

RESILIENT OR VULNERABLE? THE GEOGRAPHY OF CRIME
AND ITS IMPACT ON MENTAL HEALTH
IN URBAN COMMUNITIES

by

QIAN HE

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Dissertation Committee:

Dr. Jianling Li (Chair)

Dr. Joowon Im

Dr. Qisheng Pan

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Dedication

This dissertation is dedicated to
my mother 周晓兰 (Zhou Xiaolan) and my father 何大友(He Dayou),
for their love and care, and for doing the most impossible works to support me.

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Abstract

RESILIENT OR VULNERABLE? THE GEOGRAPHY OF CRIME
AND ITS IMPACT ON MENTAL HEALTH
IN URBAN COMMUNITIES

Qian He

The University of Texas at Arlington, 2022

Supervising Professor: Jianling Li

This dissertation examines the relationship between neighborhood characteristics, crime, and mental health, with an emphasis on the role of social disadvantage. Using 5-year panel data from Dallas- Fort Worth metroplex, Texas, and a Spatial Econometric research approach, the findings of this study provide suggestions for building safe and healthy communities. Building upon the interdisciplinary literature on urban planning, environmental criminology, and public health, this study first identifies the impact of environmental factors on property crime, then detects the moderating effects of neighborhood environment upon crime's impact on mental health status.

This study finds that commercial and mixed land-use development, number of transit facilities, and alcohol-related establishments are positively associated with property crime rate

while controlling for other factors and spatial spillover effects. Neighborhoods with a higher percentage of Black and African American people and a lower level of educational attainment tend to register a higher property crime rate. While crime, particularly violent crime, poses a significant threat to the mental health status, built environmental characteristics such as parks and recreational space, commercial and retail space, and employment density could help mitigate the negative impact on mental health. Additionally, Black or African American communities, Hispanic/Latinx communities, and people from renter households are more vulnerable to crime's impact on mental health while controlling all other factors. This dissertation contributes to the understanding of how urban planners could address the challenge of crime and build healthy, resilient, and equitable neighborhoods.

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Chapter One: Introduction

*“Beloved community is formed not by the eradication of difference
but by its affirmation, by each of us claiming the identities and cultural legacies
that shape who we are and how we live in the world.”*

-- bell hooks¹ (1952-2021)

1.1 Purpose of the Study

Neighborhood safety is one of the most important topics in urban planning research. Studies show that the crime rates in Metropolitan Statistical Areas (MSAs) are significantly higher compared with rural areas, among which violent and property crimes per person are twice the number in MSAs as opposed the rural regions (Phillips & Sandler, 2015). Consequently, crime threatens the quality of life of the residents beyond the direct impact of criminal activity (such as

¹ bell hooks (1952-2021), black feminist, author, educator, and cultural critic.

the loss of property and physical or mental injury). The aftermath of crime casts a potential impact on public health, especially on people's mental health status.

Mental health issues are one of the biggest problems in human society (Layard, 2005). World Health Organization (WHO) highlighted the importance of mental health in Sustainable Development Goals (Mills, 2018; Xiao et al., 2020; WHO, 2017). According to a recent report by the National Institute of Mental Health (2019), nearly one in five adults in the United States is living with mental health illness (a total of 51.5 million). Having issues in mental health status could affect not only individual well-being but also cause serious consequences for the welfare system on the national level (Dustmann & Fasani, 2016). The global economic cost of mental disorders was estimated to be 2.5 trillion USD in 2010 and estimated to be 6 trillion by the year 2030 (Bloom et al., 2011; Chen et al., 2018).

Regarding the economic cost of crime-related mental health issues, Cohen and Miller (1998) found that within the total population of clients who worked with the mental health care professionals, about 20% to 25% of them are crime victims or crime-trauma related population. Additionally, the expenditures for mental health care services associated with crime victims alone are estimated to be between \$5.8 and \$6.8 billion in the United States. In addition to this overall cost of mental disorders, research has estimated that the lack of treatment for crime-related trauma will cost society more than \$458 billion in the U.S. each year, with a lifetime cost of more than \$194 million per person (Gilad, 2017).

Looking at the cost of crime alone for the year 2017 (including 120 million crimes, among which 24 million are violent crimes), the overall societal crime-related incidents cost could reach \$2.6 trillion, according to a cost analysis study by Cohen and Farrington (2021). In a recent study by Miller et al. (2021), researchers used both property crime and violent crime in 2017 to estimate

the economic costs and found that the estimated crime costs totaled \$2.6 trillion while the violent crime accounted for over 85% of the costs.

When examining the crime at the place, especially in the neighborhood setting, most existing literature focuses on the built environment when describing the neighborhood characteristics, and so does the effort of Crime Prevention through Environment Design (CPTED) practice. Crime Prevention Through Environmental Design (CPTED) (Cozens, 2008; Cozens, Saville, & Hiller, 2005) is an approach that aims to prevent crime incidents through physical enhancement in the neighborhoods.

The primary mechanism of CPTED is to reduce the opportunities for crime targeting by increasing the physical visibility in the environment and strengthening the surveillance among the people (Cozens, 2008; Cozens & Love, 2015). Although CPTED does emphasize the effort of “surveillance,” it was still conceptualized and conducted through the built environment.

The built environment is the physical form of the neighborhoods (Su et al., 2014). It is usually measured through six dimensions: residential density, street connectivity, access to destinations, and design (functionality and aesthetics). Environmental criminology claims that openness, or permeability, is an essential element that hurts neighborhood safety (Armitage, 2017; Birks & Davies, 2017; Browning et al., 2010; Cozens, 2008).

On the other hand, Jane Jacobs and other advocates for New Urbanism argue that neighborhood permeability will enhance neighborhood safety because the interaction between people, the “eyes on the streets” (Jacobs, 1961), will strengthen the social control within the neighborhoods. Researchers acknowledge that land use and mixed land use have important influences on crime, but conclusions are conflicting.

Although people widely accept the core philosophy that the built environment shapes the geography of crime, criminologists and urban planning researchers hold different views on the specific effects of the built environment characteristics on neighborhood crime. Besides, even though the neighborhood social structure is known to have a substantial impact on neighborhood crimes, limited studies on the effect of the built environment on crime have fully considered social and environmental factors, for example, the concentrated disadvantage and neighborhood collective efficacy.

Social Environment measures the ecological structure and socioeconomic conditions among the residents. Among the existing literature, few studies that examine the effect of the built environment on crime have thoroughly combined social environmental factors. The inconclusive research findings and the lack of attention to the social environment failed to provide a valid theoretical backbone for creating a safe and resilient community.

The purpose of my dissertation study is to position the roles of urban planning in the relationship between crime and mental health and examine the potential moderating effect on the relationship between crime and mental health. More specifically, this dissertation aims to examine: First, How built environmental factors and social environmental attributes affect neighborhood crime (particularly property crime), with the emphasis on neighborhood permeability (mixed land-use, transit accessibility, and access to alcohol-related establishments) and the collective efficacy (measured through concentrated disadvantage and residential instability); and then, How do neighborhood environmental factors (built environment and social environment) moderate the relationship between crime and mental health.

Primarily, this study examines how the potential moderating effect of mixed-use, access to parks & recreational space, access to transit and alcohol-related establishments, concentrated

disadvantage, and residential instability affect crime's impact on mental health (for both property crime and violent crime).

The spatial characteristics of crime make it an important environmental factor in affecting people's mental health. Crime affects mental health through direct experience (victimization or witness) and indirect experience (fear of crime upon the knowledge of crime status). Acknowledging the relationship between crimes and mental health, studies from multidisciplinary backgrounds (such as public health, criminology, and urban planning) concluded that neighborhood crime has a significant impact on residents' mental health and well-being. However, very few studies have examined the potential moderating effect of the neighborhood environment (including both the built environment and social environment) within the crime-mental health relationship.

This study summarizes the current stage of crime research within environmental criminology, urban planning, and public health. It identifies the gaps where future research is needed to validate neighborhood environmental characteristics' moderating effect on crime. With the empirical evidence from the Dallas Fort Worth area, this 5-year study will provide policy recommendations for building safe, equitable, and healthy communities based on the findings. This study builds upon the multidisciplinary intersection of urban planning, environmental criminology, and public health. The findings look to provide suggestions for building safe and healthy communities.

The neighborhood environment forges social equity. This study will contribute to the planning discipline by demonstrating the roles and impacts that urban planning could have on *alleviating* or *exacerbating* the structural disadvantage. This study aims to demonstrate that urban

planning *can* and *should* address the challenge of public health by planning for active, cohesive, and equitable communities in a proactive way.

1.2 Research Questions Proposed

This study aims to answer the question below:

Question 1: What are the relationships between the number of property crimes and the neighborhood characteristics (built environment and social environment)?

Question 2: What are the relationships between neighborhood environment, crime, and mental health? How does the neighborhood environment affect the relationship between crime and mental health (for both property crime and violent crime)?

The neighborhood built environment focuses on the role of permeability: mixed land use, access to public transit (rail stations and bus stops), and access to alcohol-related establishments. The neighborhood social environment focuses on the role of collective efficacy, which is measured through the degree of Concentrated Disadvantage and Residential Instability while controlling for the basic demographic structure. Mental Health measurements include the percentage of nervousness and the percentage of restlessness among adults from a national public health database (EASI, 2015-2019).

I choose mental health as the outcome factor of this study includes two reasons: First, the cost of mental health is severe and needs to be addressed; Second, the lack of empirical studies within the urban planning context places urgency on understanding the association between mental health, crime, and other environmental factors. The following section discusses each reason specifically.

Firstly, mental health issues are one of the biggest problems in human society (Layard, 2005). Additionally, compared with the other public health dimension, such as physical health,

mental health is less examined due to its intangible nature of a “non-communicable disease” (NCD). The World Health Organization defines health as “a state of complete physical, mental, and social well-being, not just the absence of disease or infirmity (WHO, 1948).” In its broad sense, environmental health includes the aspects of human health, disease, and injury that are determined or influenced by environmental factors (U.S. Department of Health and Human Services, 2010).

However, mental health is usually neglected or less prioritized in empirical research. In recent years, studies have recognized the challenge of non-communicable diseases (NCDs), such as mental health illnesses. The epidemic of NCDs, including mental health issues, cardiovascular disorders, diabetes, obesity, chronic respiratory diseases, etc., is closely related to the urban environment and people’s lifestyles (Miranda et al., 2008; van den Bosch & Ode Sang, 2017).

Recent statistics show that NCDs are dominating the global disease burden, and this burden is expected to increase in prevalence, especially in low- and middle-income countries (Miranda et al., 2008). The risk factors for non-communicable diseases include socioeconomic factors, modifiable behaviors, and genetic factors (Miranda et al., 2008), among which the *societal and environmental interventions* are most effective in disease prevention (WHO, 2012).”

Secondly, there have not been enough empirical studies examining the environmental context (including both built environment and social environment) of mental health within urban planning literature, nonetheless to consider crime as an environmental factor (as a stressor & trigger for mental health). Studies on the relationship between neighborhood environment and mental health reported that factors such as the walking distance to public spaces, the quality of public utilities, access to transportation, dense urban structure (versus sprawl), and the level of infrastructure could affect people’s state of well-being, response to stressors, the ability to maintain productivity at work and creation, and the ability to contribute to the community (Beyer et al.,

2014; Núñez-González et al., 2020; Shen, 2014; van den Bosch & ode Sang, 2017; McCormick, 2017; Melis et al., 2015; Rautio et al., 2017).

Though the planning literature acknowledges the relationship between neighborhood environment and mental health, planners have rarely considered crime an *environmental stressor* when examining mental health issues. Additionally, there is a gap in conceptualizing the neighborhood environment as the conditioning context for the crime-mental health relationship.

1.3 Theoretical Framework

Theoretical Frameworks for Property Crime and Neighborhood Environment

Following the concept of social-ecological models, this study is based on the environmental determinants of physical activity (Sallis et al., 1990). Crime incident, largely an outcome of physical activities, is affected at multiple levels by the impact of neighborhood characteristics, including the built environment and the social environment.

Classical criminology theory views criminal activities as the product of the interaction between “criminally motivated individuals” and “the opportunities for crime,” based on the principle of human action (Natarajan, 2011, p.14). Extensive literature has examined the causes of crime from the aspect of neighborhood characteristics. These inquiries generally fall into the following three categories: (1) the criminal perspective, focusing on crime offenders’ motivation and “rationale,” (2) the victim perspective, examining the conditions (activities or choices) that situate a person into criminal victimization; (3) and the context perspective, exploring the specific environmental and social conditions that cause potential crime (Miethe & Meier, 1994; Raleigh & Galster, 2015)

Studies within the realm of criminal perspective examine how the social background and the individual's immediate network activities influence the "becoming" of a criminal offender, with influencing factors such as family members, peers, and community, how a person develops the potential to commit crimes. One of the mechanisms is *rational choice theory*. It explores the decision-making process of the crime offenders and analyzes their calculations of the potential benefits or costs of committing a crime (Felson & Boba, 2010).

Similarly, *criminal opportunity theory* (Cook, 1986) argues that criminal behavior is motivated and calculated by rationality, especially for property crime (Hannon, 2002). This rationality upon which the crime offenders conduct their cost-benefit assessment is often limited to the short-term and immediate surroundings, like most human behaviors (Van Dijk, 1994). On the setting neighborhood level, the application of rational choice theory and criminal opportunity theory indicates that criminal offenders are more likely to commit a crime where either their precepted benefits are greater or their precepted costs are lower.

On the other hand, the victim perspective approaches the question by asking why and how a person becomes the target, or the victim, of criminal activities. One of the most influential theories is the *routine activity theory*. Routine activity theory identifies two elements that make crime activities possible: the suitability of a location that lacks protection and the existence of targets, namely the vulnerable and unprotected objects (Felson & Cohen, 1980).

Another prominent example is the *lifestyle exposure theory*, which concerns that people within different demographic profiles are prone to experience different chances of victimization because of their lifestyles (Hindelang, Gottfredson, & Garofalo, 1978). An underlying assumption is that some lifestyles would expose people to more dangerous times, places, and situations

(Miethe & Meier, 1994; McNeely, 2015; Raleigh & Galster, 2015). The application of such frameworks in neighborhood settings suggests that some places are more prone to experience crimes because the residents/visitors are more attractive to crime offenders.

Studies from the context perspective examine how certain neighborhood environmental characteristics give rise to the chance of crime, considering the influence of the built environment and social environment. The current study primarily falls into this perspective in its theoretical framework and research design. From the aspect of the built environment, most studies within the context perspective focus on the elements that make a location vulnerable or resilient to criminal activities.

One of the most widely discussed theories is the “*Broken Window Theory*” proposed by Wilson and Kelling (1982), stating the visible signs of physical disorder (e.g., broken windows, graffiti, litter, etc.) and social disorder (e.g., vandalism, anti-social activities) could encourage further criminal activities (Ellis et al., 2020). The *signaling effect* of physical disorder concerns that the deterioration in the physical environment could suggest a potential lack of guardianship and causes further safety issue (Wilson & Kelling, 1983).

Also, researchers argue that the architecture and environmental design shape the “responsibility” among residents to prevent crime, as elaborated in the *Defensible Space* by Newman (1972). Additionally, the *Natural surveillance* theory explores the organic monitoring mechanism to prevent crimes in the environment where “people [go] about their everyday business” (Clarke, 1997, p. 21).

The third perspective within the theoretical framework is the context perspective. A body of literature in the context perspective discussed the neighborhood environment and its influence

on crime. These theories include the *social disorganization theory* (Shaw & McKay, 1942), *place attachment* (Brown, Perkins, & Brown, 2004), *informal social control*, *collective control* (Harcourt & Ludwig, 2006; Shaw & McCay, 1984), and *collective efficacy* (Sampson & Raudenbush, 1989). Through analyzing the social conditions, the studies aim to identify the informal control, collective mechanism, or collective efficacy upon crime. Neighborhood social structure, as the backbone of natural surveillance, is a direct determinant of neighborhood cohesion, or collective efficacy, which is defined as the neighborhood residents' willingness to interfere, interact, and engage in public affairs on the neighborhood scale.

Collective efficacy shapes the overall sense of community through social trust and the informal social control community (Sampson et al., 1997). It embeds in the structural context and ties closely with the socio-economical characteristics of neighborhoods. Initially measured through five-point Likert questionnaires (Morenoff et al., 2001; Langton & Steenbeek, 2017; Sampson et al., 1997), the degree of collective efficacy has been explained by two neighborhood stratifications: *concentrated disadvantage* and *neighborhood instability* (Hipp, 2007; Park & Burgess, 1921; Sampson et al., 1997). Both factors play vital roles in the crime prevention mechanism by shaping neighborhood cohesion, social control, and natural surveillance (Hipp et al., 2009).

Theoretical Framework for neighborhood environment, crime, and mental health.

Health is the most important element in determining people's quality of life. It is also the main task force in government administration, urban planning, and public health agencies. Studies show that the built environment has an important impact on people's health conditions through pathological impact (for example, effects of various chemical, physical, and biological agents) and also through the "broad physical and social environment, which includes housing, urban

development, land-use and transportation, industry, and agriculture” (U.S. Department of Health and Human Services, 2000).

Studies in the field of public health identify that people’s condition of mental health depends on both individual factors and the health determinants in surrounding areas. The health determinant factors refer to the influence of the environment that affects the individual’s ability to stay healthy (Núñez-González et al., 2020). These neighborhood environmental characteristics include both built environment and social environment. The built environment generally refers to man-made physical elements such as housing, buildings, streets, parks, infrastructure, etc. These physical surroundings could have an impact on the physical and mental health status of the individuals and the communities.

On the other hand, social environment refers to the demographic structure, socioeconomic status, networks and kinship groups, etc., which are intangible measurements that shape the sense of community and the degree of cohesion within the neighborhoods.

The theoretical framework of neighborhood environment and public health identifies the mechanism where the environment affects people’s health status through direct and indirect impacts. Direct impact refers to the exposure to environmental hazards that may create a negative impact on people’s health status, for example, water pollution, air pollution, toxic chemical, and experience of crime victimization.

Meanwhile, the indirect impact refers to the habit or lifestyle shaped by the neighborhood environment that further affects people’s health conditions (for example, diet habits, physical activity, and chronic stress). In the field of urban planning, most studies primarily focus on the relationship between the built environment and public health through the indirect impact. As an important environmental stressor (Lewis & Riger, 1986; Perkins & Taylor, 1996; Taylor &

Shumaker, 1990), crime may distress both the physical and subjective well-being of people, such as fear, anxiety, and other mental illness (Becker & Rubinstein 2011; Dustmann & Fasani, 2016).

1.4 Research Hypothesis

According to the classification of research strategies, this research will follow a Deductive method (Blaike, 2012, p.84) within the approach of Positivism. The examination follows a pre-assumed hypothesis, which starts by identifying a regularity that needs to be explained and uses theoretical and empirical evidence to test the hypothesis.

The hypothesis for this study includes two parts. For the first research question, my hypothesis is that neighborhoods with a higher degree of permeability (namely, mixed land-use development, convenient access to transit, and access to liquor/alcohol establishments) are positively associated with property crime, holding all else constant. On the social environment side, I hypothesize that neighborhoods with a high degree of concentrated disadvantage and high residential instability are positively associated with property crime, holding all else constant.

I also hypothesize that there is a non-linear relationship between property crime and population density. Notably, there is a U-shape relationship: the negative association between population density and property crime under a certain level (natural surveillance reduces crime opportunities); positive association after the threshold level (visibility for crime prevention decreases, so does the natural surveillance).

For the second research question, I hypothesize that crime hurts residents' status of mental health when controlling for the neighborhood demographic structure and all else being constant. For the moderating effect of the built environment, I hypothesize that a higher percentage of parks and recreation, a higher degree of mixed-use, convenient access to transit could moderate crime's impact on mental health; Meanwhile, having access to alcohol-related establishments, a high

degree of concentrated disadvantage (high percentage of historically disadvantaged racial minority and income disparity) and a high degree of residential instability could exacerbate crime's impact on mental health, holding all else constant.

1.5 Significance of the Study

City governments and local non-profit organizations are embarking on various solutions for crime prevention, either through environmental renovation or evidence-policing. However, the consequential impact of crime on mental health remains a problem where the role of concentrated disadvantage remains unexplored. As yet not fully concluded, the exploration of relationships between environment and crime on the neighborhood level weighs heavily on achieving effective outcomes. Exploring the relationship between property crime and neighborhood characteristics could help lift the barrier to achieving an effective outcome for crime prevention at the local level and the neighborhood level. Additionally, understanding the potential moderating effect of neighborhood environmental characteristics on crime and mental health relationships is an integral part of building healthy urban communities.

This study examines the joint effect of the built environment and social environment on neighborhood crime patterns and explores the potential moderating effect that the neighborhood environment could have on crime-mental health relationships. Using 5-year longitudinal data in Dallas-Fort Worth, TX metropolitan area (see Figure 1 below), the findings aim to provide policy recommendations and practical references for building crime resilient and healthy communities.

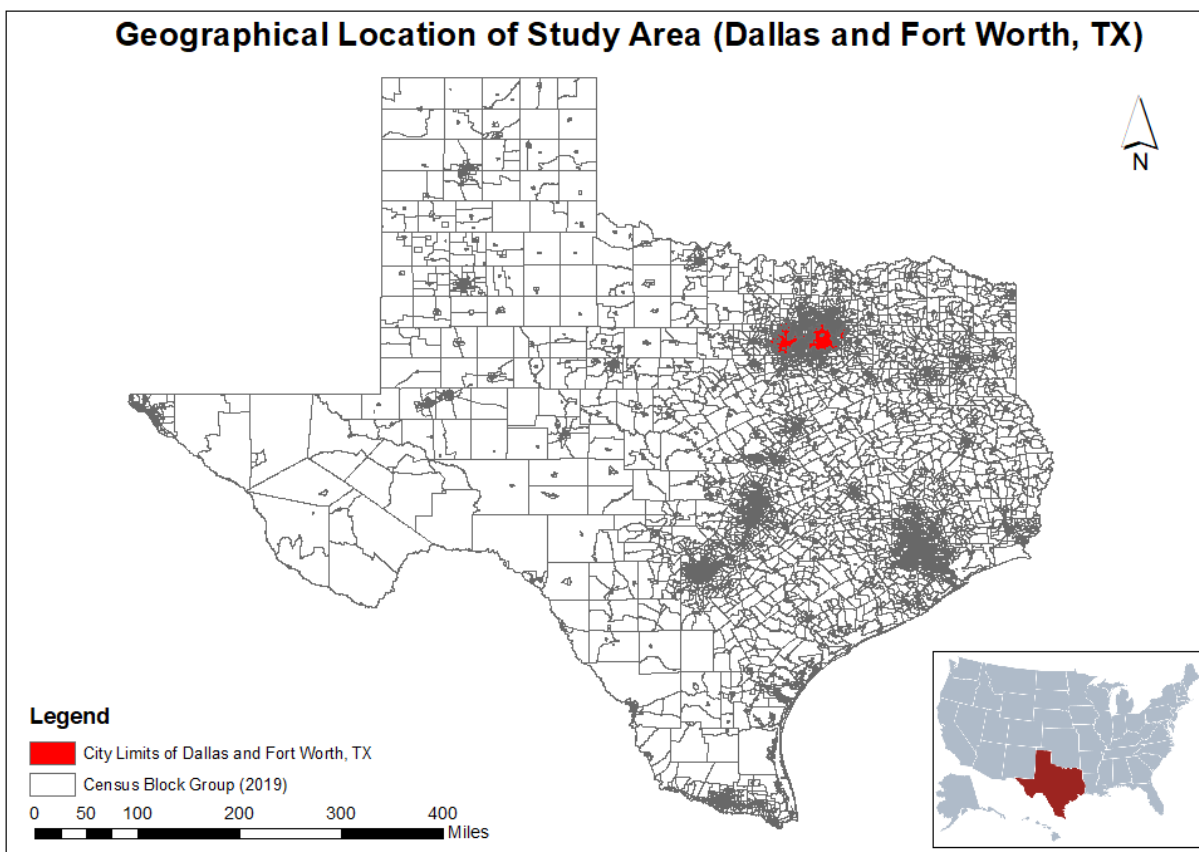


Figure 1: Map of Study Area (Dallas and Fort Worth, TX)

By identifying the vulnerable geographical areas where mental health status is more prone to be affected by crime-related tension and examining the moderating effect on that neighborhood environment, this study help to improve the work of government, public health agency, and non-profit organizations in creating safe, equitable, and healthy urban communities, and healing the existing distress.

1.6 Structure of the Dissertation

This dissertation includes five chapters. Chapter One is an introduction to the research, discussing the purpose of the study, the research question, theoretical framework, significance of the study, the research outline, and the structure of this research proposal. Chapter Two is the

literature review, introducing the theoretical background of the research topic and analyzing existing empirical studies. Chapter Three introduces the Research Design. This section includes major methodological elements of this study, including the research concept, study area, data collection, and data analysis methods. Chapter Four will discuss the research findings and discussion. Finally, Chapter Five provides the conclusion and implications for urban planning and public policy.

Chapter Two: Literature Review

2.1 Classification of Crimes

Criminology studies differentiate crimes by property crimes and violent crimes based on the nature of crimes. According to the classification set forth by the FBI Uniform Crime Reporting (UCR) Program, property crimes include *burglary, larceny-theft, motor vehicle theft, and arson*. On the other hand, violent crimes refer to those of *murder and nonnegligent manslaughter, rape, robbery, and aggravated assault*. Property crimes aim at taking money or property from another person, with no physical force or threat against the victim.

However, violent crimes usually involve intentional force or the threat of force. The first research question of this dissertation primarily focuses on property crimes, exploring the relationship between neighborhood environment and property crime. The second research question explores the relationship between neighborhood environment, crime, and mental health. More specifically, the second question aims to examine the potential moderating effect of the neighborhood environment on the crime-mental health relationship in the settings of property crime and violent crime.

