019 National Housing Strategy Act, which recognizes housing as a fundamental human right and establish mechanisms to further Canada's housing policy (Government of Canada, 2019). Despite the introduction of this strategy, which largely exists to provide funding to provincial entities who oversee housing, unaffordability and homelessness continue to grow across the nation (CMHC, 2022a; The Housing Policy and Research Exchange, 2021). This raises a critical question about the federal government's commitment to upholding housing as a fundamental human right.

New Brunswick Context

All of Canada's provinces and territories, including New Brunswick, provide low-to-moderate income households with access to deeply affordable rent-geared-to-income housing through public housing and rent subsidies (National Housing Council, 2023; Social support NB, 2024). The processes for accessing public housing and rent subsidies vary slightly by jurisdiction; however, to access these, households are typically required to put forth an application for subsidized housing (Government of New Brunswick, 2024). Some households who are working directly with non-profit organizations and meet specific non-profit program criteria may be able to access rent subsidies through these organizations; however, this is not a widespread practice.

Across Canada, waitlists for subsidized housing are long and often include households experiencing homelessness and those who rent precariously (Statistics Canada, 2023; Social Supports NB, 2023). This is also the case in New Brunswick, where the length of the provincially administered subsidized housing wait has more than doubled in the past three years (Government of New Brunswick, 2023b; Pickrell, 2023; Woodhall-Melnik et al., 2022). The provincially administered subsidized housing waiting list in New Brunswick is used to allocate rent-geared-to-income (RGI) units in publicly owned housing. Further, it is used to allocate most available rent supplements provided through non-profit and private market landlords (Government of New Brunswick, 2023b).

New Brunswick is experiencing a housing crisis, characterized by rapidly increasing rents, and a lack of strong tenants' rights legislation, which leads to the expansion and infiltration of real-estate investment trusts (REITs) and other financialized landlords into the housing market⁵, renovations, and a rapid loss of once affordable housing units (Hayes, 2023). Like other provinces and territories across Canada (Suttor, 2016), New Brunswick, until recently, has had no meaningful investment in publicly subsidized housing since the 1980s, leaving existing government owned housing stock in poor repair (Zhu et al., 2021).

⁵ Financialized landlords are private for profit corporate firms that acquire properties as investment products (August, 2022). As described by Martine August (2022) "the growing dominance of financial actors in the housing sector, which is transforming the primary function of housing from a place to live into a financial asset and tool for investor profits" (p. 3).

Therefore, this study is important for assessing the specific health needs and characteristics of the two distinct populations on the waitlist for subsidized housing. By comparing these groups, this research fills a critical gap in the existing literature, providing valuable insights for future impact studies in both urban and rural contexts, and informing the development of targeted housing and social services' interventions.

Methods

Recruitment

This study uses baseline data from the NB Housing Study (Woodhall-Melnik et al., 2022), which is a longitudinal survey conducted in partnership with the Department of Social Development (DSD) in New Brunswick. In May 2021, DSD mailed a recruitment letter to each household (N = 4,750) on NB's subsidized housing list with an invitation for one member of each household to participate in the study. A reminder was sent in August 2021. The recruitment letter included study details, a link to a self-administered online survey, and contact information for the research team. Participants were encouraged to complete the survey online or over the phone with a research assistant. When participants requested mailed surveys, they were provided with return postage. In-person surveys were conducted at emergency shelters, or other services that are frequented by individuals who experience homelessness, in the province's three largest cities. The survey was conducted in both English and French.

A total of 505 waitlist members participated in the baseline survey. Each participant received a \$10 gift card as compensation for participation. Participants' names were also entered into an end of study draw for one of three \$500 Visa gift cards. As this study was longitudinal, email addresses, phone numbers, and addresses

were kept on file and to contact participants for control group surveys every 6 months for 18 months or until they received subsidized housing. Individuals who did receive subsidized housing were administered three intervention group surveys at 6, 12, and 18 months after they received subsidized housing. Intervention surveys will conclude in 2025.

Ethics Approval and Participant Consent

This study was approved by the Research Ethics Board (#2020-032) at REDACTED. Electronic (online surveys), verbal (telephone surveys) or written (in person and mail surveys) consent was obtained from all participants prior to participation. Each participant was assigned a unique study ID to maintain confidentiality.

Housing Status

Participants in the NB Housing Study were asked about their current housing situation (e.g., living in an emergency shelter, an apartment, etc.). They were also able to select “other” and enter their own description of their housing. We used the responses to this question to designate two groups: 1) those experiencing homelessness (*‘unhoused’*); and 2) those housed in market rentals, albeit unaffordably (*‘precarious renters’*). Those who were unhoused (n=72) included individuals who resided in emergency shelters, group or congregate living arrangements (e.g. boarding houses, single room occupancy arrangements), individuals who “couch surfed”, lived in

vehicles, and those who camped or slept outdoors. Precarious renters (n=248) included all other housing arrangements, regardless of rental unit type, as all individuals were housed through the private market. Applicants with different characteristics are often assigned different levels of urgency on subsidized housing waitlists in Canada. For example, individuals who are unhoused and those who are fleeing Intimate Partner Violence are often moved to the top of subsidized housing waitlists. As the NB Housing Study does not ask about recent experiences of Intimate Partner Violence, individuals who were unhoused were chosen for comparison with those who were precariously housed to assess the variations in mental health.

Outcome Variables

Depression was assessed using the Centre for Epidemiological Studies Depression Scale Short Form (CESD-10; Björgvinsson et al., 2013; Miller et al., 2008; Radloff, 1977). The survey assessed feelings of depression, sensitivity to everyday concerns, happiness, loneliness, fear, and sleep quality in the week preceding the survey using a 10-item scale to generate a score ranging from 0 to 30. Higher scores indicate a greater presence of depressive symptomatology. A score of 10 or higher indicates significant depressive symptomatology. An algorithm calculates the total score by adding up the values of the 10 questions.

Distress is assessed using the Kessler 6 (Kessler et al., 2002), which measures feelings over the 30 days preceding the survey date. This instrument assessed feelings of nervousness, hopelessness, restlessness or fidgetiness, depression, exertion in everyday tasks, and sense of worthlessness. Each of the six items on the K6 is rated on

a 5-point scale ranging from none of the time (value = 0) to all of the time (value = 4). The sum of the response values ranges from 0 to 24, with higher values indicative of greater symptomology. A K-6 score of 13+ indicates severe distress, scores between 8 and 12 are moderate, and scores between 0 and 7 represent low distress (Furukawa et al., 2003; Kessler et al., 2002). In the present study, both outcome measures were treated as continuous variables to demonstrate more detailed, rather than larger categorical, differences (Andresen et al., 2013; Mitchell & Beals, 2011; Umucu et al., 2022).

Explanatory Variables

Demographic and socioeconomic variables: All participants completed a researcher-designed survey that included the following sociodemographic variables: participant age (calculated using date of birth and the survey date), gender (female, male)⁶, education level (some high school or less, high school/GED, or higher education), employment status (employed, unemployed, retired or disabled), ethnicity (Indigenous, European, Caribbean, Latin, Central and South American, African, Asian, Oceanic). **Ethnicity** was grouped into White and Non-White, as the vast majority of individuals identified as being of European descent.

Income was measured continuously. Participants were asked to report their after tax, monthly, household income (Sareen et al., 2011; Smith et al., 2007; Thomson et al., 2022), which was multiplied by 12 to estimate an approximate annual income.

⁶ We allowed for other responses; however, only one participant identified as non-binary.

For the purposes of this study, income is defined as net annual household income, including all sources except the Canada Child Benefit, which was collected separately. Participants were also asked to report how many people, not including themselves, reside in their household. Individuals who reported living in shelters or congregate arrangements were assigned a household size of one. Reported incomes were adjusted for household size by dividing household income by the square root of the household size.

Social support: The Oslo Social Support Scale (OSS-3) scale consists of three questions designed to measure perceived social support. The instrument asks participants to report their perceptions of the social support they receive, their ability to access health from neighbours, and the concern and interest that others show in their lives. Responses to each of these items are summed to calculate a score that ranges from 3 to 14. Higher scores indicate higher levels of social support (Barton et al., 2018; Bøen et al., 2012; Kocalevent et al., 2018; Zeng & Wu, 2022).

Physical health status: This was measured using the EuroQol-visual analogue scale (EQ-VAS). The EQ-VAS is a visual analogue scale that provides a one-item ranking index, whereby the person ranks themselves on a 0-100 continuum of self-perceived health, with 0 indicating the worst health imaginable and 100 indicating the best possible health (EuroQol Research Foundation, 2018; Herdman et al., 2011)⁷.

Data Analysis

⁷ This visual analogue scale (EQ VAS) is similar to a thermometer, ranging from 0 (worst imaginable health state) to 100 (best imaginable health state).

Statistical analyses were performed using STATA/BE software (version 17.0). Descriptive and summary statistics were computed for baseline health, social, and economic characteristics. This was done for the entire study group and for the unhoused and precarious renter groups separately. To test for between-group differences, Pearson chi²-tests and means comparisons, using two-sample t-tests, were performed. T-tests were used to compare the means of continuous variables (i.e., age, physical health, depression, distress, income, and social support scores) between the two groups. Pearson chi²-tests were used to test for differences in nominal and ordinal level data (i.e., gender, ethnicity, education levels, and employment status).

Ordinary Least Squares (OLS) regression was used to estimate the associations between outcome scores and explanatory variables. Two separate regression models, one for the unhoused group and one for the precarious renter group, were applied to estimate the associations between the explanatory variables and outcome variables. Given the presence of non-constant variance, i.e., heteroskedasticity, robust standard errors with respective p-values were computed to better ensure unbiased standard errors (Atkinson et al., 2016; Hayes & Cai, 2007). All descriptive and inferential statistics were computed using a constant set of observations, whereby the sample size is less than the number of participants, due to missing observations.

Results

Participant Characteristics

The mean age of precarious renters was just under 57, whereas the mean for the unhoused group was considerably lower at 48 years. Most participants identified as female (precarious renters: 69%; unhoused: 61%) and identified as White (precarious

renters: 90%; unhoused: 83%). The percentage of those who were unemployed was about 10% higher in the unhoused group (precarious renters: 72%; unhoused: 82%). There was also an approximate 9% difference in high school completion between the two groups (precarious renters: 70%; unhoused: 79%).

As shown in table 2 below, the unhoused and precarious renter groups showed weak differences in ethnicity distribution ($\chi^2 = 2.73, p < .01$). However, there were no disparities between these groups in gender ($\chi^2 = 1.39, p > .05$), employment status ($\chi^2 = 2.91, p > .05$), or education level with high school completion or above ($\chi^2 = 2.25, p > .05$).

Table 2: Characteristics of Precarious Renters and Unhoused Individuals and Assessment of Significant Differences

	Precarious	Unhoused	P-value
Gender (n=320)			
Female	170	44	0.238
Male	78	28	
Employment status (n=320)			
Employed	41	7	0.235
Unemployed	179	59	
Retired or disabled	28	6	
Education level (n=320)			
some high school or less	74	15	0.133
high school or GED or higher	174	57	
Ethnicity (n=320)			
White	224	60	0.098
Non-White and Indigenous	24	12	
No. of observations	248	72	

***p<0.001 **p<0.01 * p<0.05

T-tests assessed statistical differences between the groups regarding continuous variables (see Table 3). Significant differences were found with respect to age, distress,

and income. That is, precarious renters were older (precarious renters: 57; unhoused group: 48; $t = 4.41, p < .001$), had lower average distress scores (precarious renters: 9.11; unhoused group: 11.25; $t = -2.53, p < .01$), and a higher mean income (precarious renters: \$13041; unhoused group: \$8983; $t = 5.53, p < .001$). Mean differences for the other variables were not statistically significant at conventional levels. Depressive symptoms were relatively high for both groups (precarious renters: 13.67; unhoused group: 14.74; $t = -1.05, p > .05$). The mean score of social support for precarious renters was 8.14, compared to 7.71 in the unhoused group ($t = 1.23, p > .05$). Scores for both groups were relatively low and indicated low to moderate social support. Likewise, on a scale of 0 to 100, the mean score of physical health status in precarious renters was 60.12 and 57.44 in the unhoused group; $t = 0.811, p > .05$. Both scores fell far below the mean score of 82 calculated for the general population (see EuroQol Research Foundation, 2018; Sayah et al., 2016).

Table 3: Differences in Age, and Distress, Social Support, Depression, and Physical Health Scores between Precarious Renters and Unhoused Individuals

Variable	Precarious Renters (SE)	Unhoused Individuals (SE)	Difference (SE)	95% CI	
				Lower	Upper
Age (years)	56.74(0.94)	47.98(1.73)	8.76(1.98) ***	4.84	12.67
Distress score (K6)	9.11(0.43)	11.25 (0.71)	-2.14(0.88)**	-3.99	-0.501
Social support	8.14(0.16)	7.71(0.32)	0.43(0.35)	-0.25	1.14
Depression score (CES-D)	13.67(0.49)	14.74(0.77)	-1.07(1.01)	-3.07	9.19
Physical health status	60.12(1.53)	57.44(3.09)	2.68(3.31)	-3.82	9.19
Income	13041(393.34)	8983 (511.94)	4058(781.77)***	2521	5593
No. of observations	248		72		

*** $p < 0.001$, ** $p < 0.01$ * $p < 0.05$

Regression Analysis

A separate regression model was used for each group (see Table 4 and 5). In each instance, regressions were run for both depression and distress. As noted above, the explanatory variables included the following: age, gender (female = reference), ethnicity (White = reference), education level (some high school education or less = reference), employment status (employed = reference), health status, social support, and income.

Predictors of Depression: The model explains 45% of the variability in depression scores in precarious renters, $F(9, 238) = 29.47, p < .001, R^2 = 0.45$. In contrast, the regression model for the unhoused group explained 33% of the variability in depression scores, $F(9, 62) = 6.50, p < .001, R^2 = 0.33$. Each additional score of physical health status was associated with decreased depression in both precarious renters ($b = -.15, p < .001$) and the unhoused group ($b = -.07, p < .05$). Further, each additional point in social support correlated with reduced depression in both precarious renters ($b = -.82, p < .001$) and the unhoused group ($b = -.89, p < .001$). Income, education, and ethnicity were not significant contributors to depression in either group.