2.2 Classic Crime Theories and Prevention Strategies

Classical criminology theory borrows the principle of human action to state criminal activities as the product of the interaction between “criminally motivated individuals” and “the opportunities for crime” (i.e., $\text{Crime} = \text{motive} * \text{opportunity}$) (Natarajan, 2017, p.14). Following this formula, the existing criminology theories have been focusing on two major aspects: the crime opportunity (the happening of crime) and the mechanism of surveillance (the prevention of crime). The crime opportunity theory explains the occurrence of crime (Natarajan, 2017) by understanding

the situations that make crime possible. Among the crime opportunity theories, the routine activity theory is the most influential one.

At the beginning of the 1980s, Felson and Cohen (1980) developed routine activity theory by adopting the human ecology approach to understanding neighborhood structure (Hawley, 1950) and further examined the situation of crimes. Routine activity theory identifies two elements that make crime activities possible: the suitability of location (lack of protection) and the existence of targets (vulnerable and unprotected objects).

On the other hand, the studies on crime prevention majorly focus on the elements that make a location, such as neighborhoods, resilient to criminal activities, such as natural surveillance theory. Natural surveillance theory explores the organic monitoring mechanism to prevent crimes in the environment while “people [go] about their everyday business” (Clarke, 1997, p. 21). It emphasizes the role of public visibility by assuming participation in crime prevention among the citizens. The philosophical root of natural surveillance goes back to the theory of Jeremy Bentham. For example, Bentham described the role of surveillance over prisoners by creating maximum visibility through architectural design in jail. The rate of misbehaving among prisoners reduces because of the possibility of being observed at any location (Ryan, 1988).

In the early 1970s, the principles of natural surveillance were adopted by the act of Crime Prevention Through Environmental Design (CPTED) (Cozens, Saville, & Hillier, 2005). CPTED is an urban development strategy that develops a “self-policing” effect through specific designs in the physical environment, and it became popular after Oscar Newman’s (1972) study on Defensible Space. Defensible space theory argues that the architecture and environmental design shape the “responsibility” among residents to prevent crime (Newman, 1972). Natural surveillance

theory explores the organic monitoring mechanism to prevent crimes in the environment where “people [go] about their everyday business” (Clarke, 1997, p. 21). Both theories emphasize the role of public visibility by assuming participation in crime prevention among citizens. However, they differ in the approach to creating an environment for crime prevention, as detailed in the next section. Today’s CPTED practice is still embedding the principles of natural surveillance, emphasizing the role of the physical environment in crime prevention.

2.2.1 The Debate on “Permeability.”

Criminologists and planners hold different views on the effect of the built environment on crime. A key discussion centers on the debate is “permeability,” which refers to the degree of openness of a neighborhood and the scale of convenience for traffic and pedestrian access. Following the defensible space theory, criminologists believe that mixed land-use and the grid pattern of the street system would generate gaps in territoriality's spatial distribution (Taylor 1988; Taylor, Koons, Kurtz, Greene, & Perkins, 1955), attract outsiders to neighborhoods (Cozens & Love, 2015; Johnson & Bowers, 2010), weaken social control and make it difficult for people to differentiate strangers and community members (Taylor, 1988).

On the other hand, planners, represented by Jane Jacobs (1961) and other advocates for New Urbanism, adopt the natural surveillance principle and argue that an open, denser, and mixed-use environment enhances neighborhood safety because the interaction among people, coined the “eyes on the streets,” strengthens neighborhoods' social control. According to Jacobs, the result of ongoing public contact is “a web of public respect and trust” and an “almost unconscious assumption of general street support when the chips are down” (Jacobs, 1961, p.56). Through daily

interactions, community members can establish mutual trust and shared expectations regarding the control of public space.

Up to date, studies about the impact of neighborhood built environment characteristics on crime are still holding conflicting arguments between criminologists and urban planning researchers. To achieve a more effective crime prevention policy design, researchers need to validate the relationships between environmental characteristics and crime. This study reviews the existing studies on crime from both the built environment and social environment perspectives and identifies the gaps that future research needs to fill in.

2.3 Research Evidence upon Built Environment & Crime

As discussed in the previous section, research in environmental criminology claims that neighborhood openness is an essential element in neighborhood safety (Armitage, 2017; Birks & Davies, 2017; Browning, Byron, & Calder, 2010; Cozens, 2008). Neighborhood openness is also referred to as neighborhood permeability. Originated in the discussion of relationships between road segments and the crime rate (Birks & Davies, 2017; Johnson & Bowers, 2010), permeability describes the degree of openness of a neighborhood and the scale of convenience for traffic and pedestrian access.

The neighborhood permeability, in the context of the built environment, has been examined along the dimensions of *land-use, street connectivity, park/public space, proximity to transit and alcohol stores, and the design elements of buildings, streets, and public space*. However, empirical studies of the relationship between the built environment and crime largely remain unsettled. For example, using a quasi-experimental design, Anderson et al. (2013) found that blocks with residential and commercial zonings are associated with less crime than blocks zoned exclusively for commercial in Los Angeles. Similarly, Sohn et al. (2018) found that commercial land use,

especially grocery stores and offices, is negatively associated with residential burglary. Both studies mainly focus on the built environment characteristics.

Following the rationale of routine activity theory, criminologists believe that neighborhoods with high permeability will attract outsiders to the community, weaken social control in the neighborhood, and make it more difficult to differentiate strangers from the local residents (Taylor, 1988). Taylor (1988) argued that when the prevalence of unfamiliar faces increases, the sense of anonymity increases along with it. In turn, anonymity induces withdrawal among those who live in the neighborhood, shrinking the radius of responsibility maintained by residents and diminishing social control inclinations and effectiveness.

Meanwhile, more street activity brings potential offenders and victims together in a context of increasingly absent guardianship, escalating the risk of crime (Browning et al., 2010; Felson & Cohen, 1980). In addition to the difficulty in identification and the increase of potential crime offenders, the mix of business with residential space generates gaps in the spatial distribution of territoriality (Taylor 1988; Taylor, Koons, Kurtz, Greene, & Perkins, 1955). This is because the property owners are less effective in monitoring the public space surrounding the establishments when their businesses are closed by the end of the day.

On the opposite side, Jane Jacobs and the advocates for New Urbanism argued that neighborhood permeability would enhance neighborhood safety because the interaction between people, the “eyes on the streets, ” will strengthen the neighborhoods' social control. This argument laid its theoretical backbone upon the rationale of natural surveillance theory. In the late 1980s, New Urbanism arose as a planning approach promoting walkable streets, housing and shopping in close proximity, and accessible public spaces. While New Urbanism became prevailing, planners

believe that combining commercial and residential uses can reduce neighborhood crime because it increases opportunities for natural surveillance, encourages social interaction, and promotes a sense of community coherence among neighborhood members (Jacobs, 1961; Sohn et al., 2018).

Jane Jacobs (1961) is one of the earliest urban scholars to discuss the role of “eyes upon the street” in urban crime prevention. She claimed that the high utilization of sidewalks and the street activities it generates would enhance the social control benefit, emphasizing urban design in crime prevention. The result of ongoing public contact is “a web of public respect and trust” and “almost unconscious assumption of general street support when the chips are down” (Jacobs, 1961, p.56), where the role of mutual trust and shared expectations regarding the control of public space were emphasized.

On the side of the built environment, this study will examine the existing literature related to the following variables: the effect of mixed land-use, park and recreational area, access to the transit station, and the adjacency to alcohol-related establishments. We will also discuss the recent research trend on urban morphology and urban design elements regarding their impact on neighborhood crime.

2.3.1 Mixed land-use

Previous research utilizing the Routine Activity Theory as a framework has linked certain location types to crime. Researchers acknowledged that land use and mixed land use have an essential impact on crime, but the conclusions are conflicting. Studies measuring the degree of mixed land-used development show significant relationships between mixed-use and crime rates (Cozens, 2008; Stucky & Ottensmann, 2009; Jones & Pridemore, 2018; Sohn et al., 2018), but in the results, some relationships are positive while others are negative. With a quasi-experimental

research design, Anderson et al. (2013) found that blocks with residential and commercial zonings are associated with less crime than blocks zoned exclusively for commercial in Los Angeles. Similarly, Sohn et al. (2018) found that commercial land use, especially grocery stores and offices, is negatively associated with residential burglary. Both studies mainly focus on the built environment characteristics.

However, in a case study in Australia, Cozens (2008) found that mixed-use development is associated with higher neighborhood crimes. Stucky & Ottensmann (2009) also found that commercial activity and high-density residential land-uses are associated with higher violent crimes. Using aggregated measures of mixed land-use variables, Brownings et al. (2010) found a curvilinear relationship between the mixed commercial and residential land use and crime rates after controlling for age, employment, income, and residential instability measures.

2.3.2 Parks and Urban Green Areas

The primary theoretical debate over the impact of parks and urban green areas on crime is around the decrease in visibility versus the increase in aesthetic enjoyment and neighborhood interaction. On the one hand, dense vegetation in the park is usually related to people's fear of crime (Shaffer & Anderson, 1985) because it lowers the visibility of criminal action, conceals criminal behavior, and weakens natural surveillance (Michael & Hull, 1994; Nasar & Fisher, 1993; Wolfe & Mennis, 2012). The argument centers on the tradeoff between aesthetic enjoyment created by vegetation and its effect on visibility, hence crime rates. In the study of such a relationship in Chicago, Kuo & Sullivan (2001) concluded that vegetation could create an enjoyable aesthetic environment and reduce crime.

Another study by Harris, Larson, and Ogletree (2018) found proximity to the “greenway” trail is associated with a higher property crime in Chicago. Groff and McCord (2012) examined the relationship between neighborhood parks and crime rates in Philadelphia and claimed that parks are significantly associated with higher crime rates. In a study in Philadelphia, Pennsylvania, Wolfe & Mennis (2012) found that vegetation abundance is significantly associated with fewer burglaries after controlling for poverty, education attainment, and population density. However, there was no correlation between vegetation abundance and thefts. Using evidence from Chicago, Kuo and Sullivan’s study showed that in inner-city neighborhoods, “vegetation might introduce more eyes on the street by increasing residents’ use of neighborhood outdoor spaces” (2001, p.346). Kuo and Sullivan (2001) argue that the social interaction that parks create will promote natural surveillance.

2.3.3 Access to Transit

In the United States., local communities often resist public transit expansion because of the fear that access to transit will bring potential offenders outside of the community and generate crimes in neighborhoods. Results of studies on the relationships between crime and proximity to public transit and liquor/alcohol establishments are relatively consistent. *Public transit* has been characterized as a “crime attractor,” “crime generator,” and “fear generator” (Brantingham & Brantingham, 1995; Felson & Cohen., 1980). Transit-related crime is the primary concern among the public for transit development (Loukaitou-Sideris, Taylor, & Fink, 2006).

However, there is a lack of empirical evidence supporting this argument (Loukaitou-Sideris et al., 2006; Plano, 1993; Poister, 1996; Ridgeway & MacDonald, 2017). Some studies found that architectural and environmental design features and the lack of surveillance in transit stations

contribute to crime around transit stations (Felson et al., 1996; La Vigne, 1996; Loukaiton-Sederis, 1999). Others found that neighborhoods' socioeconomic status around transit stations is correlated with crime outcomes in transit stations (Loukaitou-Sideris et al., 2002; Ceccato et al., 2013; Irvin-Erickson, 2015).

Loukaitou-Sideris, Taylor, and Fink (2006) found that transit-related crime is the primary concern among the public for transit operators to develop transit services. Many studies are based upon theoretical analysis, concluding that transit stations will generate crime by bringing more outsiders. Wilson and Kelling (1982) argued that transit systems might generate more disorder in neighborhoods, increasing blight and signal that an area is unguarded and crime is tolerated in their “broken window theory,” emphasizing that environmental elements that indicate disorder will make a neighborhood more easily to become the crime target.

Using data from the Baltimore Metro system, Plano (1993) compared the crime trend in the neighborhood surrounding three railway stations before and after the stations were built. Results show that there is no significant relationship between neighborhood crime and the development of rail stations. In a similar study in the Metropolitan Atlanta Rapid Transit Authority (MARTA) area, Poister (1996) examined the before-and-after crime rate in neighborhoods around newly-built rail stations, and the results show little or no overall impact on crime rate trends. Besides the uncertainty about the impact of transit on crime, Bowes and Ihlanfeldt (2001) found that access to transit may lead to reductions in crime in an area by spurring economic development and rising property values.

2.3.4 Adjacency to Liquor Stores

Traditionally, people believe that alcohol-related commercials will increase crime by promoting irrational behaviors. Existing studies have also shown that higher levels of alcohol outlet density are significantly associated with higher rates of violence and street crimes (Furr- Holden et al., 2016; Gruenewald & Remer, 2006; Livingston, 2011; Toomey et al., 2012; White et al., 2015). More specifically, higher levels of alcohol outlet density are significantly associated with higher rates of violence and street crimes (Gorman, Speer, Gruenewald, & Labouvie, 2001; Gruenewald & Remer, 2006; Livingston, 2011; Toomey et al., 2012; White, Gainey, & Triplett, 2015). Liquor stores are also geographically linked with interpersonal and domestic violence (Livingston 2011; Cunradi, Mair, & Todd, 2012; Snowden 2016) and suicide mortality (Värnik et al., 2007). Furr- Holden et al. (2016) found that violent crimes are significantly higher around liquor stores. The study by Trangenstein et al. (2018) also identified a 10% increase in access to alcohol outlets was significantly associated with a 4.2% rise in violent crime in Baltimore, MD.

2.3.5 Urban Morphology and Street Elements

Recent studies have shown an increasing awareness of the relationship between the *fine-scale measurements for urban morphology* and crime. Within the existing crime studies upon crime-place examination, most were conducted on a collective scale when analyzing the environmental factors. Lee, Jung, Lee, and Macdonald (2017) used individual locations for the streets' specified crime incidents. Using the street view's physical characteristics in a low-density residential area (low-rise housing) in South Korea, Lee et al. (2017) conducted assessments of the built environment on both general street conditions and the specific street design elements.

Various factors are included in the measurement, for example, the high solid front wall in front of the house, street parking, visual obstructions, hidden places, personalized decoration, balcony above the street, building setback, stairwell window, entrance on the street, ground-floor windows facing the street, visibility of garbage, front windows on the street, ground-floor parking. The multilevel logistic model results found that all the built environment factors that are hypothetically negative do have a significant association with the occurrence of street crime ($p < 0.05$). Elements that enhance visibility and images, such as the streetlights, entrance-facing streets, etc., are associated with a low crime rate. However, those hindering visibility and images, such as ground floor parking, building setbacks, visual obstructions, trash piles by the road, damaged appearance, etc., are associated with a high crime rate.

Similarly, Shach-Pinsly (2019) created a GIS-based security-rating index that quantified the vulnerability of urban elements and demonstrated that urban design elements are important for crime prevention. Shach-Pinsly (2019) used the term "urban vulnerability" to describe people's perceptions about safety under the influence of the built environment in urban space. The research focuses on the subjective perception of security, the counter-equivalent term for fear of crime, and its association with the built environment factors in urban morphology.

Based on the analysis of two cities: Tel Aviv, Israel, and Portland(OR), U.S., with the Security Rating Index (SRI) model, the result identifies the rated "insecure areas" within the study area for further analysis. Within the model design, Shach-Pinsly included detailed urban elements, mixed-use development, streetlights, and building proximity. The environmental assessment also consists of architectural details. For example, the conjunction of different territories is vital in marking out the boundaries (and related responsibilities) between private, public, and semipublic areas (Gehl, 2010; Cozens et al., 2005; Shach-Pinsly, 2019); the hierarchy of space (Newman,

1972); surveillance monitoring facilities (e.g., closed-circuit television, CCTV); the physical barrier for territories (e.g., the gates, fences, gated parks, and gated communities). These micro-level design factors demonstrated a significant impact on the crime prevention outcome.

It is important to note that the fear of crime is different from the crime statistics themselves, even though there are specific associations between these two terms. Assessing the subjective perception should be a separate topic from assessing the objective status of crime (e.g., how many crime incidents happened in a neighborhood within the last three months?). Though the findings from this study provide suggestions on where the urban planners should target to improve the sense of safety, it does not inform a clear rationale regarding the specific association between the physical characteristics and the "real" threat of crime. Additionally, both studies mentioned above did not control for neighborhood sociodemographic characteristics.

2.4 Research Evidence upon Social Environment & Crime

While the aforesaid studies primarily focus on the relationships between crime and the built environment, others emphasize the impacts of a neighborhood's social characteristics on crime. Jones & Pridemore (2018) argued that social structure is vital for realizing a neighborhood's social norm and its residents' behavior towards crime.

2.4.1 Neighborhood Demographic Structure

Demographic characteristics are the major attributes that describe the overall social structure of a neighborhood. In the crime studies, several demographic variables are most frequently used: population density (Beasley & Antunes, 1974; Roncek, 2004; Roncek & Maier, 1999; Rotolo & Tittle, 2006; Zhang & Peterson, 2007), the percentage of the minority population that reflects the racial and ethnic heterogeneity of the neighborhood (Ellis & Walsh, 2000; Zhang

& Peterson, 2007), the percentage of young males between the ages of 15-24(Ackerman, 1998; Hannon, 2002). In addition, the heterogeneity in race structure measures the degree of neighborhood coherence and the degree of social control (Ellis & Walsh, 2000; Zhang & Peterson, 2007).

Population density is considered an important measurement for neighborhood demographic structure, however the results are debatable(Beasley & Antunes, 1974; Roncek, 2004; Roncek & Maier, 1991; Rotolo & Tittle, 2006; Zhang & Peterson, 2007). Population density and population size affect social interaction and thus influence the crime rate (Hipp & Rousell, 2013). One classic argument is that density offer opportunity(Harries, 2006). The distribution of private property concentrates along with people, attracting offenders to commit property crimes. However, the natural surveillance theory believes that high population density increases the visibility in the neighborhood, thus strengthening the surveillance mechanism.

Similarly, studies also consider the percentage of young people (especially young males) between the ages of 15 to 24 (Ackerman & Murray, 2004; Browning et al., 2010; Hannon, 2002; Kearns et al., 2019) as a higher crime risk factor. From the victim perspective, lifestyle exposure theory” considers young people between 15 to 24 tend to have a higher chance of situating themselves in places and times that attract offenders; from the criminal perspective, this population group is prone to be under the influence of their friends, peers, and other social networks who are more likely to experience economic challenges (Ackerman & Murray, 2004). These are several important aspects measured by the context perspective within crim and place studies.

2.4.2 Collective Efficacy & Concentrated Disadvantage

Neighborhood social structure, as the backbone of natural surveillance, is a direct determinant of neighborhood cohesion, or collective efficacy, which is defined as the neighborhood residents' willingness to interfere, interact, and engage in public affairs on the neighborhood scale.

Collective efficacy shapes the overall sense of community through social trust and the informal social control community (Sampson et al., 1997). It embeds in the structural context and ties closely with the socio-economical characteristics of neighborhoods. Initially measured through five-point Likert questionnaires (Morenoff et al., 2001; Langton & Steenbeek, 2017; Sampson et al., 1997), the degree of collective efficacy has been primarily explained by two neighborhood stratifications: *concentrated disadvantage* and *neighborhood instability* (Hipp, 2007; Park & Burgess, 1921; Sampson et al., 1997). Both factors play essential roles in the crime prevention mechanism by shaping neighborhood cohesion, social control, and natural surveillance (Hipp et al., 2009). Following the social disorganization theory, the *concentrated disadvantage* is usually quantified by the agglomeration of poverty, low-education attainment, and racial minorities.

2.4.3 Residential Instability

Residential instability is highly concerned with crime status because it affects the dynamic structure of residents in neighborhoods, measuring if the members of a community are stable or constantly changing. According to the routine activity theory, more strangers in a neighborhood will increase the number of potential offenders. Also, the high mobility of neighborhoods decreases the neighborhood coherence and weakens the strength of natural surveillance. The nature

of high residential instability usually indicates a low steadiness within the neighborhood structure, hence the low familiarity developed between the residents. Sampson et al. (1979) examined the connection between residential instability and collective efficacy based on neighborhood surveys, and they found that residential instability is negatively associated with collective efficacy.

The measurement of *residential instability* includes the percentage of owner-occupied houses, the percentage of vacant property, the percentage of Household moving in during recent years, and the percentage of people who have lived in present homes for more than five years (Walsh & Ellis, 2006; Zhao & Thurman, 2002; Zhang & Peterson, 2007).

2.4.4 Other Social Environmental Factors

As an extended inquiry into collective efficacy, studies found that *local organizations*, such as non-profit organizations, volunteer groups, church/religious groups, and friend/kinship networks, contribute to neighborhoods' collective efficacy (Morenoff et al., 2001; Wo, 2018). On the contrary, potential harmful elements in the community, such as crime offenders living within/nearby, could put neighborhood safety at risk (Livingston et al., 2014; Chamberlain & Wallace, 2016).

Public housing and *voucher holders* have long been viewed as factors contributing to neighborhood crime. Originated from the 1970s, the social norm perspective believes that high-rise public housing will increase crime within and outside the neighborhoods (Aliprantis & Hartley, 2015; Sandler, 2017). Some people are concerned that public housing projects and Housing Choice Vouchers (HCVs) may increase crime because of their associations with the socioeconomic disadvantage, neighborhood instability, and the potential of the criminal network (Ellen et al., 2012; Goering et al., 2002; Popkin et al., 2012; Rosin, 2008). However, the empirical evidence that

supports the claim of danger brought by public housing and voucher holders (Aliprantis & Hartley, 2015; Ellen et al., 2012) is not abundant.

An increasing number of studies have investigated the joint effects of permeability in the built environment and the role of concentrated disadvantage in neighborhoods in recent years. However, such studies are limited in number and scope. Using data from Detroit, MI, Raleigh & Galster (2014) used variables in three major areas, including housing and land vacancy, local business characteristics, and the characteristics of neighborhood population structure to measure the neighborhood environment. They found that several neighborhood characteristics, such as renter occupancy, population density, and establishments with liquor licenses, are associated with all types of crimes. Wo (2019) examined the impact of the overall degree of mixed land use on neighborhood crimes using the concentrated disadvantage, residential stability, and the percentage of minority population as sociodemographic variables and found a curvilinear relationship between mixed-use and neighborhood burglary rate.

In summary, the existing studies have exhibited a mixed picture of the relationships between crime, the permeability of the built environment, and the collective efficacy in neighborhoods. This study builds upon and improves the existing literature with a more comprehensive framework and some enhanced measurements of neighborhood characteristics on both the neighborhood permeability and collective efficacy dimensions, as well as the more recent data in the DFW metroplex. The framework and enhancements are described in detail below.

2.5 Urban Environment and Public Health

In the following section, we will first review the literature on neighborhood environment and public health overall, and then the studies on the relationship between neighborhood

environment and mental health, and then we will focus on the studies on the relationship between crime and mental health.

2.5.1 Neighborhood Environment and Public Health

The World Health Organization defines health as “a state of complete physical, mental, and social wellbeing, not just the absence of disease or infirmity (WHO, 1948).” Environmental health, in its broad sense, includes the aspects of human health, disease, and injury that are determined or influenced by environmental factors (U.S. Department of Health and Human Services, 2010). In recent years, studies have started to recognize the challenge of non-communicable diseases (NCDs). The epidemic of NCDs, including diabetes, obesity, chronic respiratory diseases, cancer, mental health issue, cardiovascular disorders, is closely related to the urban environment and people’s lifestyles (Miranda et al., 2008; Vos et al., 2015; van den Bosch & Ode Sang, 2017). Recent statistics show that NCDs are dominating the global disease burden, and this burden is expected to increase in prevalence also in low- and middle-income countries (Miranda et al., 2008, Vos et al., 2015). The risk factors for non-communicable diseases include socioeconomic factors, modifiable behaviors, and genetic factors (Miranda et al., 2008), among which the societal and environmental interventions are most effective in disease prevention (WHO, 2012).”

Jackson and Kochititzky (2000) summarized the aspects through which the built environment affects public health in the monograph report “Creating a Healthy Environment: The impact of the Built Environment on Public Health.” These aspects include land use and their impact on quality and respiratory health; urban design, infrastructure, and physical elements such as buildings, streets, open spaces that affect people’s physical activity; transportation-related design

regarding safety for the different populations; mobility options that affect the quality of life for the transportation disadvantaged groups such as the elderly and people with disability; and the land-use decisions that affect the quality of water, sanitation, and the incidence of disease (Jackson & Kochtitzky, 2000).

In the history of urban planning practice in North America, the advocacy for public health dates back as early as 1926, the U.S. Supreme court, in the case of “Village of Euclid vs. Ambler Realty Co.,” cited that public health should be prioritized and protected as one of the basic responsibilities of local government in planning practice. The Supreme court hence delivers the legal mandate to “restrict or control land-use decisions in the community.”

Using empirical evidence, a body of literature has examined the relationship between built environment characteristics and public health. As summarized by Jackson & Kochtitzky (2000), they are mainly conducted under the following spectrum: land-use pattern, transportation planning (looking at the private vehicle, public transit, and active transportation modes like biking and walking), urban design (for example, measuring walkability and the suitability for physical activity), accessibility to healthy lifestyle elements (e.g., grocery store, doctor’s office, etc.).

An increasing amount of studies have examined the relationship between neighborhood environment and public health. On the side of the built environment, studies show that neighborhood walkability and the quality of green areas could promote physical activity and the frequencies of active transportation of children and the elderly (Smith et al., 2017). Zhang et al. (date) concluded in a systematic literature review that people with mobility disabilities could “gain different health benefits, including physical health benefits, mental health benefits and social

health benefits from nature in different kinds of nature contacts ranging from passive contact, active involvement to rehabilitative interventions.”

In a systematic review, Nowak et al. (2017) found that seven out of eight examined studies demonstrated a significant association between living in neighborhoods with poor environmental quality and the negative birth outcome. The examined conditions include both built environment and social environment characteristics: property disorder, housing damage, physical disorder, physical incivilities, built environment, nuisance, vacancy, tenure, occupancy, and structural deterioration.