Significant contributors to depression scores that varied between the two groups are age and unemployment. In the precarious renter group, increases in age were associated with decrease in depression scores ($b = -.11, p < .001$), and unemployment had a significant negative impact on depression scores ($b = 2.69, p < 0.05$). In contrast, age and unemployment did not contribute significantly to depression scores in the unhoused group.

Table 4: Predictors of Depression in Unhoused Individuals and Precarious Renters

	CES-D	95% CI	95% CI
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Variable	Precariou s	Unhouse d	Precarious		Unhoused	
			Lower	Upper	Lower	Upper
Age	-.11*** (.03)	-.01 (.04)	-.17	-.05	-.10	.09
Male	-.32 (.84)	-.67 (1.49)	-1.99	1.34	-3.66	2.31
Non-White or Indigenous Ethnicity	-1.62 (1.53)	-2.02 (1.98)	-4.64	1.39	-5.99	1.95
Graduate of high school or higher	1.32 (.93)	.83 (1.81)	-.51	3.15	-2.78	4.45
Unemployment	2.69* (1.21)	1.41 (2.1)	.32	5.06	-2.74	5.56
Retired/disabled	1.65 (1.56)	-.15 (2.72)	-1.44	4.74	-5.59	5.29
Physical health	-.15*** (.02)	-.07* (.02)	-.18	-.11	-.13	-.02
Social support	-.82*** (.16)	-.89*** (.25)	-1.13	-.509	-1.41	-.38
Income	-.05 (.07)	-.19 (.17)	-.21	.09	-.52	.15
Constant	33.21*** (2.09)	26.55*** (3.67)	29.08	37.35	19.22	33.89
Number of observations	248	72				
R-squared	0.45	0.33				

Notes: ***p<0.001 **p<0.01 * p<0.05. Robust standard errors in parentheses. Reference categories are as follows: female, White , some high school education (or less), employed.

Predictors of Distress: The model explains 33% of variation in distress scores in precarious renters, $F(9, 238)=18$, $p < .001$. $R^2=0.33$ and 25% of the variation in distress in the unhoused group, $F(9, 62) = 3.03$, $p < .001$. $R^2=0.25$. Social support was the only significant predictor of distress in both groups, as each additional score in social support correlated with reduced distress (precarious renters: $b = -.64$, $p < .001$; unhoused group: $b = -.77$, $p < .001$). In addition to employment, similar to the depression model, neither education nor ethnicity showed a significant connection with distress levels in either group

Three variables emerged as significant predictors of distress in the precariously housed group, but not in the unhoused group. Each additional point in physical health status was significantly associated with decreased distress in precarious renters ($b = -.11, p < .001$), as was each additional income point ($b = -.15, p < .05$). As with depression, a positive age-related effect was also observed specifically among precarious renters. An increase of one year in participant age was significantly associated with reduced distress ($b = -0.07, p < .05$) in precarious renters.

Table 5: Predictors of Distress Levels in Unhoused individuals and Precarious Renters

Variable	K6		95% CI		95% CI	
	Precarious	Unhoused	Precarious Renters		Unhoused	
			Lower	Upper	Lower	Upper
Age	-.07* (.03)	.01 (.04)	-.12	-.01	-.08	.11
Male	-.11 (.81)	-.86 (1.47)	-2.61	.58	-3.81	2.07
Non-White or Indigenous Ethnicity	-1.46 (1.76)	.37 (2.12)	-4.95	2.02	-3.87	4.61
Graduate of high school or higher	1.39 (.86)	-.86 (1.95)	-.31	3.09	-4.76	3.04
Unemployment	-.23 (1.03)	-1.85 (1.68)	-2.26	1.81	-5.21	1.51
Retired/disabled	-.13 (1.48)	-1.09 (2.75)	-3.06	2.79	-5.95	3.77
Physical health	-.11*** (.02)	-.05 (.03)	-.13	-.06	-.11	.02
Social support	-.64*** (.15)	-.77*** (.27)	-.94	-.32	-1.31	-.24
Income	-.15* (.06)	-.16 (.17)	-.27	-.01	-.49	.17
Constant	25.71*** (1.97)	23.27*** (4.02)	21.83	29.58	15.23	31.32
Number of observations	248	72				
R-squared	0.33	0.25				

Notes: ***p<0.001 **p<0.01 * p<0.05. Robust standard errors in parentheses. Reference categories are as follows: female, White , some high school education (or less), employed.

Discussion

This study highlights the shared experience of poor mental health among unhoused individuals and precariously housed renters, which indicates a need to improve access to affordable and adequate housing, alongside other interventions to improve general mental health and wellbeing. Ultimately, the results indicate that both unhoused applicants and precarious renters on the waitlist for subsidized housing in New Brunswick experience moderate to high levels of depression and psychological

distress. Although the precarious renter group is housed, they experienced challenges with health, social support, health, income, housing instability, and unemployment. The unhoused group experienced significantly higher levels of distress than the precariously housed group; however, there were no statistically significant differences in depression scores between the two groups. Nonetheless, the mean scores indicate moderately high levels of distress in both groups. Depressive symptoms are high in severity and, although they are higher in the unhoused group, no statistically significant differences exist between the two groups. Studies confirm that poor mental health directly exacerbates poverty (Anakwenze, 2013; Ridley, 2020). Conversely, financial strain, chronic stress, and a sense of insecurity are closely linked to elevated depressive and distress symptomology (Bentley et al., 2011; Dotsikas et al., 2023; Mason et al., 2013).

In the present study, income is significantly associated with distress among precarious renters, but this association is not seen in the unhoused group. Unhoused individuals often face multiple morbidities (e.g. poor physical and mental health and substance use) that may contribute to distress more than income and employment (Giano et al., 2020; Greenberg & Rosenheck, 2010; Zuvekas & Hill, 2000). Indeed, in Moncton, New Brunswick, a study on implementation of a peer-supported housing program found similar issues among the unhoused population (Yamin et al., 2014). Herein, researchers find that individuals who are not ready for change and had substance use concerns have poorer mental and physical health.

These R² values indicate that the models predicting distress and depression fit better in the precariously housed group than in the unhoused group. Variability in precarious renters is largely explained by variation in physical health, income, employment and age. The effect of physical health on depression was larger and more significant among precarious renters than in the unhoused group. Conversely, the effects of income, employment, and age were diminished among the unhoused group. This indicates that there are other factors that may better explain depression and distress in the unhoused group. The literature indicates that factors which contribute to poor mental health in unhoused individuals include exposure to potentially hazardous environments, trauma and victimization, and substance abuse disorder could contribute to poor mental health (Folsom, 2005; Heerde & Bailey, 2023). These factors were not captured in the present study but could be more important to the mental health experiences of unhoused individuals.