2.5.2 Neighborhood Environment and Mental Health

2.5.2.1 Mental Health: Definition and Measurement.

According to the definition by WHO, mental health conditions include one’s “mental, neurological and substance use disorders, suicide risk and associated psychosocial, cognitive and intellectual disabilities” (WHO, 2019). CDC states that mental health includes people’s emotional, psychological, and social wellbeing, which further affects how we think, feel, and act in our daily life (CDC, 2022). Generally, mental health includes two ranges of measurement, poor mental health status, and mental illness, which differ from each other. Poor mental health status refers to a state of mental wellbeing where our emotions, thoughts, and feelings are negatively impacted, while mental illness means the illness that affects the way we think, feel, behave, or interact with others (Canadian Mental Health Association, 2019). Up to date, mental health is causing 1 in 5 years lived with disability globally, leading to other physical health problems and an early mortality rate, with 800,000 deaths per year due to suicide (WHO, 2019).

Despite these impacts, mental health issues remain a neglected factor in a global effort to improve public health.

In our life span, we can have periods of time with poor mental health status due to circumstances, feeling of loneliness, or isolation, but this would not necessarily be diagnosed as mental illness. On the other hand, a person with mental illness can experience different mental health statuses. However, our review finds that most existing literature lacks the accurate differentiation between these two terms in both the theoretical discussion and empirical sampling. During the phase of research design, there is usually no distinct classification for clinical sampling data versus the survey or questionnaire outcome from the general public.

Geographic context and Spatial Disparity

Many factors could lead to or contribute to the mental health issue. According to the report from CDC, the risk factors that could lead to mental health challenges include (1) early adverse life experience, (2) experience related to other ongoing medical conditions, (3) biological factors or chemical imbalances in the brain, (4) use of alcohol or drugs, and (5) the feelings of loneliness or social isolation (CDC, 2022). Among the listed factors, the research from the environmental criminology perspective has been focusing exclusively on the impact of adverse life experiences on mental health, especially the trauma experience or the history of abusive interaction, for example, child abuse, sexual assault, witnessing violence. Particularly, many traumatic experiences associated with mental health issues are potentially led by inequitable living conditions and humanitarian crises. This further demonstrates that mental health issues not only need remedying attention from public health but also should be approached as an outcome of the environmental equity crisis.

Like many physical health conditions, the distribution of mental health issues is shaped by spatial and socioeconomic factors, leading to consequences in mental health disparity. According to the WHO report, suicide mortality is disproportionately higher among the younger population and older females in countries with low and medium-income within the Global South. The following section explains how crime, among other environmental factors, could impact the mental health status within a community, especially among vulnerable populations.

Mental health illness includes many different conditions that could vary in degree of severity and range from mild, moderate, to severe. The National Institute of Mental Health uses two broad categories can be used to describe these conditions: Any Mental Illness (AMI) and Serious Mental Illness (SMI). AMI encompasses all recognized mental illnesses, while SMI is a smaller and more severe subset of AMI (NIMH, 2021).

Studies on the relationship between neighborhood environment and mental health reported that factors such as the walking distance to public spaces, the quality of public utilities, access to transportation, dense urban structure (versus sprawl), and the level of infrastructure could affect people's state of wellbeing, response to stressors, the ability to maintain productivity at work and creation, and the ability to contribute to the community (Beyer et al., 2014; Núñez-González et al., 2020; Shen, 2014; van den Bosch & ode Sang, 2017; McCormick, 2017; Melis et al., 2015; Rautio et al., 2017).

According to the systematic review by Gascon et al. (2017), empirical scholars measure mental health status via multiple indicators such as depression, stress, and psychological distress, emotional problems, wellbeing, self-esteem (Rautio et al., 2017; Turley et al., 2013, Gong et al., 2016, Alcock et al., 2015; de Vries et al., 2003; Triguero-Mas et al., 2015; White et al., 2013a)

through self-reported data, for example, General Health Questionnaire (GHQ). Other scholars use either single-item measures of wellbeing, e.g., life satisfaction (Brereton et al., 2008; White et al., 2013a), happiness (MacKerron & Mourato, 2013), or use constructed original scales based on existing surveys, e.g., recalled mental restoration (White et al., 2013b), perceived depression or anxiety, and visits to mental health specialists and medication intake (Triguero-Mas et al., 2015), within the untested psychometric properties.

Literature shows that the pattern of mental health is associated with life circumstances, which include both social and built environmental conditions, such as opportunities for educational or economic development, access to quality health care, neighborhood safety, and supportive relationships (Schulz et al., 2006; Takeuchi & Williams, 2003). Studies on the relationship between neighborhood environment and mental health reported that physical factors play an important part in conditioning people's state of wellbeing, response to stressors, the ability to maintain productivity at work and creation, and the ability to contribute to the community (Beyer et al., 2014; Núñez-González et al., 2020; Shen, 2014; McCormick, 2017; Melis et al., 2015; Rautio et al., 2017).

In the following section, I will review the theoretical framework and relevant literature regarding the relationship between built environmental characteristics and mental health: including mixed land-use, parks, and recreation land use, access to transit, and access to alcohol-related establishments.

2.5.2.2 Empirical Framework on Mental Health and Neighborhood Environment.

Studies on the relationship between neighborhood environment and mental health reported that physical factors play an important part in conditioning people's state of wellbeing, response to stressors, the ability to maintain productivity at work and creation, and the ability to contribute

to the community (Beyer et al., 2014; McCormick, 2017; Melis et al., 2015; Núñez-González et al., 2020; Rautio et al., 2018; Shen, 2014). Existing studies in the public health approach the relationship between mental health and neighborhood built environment from two perspectives: the reactive and proactive perspectives. In the reactive studies, target populations are people with existing mental health issues (such as chronic mental illness, or CMI), where researchers examine the impact of the environment on their needs and quality of life (such as psychiatric studies);

Meanwhile, among the proactive approach, researchers treat the general public as their target population, examining the overall relationship between environmental factors and the distribution of mental health illnesses (especially in studies from collective scales, such as neighborhood built environment factors in urban planning studies).

Through a reactive approach, early literature in the psychiatric study offers two opposing speculations regarding the environmental effect on people with existing mental health illnesses. One group of researchers argues that smaller housing scale and neighborhood units could facilitate the “pain-avoidance needs” among people with mental illness because the “individual-centered environment” could better formulate the “sense of community” and the “familiar atmosphere” within the neighborhood (Earls & Nelson, 1988; Nagy, Fisher, & Tessler, 1988; Nelson, Hall, & Walsh-Bowers, 1998).

Saarloos et al. (2011) found that the “odds of depression in older men were higher in areas with more land-use diversity, independent of neighborhood composition, diverse individual-level factors, and other BE attributes (street connectivity and residential density)” (p.468). On the opposing side, another group of researchers argues that neighborhoods with robust diversities, including socioeconomically and demographically diverse populations, mix-use development of

commercial and residential land could contribute to better mental health status because these characteristics are more likely to promote social cohesion and a sense of community, hence lead to better mental health outcome (Trute & Segal 1976; Segal, Silverman, & Baumohl 1989; Segal & Aviram 1978; Hall, Nelson, & Fowler 1987; Newman et al. 1994).

From the proactive approach, recent studies (targeting at general population) found that neighborhood environmental features such as mixed land use, accessibility to versatile places such as recreational areas and public transit (Frank, Kerr, Chapman, & Sallis, 2007; Nordbø, Nordh, Raanaas, & Aamodt, 2018) are associated with mental health benefits among the general public. Within the physical environmental setting, one detrimental factor for mental health is whether the neighborhood environment could promote a healthy lifestyle that supports active physical activity and positive mental health status.

2.5.2.3 Neighborhood Built Environment and Mental Health.

Mixed Land-use and Mental Health.

The land-use pattern could promote a healthy lifestyle by increasing the environmental vitality within the neighborhoods (with more opportunities for public interactions) and reducing travel distance to essential destinations (for example, work, recreation, grocery, healthcare, etc.). A rich body of literature examines the relationship between mixed land-use patterns and healthy lifestyles in planning literature.

Planning studies use “5D” variables (Density, Design, Diversity, Distance to Transit, and Destination accessibility) to describe the built environment characteristics and test the association between these factors with people’s travel behavior (walking, biking, and public transit use) (Ewing & Cervero, 2010). People who live in a built environment with higher density, better design,

diverse land-use patterns, shorter distances to transit, and better destination accessibility are more likely to conduct active transportation modes. Hence, the built environment could affect, or even shape, people's travel behavior, physical activeness, lifestyle, and mental health status.

Harkness et al. (2004) found that neighborhoods with mixed land-use developments (including various types of non-residential land-use) are associated with better mental health outcomes. Establishments such as a local coffee shop, bakery, restaurants, and convenience stores are vital to the community's liveliness (Jacobs, 1961). However, these types of developments are usually excluded from single-zoning residential development because it would violate the zoning ordinance. Recent trends in building urban villages in suburban areas, pursuing "mixed-use neighborhoods with a center that accommodates shopping, entertainment, some workspace, community-oriented uses, and the associated public space" because of the associated benefits for quality of life and street liveliness (Mehta & Bosson, 2018).

From the social capital perspective, Leyden (2003) argued that neighborhood with mixed-use development is more likely to encourage social capital when compared with the traditional car-dependent and single-use zoning neighborhoods, "persons who are socially engaged with others and actively involved in their communities tend to live longer and be healthier physically and mentally" (Leyden, 2003, p.1546).

Access to Transit and Mental Health.

Having access to public transit could affect the mental health status among local residents through several pathways (Yang et al., 2019): (1) meeting essential needs (such as grocery shopping, visiting doctors, going to the pharmacy, etc.), which otherwise would increase chances of mental health vulnerability (such as anxiety, stress, and depression, etc.), especially for socially

disadvantaged populations (Choi & DiNitto, 2016); (2) promoting active lifestyle by maintaining contacts with public space, natural environment, and bonding with other people within the community, which lead to a positive impact on mental health and subjective-wellbeing (Kawachi & Beckerman, 2001; Ulrich et al., 1991; Yang et al., 2019); and (3) facilitating physical activity by conducting active transportation, which leads to a positive impact on both physical health and mental health status (Barbour & Blumenthal, 2005; De Mello et al., 2013; Mammen & Faulkner, 2013).

Transportation and Mental Health.

Traffic volume (measured by the neighborhood's daily vehicle miles traveled) was also found to have a positive association with increased psychological distress (Yang & Matthews, 2010). The traffic volume and the negative environmental consequences (e.g., noise and air pollution) are especially associated with the *street hierarchy*, where the “highway” has the heaviest impact (with a higher speed limit and greater traffic volume).

According to the narrative by Bill Lee (p.166) (Bullard & Johnson, 1997), “the civil rights case of the East Los Angeles community's opposition to the extension of the Long Beach Freeway” demonstrated that “one impact of the freeway would have been that ‘a significant part of the cohesive El Sereno community would be orphaned’ ” (Bullard & Johnson, p. 168).

On the other hand, transportation structure is also linked to the degree of connectivity of the neighborhoods, which ultimately contributes to the walkability of an area.

Parks, Recreational Space, and Mental Health.

Access to parks and recreational spaces is another factor in shaping an active lifestyle and is closely related to mental health. The empirical literature suggests that a natural environment in

the outdoor setting may help reduce stress and promote physical activity and social interaction, hence could help improve people's health and wellbeing (Dadvand et al., 2016; Nieuwenhuijsen et al., 2017; Pasanen et al., 2014). Bowler et al. (2010) found that natural environments may directly and positively impact people's mental health status through their effect on anger, fatigue, and sadness. Exposure to outdoor spaces (for example, urban parks, walkable neighborhoods) is positively associated with mental health and wellbeing, though the direction of causality is unclear (Gascon et al., 2017).

Housing and Mental Health.

Housing has been shown to affect public health through indirect pathways. Housing characteristics may influence other lifestyle and well-being-related factors, which in turn influence mental health. Studies have examined the relationship between public health and housing tenure, neighborhood environment, and housing affordability. Ige et al.'s review (2019) suggests that good quality affordable housing with efficient energy and adequate ventilation could potentially contribute to mental health and wellbeing. Friesinger et al. (2019) argued that the environment of community and neighborhood quality is more likely to contribute to people's wellbeing and mental health compared with specific building conditions.

Bentley, Baker, and Mason (2012) found that the average mental health status for people under long-term Housing Affordability Stress (HAS) is lower, holding all else constant. Residential density within developed land could be retrieved through Smart Location Database developed by the Environmental Protection Agency. Literature shows that residential density is associated with the degree of active travel, the substitution of walking or cycling for motorized transportation methods and that people living in areas with higher residential density are more

conducive to active travel and thus have a lower risk of being overweight (Cervero, 2002; Cervero & Gorham, 1995; S. L. Handy, 1996; Owens et al., 2010).

Access to Alcohol-related Establishments and Mental Health.

Besides the environmental characteristics that could contribute to a healthy lifestyle, it is also necessary to consider the environmental factors that could discourage or jeopardize the healthy lifestyles essential to one's mental health, such as alcohol use. According to World Health Organization, alcohol consumption is the leading risk factor for public health in the Western Pacific and the Americas (WHO, 2011). Global statistics also show that alcohol's harmful use is "responsible for approximately 2.5 million deaths annually" (WHO, 2011).

Among many environmental factors that contribute to alcohol usage, alcohol availability is prominent (Kypri, Bell, Hay, & Baxter, 2008; Popova, Giesbrecht, Bekmuradov, & Patra, 2009; Weitzman, Folkman, Folkman, & Wechsler, 2003). It is widely accepted that having convenient *access to alcohol-related establishments* is associated with more alcohol consumption. Excessive alcohol use could negatively impact mental health (such as depression, disorders, neuropsychiatric issues, etc.) (WHO, 2011). Pereira et al. (2013) found that people "with greater access to liquor stores were more likely to consume alcohol at harmful levels and to have had a hospital contact for anxiety, stress or depression," holding all else constant.

Meanwhile, the existing studies also point out a mutual dynamic within the relationship between alcohol use and mental health issue. Evidence shows that people with underlying mental health issues or relatively more vulnerable to mental health impacts are more likely to conduct harmful alcohol consumption (Boden & Fergusson, 2011; Castaneda, Sussman, Westreich, Levy,

& O'Malley, 1996). However, accessibility to alcohol-related establishments is an essential factor in the examination of this relationship.

Additionally, there is a growing awareness of the socioeconomic disparity lying behind the geography of alcohol-related establishments. Studies found an association between the geographic agglomeration of alcohol retails and low socioeconomic status, historically disadvantaged racial or ethnic communities (Berke, 2010; Hay, Whigham, Kypri, & Langley, 2009; LaVeist & Wallace, 2000; Romley, 2007). A similar pattern was detected within the Tobacco literature previously (Chuang, Cubbin, Ahn, & Winkleby, 2005; Novak, Reardon, Raudenbush, & Buka, 2006). The spatial distribution of alcohol-related establishments is an important factor, given its association with concentrated disadvantage.

In addition to the environmental factors mentioned above, there are other characteristics that have demonstrated impacts on mental health. On a fine-scale level (for example, the neighborhood street level), environmental factors such as walkability, tree canopy, and vegetation coverage are all critical factors that could affect mental health. Berke et al. (2007) examined the relationship between *walkability* and the degree of depression among older men. They found a significant relationship between the poor degree of walkability and depression in older men in the U.S. In a systematic review, van den Berg et al. (2015) summarized that adults living in an urban environment with more green coverage and vegetation are likely to report better mental health than adults living in an area with less green.

Lately, new urban green practice, such as urban gardening, has shown an association with better mental health status. "People who had a garden reported better mental health only when they lived in very strong urban environments" (de Vries et al., 2003). However, due to the data

limitation, this study will not be able to examine the built environment factors on street level (e.g., walkability, tree canopy, and vegetation coverage). Future studies should consider using fine-scale and urban design indicators to refine the inquiry.

2.5.2.4 Neighborhood Social Environment and Mental Health.

The mechanism of the indirect impact of neighborhood crimes on public health and wellbeing roots down in the diffuse effect of structural disadvantage (Lorenc et al., 2012). One of the consequences of crime is the “*time-space inequalities*”(Whitley & Prince, 2005), which refer to the inequality in the ability to access and utilize different times and spaces due to the fear of crime. The constrain in spatial and temporal movement could further affect one’s protective social activity (social bonding), health-promoting community involvement, and the use of wellbeing determinant services (such as public space, public transit, and public service). People of historically disadvantaged races, ethnicities, and socioeconomic statuses appear to become more *vulnerable* than people with more affluent backgrounds in dealing with crime-related stress.

Consistent with the environmental criminology theory, empirical studies that discussed the association between fear of crime and mental health concluded that contextual factors, including physical and social aspects of neighborhoods, such as social disorder, deprivation, overcrowding, vandalism, vacant housing, incivility, and the lack of investment or maintenance could also affect the fear of crime among residents (Halpern, 1995; Perkins & Taylor, 1996; Stafford et al., 2007). One essential factor within the relationship between neighborhood environment and individual wellbeing is collective efficacy.

Collective efficacy is defined as the neighborhood residents' willingness to interfere, interact, and engage in public affairs on the neighborhood scale. Originally, collective efficacy

was measured through Likert scale questionnaires, assessing the degree of psychological sense of community (Buckner, 1988; Foster et al., 2016; French et al., 2014). Collective efficacy shapes the overall sense of community through social trust and the informal social control community (Sampson et al., 1997). It embeds in the structural context and ties closely with the socio-economical characteristics of the neighborhood. Collective efficacy affects both individual mental health status and social capital. A cohesive neighborhood atmosphere (high collective efficacy) helps to provide natural surveillance in crime prevention and affects people's willingness to participate, interfere, and socialize with the neighbors. The association between collective efficacy with the degree of socialization, sense of community of belonging, and the feeling of security (with a high level of natural surveillance and social capital) make collective efficacy an influencing factor for residents' mental health resilience or individual vulnerability.

The lack of collective efficacy and social control could discourage the residents from participating in the community affair and thus create a low sense of belonging and a stronger feeling of isolation, especially for people of lower socioeconomic status and with lower social capital. Not only crime, but the fear of crime is also negatively associated with neighborhood ties and cohesion (Liska & Baccaglioni, 1990). Studies use survey questionnaires to measure community participation, which includes the count of activities for volunteer organizations or fundraising that the participants were involved in during the past year (Foster et al., 2016; Lindström et al., 2001).

Ross and Jang (2000) used telephone interview data from Illinois to test the relationship between neighborhood disorder and the fear of crime. Their finding shows that despite the impact of physical disorder, *social ties* between residents could help mitigate perceived (Ross &

Jang, 2000). The degree of social tie shows how much a person is embedded in their community or neighborhood, which is directly associated with the level of collective efficacy. Conceptually, social ties consist of two parts: informal integration between neighbors and formal participation with neighborhood organizations (Bursik Jr., 1988; Ross & Jang, 2000; Sampson & Groves, 1989). Informal integration is measured through a series of activities conducted between neighbors, capturing the degree of interactions, connections, and alliances (Gerson et al., 1997; Campbell & Lee, 1992). For example, some scholars use questions such as “the degree to which a respondent visits and talks with neighbors and the degree to which the respondent and his or her neighbors help each other out by lending things, watching each other’s houses, giving each other a ride” (Ross & Jang, 2000), etc. as measurement.

Empirical evidence shows that people living under disadvantaged social status tend to suffer disproportionately from the environmental impact on health (Bullard & Johnson, 1997). Early studies of the fear of crime focusing on the sociodemographic correlations find that the perception of risk and the degree of fear are associated with age and gender (Baumer, 1979; Clarke & Lewis, 1982; Garofalo, 1979). The sociodemographic correlates, according to existing literature, are presumably related to the one’s “physical or social vulnerability” (Rountree & Land, 1996). Studies also show that women and the elderly are more likely to report fear associated with crime, while young males are reportedly less likely to be fearful of crime (Ferraro, 1995; Lagrange & Ferraro, 1989; Perkins & Taylor, 1996).

Based on a national survey in Britain, Whitley and Prince (2005) found that fear of crime could cast a disproportionately negative impact on people that are undergoing socioeconomic or mental health challenges, in their case, low-income mothers and people with existing mental

illnesses. They mentioned the perspective of women with children that they would worry about the negative consequences that could potentially happen to their children (Whitley & Prince, 2005). White et al. (1987) conducted a three-year panel study to examine the impact of the residential environment on residents' mental health. With a specific focus on 337 Black and Hispanic women and their children, the results show a negative effect of crime on mental health among the examined adults (White et al., 1987).

For older adults, the challenge of social isolation has been examined as a threat to mental health over decades. In the classic psychology literature, Cumming and Henry (1961) use social disengagement theory to explain the sense of isolation as a result of “a gradual and irreversible abandonment of social roles, narrowing role sets, and the weakening of existing social bonds” (Cornwell et al., 2008, p. 186). Activity theory, on the other hand, notes that older adults who are able to remain socially active are “happier and healthier” than those who disengage from previous social activity (Cavan et al., 1949; Cornwell et al., 2008; Lemon et al., 1972). Social ties are important to healthy aging because they provide the embeddedness for the older adults in systems of norms, control, and trust (Coleman, 1988); access to information and resource; and social support (Ajrouch et al., 2018), which are crucial social capital for a person's wellbeing (House et al., 1988).

There is rising attention to the Feminism perspective on the gender inequality among crime victimization and its aftermath. The Feminism perspective on the environmental context sets women's safety, and perception of safety, in a socio-political framework, where the fear is related to tangible risks and to the broader social vulnerability among women (Greed, 1994; Koskela & Pain, 2000). As pointed out by criminologist Elizabeth Stanko (Stanko, 1997), fear of

crime is largely *constructed* by socio-political conditions, in particular in its gendered nature.

Within the field of urban planning and design, women's fear of attack/unsafety has been noted as early as the 1990s (for example, Valentine, 1990; Wekerle & Whitzman, 1995).

Lynch and Atkins (1988) conducted a survey in the U.K. among 249 women and found that women tend to adopt precautionary measures to protect themselves from sexual harassment in public spaces. Some of the most frequently mentioned measures include “*do not go out in the dark; do not walk at night; try and travel with other people*” (Lynch & Atkins, 1988).

Additionally, studies find that women tend to exhibit higher levels of anxiety and concern over personal safety when compared with men, which leads to the constrain on travel behavior and mobility options (Ding et al., 2020; Keane, 1998; Loukaitou-Sideris, 2005; Loukaitou-Sideris & Fink, 2009). The constrain in travel options and personal mobility could, in return, exacerbate the mental health conditions by alienating them from social activities and discouraging physical activities. In the book “The fear that stalks – “gender-based violence in public spaces,” the authors demonstrated how gender-based violence has been creating damage to the socially-vulnerable gender groups within the politics and dynamics of public space (Pilot, 2015).

As a social reality, the construction of fear is embedded into the male-dominant environmental design and social-political decision-making. Koskela and Pain (2000) conducted a qualitative study based on two European cities, Edinburgh, Scotland, and Helsinki, Finland, to examine the relationship between the built environment and women's fear of crime. The results show that there are several particular types of environments being identified when women talk about the “threat of attack.” From many women respondents' perspectives, it is the social connotations attached, or indicated, by certain built environmental characteristics that make them

“fearful.” As a consequence, “fear influences our experience of places, as much as places influence our experiences of fear.”(Koskela & Pain, 2000, p.269).

Within our selected articles, studies have also examined other social factors that could affect people’s mental health vulnerability towards crime, for example, systemic racism and discrimination. Using individual narratives from psychiatric clinic data from the U.S., studies found that the tension between historically disadvantaged racial groups (especially Black or African American people), recent immigrants (especially first-generation non-English speaking and undocumented immigrant people), and the law enforcement officers could pose additional stress on mental health (Hansen et al., 2018). The reports from American Psychiatric Association’s Council on Minority Affairs reported increased fear among patients from the vulnerable groups, including children “*who worry about the safety of their parents and caretakers*”(Hansen et al., 2018).

Hate crimes associated with discrimination against the LGBTQIA+ population also created a series of mental health consequences in victimized individuals and the wider population of the LGBTQIA+ community (Hein & Scharer, 2013). According to a systematic literature review of studies on mental health among LGBTQIA+ youth, the rates of depressive disorder and depressive symptoms are more elevated in sexual minority youth when compared to the heterosexual and cisgender youth, and the quantitative evidence for this conclusion is robust (Lucassen et al., 2017; Wilson & Cariola, 2020). In addition to the psychological impacts discussed above, victims from the LGBTQIA+ community are also likely to experience diminished self-efficacy and self-blame, victim-blaming (by others), internalized homophobia, loss of trust in others, and suicidal ideation(Hein & Scharer, 2013; Herek et al., 1997; Meyer,

1995), which position them to become more vulnerable when dealing with crime-related tensions.

2.5.3 Crime and Mental Health

2.5.3.1 Crime's Aftermath on Mental Health

Classic environmental criminology literature approaches the fear of crime and the mental burden created by crime from primarily five perspectives: (1) actual experience of criminal victimization; (2) second-hand information regarding a criminal victimization experience, usually distributed through the social network; (3) undesirable physical environment including physical deterioration and signs of disorder; (4) certain characteristics of neighborhood built environment, such as the physical composition of the housing stock; and (5) signs or atmosphere of group conflicts within the community (Moore & Trojanowicz, 1988; Skogan, 1986).

Figure 2 shows the word cloud frequency within the selected studies generated by NVivo12.



Figure 2: Word Cloud of Identified Literature Generated by Nvivo² based on Frequency As a critical environmental stressor (Lewis & Riger, 1986; Taylor & Shumaker, 1990),

crime may distress both the physical and subjective wellbeing of people, such as fear, anxiety, and other mental illness (Becker & Rubinstein, 2011; Dustmann & Fasani, 2016). The consequences of crime affect people’s physical and subjective wellbeing. These impacts include psychological symptoms such as fear and anxiety (Becker & Rubinstein, 2011; Dustmann &

² NVivo is a qualitative data analysis software package produced by QSR International.

Fasani, 2016), which trigger further mental illness. The aftermath of crime casts a potential impact on public health, especially on people's mental health status and people with lower social capital and limited public health resources in the Global South.

Existing literature identifies two pathways through which crime affects mental health (Halpern, 1995; Kunst, 2012): (1) direct victimization, where the person was directly victimized in a crime incident and developed mental health issues after that; and (2) indirect experience of crime victimization. For example, knowing a family member or friend who was victimized, in this case, the person's mental health is most affected by the fear of crime upon listening/imagining someone else's experience of victimization. Direct victims of violent civilian trauma may suffer from a wide array of negative psychological and social adjustment problems (Kunst, 2012), such as posttraumatic stress disorder (Orth et al., 2008), depression (Bargai et al., 2007), somatization, hostility, generalized and phobic anxiety (Norris & Kaniasty, 1994; Winkel, 2009), etc.

However, it is less noted that the population who are affected by the indirect experience of crime victimization and the fear of crime are significantly larger than the population who were directly victimized. This larger group of the population is dealing with the day-to-day fear of crime, the perception that they could be victimized. Although the traumatic impact of indirect impact is not as evident as direct victimization, the chronic stress and psychological burden could lead to mental health illnesses, such as anxiety and depression (Dustmann & Fasani, 2016; Jackson & Stafford, 2009).

Alongside the efforts to address the direct experience with crime in the field of public health, planners and planning researchers examine the relationship between crime and mental

health issues at a broader spatial scale. The insecurities about public safety and crime are widely accepted for their negative impact on neighborhood cohesion and individual wellbeing (Jackson & Stafford, 2009), and it is very important for planners to recognize this relationship in the endeavor of building resilient and healthy neighborhoods.

2.5.3.2 Classification & Measurement of “Crime.”

Fear of Crime.

Within the discussion on how crime affects people’s mental health, the indirect impact of crime usually refers to the negative consequences of the *fear* of crime. Fear of crime comes from a sense of insecurity, namely, a perception that crime *may* happen to oneself or the ones that one cares about. This indirect impact of crime may lead to stress, a sense of insecurity, concerns, and worries. These mental health symptoms could alone cause further clinical symptoms due to long-term emotional distress. The negative emotions generated by fear of crime could also lead to avoidance tendencies in physical activity and cause additional physical health issues.

In a systemic literature review, Lorenc et al. (2012) reviewed the existing studies on the connections between crime, fear of crime, environment (social and built environment), and health and wellbeing (Lorenc et al., 2012). Through a pragmatic approach, they found that both crime and the fear of crime have substantial impacts on people's health and wellbeing through an indirect mechanism. They also found that this relationship is conditioned by *environmental factors* (both the built environment and social environment). However, the current literature has yet to conclude what are the exact roles of each environmental factor.

Generally, fear of crime is measured by a subjective response to a set of questions assigned to assess to which degree the survey taker worries about a matter. For example, in the

study by Foster, Hooper, Knuiman, and Giles-Corti (2016), fear of crime was derived from the question "In your everyday life, how fearful, or not, do you worry about the following situations" : (1) having someone break into your house while you're at home; (2) being attacked by someone with a weapon; (3) being robbed or mugged on the street; (4) having your property damaged by vandals; and (5) having someone loiter near your home at night"(Foster et al., 2016).

Stafford, Chandola, and Marmot (2007) use a similar set of questions to assess how worried the survey takers are about the following items: (1) home being broken into, (2) being mugged or robbed, (3) car being stolen or (4) things being stolen from the car, or (5) being raped"(Stafford et al., 2007). Main aspects of fear of crime include home being broken in, property safety, and violence against oneself. Other aspects were mentioned in recent studies as well. For example, Stafford et al. (2007) incorporated sexual violence into the fear of crime. These questions are composed of different concerns related to crime: either imagining a certain type of crime happening to *themselves*, their *properties*, or to the *ones that they deeply care about* (such as children or family members). They are commonly utilized as identifiers for fear of crime in both quantitative and qualitative studies.

Empirical studies support the argument that fear of crime is closely related to the lived experience of victimization. More specifically, the specific type of victimization, the degree of harm, and the location of victimization all further influence the victim's perception of safety (fear of crime). For example, Culbertson, Vik, and Kooiman (2001) conducted a survey among female undergraduate students in the U.S. to examine the impact of sexual assault on perceived safety (Culbertson et al., 2001). They found that when holding all else constant, women who

have experienced sexual assault are more likely to feel less safe and that as the impact of sexual assault increases, the victim's perceived safety decreases. Culbertson et al.'s study also found that the location of victimization plays an important role in shaping the perceived safety: women who experienced sexual assault at home have lower perceived safety at home than the victims who experienced sexual assault in other locations, and victims who were sexually assaulted in a public setting tend to feel less safe in the isolated public setting.

Crime Statistics.

The direct impact of crime on mental health were extensively examined within the field of medicine, psychology, psychiatry, and criminology. Within these fields, the queries of relationships are mostly based on individual records with a case-by-case focus, as are the clinical implication and healing interventions. Meanwhile, in the field of urban planning, crime statistics, or the aggregated record of criminal incidents, is a commonly used measurement on the collective level. Aggregated measurement of crime statistics is regarded as a contextual variable, as opposed to a direct trigger of mental health issues in the studies using the individual case of direct victimization.

The impact of actual crime statistics could affect mental health through direct (by victimization) and indirect pathways (by inducing the fear of crime). Direct impact happens mostly among victims (and mostly arouse from the violent crime incidents), including physical injuries and psychological trauma on the individual level (Lorenc et al., 2012). Meanwhile, the indirect impact could happen within a wider population within the community (triggered by either experiencing, witnessing, or hearing about the criminal incidents). Using panel data from two national surveys in Britain, Dustmann and Fasani (2016) found that crime in local areas

causes considerable mental distress for residents, and this relationship is even primarily driven by property crime, “increase in the overall local crime rate causes an increase in mental (within-individual) in self-reported mental wellbeing” ((Dustmann & Fasani, 2016, p.979).

Astell-Burt et al. used the data from Social Economic and Environmental Factors (SEEF) Study and the Kessler 10 scores reported by 25,545 men and 29,299 women to examine the relationship between crime and mental health symptoms, in their case, distress level. They used the measurement of annual crime rates per 1000 persons from 2006 to 2010, including non-domestic violence, malicious damage, break and enter, stealing, theft, and robbery. The finding shows that the increase in the local crime rate is associated with a greater risk of experiencing psychological distress (Astell-Burt et al., 2015). This impact is found to be particularly strong among women, especially with the crime of malicious damage.

2.5.3.3 Crime and Mental Health -- An Environmental Perspective

Whether it is generated from the fear of crime or the actual experience of crime victimization, the impact of crime-related tension on mental health tends to be associated with environmental characteristics in one’s neighborhood, such as the built environment and the social environments. Built environment and social environment function as the influencing factors in the “crime and mental health” relationship because they condition the context where people live their daily life. Both the built environment and social environment could affect the way how people engage with each other within the community. Figure 1 below illustrates the mechanism where environmental context could work as a moderator in the relationship between crime and mental health.

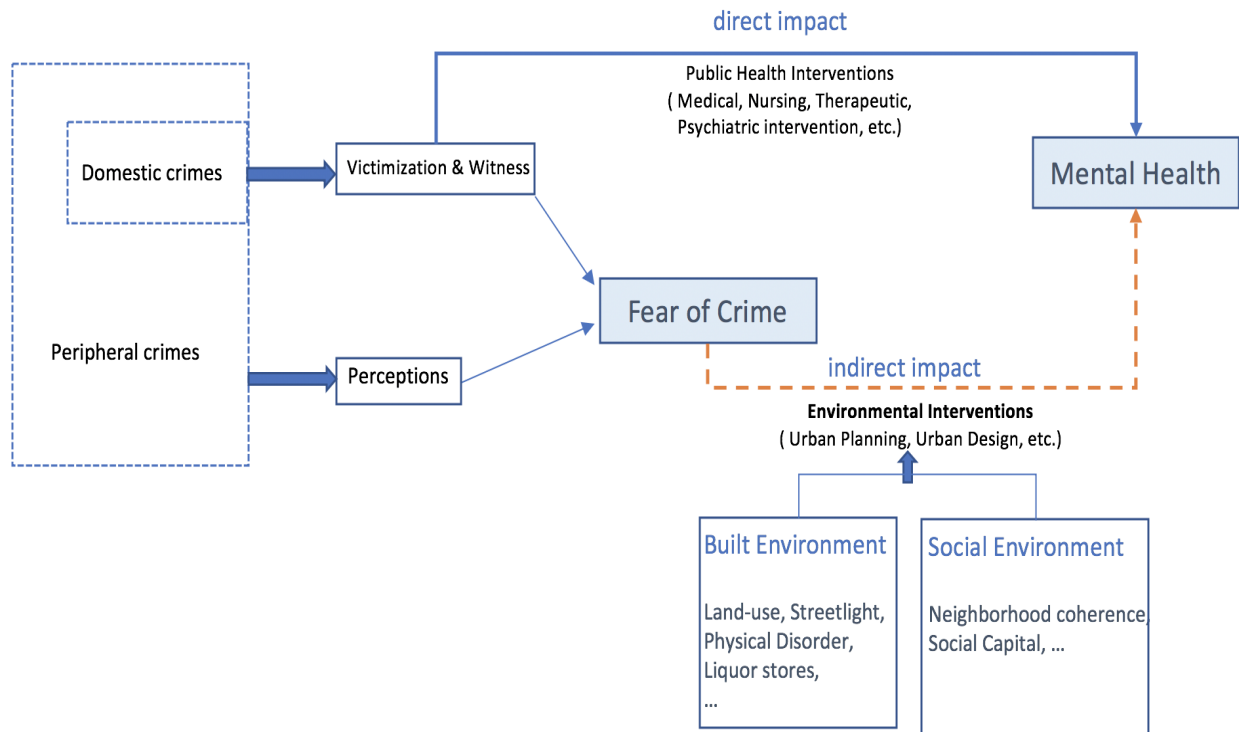


Figure 3 Environmental Context as a Moderator in the Crime & Mental Health Relationship

Among empirical studies, fear of crime was hardly considered as the main independent variable versus the actual crime. For those who did consider the fear of crime as an influencing factor, we analyzed the pattern of measurement for Fear of Crime (see Table 1). These studies use the Fear of Crime as the main measurement to examine the crime-related consequences on health. Most of the research areas were outside of the North American context, except for Villarreal and Yu (2017) focused on Mexico. Most research was designed in the quantitative approach, which relies on the statistical analysis of national longitudinal survey data.

Table 1 Analysis of studies using Fear of Crime as the Experimental Variable

Author, Year	Research Design	Location	Data source & Sample size	Main Methods	FOC Measurement	Mental Health Measurement	Control for Built Environment
Foster et al., 2016	Quantitative	Australia	RESIDE participants in Perth, Australia, completed a questionnaire three years after moving to their neighborhood (2007 - 2008, n=1230) and again four years later (2011-2012, n=531).	Proc Mixed procedure (marginal repeated measures model with unrestricted variance pattern): firstly measure the overall impact of the fear of crime on psychological distress, additional models decomposed fear of crime and measure in cross-sectional effect and longitudinal effect.	Derived from the survey question: In your everyday life, how fearful, or not, are you about the following situations: (1) having someone break into your house while you're at home; (2) being attacked by someone with a weapon; (3) being robbed or mugged on the street; (4) having your property damaged by vandals; and (5) having someone loiter near your home at night (Cronbach's $\alpha = 0.92$) (Ferraro, 1995). Participants rated each item on a Likert scale (1 = not at all fearful to 5= extremely fearful) which were averaged to produce a score between 1 and 5)	Questionnaires using psychological distress (Kessler-6): nervousness, tiredness, hopelessness, and restlessness.	Walking (minutes/week inside the neighborhood) was measured using the Neighborhood Physical Activity Questionnaire, which has acceptable reliability (ICC ≥ 0.82) and distinguishes the location and purpose of walking (Giles-Corti et al., 2006).
Stafford & Marmot, 2007	Quantitative	UK	Data from 2002 to 2004 of the Whitehall II study, a longitudinal study of more than 10000 London-based civil servants aged 35 to 55 years at baseline	linear regression to assess the association between fear of crime and SF-36 scores, walking speed, lung function, and CASP-19 quality of life (1 model for each health outcome); logistic regression to assess the association between fear of crime and common mental disorders. Comparing Nested Model (To assess the contribution of social and physical	Fear of Crime: Measured by survey questions asking how worried they are about the following items: home being broken into, being mugged or robbed, a car being stolen or things being stolen from the car, or being raped. Possible responses to each item were very worried (score 3), fairly worried (2), not very worried (1), or not worried at all (0). These responses were summed to create a fear scale ranging from 0 to 12 (Cronbach's $\alpha=0.77$)."	The 30-item General Health Questionnaire ²⁴ captured common mental disorders and included anxiety and depression subscales.	Not Controlled

				activities to the fear of crime–health relationship)			
Whitley & Prince (2005)	Qualitative	UK	Data were gathered over a 2-year period in the Gospel Oak neighborhood of North London using in-depth interviews, focus groups, and participant observation.	Qualitative (in-depth interviews, focus group, participant observation) (comparing the impact of fear of crime across sub-groups notably divided by gender, age, and mental health status, by analysis)	Identified through interviews and participant observations. E.g., "Women disproportionately mentioned fear of neighborhood crime as a factor of concern affecting their everyday lives. "	Identified through interviews and participant observations. E.g., "They frequently talked about threatening situations or actual incidents which led to psychological stress and behavioral changes."	Comprehensive local transport, government-issued free travel passes for vulnerable populations and neighborhood community safety measures such as the installation of CCTV.
Villareal & Yu (2017)	Quantitative	Mexico	Mexican Family Life Survey (MxFLS, a National longitudinal survey of Mexican households (n=30,000) from 2002, 2005-2006, 2009-2012	Fixed-effects model (panel data)	Drug trafficking organization (DTO) related Fear of Crime, as one of the outputs (the other output is the psychological distress), was measured through the survey: how afraid they feel of being assaulted or robbed during the day and during the night, respectively, on a scale from 1 to 4 (not scared, a little scared, scared, very scared).	Using the survey data to measure the psychological distress. "Symptoms include feeling sad or anguished, crying, having difficulty sleeping, diminished appetite, obsessive thoughts, trouble focusing, and feeling nervous or anxious, among others.	Presence of military personnel and checkpoints in the neighborhood, whether there are paramilitary (white guardians) operating in the neighborhood,

Jackson and Stafford (2009) conducted an empirical study on the fear of crime and public health and found that worrying about crime harms health and that, in turn, “heightens the worries about crime” (Jackson & Stafford, 2009). Their study concludes that “fear of crime may express a whole set of social and political anxieties. There is a core to worry about the crime that is implicated in real cycles of decreased health and perceived vulnerability to victimization.”

Whitley and Prince (2005) conducted a qualitative study using in-depth interviews, focus groups, and participant observations in a North London neighborhood for over two years (Whitley & Prince, 2005). Their results show that fear of crime disproportionately affects certain population groups more than others.

Hill et al. examined the relationship between the perceived risk of crime and the sleep quality using data (n = 39,590) from Wave I of the World Health Organization’s Longitudinal Study on Global Ageing and Adult Health (2007–2010), including six countries: Mexico, Ghana, South Africa, India, China, and Russia. They estimated a series of multinomial and binary logistic regression equations, modeled each sleep outcome within a different country and found that respondents who feel safer from crime and violence in the neighborhoods are more likely to exhibit more favorable sleep outcomes than respondents who feel less safe in their own neighborhood environment (Hill et al., 2016).

Additionally, there are some debates on the overall consequences of the fear of crime, whether they lead to the functional or dysfunctional outcome, or are they part of situational caution that could help increase the self-protection mechanism? Classic criminology literature has been primarily focusing on the negative consequences (especially in the 1970s and 1980s, see Fattah, 1993). On the other side, the benefits (such as situational cautions, self-protection

awareness) that a certain amount of fear of crime could bring are relatively less notified or mentioned (Fattah, 1993; Hale, 1996; Warr, 2000). Jackson and Gray (2010) examined this differentiation on both sides as "a dysfunctional worry that erodes the quality of life and a functional worry that motivates vigilance and routine precaution"(Jackson & Gray, 2010). Using representative sampling survey data from seven neighborhoods in London, U.K., they argue that fear of crime can be *helpful* just as harmful: it creates stress and tension but also encourages precaution that reduces chances of being victimized.

A previous study on crime's impact on mental health suggests that this mechanism is embedded in the general perception of "social disorder" in one's neighborhood environment. This sense of "social disorder" could come from multiple sources: (1) news and media reports on local crime incidents (Liska & Baccaglini, 1990); (2) physical signs of the disorder, such as vandalism, litter, and the lack of maintenance as illustrated by the "broken window theory" (Wilson & Kelling, 1975). Neighborhood deterioration may also be associated with the fear of crime (White et al., 1987).

Lewis and Maxfield (1980) studied the neighborhoods in Chicago, IL, and found the "symbols of incivility" (e.g., physical deterioration, abandoned property, etc.) are associated with a greater likelihood of residents reporting crime-related concerns while controlling for the actual crime statistics. The physical deterioration of the residential environment could intensify the residents' "fear of crime," with the perception that "the neighborhood is not safe" (Lewis & Maxfield, 1980). As a consequence, undesirable conditions of the neighborhood environment may also trigger negative emotions in residents that they are "unworthy" and that they lack the access to obtain necessary public service or adequate maintenance.

On the other hand, good quality neighborhood environment could help to buffer or mitigate the fear of crime, according to existing studies. Some early studies on “fear of crime” even argue that the fear of crime is “more than fear of crime,” but rather a part of a psychological syndrome of anxiety, worry, and nervousness under the environmental conditions (Liska & Baccaglini, 1990), which was termed as “urban unease,” “associated with the disorganization and the physical and social disabilities of contemporary urban life” (Garofalo & Laub, 1979; Liska & Baccaglini, 1990; Taylor & Hale, 1986). The evidence of existing studies suggests that the relationship between neighborhood environment and the fear of crime is *interactive* through the perception of “social order/disorder”: a poor-quality environment could trigger the fear of crime, and a good-quality environment could help improve the perception of safety (White et al., 1987).

A rich body of literature has examined how crime and the sense of safety affect activities such as walking (Handy et al., 2006; Hong & Chen, 2014; Joh et al., 2012; Mason et al., 2013). Using travel data from King County, Washington, Hong and Chen (2014) found that the built environment is not only significantly related to the walking behavior among residents but also shows a correlation with people’s perception of crime risk (Hong & Chen, 2014). The two-stage least square analysis shows that people living in neighborhoods with good accessibility and pedestrian facilities are more likely to perceive their neighborhood surrounding as a safe place, even though density demonstrates the opposite impact on people’s perception of safety. Consequently, people living in neighborhoods where they feel “safe” and have higher density measurements are more likely to walk (Hong & Chen, 2014).

Among the younger adults, the research findings on the impact of crime and the perception of crime have been less conclusive. Janssen used the sample of 14,125 youths in grades 6–10 (ages 11–15) who participated in the nationally representative cross-sectional 2009/10 Canadian Health Behavior in School-Aged Children Survey. The odds ratio from the associations between perceived safety and crimes against persons with physical activity indicates that youth living in environments that are relatively safer and youths who have a relatively lower perceived risk of crime are more likely to be physically active in their free time after school. More importantly, Janssen found that the perceived neighborhood safety was a stronger predictor than neighborhood crime for the physical activeness among youth in post-school time (Janssen, 2014).

Chapter Three: Research Design and Methodology

3.1 Research Design

In order to capture the impact of neighborhood characteristics on crime, I incorporated both the built environment and the social environment to re-conceptualize neighborhood characteristics. I improve the conceptual framework for property crime research by incorporating both the neighborhood permeability and neighborhood collective efficacy factors with the control of basic demographic characteristics. Then, I use a five-year dataset from 2015 to 2019 to explore the moderating effect of the neighborhood environment on the crime and mental health relationship.

The framework for the first part of this study (Part A) is depicted in Figure 2. Building upon the existing literature, I measure neighborhood permeability along the dimensions of land use and the access to transit, adding access to liquor/alcohol establishments. I also include the neighborhood collective efficacy measurements in the dimensions of concentrated disadvantage and residential instability. In addition, I include the neighborhood demographic structure as the control for neighborhood permeability and collective efficacy.

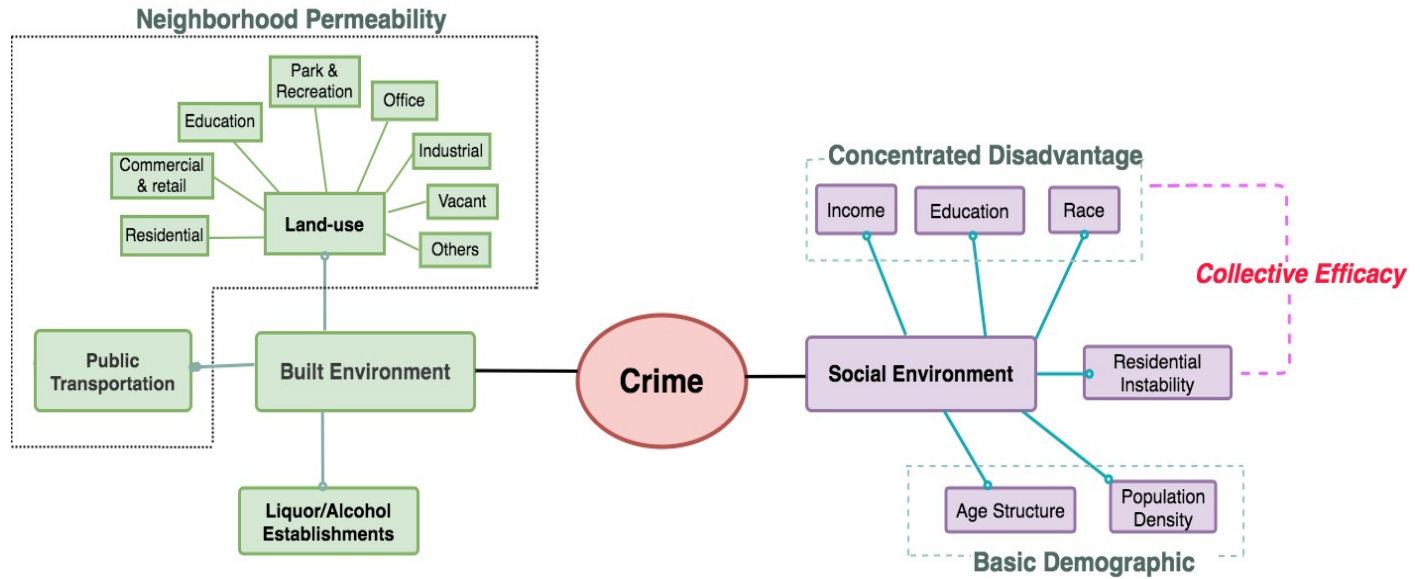


Figure Conceptual Diagram of the Research Design - Part A

Built environmental characteristics include the assessment of land-use patterns, within which seven types of land use were calculated in order to project the degree of mixed-use, together with Access to transit and Access to liquor stores. The neighborhood social environment is defined by three measurements: concentrated disadvantage and residential instability while controlling for the basic demographic structure. The measurement of concentrated disadvantage measures three main domains: education, income, and racial segregation.

I used the percentage of adults with a master's degree and above, Per Capita Income, and Percentage under Poverty Line. I then used the heterogeneity index for income, and racial segregation was also calculated using the adjusted model from the Herfindahl-Hirschman method (for further discussion, see the later part in the Methods Section). Residential instability consists of three variables: the percentage of property owner-occupants, the percentage of vacant units, and the percentage of Households Moved in within the last two years. Basic demographic variables include the age structure (by the percentage of Age 15 to 24) and the population density.

To explore the relationship between neighborhood environment, crime, and mental health, the second part of the research design was designed as depicted in Figure 3.

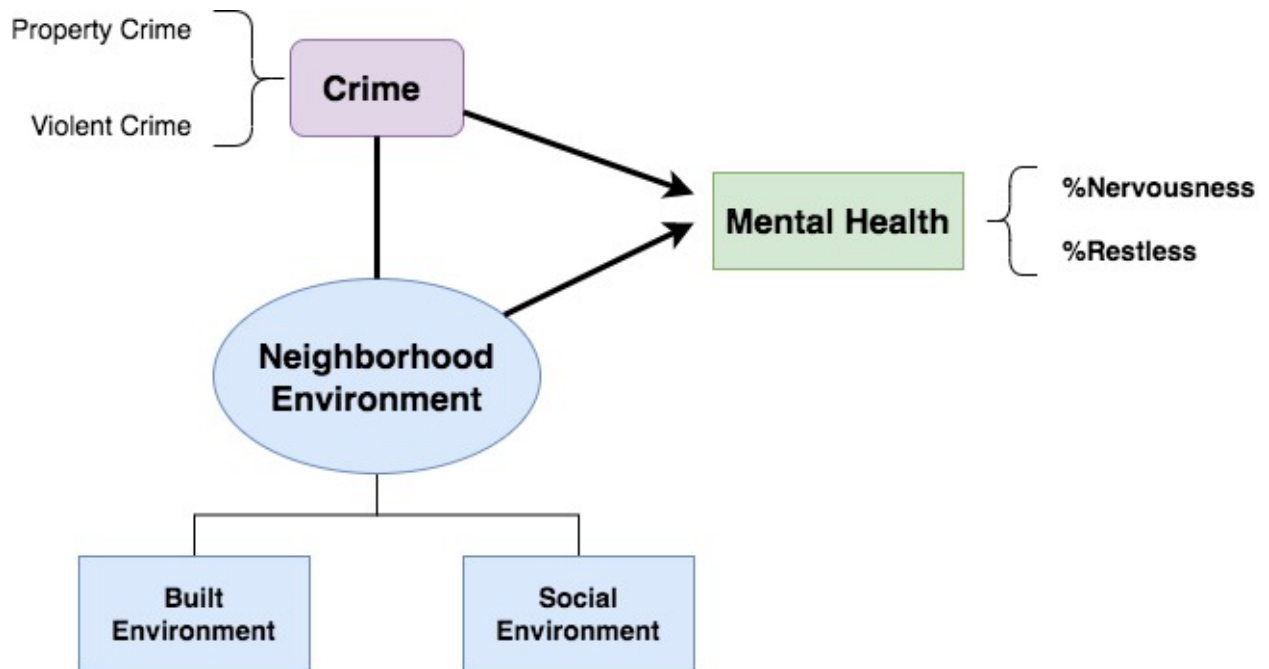


Figure 4 Conceptual diagram of the Research Design – Part B

3.2 Study Area

I chose the cities of Dallas and Fort Worth as the research area, as they are the two major cities in the fourth largest and one of the fastest-growing metropolitan areas in the United States. Being the economic backbone and cultural hub of North Texas, the increasing amount of practice in mixed-use development, advocacy for public transit, and the challenge in crime and community mental health issues make the DFW area an ideal research target. The unit of analysis is Census Block Group (N= 1,580), and the time of examination is a five-year period, from 2015 to 2019.