The study participants are extremely low-income, regardless of housing status. The median household income (after-tax) of precarious renters (\$11,750) and unhoused households (\$7,272) is significantly lower than that of renters in New Brunswick (\$37,000; Canadian Housing Survey, 2021). Further, both groups' median incomes were significantly lower than the Market Basket Measure (after-tax) for poverty in New Brunswick in 2022, which was \$22,404 or less for a single person, \$31,684 or less for a lone parent with one child, or \$44,802 for a couple with two children (Driscoll, 2022).

In addition to income, age is the only other factor that differs significantly between the two groups. In the present sample, unhoused individuals have a younger mean age than those who are precariously housed. Lower-income and younger age may partially account for the higher distress and depression scores relative to those reported by the precariously housed. The protective effect of age among precarious renters could be explained by financial, social, and structural support from services and programs for older adults and/or family members (Government of New Brunswick, 2023b; Statistics Canada, 2022b; Park, 2009). Another possible explanation could be that younger individuals are more likely than their older counterparts to use substances (Esmaeelzadeh et al., 2018) and experience higher rates intimate partner violence (Exner-Cortens, 2023). Both substance use (Quello et al., 2005) and intimate partner violence (Lövestad, et al., 2017) are associated with depression and distress. These factors were not considered in the present study and should be included in future research.

In this study, social support emerges as a protective factor against distress and depression in both groups, although a notably larger effect is observed in the unhoused group compared to precarious renters. These findings highlight the potential role of a supportive network in mitigating the adverse effects of stress, instability, insecurity, and social isolation experienced by individuals facing homelessness (Hwang et al., 2009). Being unhoused and precariously housed is traumatic (Ayano et al., 2021; Bentley et al., 2019). The presence of social support is consistently found to buffer the impacts of trauma on mental health (Bøen et al., 2012; Sippel, et al., 2015). Individuals

with higher levels of social support often receive emotional and instrumental assistance, which is found to improve mental health and wellbeing (Bassuk et al., 2002; Henly et al., 2005). Further, social support protects individuals from social isolation, which is also detrimental to mental health (Ozbay et al., 2007; Harandi et al., 2017). Levels of social support are moderate to low in both groups in the present study, which indicates that programs and interventions to increase social support in subsidized housing applicants, regardless of housing status, may reduce depression and distress.

The results of the present study are in agreement with findings from previous studies on mental health in individuals who are unhoused (Duke & Searby, 2019; McIntosh, 2023; Spence et al., 2004) and precariously housed (Bentley, 2011; Desmond & Kimbro, 2015; Mason et al., 2013; Rolfe et al., 2020). Both groups' experiences of poor mental health likely result from multifaceted factors associated with material and social deprivation, such as low income, poor physical health status, social isolation, and unstable and unaffordable housing (Cline, 2021; Desmond & Kimbro, 2015; Fowler et al., 2015; Rolfe et al., 2020; Suglia et al., 2011). Poor health might stem from limited housing security, inadequate housing, and restricted access to essential services and food (Jones, 2023; Krieger & Higgins, 2002). For unhoused individuals residing in emergency shelters, exposure to potentially hazardous environments, social isolation, and increased emotional stress could contribute to poor mental health (Aubry et al., 2014; 2016).

The study's findings align with conceptual frameworks that present housing as a determinant of health (Kinser & Lyon, 2014; Singh et al., 2019; Solar & Irwin, 2010; Rolf

et al., 2020). The psychological implications of low-income, unemployment, insecure housing, inherent worries about paying rent and utilities, and fear of eviction can elevate stress and vulnerability to distress and symptoms of anxiety and depression (Chamberlain & Johnson, 2013; Stonehouse et al., 2021; Woodhall-Melnik et al., 2018).

In both groups, material deprivation and poor living conditions could also be contributing factors to increased psychological distress and impaired physical health status (Eurofound, 2023; Newton et al., 2022). Adults burdened by housing costs are more susceptible to cardiovascular diseases, hypertension, and depression when compared to those living in stable and affordable homes (Bowen & Mitchell, 2016; Leventhal & Newman, 2010; Newman & Holupka, 2014). In contrast, having more discretionary income enables individuals to access more health services, afford nutritious food, and secure improved housing, all of which are essential for maintaining good health (Marmot, 2002).

Housing insecurity is inextricably linked to crowding, poor housing quality, and frequent moves, leading to negative consequences for food security (Kushel et al., 2006), access to medical care (Meltzer & Schwartz, 2016), injuries (Delgado et al., 2002; Hock et al., 2023); and physical health issues such as elevated blood pressure (Evans et al., 2006) and asthma (Gabby et al., 2024). Additionally, housing insecurity emerges as a significant precursor to homelessness, particularly impacting low-income households and heightening their vulnerability to housing loss and poor health (Blanch, 2023; Hock et al., 2023). The threat of eviction impacts chronic diseases and contributes to higher all-cause mortality rates associated with serious medical conditions such as depression,

cardiovascular disease, and suicidal attempts (Hock & Boen, 2021; Vásquez-Vera et al., 2017).

Unobserved poor housing conditions such as mold, dampness, and inadequate ventilation and sanitation facilities, in part, could explain the reported poor physical health. Environmental hazards are particularly prevalent in precarious rental situations, where individuals often reside in overcrowded, deteriorating housing with poor maintenance, leading to increased exposure to air pollutants and various hazards (Pevalin et al., 2017; Rautio et al., 2018; Rollings et al., 2017; Suglia et al., 2011). These environmental factors can exacerbate respiratory conditions such as asthma and elevate the risk of respiratory infections (Jaakkola et al., 2010; Krieger & Higgins, 2002; Wimalasena et al., 2021). Poor housing quality has also been linked to the development of chronic diseases, injuries, disabilities, and increased morbidity rates independent of other measures of deprivation (Gielen et al., 2015; Krieger & Higgins, 2002; Neghab et al., 2006; WHO Housing and Health Guidelines, 2018).

Application to Housing Policy & Practice

The findings display that both precarious renters and unhoused individuals experience poor mental health, and social and economic precarity, which, from a social determinants of health perspective, may be improved through access to affordable and adequate housing (Kottke et al., 2022; Maqbool et al., 2015; Mason et al., 2013). Poor mental health in both unhoused and precariously housed renters who wait on New Brunswick's subsidized housing waitlist is indicative of a broader problem in Federal and Provincial approaches to affordable housing. These approaches largely rely on the

private sector to meet the human right to housing (Findeisen, 2022; National Housing Council, 2023; Suttor, 2016).

Improving rental housing affordability may decrease financial burdens on low-income families, freeing up resources for adequate diet, healthcare, and health-promoting goods, services, and lifestyles (Kirkpatrick & Tarasuk, 2011; Maqbool et al., 2015; Seo & Park, 2021). Furthermore, access to stable and affordable housing could promote better mental and physical health outcomes by reducing stress related to financial burdens, frequent relocations, and housing insecurity (Barrett, 2022; Chen et al., 2022; Chung et al., 2020; Hock et al., 2023; Maqbool et al., 2015). Reducing health disparities is also contingent upon access to adequate housing and high quality neighbourhoods that provide access to socioeconomic opportunities (Maqbool et al., 2015; Thomson et al., 2013).

Individuals who experience homelessness are often prioritized on subsidized housing waitlists for quicker access to subsidized housing in jurisdictions across Canada. The present authors refer to this as a triaged approach to housing affordability. This is a logical, harm reduction-based approach to administering subsidized housing. However, with waitlists growing across Canada (Government of New Brunswick, 2023b; Magee, 2022; Mudge, 2021), the needs of precariously housed households cannot be met without extremely lengthy waits (Government of New Brunswick, 2023b; Magee, 2022; Mudge, 2021). The poor mental health in both precarious renters and those without housing indicates a need to increase access to deeply affordable housing in order to meet the needs of more individuals and households who are living precariously.

The present study indicates that there are real consequences to government disengagement in housing. In a system of scarcity which has been ignored and underfunded for years, the needs of all rightsholders who deserve access to subsidized housing cannot be met (Ontario Human Rights Commission, 2008; Hulchanski, 2021) and a triaged approach to subsidized housing is applied. The provision of affordable and adequate housing for those who experience significant material deprivation, among other concerns, is critical to ensure housing adequacy and stability (Lerman & Reeder, 1987; Rachel, 2002). Critical housing scholars argue that the only way to meet the needs of all households for affordable housing is engage in large scale systems change that prioritizes public engagement in subsidized and affordable housing (Madden & Marcuse, 2016), which align with the notion that housing is a human right (Chapman, 2019). Further, mass expansion in publicly owned and operated housing and government funded non-profit and cooperative housing may serve as an intervention to reduce the reliance on triaging populations on housing waitlists, who in New Brunswick, as demonstrated in our current study, experience moderate to high rates of distress and depression. These findings align with studies of other jurisdictions that examine mental health in unhoused individuals and precarious renters separately and indicate that both groups survive in a continuous cycle of instability (Nilsson et al., 2019; Stonehouse et al., 2021), which is strongly associated with poor mental health (Baker et al., 2016, 2017). These poor outcomes across both groups indicates a need to act employ rights-based approaches to housing through the creation of policies and practices that promote access to subsidized housing for all who qualify.

As one of the few investigations of those waiting for subsidized housing in Canada, this paper speaks to a need to reconsider public housing investment and policies to better address the needs of all who qualify for housing support. Despite the Federal government's reinvestment in housing through the National Housing Strategy, housing precarity continues to worsen (National Housing Council, 2023), which indicates a need for new policies that provide access to housing for those in need.

Finally, the results of this study indicate a need for healthcare for individuals who experience housing precarity and homelessness. For example, the elevated prevalence of depression and psychological distress in those who wait for subsidized housing demonstrates a need to provide accessible mental healthcare resources such as screening programs, low-barrier access to psychiatric support, and accessible publicly funded talk therapy. This could be offered through the co-location of housing and mental health services or through outreach programming that specifically assesses and plans to meet the needs of households when they register for the subsidized housing waitlist.

Limitations

This study has several limitations. The cross-sectional design of this study does not allow us to draw causal inferences among the variables. Likewise, the study did not capture length of homelessness or readiness for change. Future studies of unhoused populations may consider these factors when measuring distress and depression. Future analyses from the NB Housing Study will work with longitudinal data that will make causal relationships more apparent. Future research should include measures to

assess exposure to intimate partner violence and elicit substance use. Further, this study was designed to investigate the experiences of those waiting for access to subsidized housing and was not specifically designed to assess the needs of individuals who experience homelessness. Hence, the measures applied within the study may better capture experiences of housing precarity than experiences of homelessness. As all individuals on the housing waitlist were provided the opportunity to participate in the study and the response rate was approximately 11%. The choice to self-select into the research study could have produced self-selection bias, which could have produced a sample that did not necessarily represent a random cross-section of the population of interest and may not be generalizable. Applying propensity score matching could reduce this bias and improve the groups across relevant characteristics (Antonakos & Colabianchi, 2018; Leech, 2012; Newman & Holupka, 2017). Nevertheless, the data represent an informative sample of individuals on the waitlist and present interesting insights into the characteristics of people waiting for subsidized housing in New Brunswick, Canada.

Conclusion

The findings of this study indicate that rates of depression and distress are moderate to severe in individuals who rent precariously and those who are unhoused. Further, they demonstrate significant levels of social and economic vulnerability in study participants, which may be improved by quicker access to deeply affordably, rent-geared-to-income housing. Hence, there is a need for fundamental changes in how we address housing need. Current approaches to the provision of affordable housing in Canada are ineffective in quickly meeting the needs of all individuals who

qualify for access to rent-g geared-to-income accommodations. Madden and Marcuse (2016) eloquently describe this in their book *In Defense of Housing*:

The goal of universal housing, then, is not some sectarian fantasy. It is in fact widely held. Nearly all political actors and parties claim to support some version of it. But there is a contradiction between the end of housing for all and the means that are supposed to accomplish it: market systems and capitalist states. Ideological visions about benevolent government policy or efficient markets hide this essential conflict (p.127).

To improve mental and physical health in this population, mechanisms to provide faster access to housing for all those in need are critical. New systems that promote access to public housing as an affordable, accessible, and large component of housing options, rather than as a transitional step toward the acquisition or renting of private property, may prove successful in improving these goals. Vienna exemplifies effective strategies despite differing social welfare systems, funding mechanisms, and housing policies, as 25% of their housing stock is publicly owned (Pelleteret, 2020). To achieve this success, Canada needs a fundamental shift in how housing is perceived and used (e.g. as a social good and right rather than as a vehicle for wealth generation). This shift can begin with significant government involvement in public housing construction and the implementation of targeted strategies to increase housing supply and preserve existing affordable rental housing.

The findings of this study indicate that it may be useful to integrate services and interventions to foster employment and ensure income stability into public housing.

Social support also appeared to operate as a protective factor in the precarious renter and unhoused groups. Hence, programs and interventions to increase social support in individuals who wait for access to subsidized housing should be explored, alongside accessible supports for mental health. The outcomes of this research carry significant implications for national housing policy, particularly when viewed through a human rights lens. They emphasize the importance of examining the health status of precarious renters and unhoused individuals who wait for subsidized housing and indicate a need for systems that provide both groups with quick access to housing.

Addressing the complex mechanisms underlying poor housing status among vulnerable populations requires a multidisciplinary approach to research and housing and social services (Lawrence, 2004, 2006, 2017). For example, addiction, is a multidimensional issue involving social exclusion, isolation, poor mental health, unemployment, housing instability, and poverty - interrelated risk factors and determinants that are inseparable. Examining factors such as the duration of housing instability and pathways to homelessness or housing precarity can provide important insights into the unique health and socioeconomic challenges these households face. These insights can then inform the housing policy development and the creation of tailored healthcare and support services specifically designed to meet the distinct needs of unstably and unhoused households. Future research should focus on the development of sustainable and comprehensive approaches to offering subsidized housing and should explore options for improving housing policies and approaches to waitlist management.