3.3 Data Collection and Sampling Process

Based on previous literature, I use the “D” factors to measure the built environment, including “Density,” “Diversity,” “Design,” and the “Distance to Transit.” More specifically, density includes the measurements of gross residential density (households/acre) on unprotected land, gross population density (people/acre) on unprotected land, and gross employment density (jobs/acre). Diversity measurement includes the employment density, which measures jobs per acre. The design includes the measurement of total road network density and street connection density (weighted, auto-oriented intersection eliminated). Distance to Transit measures the distance from the population-weighted centroid to the nearest transit stop (meters). The data were obtained and calculated from datasets including EPA Smart Location Dataset, 2018 HERE Maps, NAVSTREETS, GTFS, and land use shapefiles from North Central Texas Council of Government. The socioeconomic data and demographic data were obtained from the American Community Survey (5 Year Estimate).

The crime data were obtained from the City of Dallas Police Department and City of Fort Worth Police Department and were then classified into Property Crime and Violent Crime based on FBI Uniform Crime Reporting (UCR) Program. Property Crime includes arson, burglary, larceny-theft, and motor vehicle theft. Violent Crime includes robbery, murder, nonnegligent manslaughter, rape, and aggravated assault.

The transit station data from the Dallas Area Rapid Transit (DART) and Fort Worth Transit Authority (the T), respectively. The alcohol-related retail data was from the North American Industry Classification System (NAICS) database. I also obtain the geographic

boundary of the cities and the Census Block Group from the North Central Council of Government (NCTCOG) open data portal.

The Mental Health symptom data were retrieved from the EASI National Health Database (which were calculated based on the National Health Interview Survey) for the year 2015 to 2019. There are a total of two symptoms selected, including the feeling of Nervousness and the feeling of Restlessness. These values were calculated based on the survey feedback from the original questionnaires from the National Health Interview Survey.

For example, “During the PAST 30 DAYS, how often did you feel nervous/restless? 1 ALL of the time; 2 MOST of the time; 3 SOME of the time; 4 A LITTLE of the time; 5 NONE of the time; 7 Refused; 9 Don't know”. The sample includes all adults that are 18 years old and plus. For this study, I used the percentage of adults who responded All or Most of the time or Some of the time.

In the built environment measurement, I use the adjusted Herfindahl-Hirschman Index as the enhanced measurement of land-use heterogeneity. The common form of the adjusted Herfindahl-Hirschman Index is expressed below:

$$H = 1 - \sum_{j=1}^J G_j^2$$

where H represents the outcome of the Adjusted Herfindahl – Hirschman Index value; G represents the fraction of the measured variable within the unit of analysis out of j categories (Gundelach & Fritag, 2014; Wo, 2019). This measurement is preferred over other measures, such as the widely used entropy-based land-use mix index, the segregation index, or the Gini Index,

because it is simple and easy to understand and use (Zagorskas, 2016). When the value of the Index gets closer to 1, it approaches perfect heterogeneity, whereas values closer to 0 approach perfect homogeneity (Gibbs & Martin, 1962, p.672). Heterogeneity here means the state of diversity, to which degree one unit is different from another, and homogeneity implies the concentration of the features. Therefore, the higher the Index value is, the more diverse the measurement is.

To measure access to transit, I use the number of transit stops/rail stations in each census block group. The higher the number of bus stops/rail stations are, the more convenient it is for transit services. Similarly, I use the number of liquor/alcohol stores as the measurement of access to alcohol-related establishments. I consider that these measures are more precise than the measures widely used in many existing studies, which usually treat access as a dummy variable. Specifically, these studies usually identify the buffer zone of half-mile (805 meters) from facilities and use a dummy variable to distinguish the within or outside of the buffer zone (Agrawal, Schossberg, & Irvin, 2008; Austin, Sanchez, Patel, & Gortmaker, 2005; Le, Engler-Stringer, & Muhajarine, 2016; Saelens, Glanz, Sallis, & Frank, 2007; Rull et al., 2009; Rundle et al., 2013; Ward et al., 2006).

Social Disadvantage is measured through three dimensions: income, education, and race or ethnic structure. Additionally, I also include a quadratic term of population density to capture the potential non-linear relationship between property crime and population density, as suggested by Browning et al. (2010), Kikuchi & Desmond (2010), and Wo (2019). Other measures of neighborhood permeability, collective efficacy, and demographic characteristics are straightforward.

The variables used in this study are presented in Table 3 and Table 4, along with their data source and expected relationship with the dependent variable.

Table 2 Research Variables, Data Source, and the Expected Effect-Part A

Variable	Measurement	Data Source	Expected Effect on Crime
Dependent Variable	Count of Property Crime (burglary, larceny-theft, motor vehicle theft, and arson per block group)	Police Department Records, the City of Dallas & the City of Fort Worth (2017)	N/A
Built Environment	Land-use		
	Herfindahl- Hirschman Index for Mixed Land-use	Ratio	*Calculated by Author
	% Commercial & Retail	Percentage	NCTCOG
	% Education	Percentage	NCTCOG
	% Park & Recreational	Percentage	NCTCOG
# Transit Stations/Stops	Integer	Transit Agencies(DART, the FWTA)	+
# Alcohol-related Establishments	Integer	NAICS	+
Social Environment	Neighborhood Demographic		
	Population Density	Ratio	ACS 2017 (5Y)
	Squared Population Density	Ratio	*Calculated by Author
	% Age 15-24	Percentage	ACS 2017 (5Y)
	Concentrated Disadvantage		
	Race		
	Herfindahl – Hirschman Index for Racial Heterogeneity	Ratio	*Calculated by Author
	Education		
	% Adults with a Master's Degree and above	Percentage	ACS 2017 (5Y)
	Income		
Log Per Capita Income	Ratio	ACS 2017 (5Y)	
% under Poverty Line	Percentage	ACS 2017 (5Y)	
Herfindahl – Hirschman Index for Income Heterogeneity	Ratio	*Calculated by Author	
Residential Instability			
% Owner Occupants	Ratio	ACS 2017(5Y)	
% Vacant Units	Ratio	ACS 2017 (5Y)	
% Household Moved in since 2015	Ratio	ACS 2017 (5Y)	

Note: “-” means that the variable's expected relationship is negative, while “+” means that the variable's expected relationship is positive.

Table 3 Research Variables, Data Source, and the Expected Effect-Part B

	Variable	Measurement	Data Source	Expected Effect
Dependent Variable	Mental health status (among adults) % Nervousness % Restlessness	Percentage point	EASI National Dataset (2015-2019)	N/A
Crime	Property Crime Violent Crime	Count Count	Police Department Records, the City of Dallas & the City of Fort Worth	+ +
Built Environment	Land-use Herfindahl- Hirschman Index for Mixed Land-use % Commercial land use % Park or Recreational land use % Residential % Vacant land use Density Population Density (people/acre) Residential Housing Density (households/acre) Employment Density (jobs/acre) Road Network Density Distance from the population-weighted centroid to the nearest Transit (meters) Transit Stops/station Liquor Store	Ratio Ratio Percentage Percentage Percentage Ratio Ratio Ratio Ratio Integer Count	*Calculated by Author NCTCOG (2015) Smart Location Database HERE Maps, NAVSTREETS GTFS, CTOD DART, FWTA NAICS (2017)	- + - - - - - - - - -
Social Environment	Social Disadvantage Race Black or African American Hispanic or Latinx Non-Hispanic White Alone Age Females above 65 and plus Male above 65 and plus Education Adults with a High School degree Adults with a High School degree	Count	ACS 2015-2019 (5Y)	+ +
	Income Median Household Income Poverty status Unemployment Renter Household Household with no Vehicle Median Home Value	Integer Percentage Integer	ACS 2015-2019 (5Y) ACS 2015-2019 (5Y) ACS 2015-2019 (5Y)	- + -

Note: “-” means that the variable's expected effect is negative, while “+” means that the variable's expected effect is positive.

3.4 Data Analysis Methods

The modeling approach for the first research question is Negative Binomial. The nature of our dependent variable, crime counts, is a non-negative integer value. The count data is not normally distributed. Due to these characteristics, a linear model like Ordinary Least Squares (OLS) may not provide the ideal estimation for all the values in the explanatory variables due to the lack of variation and the common skewness in discrete data (Wooldridge, 2012). Two types of Generalized Linear models are suggested by the literature for the count dependent variables: Poisson regression and Negative Binomial Regression (Gilbreath, 2013; Willits et al., 2011; Zhang, Wei, He, & Li, 2018).

Unlike the OLS, which chooses the output that maximizes the R-square, the Generalized Linear Models select the outcome that maximizes its log-likelihood (Wooldridge, 2012). However, one of the basic assumptions must hold to apply Poisson regression: the mean value (μ) should equal the standard deviation (σ) in the dependent variable (Cameron & Trivedi, 1990; Wooldridge, 2012). According to the descriptive analysis, our dependent variable, crime counts, fails to meet this condition because its standard deviation (σ) is significantly greater than the mean value (μ). Negative Binomial Regression is a better fit because it enables us to conduct reliable analysis while allowing the over-dispersion in the dataset (Cameron & Trivedi, 1998; Osgood, 2000; Raleigh & Galster, 2014; Sohn et al., 2018; Willits et al., 2011; Wooldridge, 2012).

Additionally, there is a growing awareness that neighborhood context is integrated and conditioned by each other's characteristics (Anselin, 1988; Mears & Bhati, 2006; Peterson & Krivo, 2010). The potential effect of spatial spillover plays a vital role in the crime and place relationship (Grubestic & Rosso, 2014; Hipp & Yates, 2011; Raleigh & Galster, 2015; Wo, 2019). Using the

software GeoDa 1.14, I first generalize the spatial weight with the first-order contiguity. I will then apply the spatial weight to generate the spatial lag in the dependent variable (Wy) and add it to the Negative Binomial Model.

For the second research question, the dependent variable is the percentage of mental health symptoms among adults: “Percentage of Nervousness” and “percentage of Restlessness” among adults for each block group. The most commonly applied models for panel data (continuous data as a dependent variable) are the fixed-effect and random effect models. Both models have the advantage of estimating unobserved effects within panel data models (Wooldridge, 2009) over the traditional OLS modeling technique. The advantages of using panel data modeling techniques include the capacity to minimize the estimation biases that may arise from aggregating different groups and years among the time series. More specifically, the panel data models allow for heterogeneity across the examining groups and contain the ability to measure some individual-specific effects. Particularly, heterogeneous models (including both fixed effect model and random effect model) in the panel datasets allow for the model parameters to vary across different individuals, while the OLS would generate biased results in the estimations. OLS regression will become ineffective in panel data analysis because of the lack of capacity to account for the heterogeneous effect.

Additionally, each dataset's nature (such as the variation across time within variables) sets specific requirements/preferences between the Fixed-effect model and Random effect model (Bell et al., 2019). The fixed-effect model aims at the same subject by examining the longitudinal change in observation by omitting variations that are not sensitive to time periods, such as gender and race. In this case, Fixed-effect would become biased because the model omits these effects. On the other hand, the random effect model, also called Variance Components Model, uses random variables

and does not omit their variations. The Random effect model assumes that data were drawn from a hierarchical linear model from different populations whose differences are related to the hierarchy.

In the field of Econometrics, the Random Effect model is applied to panel data analysis when assuming no fixed effects (allowing the individual effects across time period). The random Effect model controls for unobserved heterogeneity (when this heterogeneity is constant over time and not correlated with each independent variable), which otherwise would be omitted in the Fixed-Effect model. The fitting assumptions are different for these two models: Fixed-effect assumes that the individual unobserved heterogeneity is correlated with the independent variables (thus chooses to omit them); while the Random Effect model assumes that the individual unobserved heterogeneity is not correlated with the independent variables (thus chooses to assist in controlling for them).

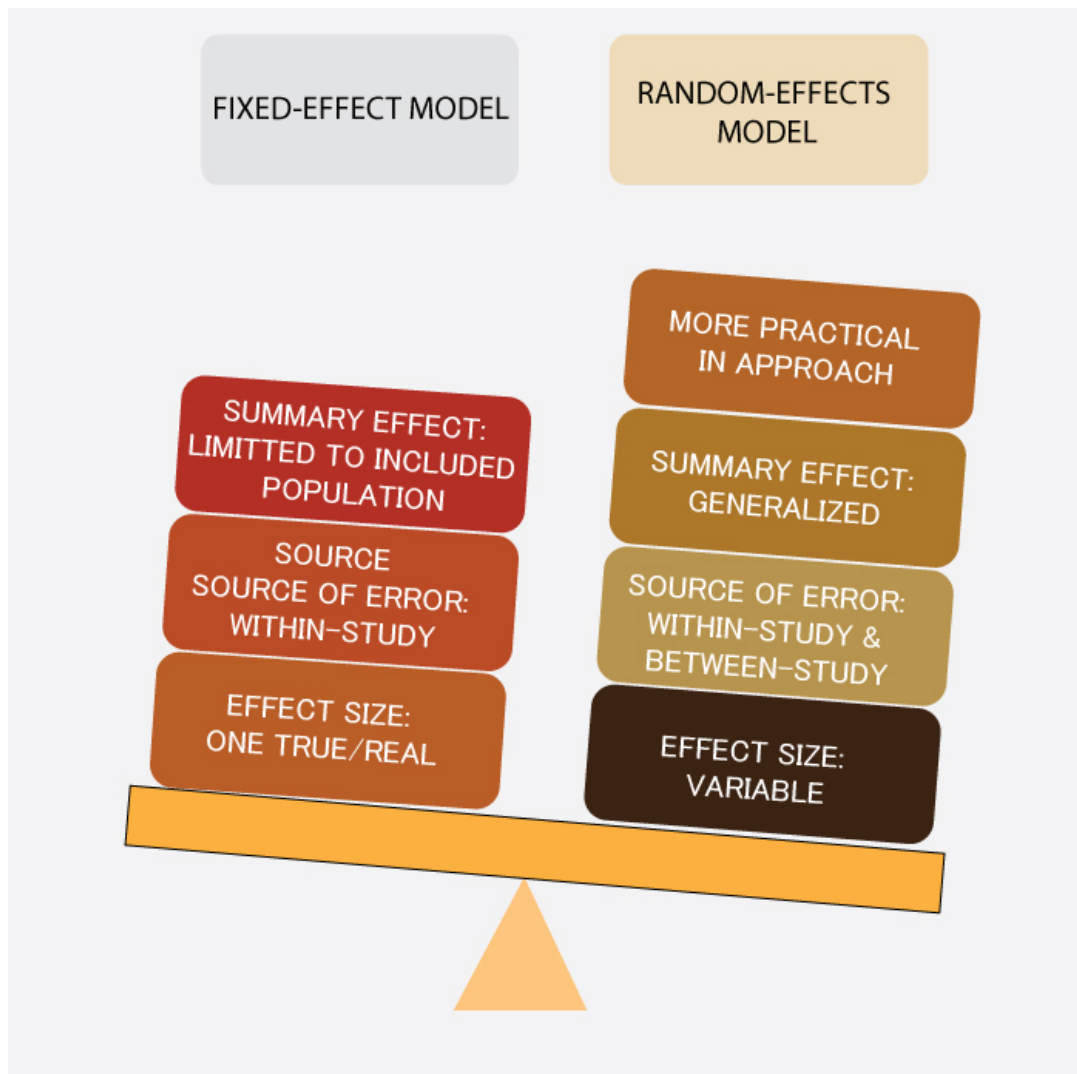


Figure 5 Illustration of the difference between Fixed Effect and Random Effect (source: Pubrica)

The purpose of this study involves comparing the block group treatments, which belong to a large population ($n=1580$) and hence are associated with the random effect (unobserved heterogeneity is not correlated with independent variables), instead of within-group comparison (West, Welch, Gałeczki, & Gillespie, 2015; Errickson, 2021), see Figure 4 above, hence makes the random effect a better fit for this study. Additionally, the nature of the dataset includes both time-variant factors (such as mental health measurement, socioeconomic status, and crime counts) and

time-constant factors within the examined period (such as built environmental characteristics). The application of the fixed effect model will sacrifice the capacity of between-group variations associated with time-constant variables by omitting them (Wooldridge, 2009; Bell et al., 2019), which compromises the research outcome. Hence, the random effect model will be the better fit for this study.

3.5 Limitations of the Study

Although the study has its value in contributing to the understanding of the geography of crime through the lens of community development and urban equity landscape, some limitations exist in the research design and the data analysis. The quantitative approach applied in this study faces the potential limitation due to the nature of large sampling from public and census data. One primary limitation is the lack of variance among the built environmental factors within the period of study (five-year period from 2015 to 2019) because the data source NCTCOG only provides land-use data based on a five-year basis. Using longer observation periods and variation among built environmental factors (e.g., land use pattern, transportation access, housing characteristics) would allow greater analytical strength in panel model analysis and enable the design for fixed effect analysis within each Census block group.

Additionally, the mental health measurements are obtained from the secondary data source, which the author believes could be improved by designing and implementing surveys with a more rigorous sampling strategy and in-depth questionnaires upon the lived experience in the future study. More specifically, qualitative methods could be conducted to gain an understanding of the context of the neighborhood because the individual narratives would provide greater insights into the perceptions of crime as well as the crime-related impacts on emotions and feelings.

Another potential limitation within this study includes the control of spatial auto-correlation between each block group (giving the nature of spatial similarity) and the potential causal dynamic between environmental characteristics and the crime. In order to address the spatial auto-correlation effect, I follow the spatial econometric approach to conduct spatial lag analysis. Additionally, panel data analysis and structured modeling would allow us to detect the causal dynamics between environmental characteristics, crime, and mental health.

Due to the nature of the cross-sectional design, the findings of this study regarding the relationship between crime and neighborhood characteristics as well as the impacts of crime on mental health symptoms are limited in the ability to predict the causalities of relationships. Future studies can overcome this limitation by adopting a quasi-experimental design, such as looking at the before and after effect of implementing a specific urban policy or crime prevention program and the overtime changes within each examined unit regarding crime statistics and mental health outcomes. Crime and environmental characteristics are actively integrated. The increase in crime as an outcome could again affect neighborhood instability, concentrated disadvantage, and other crime risk factors. Future research should consider examining the relationship between the crime, neighborhood characteristics, and mental health outcomes with the intention of capturing the potential reciprocal effects.

Chapter Four: Findings and Discussions

4.1 Findings for Research Part A

To test for the potential spillover effects, we first conduct a Hot-Spot analysis to investigate the spatial pattern of crime. The result shows significant concentrations of crimes in certain specific neighborhoods than those in other areas (Figure 5). In the City of Fort Worth, crime hot-spot neighborhoods were scattered in the East, South-west, Mid-west, and Central-North, outside of the downtown area. In the City of Dallas, crime hot-spot neighborhoods are agglomerated around the central Downtown area connecting to the South Dallas neighborhoods and the two wings of the Northern part (North-East and North-west).

In a preliminary test model, all the spatially lagged variables for both the built and social environments were incorporated to examine the general outcome. The result shows that only the spatially lagged variables for transit and alcohol-related establishments, along with all the spatially lagged variables for the social environment, are statistically significant. Hence, the final model includes only these significant spatially lagged variables, along with the spatially lagged variable for the dependent variable and other variables, as shown in Table 5. The model results exhibit a number of observations that are consistent with our hypotheses and the findings in the previous studies. I also find some unexpected relationships. I discuss the results in the following sections.

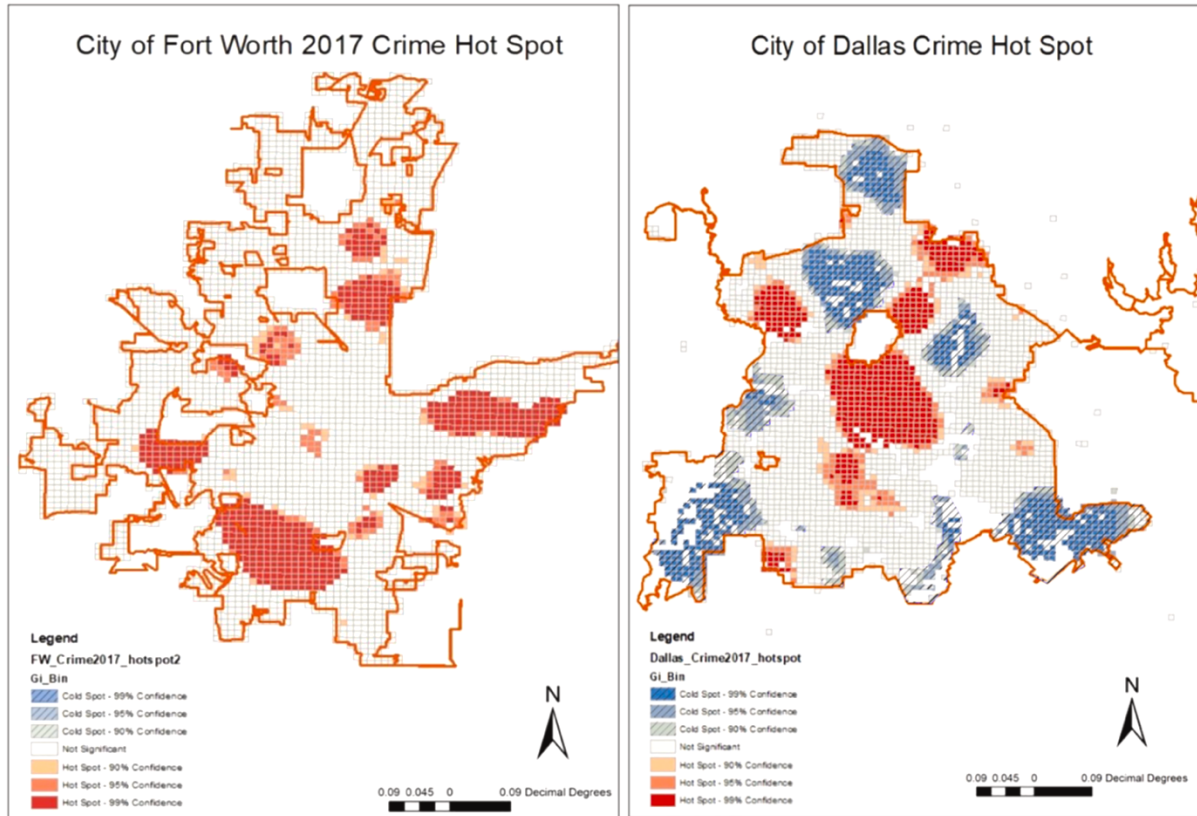


Figure 6 Hot-spot analysis of crimes in Dallas and Fort Worth, TX, 2017

The Pattern of Land-Use

As shown in Table 5, neighborhoods with a higher degree of mixed land-use development and a higher percentage of commercial and retail land-use are positively related to property crime ($p < 0.01$), holding all other factors constant. The results support the criminological concern on neighborhood permeability, which argues that mixed-use could bring gaps in the distribution of territory within the neighborhood (Taylor 1988; Taylor et al., 1955). According to previous literature, the commercial and retail land use could attract outsiders to the neighborhoods (Cozens & Love, 2015; Johnson & Bowers, 2010), decrease the level of identification between strangers and community members (Taylor, 1988), and weaken the social

control if no proper guardianship strategy is developed (Brantingham & Brantingham, 1995; Felson & Boba, 2010; Wo, 2019).

Table 4 Parameter Estimates from the Geographically Weighted Negative Binomial Regression

	Coef.	Stand. Error	95% Conf. Interval		
(Constant)	-7.551***	0.283	-8.105	-6.997	
Property Crime (Sp. Lag)	0.003	0.002	-0.0004	0.007	
<i>Land use</i>					
	HHI for Mixed-use	0.922***	0.138	0.653	1.192
	% Parkland use	0.302	0.229	-0.147	0.750
Built Environment	% Commercial land use	1.553***	0.311	0.943	2.163
	% Education land use	-0.135	0.397	-0.913	0.643
	# Transit Stations/Stops	0.022***	0.004	0.014	0.030
	# Transit Stations/Stops (Sp.lag)	-0.023***	0.005	-0.032	-0.013
	# Alcohol-related Establishments	0.082**	0.039	0.005	0.160
	# Alcohol-related Establishments (Sp.lag)	-0.153**	0.071	-0.293	-0.013
<i>Demographic Structure</i>					
	Population Density	0.00002**	0.00001	3.10e-07	0.00004
	Population Density (Sp.lag)	-0.00005***	0.00002	-0.0001	-0.00002
	Population Density ²	-2.25e-10	2.95e-10	-8.02e-10	3.52e-10
	Population Density ² (Sp.lag)	1.14e-09	6.33e-10	1.02e-10	2.38e-09
	%Population of Age 15-24	-0.502***	0.097	-0.692	-0.312
	%Population of Age 15-24 (Sp.lag)	-0.061	0.039	-0.138	-0.016
<i>Race</i>					
	%Black/African American	1.590***	0.327	0.949	2.230
	%Black/African American (Sp.lag)	-1.59***	0.485	-2.54	-0.64
	% Hispanic/Latinx	-0.327	0.194	-0.708	0.054
	% Hispanic/Latinx (Sp.lag)	0.333	0.328	-0.310	0.976
<i>Education</i>					
Social Environment	% Adults with Master's Degree and plus	-0.925***	0.344	-1.599	-0.252
	% Adults with Master Degree and plus (Sp.lag)	-0.923	0.472	-1.849	0.003
<i>Income</i>					
	Log Per Cap. Income	0.407***	0.041	0.326	0.488
	Log Per Cap. Income (Sp.lag)	0.430***	0.077	0.280	0.581
	% Household under Poverty Threshold	0.147	0.206	-0.257	0.550
	% Household under Poverty Threshold (Sp.lag)	-0.086	0.381	-0.833	0.661
	% Household with Public Assistance	7.279	7.279	-6.987	21.547
	% Household with Public Assistance (Sp. lag)	-23.175	14.638	-51.864	5.515
<i>Residential Instability & Housing Characteristics</i>					
	% Household with Owner Occupants	0.040	0.133	-0.220	0.301
	% Household with Owner Occupants (Sp.lag)	0.257	0.207	0.148	0.662
	%Vacant Units	1.773***	0.512	0.769	2.778
	%Vacant Units (Sp.lag)	1.488	1.0004	-0.479	3.455
	% Household Moved in since 2015	0.189	0.297	-0.393	0.771
	% Household Moved in since 2015 (Sp.lag)	0.616	0.539	-0.440	1.672
Population		1 (Offset)			

Note: *** p < 0.01; ** p < 0.05; Sp.lag: Spatial lag; HHI: Herfindahl – Hirschman Index;
Model Statistics: Akaike Info Criterion = 13433.82; Log-Likelihood = -6683.91; Prob > Chi2 = 0.000; Pseudo R-square = 0.080.