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CHAPTER SIX: Synthesis & Conclusion

This concluding section synthesizes the findings of the four papers and reinforces the contribution of these papers to understandings of the SDOH. An overview of the findings themselves are available in Appendix A. The contribution of these papers to the field of housing studies is discussed and the use of NB Housing Study data for future work that fills the gaps identified in understandings of the impacts of publicly subsidized housing on mental health and wellbeing are described. This dissertation closes with a call for further direct government intervention in the provision of deeply affordable housing to improve health equity and deliver on the human right to adequate and affordable housing for all.

The findings presented in the literature review articles in this dissertation indicate a need for a better understanding of the contributions of subsidized housing within a SDOH framework. As noted earlier in this dissertation, publicly subsidized housing is the only widespread public program that exists to provide access to deeply affordable housing (e.g. housing that costs less than 30% of gross household income) for low-to-moderate renters in Canada. When affordable housing is offered through non-profit organizations and private market landlords, it is often provided using a publicly funded rent supplement and is accessed through specialized programs or through the subsidized housing waitlist (Government of New Brunswick, 2023b). Given the reliance on the government on subsidized housing to provide affordable housing and the paucity of studies that exist to specifically investigate the impacts of subsidized

housing on recipients, it is critical that better understandings of subsidized housing are sought.

The literature review on mental health outcomes (Dweik & Woodhall Melink, 2022) finds a need to better understand associations between moving into subsidized housing and mental health. The third paper in this dissertation (Woodhall-Melnik et al., 2022) presents a study protocol that, when fully executed, may collect data that are useful for filling this gap. However, as we wait for these data to be collected in full, the analyses in the fourth paper in this dissertation reinforce that unstable and unaffordable housing is associated with depression and distress in both precarious renters and unhoused individuals who move between transitional and temporary accommodations and homelessness. This research highlights the exacerbating effect of the housing unaffordability on housing instability, economic disparities, and health inequalities, particularly within the rental sector. This insight deepens our comprehension of how the decline in housing affordability may contribute to a population-wide decline in mental health.

The final paper in this dissertation finds that depression and distress are prevalent in individuals in New Brunswick who are waiting for subsidized housing. This finding was not dependent on housing status. In other words, whether unhoused or precariously housed, individuals on the subsidized housing waitlist experienced poor mental health. However, the research finds that there are some factors that are associated with decreased distress and depression, which include increased social support, physical health status, age and employment in precarious renters. These

factors collectively account for a significant portion of the variability in depression and distress scores; however, further research is needed to establish whether these are characteristics of individuals with better mental health or if they are factors that contribute to better mental health.

Knowledge Gaps and Limitations

The articles presented in this dissertation uncover some significant gaps in knowledge and limitations in previous study designs, which suggests that our understanding of subsidized housing as a physical health and mental health promoting intervention is limited. This is demonstrated through the findings of both systematic reviews, wherein it is evident that the current evidence base is inconclusive on the extent to which there is correlation, let alone causation. Hence, the construction of social policies to provide publicly subsidized access to affordable housing is reliant on a very small body of evidence. There is a need for more rigorous studies to gain a better understanding of the conditions needed for housing affordability policies and programmes to positively contribute to health.

A notable impediment to asserting a definitive positive impact of current housing interventions on physical or mental health outcomes is the marked diversity inherent in the conceptualizations of subsidized housing, affordability, and health across various studies. Further, variability in the characteristics of groups studied, as well as the other potential contributing factors that often vary (e.g. the quality of housing and neighbourhoods, the existence of rent control and other tenancy stabilization mechanisms, and housing stability), limit our ability to draw definitive conclusions about

the relationship between subsidized housing and health. Addressing this diversity is imperative to arrive at a coherent understanding of the relationship between housing interventions and health outcomes.

The conceptualization of financial stress and housing affordability across research studies makes it difficult to arrive at decisive conclusions on the relationship between subsidized housing and health. Affordability measures should account for family size and regional living costs to capture geographic variations in residual income needed for essential goods and services (e.g., food, healthcare, education, and clothing; Affordable Housing Commission, 2019; Meen, 2018; Padley et al., 2018; Sliogeris et al., 2008). This would provide a better understanding of whether individuals who are in subsidized housing have enough income remaining after the rent, even when rent is limited to 30% of their income, to access health promoting basic needs and resources. For example, a single individual in New Brunswick who accesses Social Assistance for income has \$637 a month on which to live (Government of New Brunswick, 2023c). This individual would be required to spend approximately \$191 of their total pay on subsidized housing, which leaves them with \$446 per month for other expenses such as food, clothing, transportation, and access to other health expenses (e.g. therapy, eye care, etc.) that are not covered by provincial Medicare. In 2023, this is not a lot of money to acquire these other basic needs. Subsidized housing might release resources for health-promoting expenses, but enhanced housing affordability alone may not suffice significant improvements in health outcomes.

Consensus on the contributions of subsidized housing to mental health are also limited by the diversity of measures used to assess mental health. Existing research employs a variety of validated scales to measure mental health outcomes. However, these scales vary in their conceptualizations and operationalizations of anxiety and depression, which makes it difficult to draw decisive conclusions. Mental health measurement requires a comprehensive approach that captures psychological health, quality of life, and emotional, psychological, and social well-being (Alegría et al., 2018). The scales (e.g., Anxiety Symptom Scale, Difficulties Questionnaire Symptom score, the five-item version of the Mental Health Index, the Patient Health Questionnaire) used to assess the contributions of subsidized housing on mental health are limited in their capacity to comprehensively assess social and community functioning, particularly within specific populations, such as individuals with disabilities. This limitation suggests that mental health assessments within subsidized housing may not fully capture the complex interplay between housing conditions and social and community well-being for vulnerable groups with specific needs. Consequently, these assessments might overlook crucial factors, such as substance use, that may not be met by the creation of interventions for enhancing the overall well-being of those who wait for subsidized housing.

Other factors, such as housing overcrowding, substandard housing, residence in neighborhoods that are perceived as unsafe, and frequent residential moves, are recognized for their significant impact on mental health and well-being (Baker et al., 2016; Evans et al., 2022; Jones-Rounds, 2014). However, whether access to affordable

housing can alleviate depression and distress in settings that are poorly maintained, unstable, or situated in neighborhoods with these challenges remains an unanswered question which will be addressed through the larger NB Housing Study once the intervention data collection concludes.

Policy and Program Recommendations

This dissertation underscores the imperative of finding housing solutions for everyone on the waitlist while also emphasizing the need to enhance their health status. Although Canada recognizes the right to affordable and adequate housing on paper, the length of public housing waitlists across Canada is evident of a system that cannot provide housing for all in a timely fashion. For instance, in Toronto, nearly 60 percent (4,431 individuals) had been waiting for housing for two or more years, while those in the top 10% on the waitlist had been waiting for 4.5 years or longer (Sirotych et al., 2018). A lack of subsidized housing to meet actual demand results in the use of a triaged approach to the waitlist, wherein individuals who experience the worst housing conditions and vulnerabilities (e.g., those who are unhoused and those who need to escape a violent household) are prioritized (Government of Canada, 2018a; Government of Canada, 2023).