“Eyes on the Street” and “Population Density”

The results of the geographically weighted negative binomial regression model revealed a significant positive relationship between population density and property crime (p<0.05), holding

all else constant. Additionally, the spatially lagged variable of population density indicates a negative and significant association with property crime in adjacent neighborhood areas ($p < 0.01$). These findings are opposite to the expectation based on Jane Jacobs' (1961) theory regarding "eyes on the street" and may provide empirical evidence for the rational choice and the criminal opportunity theories. According to the *rational choice theory* and the *criminal opportunity theory*, crime offenders may find it less risky to commit property crimes in areas where crowds gather.

High population density lowers human's ability to identify each other, thus providing opportunities for committing crimes. The result also shows that the quadratic term of population density appears to have an insignificant relationship with property crime, which fails to meet our previous hypothesis on the nonlinear relationship between population density and property crime. This may be due to the fact that our study area focuses on a metropolitan area that is likely to have higher population density or more likely to have higher-density neighborhoods in comparison to other cities examined in the literature. Additionally, having a higher population density could also increase the likelihood of having greater numbers of potential criminal offenders, which ultimately also adds to the risk of property crime.

Access to Public Transit and Alcohol-related Establishments

Public transit provides essential access to opportunities, especially for those who rely on it to fulfill their daily needs (e.g., commuting, getting groceries, obtaining medical care, etc.). This study shows a positive association ($p < 0.01$) between the number of transit stations/stops and property crime, holding all other factors constant. This may again be explained by the criminal opportunity theory. According to the theory, the gathering of strangers (in this case, the gathering

of strangers at a specific transit station/stop) may decrease the visibility and identification between individuals and thus could create opportunities for criminal activities, especially property crime.

Additionally, the mechanism of guardianship and natural surveillance could be relatively weak when individuals do not know or trust each other. Public transit facilities tend to be locations with such characteristics and, thus, are more attractive to crime offenders.

Consistent with the previous literature (Furr-Holden et al., 2016; Gruenewald & Remer, 2006; Livingston, 2011; Raleigh & Galster, 2015; Toomey et al., 2012), I find a positive relationship ($p < 0.01$) between access to alcohol-related establishments and property crime, and a negative relationship ($p < 0.01$) between spatially lagged alcohol-related establishments and property crime, holding all else constant.

These findings provide empirical evidence for the environmental criminology theory, which argues that alcohol-related establishments may have negative impacts on neighborhood crime risk (Armitage, 2017; Birks & Davies, 2017; Raleigh & Galster, 2015; Browning et al., 2010), and the spillover effect similar to the public transit variable. All the findings highlight the importance of addressing safety concerns and improving security measures in transit stations/stops as well as in alcohol-related establishments.

The findings show that the spatially lagged variable of population density, public transit, and alcohol-related establishments have negative associations with property crime ($p < 0.05$). This result suggests an inverse spillover effect associated with these examined factors, deterring potential property crime in their surrounding neighborhoods. In addition to having significantly

higher property crime rates themselves, these block groups also tend to “attract” criminal activities from the adjacent neighborhoods.

The transitional nature associated with public transit facilities, alcohol-related establishments, along with the higher population density, not only could signify a weaker mechanism of natural surveillance but may also appear to be “easier” targets for criminal offenders to conduct property crime, according to the “rational choice theory.”

Demographic Structure and Social Disadvantage

After controlling for all other factors, both the log per capita income and its spatial lag variables are positively related to property crime ($p < 0.01$). The findings are consistent with the existing theories and empirical findings. According to the opportunity theory from the criminal perspective, neighborhoods with higher per capita income could signify the presence of more attractive targets with higher property value and attract offenders to conduct property crime. The crime pattern theory (Brantingham & Brantingham, 2008) also argues that crime offenders often commit crimes in areas that they are familiar with, especially when this condition coincides with locations of attractive targets (Kearns et al., 2019).

The results also show that the percentage of Black or African Americans in a census block group is positively associated with property crime, and its spatially lagged variable is negatively associated with property crime, holding all else constant. Both relationships are statistically significant at the .01 level. The results lend support to the social disorganization theory, which argues that historically disadvantaged racial groups are most likely to experience socioeconomic deprivation and low collective efficacy (Krivo & Peterson, 1996).

A body of literature discussed how land-use and housing policies, for example, red-lining and racial segregation acts before the 1968 Fair Housing Act, have been causing the Black or African American communities to suffer disproportionately in both socioeconomic condition and social capital (Galster, 1991; Logan & Molotch, 1987; Logan & Alba, 1993; Woldoff & Ovadia, 2009; Yinger, 1995). As one of the consequences, neighborhoods with a higher percentage of Black or African Americans could be more likely to have lower social capital and collective efficacy, leading to a lower level of natural surveillance in crime prevention mechanisms. According to previous literature, undergoing economic deprivation is one of the main factors that stimulate an offender's motivation to conduct property crime.

As argued by the rational choice theory and crime pattern theory (Brantingham & Brantingham, 2008), offenders are more likely to commit a crime near their own residence, given a higher degree of familiarity with the environmental setting and thus lower perceived risk of being caught. The locational choice for crime targets could hence pose a higher risk to socially disadvantaged neighborhoods.

In addition, the results indicate that the percentage of adults with a Master's degree or higher is negatively associated with property crime ($p < 0.01$). This finding is consistent with previous studies (Lochner, 2008; Lochner & Moretti, 2001) and the social disorganization theory. Education is one of the most determining factors for both individual development and neighborhood social atmosphere. Low education attainment could contribute to personal and neighborhood social disadvantage. Thus, having a lower level of education attainment is closely associated with low social capital, which leads to the lack of collective efficacy at the neighborhood level.

The results show that the percentage of young people between the age of 15 to 24 is negatively associated with property crime ($p < 0.01$) after controlling for all other factors and the spatial spillover effect. This finding is inconsistent with our hypothesis based on the lifestyle exposure theory. The result may be explained by psychological factors, as suggested by several scholars. For instance, Little et al. (2002) argue that age may be related to self-control ability. Younger people may lack self-control ability and act irresponsibly. They are more likely to conduct emotionally related crimes and less likely to carry out property-related crimes (Blonigen, 2010; Walker et al., 2017; Steffensmeier and & Allan, 1995). Scholars recognize the challenges of measuring the complex relationships among age, psychological, behavioral, and other factors and point to the need for further investigation (Little et al., 2002; Walker et al., 2017).

Residential Instability and Housing Characteristics

As seen in Table 5, the percentage of vacant units is positively associated with property crime after controlling for all other factors and spillover effects. This result is consistent with a large body of literature (Ellen et al., 2012; Williams et al., 2014; Raleigh & Galster, 2015). As discussed earlier, the nature of vacant units signifies a strong sense of disorganization and lack of guardianship, which provide an “ideal condition” for criminal activities. Additionally, block groups with higher vacancy rates are usually associated with weaker social bonds and less collective efficacy, which also leave an opportunity for property crime, according to the Broken Window Theory (Wilson & Kelling, 1983).

Raleigh and Galster (2015) discussed the complexity of the relationship between vacant units and property crime. According to them, vacant units could provide “havens” for criminal offenders as the blight conditions create “swaths of vacant territory.” Even with less valuable

properties, vacant units may still have some abandoned appliances, furnishing, and other targets that could attract crime.

4.2 Findings for Research Part B

The figures below display the distribution of the mental health symptoms measured in this study: the percentage of Nervousness for all or most of the time and the percentage of Restlessness for all or most of the time. There is a pattern of disparity for each identified symptom seeing from the geographical distribution, where the downtown, South, and South East of Fort Worth and the South Dalla demonstrate a higher degree of concentration for the measured mental health Symptoms. Some neighborhood characteristics, including both built environmental and social

environmental factors, are associated with the consistent agglomeration of the negative mental health outcome.

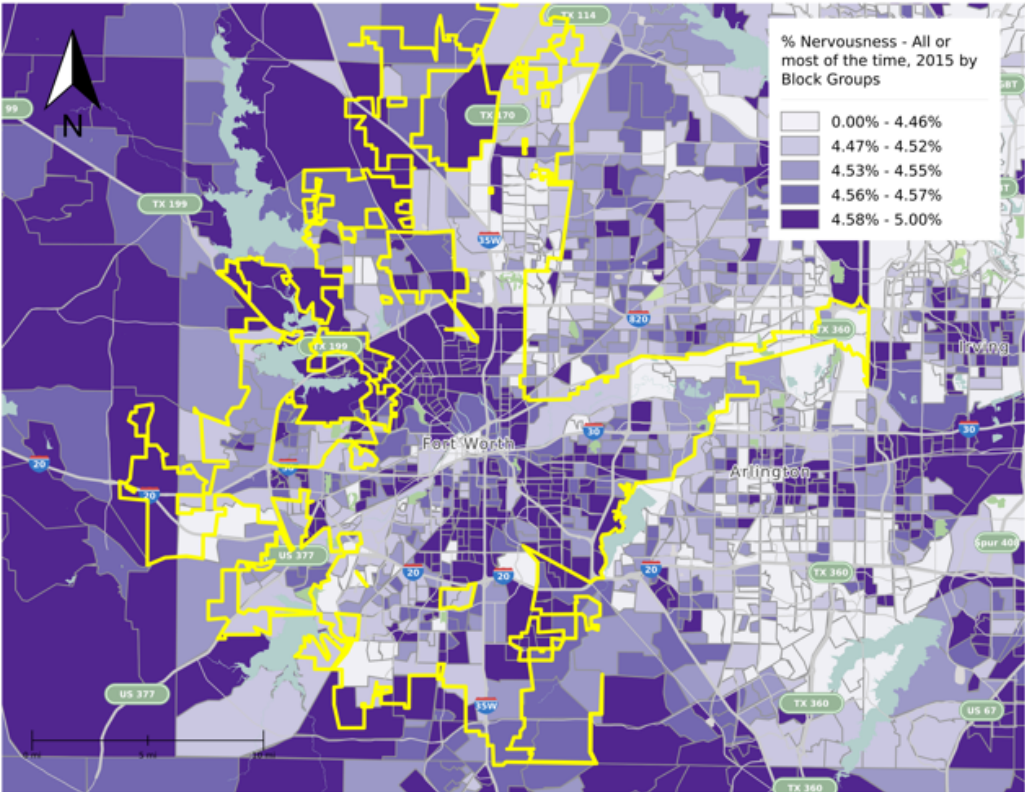


Figure 7 The Distribution of % Nervousness in Fort Worth, TX (2015)

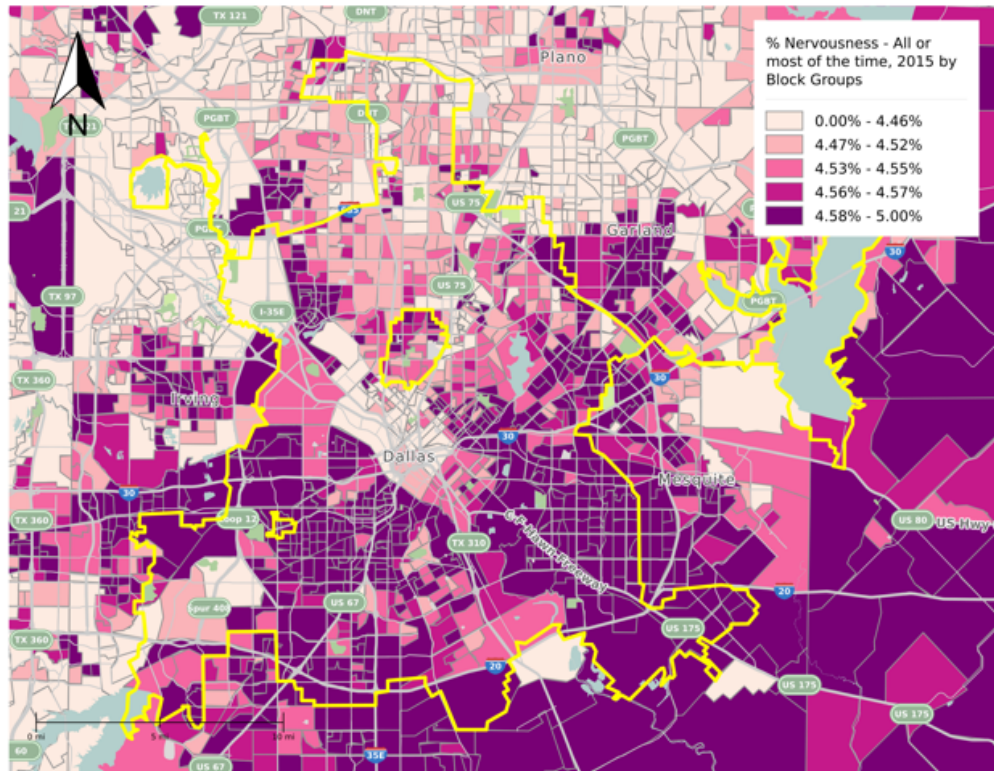


Figure 8 The Distribution of % Nervousness in Dallas, TX (2015)

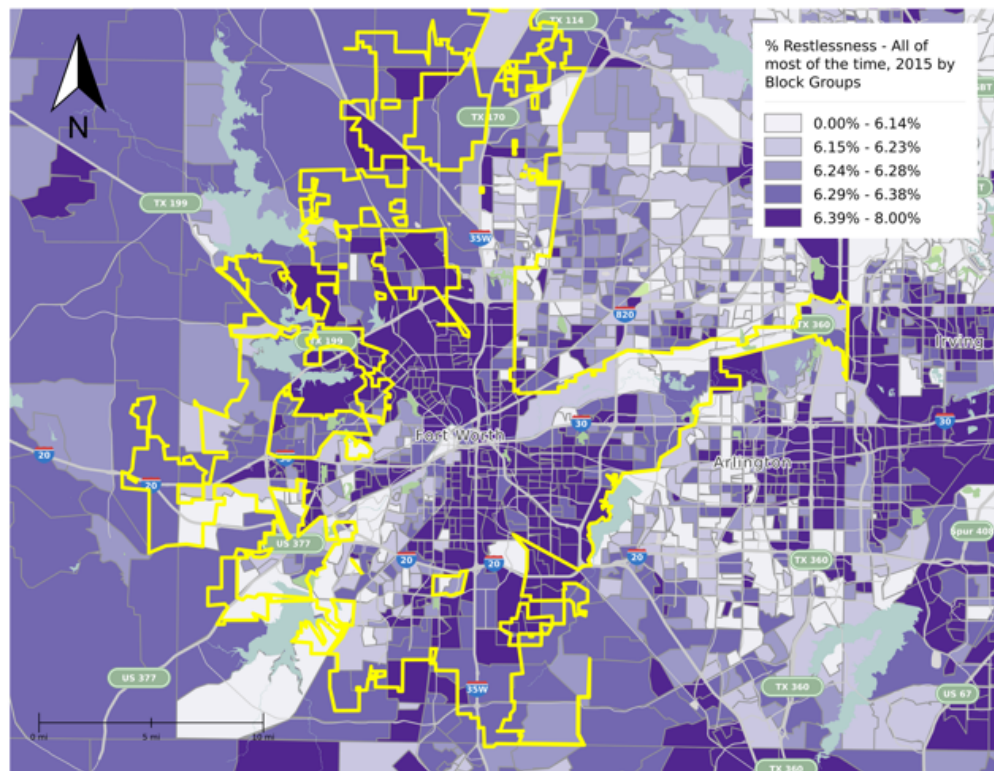


Figure 9 The Distribution of % Restlessness in Fort Worth, TX (2015)

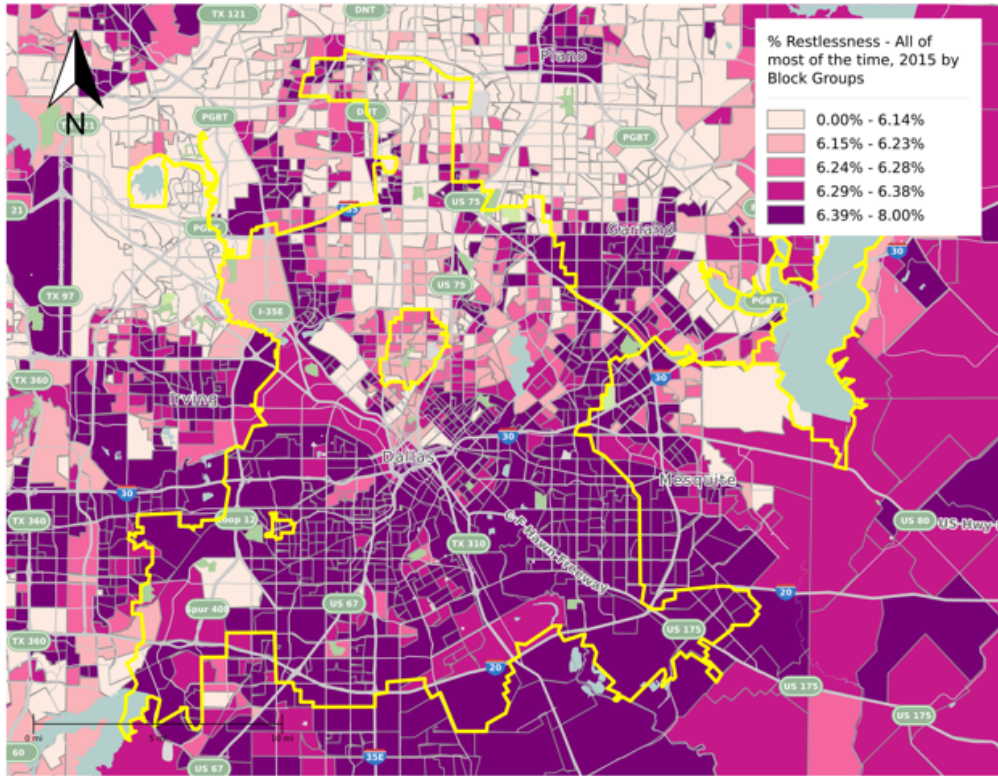


Figure 10 The Distribution of % Restlessness in Dallas, TX (2015)

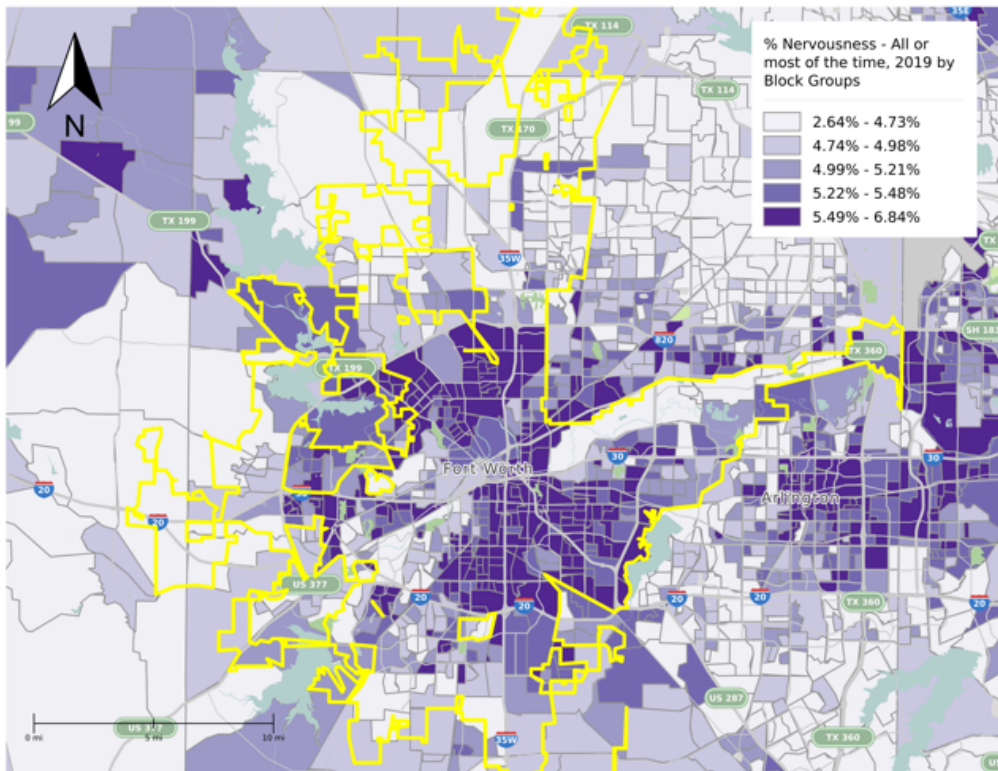


Figure 11 The Distribution of % Nervousness in Fort Worth, TX (2019)

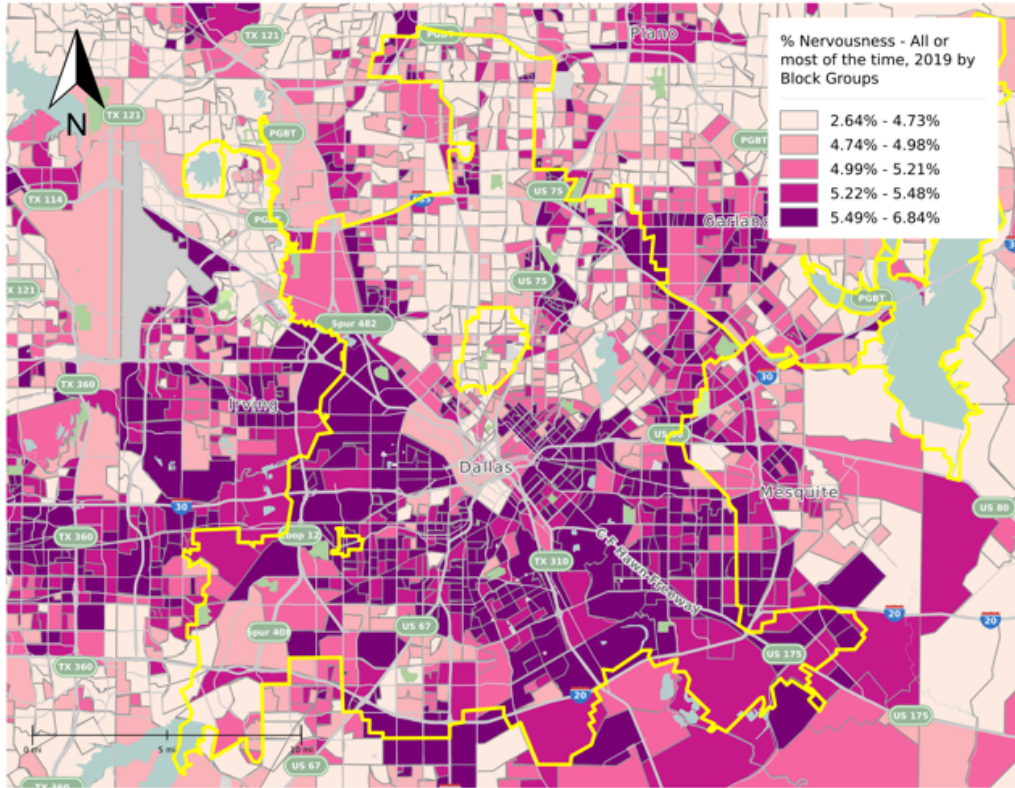


Figure 12 The Distribution of % Nervousness in Dallas, TX (2019)

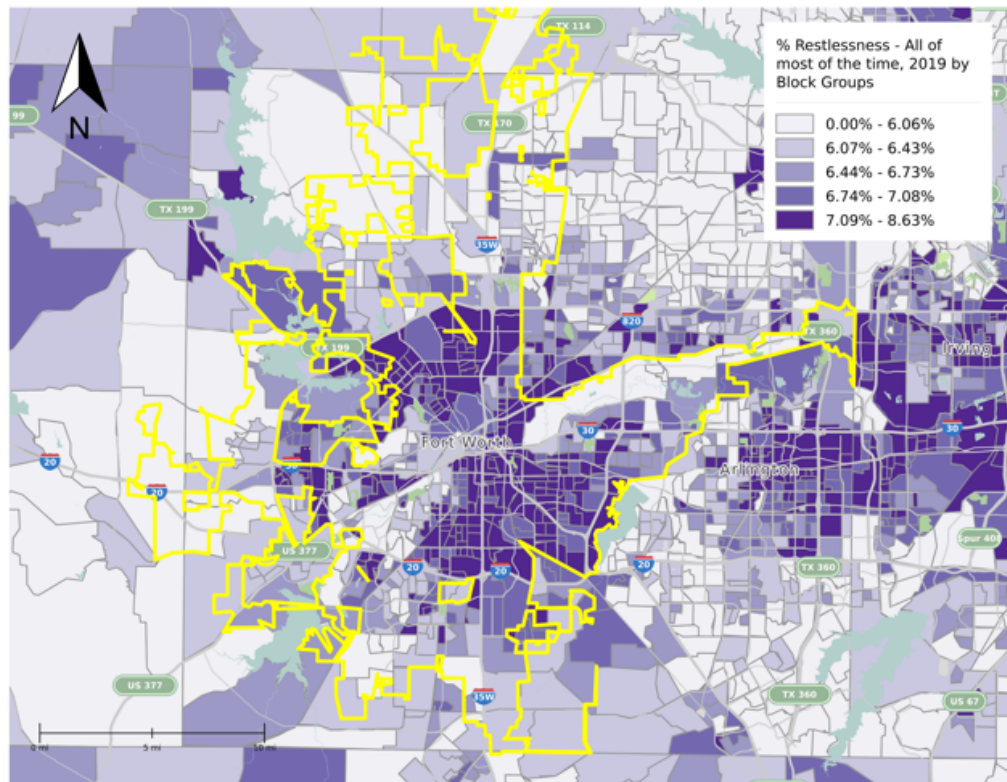


Figure 13 The Distribution of % Restlessness in Fort Worth, TX (2019)