This system is indicative of a residual approach to social welfare (see Hick & Stokes, 2017: p.1-16), wherein the most emergent needs are met, but the needs of all are not. Growth in publicly subsidized waitlists, without growth in the capacity to provide this housing, results in ongoing strain related to material deprivation and

housing unaffordability for those who wait for far too long to access the right to affordable housing. The findings of the fourth article in this dissertation indicate that individuals in New Brunswick who wait for public housing, regardless of housing status, experience poor mental health. Raphael et al. (2008) argue that housing policies across Canada fail to recognize that housing is an important determinant of health.

Findings from this dissertation reinforce that unstable and unaffordable housing is associated with depression and distress in both precarious renters and unhoused individuals. The findings highlight the negative impacts of housing precarity in the private rental market, which include various health and economic inequalities, particularly in the rental sector. In addition to demonstrating a need for greater access to subsidized housing, this dissertation displays the extent of poverty and unemployment among those on the waitlist. This indicates that there is unmet need for comprehensive social programming that reduces vulnerability and addresses economic precarity as people wait for subsidized housing. The government may consider providing direct cash transfers to households on the subsidized housing waitlist while they wait for access to housing. An example of these types of programs is the Rent Assistance program in Australia (Australian Government, 2023), wherein individuals who rent and meet the criteria for access to other forms of cash assistance are automatically considered for access to monthly cash support through the Rent Assistance program. However, according to Levitan-Reid et al. (2023), the current Canada-Provincial Housing Benefits, which attempt to provide this type of rent assistance support, fall short of producing real affordability for households. These

benefits or transfers could alleviate economic strain while simultaneously serving as an extrinsic motivator for the provincial government to prioritize the rapid provision of housing to all those who qualify; however, they need to contribute more financial support to households than is presently available.

Further, the prevalence of depression and distress in individuals on the waitlist highlights the importance of providing low-barrier and free access to therapy for individuals who wait for housing. These programs exist in other countries. For example, mental health programming is offered free of charge for individuals at risk of and experiencing homelessness in Australia and is clearly listed as available through Lifeline and Headspace on their Service Australia website (Australian Government, 2023). Mental health supports can be paired with programs that allow for optional access to other healthcare services, educational programming, and workforce placement opportunities. In New Brunswick, this could be done through partnerships with existing non-profit agencies such as the Saint John Learning Exchange (see: www.sjle.org) who provide access to education and skills-based training program, and Jobs Unlimited who provide assistance with access to employment for individuals with intellectual disabilities (see: <https://jobsunlimitednb.ca/>). These agencies are just two of many that provide access to these types of services who, with funding and resources, may be able to expand or augment their mandates to meet the needs of individuals who are on the subsidized housing waitlist.

Publicly subsidized housing options are limited in their availability and ability to meet the actual need that exists in almost all jurisdictions in Canada. To date, strategies

to improve housing affordability across Canada typically focus on bolstering private rental market supply through subsidies, tax breaks, and private market incentives (National Housing Council, 2023). However, private market rentals continue to fail to provide affordable housing options for low-to-moderate-income households (National Housing Council, 2023). Madden and Marcuse (2016) are critical of incentives and subsidies that engage the private sector in solutions for housing affordability. They argue that the only way to truly provide affordable housing for all is to make substantial investments in a robust public housing system.

Madden and Marcuse (2016) envision a successful housing policy and system that emphasizes the right to housing and universal access to a home as a place of dignity, regardless of an individual's economic or social status. Systems for ensuring the right to housing for all need to address escalating wealth and income disparities, while emphasizing equitable access to suitable, affordable, and safe housing. Achieving these objectives calls for increased production in the social and non-market sectors, and efforts to combat housing financialization and commodification. Therefore, a structured approach to implementation, ongoing monitoring, evaluation, and accountability processes is imperative (p. 196–197).

If access to affordable housing, which costs no more than 30% of gross household income, is available for all, issues related to income inequality as a determinant of health will persist. In article four of this dissertation, the median income of those waiting for subsidized housing was substantially below the median New Brunswick income. The median annual income (after-tax) among precarious

renters was \$14,400, while for the unhoused group, it stood at \$7,500. These figures are notably lower than New Brunswick's overall median household income of \$62,000 (after tax; Canadian Housing Survey, 2021). The most recently available data from the 2021 Canadian Housing Survey indicates that New Brunswick's homeowners have much higher reported after-tax median incomes (\$95,000) renters (\$41,000). Despite these existing, glaring discrepancies in median incomes, the median income for renters in general is much higher than the median income of applicants for subsidized housing in New Brunswick. The low median income and high rate of unemployment that are found in the fourth article in this dissertation indicate that applicants for subsidized housing will likely continue to experience severe material deprivation regardless of whether they receive subsidized housing. In line with the findings of my research, along with those of prominent scholars of the SDOH who argue that relative income inequality is a significant threat to population health (Raphael, 1999; 2020), I argue for the need to adopt policies and programs such as guaranteed income, living wage as minimum wage, and increasing allowances through Social Assistance, to improve mental health and wellbeing.

The results of my dissertation substantiate the hypothesis that individuals who wait for access to subsidized housing in New Brunswick have a high prevalence of depression and distress. However, these findings do not provide the evidence on the relationship between subsidized housing and health that my literature reviews indicate is lacking. The final section of this conclusion discusses the need to use longitudinal, quasi-experimental designs, such as the one described in the protocol paper, to better

understand the impacts of subsidized housing on health. As subsidized housing stock continues to age and is often located in neighbourhoods with high levels of poverty (Freedman et al., 2015; August, 2016), it may actually lead to worsened mental and physical health or may not result in changes in health status at all. If there is no effect of subsidized housing on health, additional work will be needed to indicate why this is the case so that systems and supports can be changed to better assist individuals who experience poor physical and mental health and live in subsidized housing.

Implications for Research and Evaluation

To deepen understandings of the relationships between publicly subsidized housing and mental or physical health, future studies should test for causal relationships, use diverse sets of outcomes, and conduct studies that compare health outcomes in multiple jurisdictions.

Examining the longitudinal relationship between various social determinants, health behaviours, and structural and contextual factors (e.g., the housing policy environment, subsidized housing programs, social cohesion, standard of living, perceived safety, affordability, etc.) and symptoms of depression and distress is crucial to understanding how these factors interact to impact mental health. Similarly, investigating whether improved housing affordability is linked to other health promoting factors such as good employment, educational attainment, and food security. A study conducted with individuals who experienced homelessness who are subsequently rehoused through Housing First programs find that, despite the provision of subsidized housing, barriers to employment persist (Poremski et al., 2016).

Conversely, Kirkpatrick and Tarasuk (2003) find that food insecurity proliferates in low-income populations with rent and mortgage payments, which may indicate that reduced housing payments due to access to subsidized housing may improve food security. However, to date, studies that examine the impact of subsidized housing on factors such as food security, employment in housed individuals who receive access to subsidized housing in Canada have yet to be published.

In the coming years, manuscripts that highlight findings of the impacts of subsidized housing on other health promoting factors should emerge through analyses of the data collected through the New Brunswick Housing Study, which uses a pre-post longitudinal design to assess the impact of moving into publicly subsidized housing on mental and physical health, as well as healthcare utilization among participants (see Woodhall-Melnik et al., 2022). In addition to the main health outcomes, this study controls for a variety of other factors, such as employment, income and food security, which should be useful for the development of literature on the implications of subsidized housing on individuals in New Brunswick.

Further, I intend to extend the work done for this dissertation by using subsequent waves of the New Brunswick Housing Study data, as they become available, to longitudinally measure the impact of subsidized housing on the mental health of the subgroups of individuals who were unhoused and precariously housed as they receive access to and live in subsidized housing. This research will contribute to the literature on subsidized housing and housing affordability and health by filling the

knowledge gap identified in both review articles presented and published for my article-based dissertation. It is my hope that these findings can be used to inform an updated National Housing Strategy which would prioritize access to affordable, suitable, and adequate housing for all those in need.

At present, the provincial government in New Brunswick—alongside other provincial and territorial governments in Canada—is not meeting the UN mandated human right to housing (United Nations, 1948). This is evidenced by the length of New Brunswick’s housing waitlist and is further problematized by the poor physical and mental health of subsidized housing applicants in the province. To improve the health and wellbeing of low-income groups, it is critical that scholars, activists and those working in public service continue to champion the right to affordable and adequate housing for all. Presently, housing as a fundamental human right is undermined by neoliberal policies, which favour private sector investments and lead to housing financialization which further undercuts the human right to housing (August, 2021; 2022). The private sector has demonstrated over the past 30 years that it is incapable of or unwilling to meet the needs of low-income households for adequate, stable, and affordable housing. Canada requires a housing system that upholds every citizen's right to affordable and adequate housing.

This dissertation highlights the challenges and poor health status of individuals who are waiting for subsidized housing. Further, it questions what we know about subsidized housing to date, finding that research on improvements to health in

individuals who receive public housing are not well-understood or documented. Yet, in absence of a private market solution that can improve housing affordability and health, the subsidized housing system requires further exploration so it can be utilized or reimagined to meet housing need. The highlighted challenges and needs of the waitlist in New Brunswick presented in my dissertation indicate a need for immediate action to improve access to subsidized housing for all who qualify, while simultaneously finding a need for comprehensive and universal mental health services. My ongoing academic pursuits will focus on investigating the impact of emerging housing developments on residents' income, employment, health status and outcomes, and healthcare. It is my hope that findings from my dissertation are mobilized to improve access to affordable housing as an undeniable human right.

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APPENDICES

Appendix A: Summary of the Articles Findings

This appendix presents a summary of the findings of the systematic review, literature review, and empirical study conducted for this dissertation. Please note that the protocol paper is excluded from this appendix as the paper presents research methods and does not include research findings.

Chapter 2: A systematic review of the relationship between publicly subsidised housing, depression, and anxiety among low-income households.

What are the findings?

- The evidence on publicly subsidised housing and mental health is largely cross-sectional.
- Evidence on mental health benefits from publicly subsidised housing was inconsistent, and depended on the specific housing subsidy program, type of housing assistance, housing stability, and neighbourhood quality.
- The conceptualisation and operationalisation of anxiety and/or depression varied, which made it difficult to determine the actual effect of publicly subsidised housing on mental health.
- Varying measures of affordability and the impacts of these variations on depression or anxiety among publicly subsidised housing recipients were only tangentially explored.
- A need for more rigorous studies to gain a better understanding of the conditions needed for subsidized housing to positively contribute to mental health was identified.
- Variations in measures of affordability, anxiety, and depression created a challenge for those who wish to compare improvements in mental health associated with subsidised housing across studies.

Chapter 3: Publicly subsidized housing and physical health: a literature review

What are the findings?

- Although there was some evidence that subsidized housing was associated with improved health, inconsistent results prevented a robust conclusion.
- There was insufficient evidence to conclude that current housing interventions have a direct positive impact on physical health.
- The specific type of intervention, targeted group, along with the quality of the neighbourhood and housing all contributed to variability in the findings of the reviewed studies.
- A gap in knowledge on the impact of increased discretionary income and reduced financial stress on physical health was found.

- A need for further examinations of a potential relationship between subsidized housing and physical health was found.
- Given the bulk of the reviewed studies used cross-sectional data, future studies could use longitudinal surveys and/or quasi-experimental designs to identify both within and between variations in health to improve causal interpretations.
- This review underscores a need for future research that analyzes causal relationships across a large and varied geographic space using a robust set of physical health outcomes.
- To deepen understandings of the relationships between publicly subsidized housing and physical health, future studies should test for causal relationships, use diverse sets of outcomes, and conduct studies that compare health outcomes in multiple jurisdictions.

Chapter 5: Disparity in a Failing System: An examination of the impact of housing status on depression and psychological distress in individuals on New Brunswick's public housing waitlist

What are the findings?

- This study highlights the shared poor mental health among unhoused individuals and precariously housed renters, underscoring the necessity for subsidized accommodations.
- The mean distress score of the unhoused group (11.25, SE =.71) was higher than that of precarious renters (9.01, SE =.43). Nonetheless, the scores in both groups indicate moderately high levels of distress.
- Depressive symptoms were high in severity and, although they were higher in the unhoused group, no statistically significant differences were found between the two groups (precarious renters: 13.67, SE =.51 and unhoused: 14.74, SE =.77).
- No statistically significant differences were found between the two groups in the mean scores of social support, or physical health status.
- Both groups experience extreme poverty, high unemployment, moderate to high depression and distress levels, poor physical health status, and low social support.
- The results highlighted the contribution of housing precarity to mental health and socioeconomic disparities.
- This study reinforces that all those who wait for access to subsidized housing experience mental health and socioeconomic challenges.
- Both groups experience mental health problems and social and economic precarity, which, from a social determinants of health perspective, may be improved through access to affordable and adequate housing.

- Social support and higher physical health status significantly mitigated distress and /or depression in both groups.
- The protective correlation of age, income, and employment was significantly associated with depression and/or distress solely among precarious renters.
- The current austere approach to housing affordability found across Canada is not demonstrated to provide the human right of adequate and affordable housing to all those in need.

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Curriculum Vitae

Imad Subhi Dweik is a Ph.D. candidate and a graduate researcher in the Interdisciplinary Program at the Faculty of Arts of the University of New Brunswick. Mr. Dweik is a health and pharmaceutical policy expert. He holds an undergraduate degree in pharmacy as well as having a graduate degree in public health (epidemiology and biostatistics) from Tulane University. His work has been published in several internationally ranked journals including, *Housing Studies*, *International Housing Policy*, *British Medical Journal-Public Health*, and an author of a book on *evidence-based medicine practices*. Mr. Dweik comes with over 20 years of professional experience in evidence-based strategic planning, policy analysis and evaluation, and the delivery of national development programs. He has served as a principal investigator, project director, evaluator, and research analyst on several projects in addition to serving as a consultant on a variety of research programs. His work addresses the socioeconomic challenges in health and pharmaceutical sectors, with a particular emphasis on underserved populations. He strives to contribute to health quality, equity and wellbeing through an interdisciplinary approach that accounts for social determinants of health and evidence-based medical practices.

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