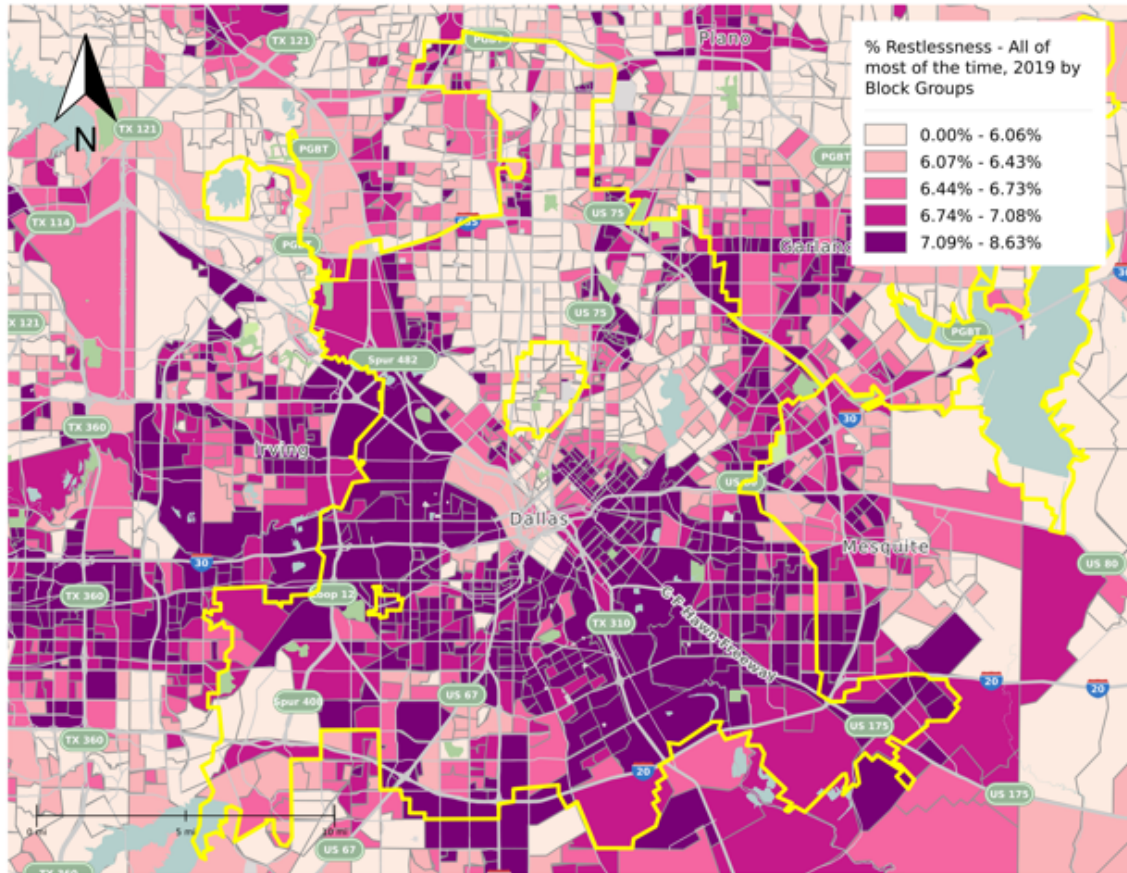


Figure 14 The Distribution of %Restlessness in Dallas, TX (2019)

Table 5 Summary Descriptive for Research Part-B

Variable	Obs	Mean	Std. Dev.	Min	Max
Nervous	7,275	17.400	2.951	0	21.6496
Restless	7,275	18.973	3.139	0	22.9498
Property crime	7,275	40.660	53.939	0	1416
Property crime (Sp. Lag)	7,090	41.190	54.325	0	1471.64
Violent crime	7,275	9.054	14.841	0	405
Violent crime (Sp. Lag)	7,090	9.183	15.004	0	420.914
Male 65 and plus years old	7,275	61.817	52.522	0	425
Female 65 and plus years old	7,275	83.891	76.343	0	939
Black or African American	7,275	328.649	450.756	0	4155
Hispanic/ Latinx	7,275	576.894	546.632	0	3886
Non-Hispanic white alone	7,275	517.294	556.363	0	6718
Below High school degree	7,275	205.669	206.312	0	1958
College and plus degree	7,275	297.884	332.483	0	4167
Median Household Income	7,183	59002.43	41275.14	0	250000
Poverty Status	7,275	53.147	61.658	0	591
Unemployment	7,275	47.134	50.912	0	511

Household with no cars	7,275	45.174	64.573	0	766
Renter Household	7,275	287.575	299.518	0	2788
Median House Value	7,045	182741.50	226808.80	0	1930600
Number of Transit Stops	7,070	6.656	9.600	0	204
Number of Transit Stops (Sp. Lag)	7,050	6.634	9.724	0	209.8303
Number of Liquor Stores	7,070	0.189	0.713	0	15
Number of Liquor Stores (Sp. Lag)	7,050	0.188	0.725	0	15.64178
Percentage of Parks and Rec	7,070	0.051	0.110	0	0.7388782
Percentage of Parks and Rec (Sp. Lag)	7,050	0.050	0.110	0	0.7289953
Percentage of Vacant land	7,070	0.078	0.096	0	0.6013264
Percentage of Vacant land (Sp. Lag)	7,050	0.078	0.096	0	0.909879
Percentage of Residential	7,070	0.465	0.216	0	0.9953942
Percentage of Residential (Sp. Lag)	7,050	0.462	0.216	0	1.004301
Percentage of Commercial and Retail	7,070	0.078	0.094	0	0.6479454
Percentage of Commercial and Retail (Sp. Lag)	7,050	0.077	0.092	0	0.6288677
Herfindahl–Hirschman index for land use	7,075	0.401	0.214	0	0.7792792
Herfindahl–Hirschman index for land use (Sp. Lag)	7,050	0.398	0.214	0	0.8155559
Residential Density	7,275	5.148	6.053	0	71.19379
Residential Density (Sp. Lag)	7,090	5.088	5.968	0	69.22703
Population Density	7,275	11.605	11.604	0	128.428
Population Density (Sp. Lag)	7,090	11.455	11.452	0	124.8801
Employment Density	7,275	4.172	15.762	0	309.6102
Employment Density (Sp. Lag)	7,090	4.128	15.854	0	314.0285
Road Network Density	7,275	22.700	7.632	3.26915	69.85129
Road Network Density (Sp. Lag)	7,090	22.481	7.677	3.2472	71.51963
Transit Distance	7,275	-12935.06	34152.49	-99999	1207
Transit Distance (Sp. Lag)	7,090	-13101.46	34295.11	-106119.4	1268.32

Table 6 Correlation Matrix among variables applied in the models

	Nervous	Restless	Property crime	Violent crime	Male 65 and plus	Female 65 and plus	Black	Hispanic	Non-Hispanic White	Below High school	College and plus	Median HH income	Poverty	Unemployed
Nervous	1													
Restless	0.9278	1												
Property crime	0.0787	0.0857	1											
Violent crime	0.2397	0.254	0.719	1										
Male 65 and plus	-0.1618	-0.2125	0.07	-0.0266	1									
Female 65 and plus	-0.124	-0.166	0.0795	0.0144	0.6824	1								
Black	0.052	0.0907	0.2783	0.339	0.1188	0.2277	1							
Hispanic	0.2882	0.3478	0.1289	0.1399	-0.0194	-0.0355	0.0817	1						
Non-Hispanic White	-0.2285	-0.3636	0.058	-0.1298	0.3916	0.311	-0.1063	-0.1944	1					
Below High school	0.2865	0.3876	0.1867	0.2375	0.0123	0.0051	0.2187	0.8411	-0.2982	1				
College and plus	-0.2172	-0.3695	0.1262	-0.0889	0.3563	0.2863	-0.034	-0.2836	0.8015	-0.4021	1			
Median HH income	-0.2208	-0.3672	-0.1097	-0.2371	0.2343	0.123	-0.2856	-0.3315	0.5206	-0.4278	0.5671	1		
Poverty	0.1858	0.2819	0.1726	0.2691	-0.006	0.065	0.5122	0.5181	-0.2648	0.5926	-0.2925	-0.452	1	
Unemployed	-0.0131	0.0359	0.1546	0.1499	0.0819	0.1536	0.4347	0.3317	0.0793	0.3323	-0.0017	-0.2054	0.437	1
HH zero vehicle	0.1328	0.1915	0.2522	0.3394	0.0849	0.2262	0.5019	0.0948	-0.1309	0.2518	-0.0916	-0.3507	0.5132	0.2969
Renter HH	0.1326	0.1216	0.3837	0.3044	0.0175	0.094	0.4354	0.1469	0.1815	0.171	0.3343	-0.2269	0.3779	0.3032
Median Housing Value	-0.1972	-0.3248	-0.0922	-0.1957	0.2796	0.1728	-0.2613	-0.3546	0.415	-0.4081	0.5114	0.6684	-0.3534	-0.2064
# Transit	0.0208	0.0297	0.0378	0.0611	0.0001	0.0107	0.0275	0.0125	-0.0301	0.0225	0.0213	-0.0252	0.0533	-0.0095
# Liquor	-0.0014	-0.006	0.005	0.0025	0.0081	-0.0222	-0.0168	-0.0237	0.0514	-0.0379	0.0464	0.0207	-0.0163	-0.0135
% Parks	-0.039	-0.0447	0.0033	-0.001	-0.03	-0.0355	-0.0211	0.0287	0.0037	0.038	0.0051	-0.0147	-0.0003	-0.0278
% Vacant	0.0351	0.045	0.0278	0.0417	-0.0386	-0.021	0.0713	0.0254	-0.0238	0.0168	-0.0386	-0.0888	0.0714	0.0513
% Reside	-0.0158	-0.0176	-0.0088	-0.0327	0.0369	0.0154	0.0012	-0.0211	-0.0264	-0.0195	0.0214	0.0725	-0.0114	0.0016
% Commercial	-0.001	-0.0048	0.014	0.0237	-0.0275	-0.0121	0.0073	-0.0034	-0.0141	0.0007	-0.0092	-0.0262	0.0102	-0.025
HHIndex_land use	0.0291	0.0337	0.0428	0.0524	-0.0486	-0.019	0.0109	0.0224	0.0172	0.0359	-0.028	-0.0892	0.038	0.0036
Residential Density	0.1138	0.1145	-0.0173	-0.0073	-0.1856	-0.1599	0.0629	0.0031	-0.0194	0.0117	0.1163	-0.1308	0.112	0.0864
Population Density	0.1746	0.1963	-0.0597	-0.0086	-0.2119	-0.1947	0.0732	0.1952	-0.0984	0.204	-0.0282	-0.1894	0.2397	0.1477
Employment Density	-0.0256	-0.0538	0.2358	0.1442	-0.0116	-0.0302	-0.049	-0.0833	0.1112	-0.094	0.2365	0.066	-0.0755	-0.0352
Road Network Density	0.0373	0.0379	0.0398	0.0366	-0.0966	-0.1071	-0.1517	-0.0834	-0.0822	-0.1038	0.0621	0.0075	-0.1245	-0.1039
Transit Distance	0.1643	0.2398	0.0241	0.0996	-0.1529	-0.0788	0.0266	0.0299	-0.4509	0.1301	-0.2422	-0.2724	0.1118	-0.0799

	HH zero vehicle	Renter HH	Median Housing Value	# Transit	# Liquor	% Parks	% Vacant	% Reside	% Commercial	HHIndex_ land use	Residential Density	Population Density	Employment Density	Road Network Density
HH zero vehicle	1													
Renter HH	0.5678	1												
Median Housing Value	-0.2206	-0.1821	1											
# Transit	0.0937	0.0942	0.0465	1										
# Liquor	-0.0054	0.0296	0.032	0.4636	1									
% Parks	-0.0056	-0.0098	-0.0179	0.0749	0.0583	1								
% Vacant	0.0228	0.0284	-0.0839	0.1063	0.0039	-0.0486	1							
% Reside	0.003	-0.0186	0.069	-0.3453	-0.2093	-0.3531	-0.4748	1						
% Commercial	0.0266	0.0688	-0.0165	0.271	0.2066	-0.1221	0.0454	-0.4506	1					
HHIndex_ land use	0.0035	0.0189	-0.0779	0.26	0.1182	0.2557	0.5164	-0.7865	0.4336	1				
Residential Density	0.2711	0.5396	-0.1626	0.0273	0.0211	-0.0251	-0.0475	0.0294	0.1123	-0.0618	1			
Population Density	0.2489	0.4425	-0.2306	0.018	0.0156	0.0016	-0.0457	0.0159	0.0964	-0.0534	0.9126	1		
Employment Density	0.0615	0.2481	0.0558	0.0579	0.059	-0.0288	-0.0012	0.002	0.0101	-0.0083	0.1345	0.037	1	
Road Network Density	0.0078	0.123	0.0285	0.0456	-0.012	-0.0469	-0.0797	0.0643	0.0352	-0.0618	0.2001	0.156	0.3063	1
Transit Distance	0.1811	0.1258	-0.1591	0.1297	0.0081	-0.0705	-0.0461	0.0445	0.0584	-0.0517	0.1984	0.1977	0.071	0.3166

Table 7 Random Effect Panel Model Output (without spatial lags)

	Model 1: Nervous			Model 2: Restless		
	Coef.	Std. Err.	P>z	Coef.	Std. Err.	P>z
Property crime	-0.0042	0.0005	0.0000	-0.0014	0.0004	0.0010
Violent crime	0.0352	0.0015	0.0000	0.0238	0.0011	0.0000
Male 65 and plus years old	-0.0010	0.0005	0.0400	-0.0011	0.0004	0.0070
Female 65 and plus years old	0.0011	0.0004	0.0040	0.0006	0.0003	0.0470
Black or African American	0.0003	0.0001	0.0000	0.0003	0.0001	0.0000
Hispanic/ Latinx	0.0010	0.0001	0.0000	0.0006	0.0001	0.0000
Non-Hispanic white alone	-0.0004	0.0001	0.0000	-0.0004	0.0001	0.0000
Below High school degree	-0.0005	0.0002	0.0240	-0.0001	0.0002	0.4670
College and plus degree	-0.0003	0.0001	0.0910	-0.0004	0.0001	0.0010
Median Household Income	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Poverty Status	-0.0048	0.0005	0.0000	-0.0041	0.0004	0.0000
Unemployment	-0.0059	0.0004	0.0000	-0.0035	0.0003	0.0000
Household with no cars	-0.0002	0.0005	0.6470	-0.0003	0.0004	0.4180
Renter Household	0.0014	0.0002	0.0000	0.0013	0.0001	0.0000
Median House Value	0.000003	0.0000	0.0000	0.0000006	0.0000	0.0000
Number of Transit Stops	-0.0069	0.0033	0.0360	-0.0043	0.0036	0.2230
Number of Liquor Stores	0.0635	0.0424	0.1340	0.0527	0.0458	0.2510
% Parks and Rec	-1.2192	0.2985	0.0000	-1.2512	0.3226	0.0000
% Vacant land	-0.1754	0.3701	0.6360	-0.1679	0.3999	0.6750
% Residential	-0.2311	0.2324	0.3200	-0.2304	0.2512	0.3590
% Commercial and Retail	-1.4294	0.3778	0.0000	-1.5046	0.4086	0.0000
Herfindahl–Hirschman index for land use	0.5901	0.2167	0.0060	0.5703	0.2343	0.0150
Residential Density	-0.0526	0.0135	0.0000	-0.0791	0.0139	0.0000
Population Density	0.0369	0.0067	0.0000	0.0488	0.0070	0.0000
Employment Density	-0.0056	0.0019	0.0020	-0.0068	0.0020	0.0010
Road Network Density	-0.0035	0.0040	0.3850	-0.0035	0.0043	0.4120
Transit Distance	0.000003	0.0000	0.0060	0.000005	0.0000	0.0000
_cons	17.1155	0.2216	0.0000	19.0415	0.2360	0.0000

Model Statistics:

Model 1: Number of Observation = 6772; Number of groups = 1378

R-Square (within = 0.2298; between = 0.1539; overall = 0.1719); Wald Chi2 (27) = 1658.29; Prob >Chi2 = 0.0000

Sigma_u = 0.8158; sigma_e = 0.9228; rho = 0.4388

Model 2: Number of Observation = 6772; Number of groups = 1378

R-Square (within = 0.1848; between = 0.2537; overall = 0.2396); Wald Chi2 (27) = 1691.53; Prob >Chi2 = 0.0000

Sigma_u = 0.9805; sigma_e = 0.6423; rho = 0.6997

Table 8 Random Effect Panel Model Output with Spatial Lags

	Model 1: Nervous			Model 2: Restless		
	Coef.	Std. Err.	P>z	Coef.	Std. Err.	P>z
Property crime	0.00532	0.010	0.582	-0.00479	0.008	0.523
Property crime (Sp. Lag)	-0.00941	0.010	0.331	0.00345	0.008	0.648

Violent crime	0.07827	0.028	0.006	0.06811	0.020	0.001
Violent crime (Sp. Lag)	-0.04325	0.028	0.128	-0.04453	0.020	0.030
Male 65 and plus years old	-0.00098	0.001	0.055	-0.00101	0.000	0.009
Female 65 and plus years old	0.00104	0.000	0.006	0.00058	0.000	0.063
Black or African American	0.00029	0.000	0.000	0.00027	0.000	0.000
Hispanic/ Latinx	0.00103	0.000	0.000	0.00064	0.000	0.000
Non-Hispanic white alone	-0.00044	0.000	0.000	-0.00044	0.000	0.000
Below High school degree	-0.00048	0.000	0.021	-0.00012	0.000	0.457
College and plus degree	-0.00023	0.000	0.132	-0.00040	0.000	0.001
Median Household Income	0.00000	0.000	0.000	0.00000	0.000	0.000
Poverty Status	-0.00470	0.000	0.000	-0.00401	0.000	0.000
Unemployment	-0.00608	0.000	0.000	-0.00360	0.000	0.000
Household with no cars	-0.00032	0.000	0.499	-0.00039	0.000	0.314
Renter Household	0.00146	0.000	0.000	0.00138	0.000	0.000
Median House Value	0.00000	0.000	0.000	0.00000	0.000	0.000
Number of Transit Stops	-0.06314	0.070	0.369	-0.05716	0.076	0.451
Number of Transit Stops (Sp. Lag)	0.05604	0.070	0.422	0.05259	0.075	0.485
Number of Liquor Stores	1.42228	0.795	0.074	1.80140	0.859	0.036
Number of Liquor Stores (Sp. Lag)	-1.35725	0.787	0.084	-1.74530	0.850	0.040
% Parks and Rec	-21.3148	7.415	0.004	-26.6206	8.005	0.001
% Parks and Rec (Sp. Lag)	20.22428	7.439	0.007	25.53266	8.031	0.001
% Vacant land	-1.04075	4.405	0.813	-0.81838	4.750	0.863
% Vacant land (Sp. Lag)	1.02727	4.387	0.815	0.82266	4.732	0.862
% Residential	-0.39433	2.540	0.877	0.44060	2.725	0.872
% Residential (Sp. Lag)	0.12161	2.537	0.962	-0.71048	2.723	0.794
% Commercial and Retail	-14.8327	7.032	0.035	-20.3982	7.595	0.007
% Commercial and Retail (Sp. Lag)	13.71020	7.113	0.054	19.30476	7.683	0.012
Herfindahl–Hirschman index for land use	7.05765	3.598	0.050	7.77002	3.884	0.045
Herfindahl–Hirschman index for land use (Sp. Lag)	-6.60405	3.607	0.067	-7.36096	3.894	0.059
Residential Density	0.11289	0.156	0.470	0.17158	0.169	0.310
Residential Density (Sp. Lag)	-0.16920	0.160	0.289	-0.25685	0.172	0.136
Population Density	0.02653	0.074	0.721	-0.00443	0.080	0.956
Population Density (Sp. Lag)	0.01135	0.076	0.881	0.05470	0.082	0.502
Employment Density	-0.13065	0.057	0.023	-0.12079	0.059	0.041
Employment Density (Sp. Lag)	0.12568	0.057	0.029	0.11493	0.059	0.053
Road Network Density	-0.09651	0.082	0.242	-0.07967	0.089	0.370
Road Network Density (Sp. Lag)	0.09329	0.083	0.260	0.07635	0.089	0.392
Transit Distance	-0.00001	0.000	0.567	-0.00002	0.000	0.405
Transit Distance (Sp. Lag)	0.00001	0.000	0.473	0.00002	0.000	0.277
_cons	17.14725	0.223	0.000	19.07593	0.237	0.000

Model Statistics:

Model 1: Number of Observation = 6772; Number of groups = 1378

R-Square (within = 0.2298; between = 0.1539; overall = 0.1719); Wald Chi2 (27) = 1658.29; Prob >Chi2 = 0.0000

Sigma_u = 0.8158; sigma_e = 0.9228; rho = 0.4388

Model 2: Number of Observation = 6772; Number of groups = 1378

R-Square (within = 0.1848; between = 0.2537; overall = 0.2396); Wald Chi2 (27) = 1691.53; Prob >Chi2 = 0.0000

Sigma_u = 0.9805; sigma_e = 0.6423; rho = 0.6997

The panel model results demonstrate a significant relationship between crime and mental health indicators. The number of violent crimes is positively related to the feeling of nervousness and the feeling of restlessness, with or without the consideration of spatial autocorrelation. The number of property crimes shows a reverse impact on the feeling of nervousness and the feeling of restlessness; however, this relationship is no longer significant after controlling the spatial autocorrelation effect. Results on the built environment are consistent with the previous hypothesis.

The model output also shows that the percentage of parks and recreational land use, the percentage of commercial and retail, and the employment density show a negative impact on the feeling of nervousness and the feeling of restlessness after controlling for the spatial spillover effect. The number of liquor stores is positively associated with the feeling of nervousness and the feeling of restlessness after controlling for the spatial spillover effect. The model also shows a positive association between the distance to transit and the examined symptoms; however, the relationships are not significant after controlling for the spatial spillover effects. The result also shows a positive relationship between the Herfindahl–Hirschman index for land use and the tested symptoms, with or without controlling for the spatial spillover effect.

Regarding the relationship between demographic structure and the mental health status, the results show that the number of Black people and Hispanic people is positively associated with the feeling of nervousness and the feeling of restlessness, while on the contrary, the Non-Hispanic white alone population shows a significantly negative association with the tested symptoms, with or without consideration of spatial spillover effect. Additionally, we find that females of age 65

and plus are associated with a higher degree of nervousness and restlessness. The relationship with the feeling of nervousness stays significant even when controlling the spatial spillover effect.

Surprisingly, the results regarding economic status are inconclusive. The median household income and median housing value both demonstrate a positive relationship with the feeling of nervousness and the feeling of restlessness. The results show that unemployed individuals and people under poverty status are negatively associated with the listed symptoms. Both of the findings point to a reverse relationship between economic deprivation and mental health well-being, which was different from the hypothesis of this study.

Regarding the residential instability, the number of households with renter occupations demonstrates a positive relationship with the feeling of nervousness and the feeling of restlessness. Consistent with social disorganization theory's argument on the association between residential instability and collective efficacy, neighborhoods with higher numbers of renter households may have a lower degree of social bond and support structure, leading to a lower capability in coping with crime impact on mental health. The pictures below taken during a field observation trip can give some additional context regarding the physical and social conditions within one of the high-

crim neighborhoods in South Dallas, near Malcolm X Street. The author took these photos in March 2020, before the lockdown of the Covid-19 global pandemic in the United States.



Figure 15 Street view of South Dallas Neighborhood – litter and incivility



Figure 16 Street view of South Dallas Neighborhood- physical disorder



Figure 17 Street view of South Dallas Neighborhood -Abandoned property



Figure 18 Street view of South Dallas Neighborhood - Church



Figure 19 Street view of South Dallas Neighborhood -vacant lot and litter



Figure 20 Street view of South Dallas Neighborhood -vacant lot and physical disorder (street sign)



Figure 21 Street view of South Dallas Neighborhood -construction site and pedestrian condition



Figure 22 Street view of South Dallas Neighborhood - pedestrian condition, litter, and physical disorder



Figure 23 Street view of South Dallas Neighborhood – vacant property



Figure 24 Street view of South Dallas Neighborhood – signs of no drinking and no loitering



Figure 25 Street view of South Dallas Neighborhood – discount liquor



Figure 26 Street view of South Dallas Neighborhood – quick cash and credit union shops



Figure 27 Street view of South Dallas Neighborhood – DART bus stop



Figure 28 Street view of South Dallas Neighborhood – community ballroom

Violent crime vs. Property crime

According to both sets of the panel modeling results, violent crime shows a greater impact on people's mental health when compared with property crime. This is consistent with the previous literature, where researchers in the U.K. found that the violent crime rate has a negative impact on mental health among both victims and non-victims, while property crime does not show similar impacts on mental health (Cornaglia et al., 2014). Using a random-digit-dialing procedure that includes 5688 persons aged 50e74 living in New Jersey U.S., Wilson-Genderson and Pruchno found that violent crime is associated with a significantly greater level of depression, based on results from the multivariate structural equation model (MSE) (Wilson-Genderson & Pruchno, 2013).

The impact of violent crime affects a greater number of people through the indirect path, even though they were not victimized in the crime incidents. Similar to the finding from Cornaglia et al. (2014), the effect of property crime on mental wellbeing is smaller across all specifications and is statistically weaker.

As the English philosopher Jeremy Bentham once wrote when describing a man who was robbed on the street, there are two types of mischief from this incident. The primary mischief is the physical harm and the loss of property from this robbery, which was individually suffered; however, there is also a "second mischief."

"The great point is, to clear the country of those crimes, each instance of which is sufficient to awaken and keep alive, in every breast within a certain circle, *the fear of boundless injury to person or property*, as well as of destruction to life itself – in comparison of this

widespreading – this almost universally extending mischief – *this fear of boundless injury* – the sum of the mischiefs resulting in each instance from losses and other injuries actually sustained would be found relatively inconsiderable”. (Quoted from “Jeremy Bentham Panoptican Versus New South Wales (p. 244)”)

“The report of this robbery circulates from hand to hand, and *spreads* itself in the neighborhood. It finds its way into the newspapers, and is propagated over the whole country. Various people, on this occasion, call to mind the *danger* which they and their friends, as it appears from this example, stand exposed to in traveling; especially such as may have occasion to travel the same road.” (Quoted from “An Introduction to the Principles of Morals and Legislation,” (1781) Ch. XII.6)

In these two paragraphs, Bentham described the indirect impact of crime on a wider population that goes beyond the direct impact of victimization. Bentham also narrated the path through which crimes, especially violent crimes, cast a negative impact on people’s mentality towards space, through the “fear of crime” or “the fear of boundless injury.”

Though it rises from a very low actual probability of victimization, this “fear of crime” leaves a long-lasting impact on people’s day-to-day life, and “the fear can be ever-present for a great number of people, depressing their lives” (Wolff, 2005).

Opportunity, Versatile Space & Healthy Lifestyle

According to the model output, the percentage of parks and recreational land use, the percentage of commercial and retail, and the employment density are negatively associated with the feeling of nervousness and the feeling of restlessness after controlling for the spatial spillover

effect and all other factors. This is consistent with the literature and the hypothesis of this study that versatile places that encourage an active lifestyle, provide an opportunity for physical activity could promote the personal well-being and mental health-related outcomes (Dadvand et al., 2016; Frank et al., 2008; Nieuwenhuijsen et al., 2017; Nordbø et al., 2018; Pasanen et al., 2014).

Having access to parks and recreational spaces, commercial and retail facilities, and living within an area with a greater employment density could promote a healthy lifestyle by increasing the environmental vitality within the neighborhoods because these types of spaces could foster more opportunities for public interactions. In addition to the social interaction, the area with higher employment density could also reduce the travel distance to essential destinations in life, for example, work, recreation, grocery, healthcare, etc.. As urban planning literature suggested before, people who live in neighborhoods with higher density, better design, diverse land-use patterns, shorter distances to transit, and better destination accessibility have greater chances to conduct more physical activities, maintain a healthy lifestyle, and have better access to health-promoting services. Using the “5D” variables (Density, Design, Diversity, Distance to Transit, and Destination accessibility), urban planners associate the built environment characteristics with not only people’s travel behavior (walking, biking, and public transit use) (Ewing & Cervero, 2010) but also physical activity and the degree of a healthy lifestyle.

To build healthy and resilient communities, it is very important for urban planners to understand the relationship between neighborhood built environments, such as the mitigating effects of parks and recreational space, commercial and retail space, as well as the employment density on mental health when facing the challenge of crime. The result also shows a positive relationship between the Herfindahl–Hirschman index for land use and the feeling of nervousness

and the feeling of restlessness, with or without controlling for the spatial spillover effect. This finding provides a contrast versus the buffering of employment density. One possible reason is that the current pattern of mixed-use development does not necessarily generate greater employment density and liveliness.

Unsurprisingly, the number of liquor stores is positively associated with the feeling of nervousness and the feeling of restlessness after controlling for the spatial spillover effect. This is consistent with the literature regarding the negative impacts of liquor store access on public health, especially its retroactive relationship with mental health. The literature identifies the prominent contribution of alcohol availability to alcohol consumption among all environmental factors (Kypri, Bell, Hay, & Baxter, 2008; Popova, Giesbrecht, Bekmuradov, & Patra, 2009; Weitzman, Folkman, Folkman, & Wechsler, 2003). Having convenient *access to alcohol-related establishments* is naturally associated with more alcohol consumption, which further leads to negative impacts on mental health (such as depression, disorders, neuropsychiatric issues, etc.) (WHO, 2011).

Consistent with a previous study by Pereira et al. in 2013, which finds that people with greater access to liquor stores are found to be more likely to consume alcohol at harmful levels and to have anxiety, stress, or depression, this study also shows a significantly negative impact of access to the liquor store on the feeling of nervousness and the feeling of restlessness. This positive association between alcohol access and poor mental health condition is also validated by previous literature on the mutual dynamic relationship between alcohol and mental health issue. Empirical evidence shows that there is a greater chance of conducting harmful alcohol consumption among people with underlying mental health issues (Boden & Fergusson, 2011; Castaneda, Sussman,

Westreich, Levy, & O'Malley, 1996). The accessibility to alcohol-related establishments could play an instrumental role in exacerbating this negative cycle on people's well-being.

Racialized Health Disparity

Results of the panel data model show a positive association between the number of African American or Black people and Hispanic/Latinx with both the feeling of nervousness and the feeling of restlessness. On the contrary, the non-Hispanic white alone population shows a significantly negative association with the feeling of nervousness and the feeling of restlessness, with or without consideration of the spatial spillover effect. This finding validates the hypothesis of this study, showing that the impact of crime on mental health is not evenly distributed among different races and ethnical backgrounds.

The black communities and Hispanic/Latinx communities are suffering from a greater risk of having poor mental health symptoms disproportionately when facing the challenge of crime-related tension in their day-to-day life. This vulnerability is rooted in the historical policies and discriminations which shaped the collective efficacy, social capital, as well as generational well-being.

In the book "The Condemnation of Blackness," Muhammad (2011) discusses race, crime, and the making of modern urban America. The argument centers on the black criminality within the modern American society through racial discrimination, public policy, and even research methodology in approaching "crime." In a statistical article, Thorsten Sellin (1928) discussed the mistreatment of the black population within crime statistics:

"We are prone to judge ourselves by our best traits and *strangers* by their worst. In the case of the Negro, *stranger in our midst*, all beliefs prejudicial to him aid in intensifying the

feeling of racial antipathy engendered by his color and his social status. The colored criminal does not as a rule enjoy the racial anonymity which cloaks the offenses of individuals of the white race. The press is almost certain to brand him, and the more revolting his crime proves to be the more likely it is that his race will be advertised. In setting the hall-mark of his color upon him, his individuality is in a sense submerged, and instead of a mere thief, robber, or murderer, he becomes a representative of his race, which in its turn is made to suffer for his sins” (Muhammad, 2011, p.2, quote Thorsten Sellin’s argument in 1928)

From this perspective, it is not hard to see the possibility of retraumatizing innocent black people when encountering violent crime incidents in one’s own community. This adds to the existing fear of crime out of potential victimization in the future, letting the racially and ethnically disadvantaged population carry the collective burden of criminality forged by history. Social disorganization theory, on the other hand, could also help to explain the social construction of mental health vulnerability when facing crime.

As argued by the literature (He & Li, 2022; Ross & Jang, 2000; Sampson & Groves, 1989; Sampson et al., 1997), historically marginalized neighborhoods, such as black and brown communities, tend to have a lower degree of collective efficacy and social bond in combating with the negative externalities such as crime. Based on the finding from this study, African American communities, as well as Hispanic/Latinx communities, not only tend to experience greater crime risk due to the weaker crime prevention mechanism but also are more likely to suffer a significant impact on mental health when facing the challenge of crimes.

The Vulnerability of Aging and the Gendered Inequality

Additionally, we find that Females aged 65 and plus are associated with a higher degree of nervousness and restlessness, and the relationship with the feeling of nervousness stays significant even when controlling the spatial spillover effect. As also discovered by Wilson-Genderson and Pruchno, older adults are more prone to the impact of crime in developing poor mental health status (Wilson-Genderson & Pruchno, 2013). Theoretically, older adults are more likely to spend a greater amount of time within their own neighborhoods, especially after retirement, where their physical activity and social activities are limited within the scope of residence (Robert & Li, 2001). Older adults are also more likely to have the longevity of living within their residence and less likely to mobilize in day-to-day life (Yen et al., 2009). Additionally, as discussed in the literature section, the social capital among older adults also declines gradually (Lawton & Nahemow, 1973), leading to the social and physical state of isolation.

The finding within this study echoed the argument on the particular vulnerability of female older adults. The feminist perspective sheds light on the gender inequity in how urban planning projects are processed and perceived. As argued by feminist scholars, in a process where the majority of decisions are made with male-dominance expertise, the mental needs and vulnerability are neglected. For example, in the study conducted by Astell-Burt et al. on the relationship between crime and distress, the effect sizes between crime and distress level were particularly more salient for women, especially for the crimes in malicious damage (Astell-Burt et al., 2015).

The finding of this study not only spotlights the vulnerability of females but also the older population groups within the female, showing the greater degree of vulnerability when facing the impact of crime. Older female adults are more likely to have symptoms of nervousness and restlessness, while their male counterparts are not subject to this risk. The result indicates that

damage to the local built environment is an important pathway linking neighborhood crime with psychological tension among female and the older population groups.

Can Money Always Bring Happiness?

The finding shows that median household income and median home value are positively related to the symptoms of nervousness and restlessness, holding all else constant. Additionally, the finding also shows that the unemployment rate and poverty status are negatively associated with the tested mental health symptoms, holding all else constant. Both of the findings are different from the initial hypothesis but surprisingly consistent with each other: having more money doesn't make one happier in this case. Although lower socioeconomic status does lead to social vulnerability and a weaker degree of collective efficacy, the literature has been inconclusive on the findings between income and mental health status.

Being unemployed and being in poverty status itself may create other types of pressure in one's life, such as seeking work opportunities and earning income, and doesn't necessarily make them more vulnerable under the influence of crime, becoming more nervous or more restless. While on the other hand, being in the stage where one has accumulated greater wealth or property could put one into a more vulnerable stage, making people worry about the potential impact of crime on their life, their belonging, and social status. In other words, when you "have" less to worry about, you could probably worry less. This hypothesis is echoed in the literature, where researchers argue that instead of direct measurement of economic status, relative deprivation measurement could be a more persuasive means to capture the impact of income-related inequity in mental health studies (Bechtel et al., 2012; Miranda et al., 2008; Saraceno et al., 2007; Schulz et al., 2006), and future study need to look into this perspective with improved measurements.

Chapter Five: Conclusion and Implication

*“We must accept finite disappointment,
but never lose infinite hope.”*

--Martin Luther King, Jr.

(1929-1968, Social activist and Baptist minister)

While environmental ecology is a focus of crime prevention and urban planning, scholars in the criminology and planning fields remain split on the role of environmental characteristics on crime. New Urbanism views compact, pedestrian-friendly, mixed-use residential developments close to amenities and public transport as effective strategies for urban sustainability. Criminologists question the effects. Previous studies demonstrate conflicting conclusions on the roles of the built environment in shaping the geography of property crimes and have not examined the consequences of social disadvantage adequately. The nonlinear relationship between population density and property crime, as well as the spillover effects of environmental variables, require further investigation.

This study contributes to the aforesaid debate and research gaps with improved measurements of land-use diversity and proximity to public transit and alcohol-related establishments, as well as new empirical evidence for an area with distinctive land use and

transportation patterns. In addition, we test the nonlinear relationship between population density and spillover effects under a context-based theoretical framework. Using cross-sectional data in the cities of Dallas and Fort Worth, TX, the results from the geographically weighted negative binomial regression model suggest that mixed-use development, the percentage of commercial land use, the number of transit facilities, the number of alcohol-related establishments are positively associated with property crime, holding all else constant.

Neighborhoods with higher income are associated with higher property crime rates. Additionally, neighborhoods with a higher percentage of Black or African American population and a lower level of educational attainment are associated with higher property crime rates.

While most findings are consistent with prior studies, this study indicates a positive relationship between population density and property crime and the insignificant nonlinear relationship between them. In addition, the study reveals an inverse spillover effect of population density on property crime. Such inverse spillover effect is also observed from the results of the spatial lag variables for proximities to transit and alcohol-related establishments, as well as the percentage of Black and African American people in neighborhoods. Nevertheless, the spatial lag of income indicates a significant positive relationship with property crime.

While this study attempts to incorporate many factors, there is room to improve the study by using more control variables and more precise measurements. For example, the current population density measurement in American Community Survey only reflects registered residents, which leaves a gap in measuring the population density in daily activities. Future studies should explore the alternative measurement for population density, incorporating both the residential and transitional population data. Future studies can also control for many other

variables, such as the architectural and environmental design and surveillance features around transit stations, as suggested by Felson et al. (1996), La Vigne (1996), Loukaitou-sideris (1999), Lee et al. (2019), and Shach-Pinsly (2019). Some examples of additional factors affecting collective efficacy are neighborhood networks/kinship groups (Willits et al., 2011), nonprofit organizations (Wo, 2018), public housing, and voucher holders (Mast & Wilson, 2013; Popkin et al., 2012; Sandler, 2007), and the crime offenders living nearby and their behavior mechanism (Galster, 2012; Kearns et al., 2019; Livingston et al., 2014).

The findings of the relationships between income level and property crime, the concentration of the black population and property crime, and their spatial relationships also indicate that the relationships between socioeconomic variables and property crime are much more complex. Future research needs to pay closer attention to the interactive dynamics during causal detection and the theories behind the relationships.

Another issue that future research should be concerned about is the mismeasurement of crimes (Muhammad, 2011). For decades of time, crime studies, especially the ones that examine the association between crime statistics and race, have unfairly stigmatized Black and African American communities, as discussed by Thorsten Sellin in 1928.

“We are prone to judge ourselves by our best traits and strangers by their worst... The colored criminal does not as a rule enjoy the racial anonymity which cloaks the offenses of individuals of the white race. The press is almost certain to brand him, and the more revolting his crime proves to be the more likely it is that his race will be advertised. In setting the hallmark of his color upon him, his individuality is in a sense submerged, and

instead of a mere thief, robber, or murderer, he becomes a representative of his race, which in its turn is made to suffer for his sins.” (Sellin, 1928)

According to Sellin, the problem of racial criminalization, the stigmatization of crime as issues in “black” neighborhoods, along with the masking of crimes among white as the failure of the individual problem has been continuously reinforced the racial inequity in black criminality (Muhammad, 2011). Before Sellin’s examination of the statistical discourse of black criminality, black social researchers had raised this concern as early as the 1890s. For example, W. E. B. Du Bois and Ida B. Wells, despite being repeatedly ignored by the mainstream scholarship under white dominance.

According to the book “the Condemnation of Blackness” written by Muhammad (2011), black criminality is one of the most cited reasons and one of the most “long-lasting reasons” for the black inequality and mortality in the modern U.S. cities (Muhammad, 2011). Unveiling the statistical discourse of black criminality and the association between race, place, crime, and punishment in the modern United States still remain a factor that needs further investigation.

Across the neighborhoods in the study, I find that both low-mental-health-status block groups within the City of Dallas and City of Fort Worth show higher violent crime rates, while the property crime rate is less consistent. This is consistent with the results from the literature that violent crime demonstrates greater significance in affecting people’s mental health status. According to the literature (Cornaglia et al., 2014; Wolff, 2005), violent crime causes a greater

degree of fear and anxiety because the nature of this type of crime leaves people with intentional harm.

The mass media and neighborhoods also would be more likely to discuss the victimization of violent crime, and hence increase the negative impact on mental health as local residents naturally prepare themselves for the possible victimization. On the other hand, property crime is more likely to be driven by the opportunity and the cost-benefit analysis from the offender's perspective, and the damage is limited to the loss of property. Hence, property crime is usually perceived as "less scary" than violent crime in the local neighborhoods. The finding also shows that the socioeconomic status of neighborhoods with low mental health status in the case study have greater deprivation than the neighborhoods with high mental health status. For example, the percentage of unemployment and the percentage of poverty are both significantly lower in block groups with low mental health status. These block groups also have a way lower percentage of non-Hispanic White alone residents, while the block groups with high mental health status have a significantly higher percentage of non-Hispanic White alone residents.

The residential structure of neighborhoods with low mental health status has significantly higher percentages of renter occupancy, which differs greatly from the neighborhoods with high mental health status. According to the social disorganization theory (Sampson et al., 1997; Sampson & Groves, 1989), neighborhood renter occupancy is an important opponent of neighborhood instability.

Housing tenure could also affect people's sense of belonging in the neighborhood and hence the willingness to participate in the public affairs within the community. The literature argues that neighborhoods with higher renter occupancy are more likely to have a higher degree

of neighborhood instability and hence a weaker social tie and collective efficacy (Sampson et al., 1997). In the findings of this case study, the evidence echoed the social disorganization theory and demonstrated the association between high renter occupancy and low mental health status within the examined neighborhoods.

Future research also needs to examine the hidden landscape of political discourse and urban antagonism among neighborhoods with different built environmental features. For example, the ones with mixed land-use and transit development versus the affluent suburb without any of the fore-mentioned urban features. In the contemporary practice of urban planning in the United States, there is a great resistance against density in urban development projects as a counter result of Suburbanization. The barriers to mixed-use development and transit expansion could come from both the neighborhood coalition groups (represented by neighborhood associations or Home Owner Associations) and the public sector (city council members and the city hall officers). The villain behind this story is the political hegemony and antagonism behind urban planning decisions – affecting the decisions that determine which neighborhoods get to be developed as mixed-use and which neighborhoods to put transit facilities. In many cases within the North Texas context, these newly advocated projects were put into neighborhoods where less resistance was displayed.

When examining the association between mixed land-use and transit facilities and the social outcome, such as crime rate and mental health, researchers too often neglect the fact that neighborhoods with these tested features are usually disadvantaged in political power, to begin with. This is the reason why the less privileged neighborhoods get the new urban planning projects built in, while others were able to say “No.” The decision-making process of urban planning projects ought to be examined to identify the contextual difference in political participation

between neighborhoods, including the power dynamics of the neighborhood association, the funding and camping activity organized, the antagonism towards urban planning decisions such as density and transit, and cultural hegemony within the stigmatization of “transit,” “density,” and their association with “undesirable people,” or the “stranger in our midst.”

Implication for Urban Planning and Recommendation for Public Policy

Traditionally, the majority of public health studies, especially mental health studies, seek to identify the predictors and stressors of poor mental health symptoms with their focus on individual characteristics. However, recent literature within both public health and urban planning has turned its attention to understanding the importance of neighborhood context. This context describes the neighborhood environment in which people live, grow, and develop their lives. Developing a proactive research agenda that focuses on the built environment and social environment that condition people’s health status has come to the urgent need for both public health and urban planning professionals.

As a long-neglected factor within planning research, crime is a consequence of environmental conditions in the urban community, which shapes the community environment in return and casts a long-lasting impact on people’s wellbeing. In the midst of the Covid-19 global pandemic, we witnessed the deaths of young African Americans in the United States, including George Floyd and Breonna Taylor, along with the increasing records of public harassment and violence on the basis of race, gender, ethnicity, religion, sexual orientation, and immigration status.

The Black Lives Matter movement spotlighted the grief, anger, and love to remake cities, from public space to public policy.

As the field of urban planning evolves from the rational and technocratic paradigm toward a more post-rationalist era, there is an increasing awareness that recognizes the importance of emotions in planning (Ferreira, 2013; Hoch, 2006; Lyles & White, 2019; Tate, 2021). Planners are called for urgent action to construct an environment that is justice and supportive as the whole society works on uprooting systemic racism. It is necessary for urban planners to work through crime-related emotions and traumas during the process of healing the communities and building justice. The foundation of environmental criminology and mental health studies could provide evidence-based lessons in distilling the consequences of urban inequity, neighborhood characteristics, and the social ties of community for urban planners and policymakers.

First, we can educate ourselves and our colleagues about how the neighborhood environment, concentrated disadvantage, social connectedness, and structural racism and discrimination can affect the impact of crime on mental health and the ways that our urban planning policies are implicated in alleviating or exacerbating this impact. Second, incorporating practices such as trauma-informed planning within the community development projects and neighborhood interventions, especially among historically marginalized or discriminated communities.

Trauma-informed practice recognizes the historical experience of the damages from discriminative policies such as red-linings and social segregation and avoids the risk of retraumatizing the community in the process of healing and building collective efficacy. Third,

planners need to address the systemic racism and other biases which have left negative impacts on public health, especially among vulnerable communities.

Fostering trust and collaboration is important in working with communities, understanding the communities, and partnering with health professionals in addressing mental health service and resource within the community. To foster structural competency, planners need to increase the awareness of the social determinants of health and the social-political inequity in the dynamics and to engage with the community, local organizations, health sector, and policymakers intentionally. This needs planners to strengthen the collaboration with public health professionals, community leaders or organizations, and local kinship groups in citizen engagement and community building process.

Last but not least, evidence shows that social bonds and collective efficacy can be more effective in alleviating the impact of crime on mental health than focusing the effort on crime control itself (Moore & Trojanowicz, 1988; Skogan, 1986). Investing in the neighborhood development and resilience could help create spaces that sprout social bonding and increases the collective efficacy, which combats both crime (He & Li, 2022; Sampson & Groves, 1989; Sampson et al., 1997) and crime-related crises in public health.

Through the findings of this study, I also argue that planning research should focus on the indirect impact of crime with regard to the mental health issue. As determined by the nature of our

field, planning researchers and planners mostly face the agglomerated crime number from a specific geographic unit as an environmental measurement.

Information collection on the individual level is valued in the planning process, for example, in neighborhood interviews and participatory studies; however, planners work on a collective scale in most cases, for example, on the neighborhood level. Given this limitation, and the difference between urban planning and the public health domain, focusing on the indirect impact of crime (i.e., the fear of crime), will allow planners to provide more functional analysis when approaching the crime-related mental health issue.

For example, instead of asking how we can mediate the victimization of an individual assault by improving our neighborhood environment, we can ask first: how could the neighborhood environment help in mediating the mental health consequences generated by crime (from the perspective of fear of crime)? Additionally, criminologists and psychological studies focus more on the direct impact of crime victimization, looking at the clinical feedback and individual analysis. During this process, the environmental context was usually neglected, and this is where planning researchers could potentially fill in the gaps -- by understanding the roles of the environmental context in the relationship between crime, neighborhood environment, and mental health.

While approaching the issue of crime in urban planning studies, it is also important to differentiate the location of crime incidents: does it mostly happen in a public setting (“street crime”) or a domestic setting (“home crime”)?) Environmental interventions on a community scale would only be effective for crimes that happen under the peripheral domain. For urban planners, understanding the limitation of environmental intervention is important for both crime prevention

and mental health resilience. Additionally, within the mechanism of crime's indirect impact on mental health, the main affecting factor is the subjective perception of danger. One possible question that planners could ask themselves is whether the outcome of Crime Prevention Through Environmental Design (CPTED) initiatives increases people's fear of crime or decrease people's fear of crime.

Reference

- Ackerman, W. V., & Murray, A. T. (2004). Assessing spatial patterns of crime in Lima, Ohio. *Cities*, 21(5), 423–437. doi:10.1016/j.cities.2004.07.008
- Agrawal, A. W., Schlossberg, M., & Irvin, K. (2008). How far, by which route and why? A spatial analysis of pedestrian preference. *Journal of Urban Design*, 13(1), 81–98. <https://doi.org/10.1080/13574800701804074>
- Ajrouch, K. J., Fuller, H. R., Akiyama, H., & Antonucci, T. C. (2018). Convoys of Social Relations in Cross-National Context. *The Gerontologist*, 58(3), 488–499. <https://doi.org/10.1093/geront/gnw204>
- Aliprantis, D., & Hartley, D. (2015). Blowing it up and knocking it down: The local and city-wide effects of demolishing high concentration public housing on crime. *Journal of Urban Economics*, 88, 67–81. <https://doi.org/10.1016/j.jue.2015.06.002>
- Alcock, I., White, M. P., Lovell, R., Higgins, S. L., Osborne, N. J., Husk, K., & Wheeler, B. W. (2015). What accounts for “England’s green and pleasant land”? A panel data analysis of mental health and land cover types in rural England. *Landscape and Urban Planning*, 142, 38–46. <https://doi.org/10.1016/j.landurbplan.2015.05.008>
- Anderson, J. M; MacDonald, J. M; Bluthenthal, R.; & Ashwood, J. S. (2013). Reducing Crime by Shaping the built environment with Zoning: An empirical study of Los Angeles. *University of Pennsylvania Law Review*, 161, 699.
- Andresen, M. A., Linning, S. J., & Malleson, N. (2017). Crime at Places and Spatial Concentrations: Exploring the Spatial Stability of Property Crime in Vancouver BC, 2003-

2013. *Journal of Quantitative Criminology*, 33(33), 255–275.

<https://doi.org/10.1007/s10940-016-9295-8>

Anselin, L. (1988). *Spatial Econometrics: Methods and Models*. Boston: Springer.

Armitage, R. (2017). Burglars' take on crime prevention through environmental design

(CPTED): Reconsidering the relevance from an offender perspective. *Security Journal*,

31(1), 285–304. <https://doi.org/10.1057/s41284-017-0101-6>

Astell-Burt, T., Feng, X., Kolt, G. S., & Jalaludin, B. (2015). Does rising crime lead to

increasing distress? Longitudinal analysis of a natural experiment with dynamic objective neighbourhood measures. *Social Science & Medicine*, 138, 68–73.

Austin, S. B., Melly, S. J., Sanchez, B. N., Patel, A., Buka, S., & Gortmaker, S. L. (2005).

Clustering of fast-food restaurants around schools: A novel application of spatial statistics to the study of food environments. *American Journal of Public Health*, 95(9),

1575–1581. <https://doi.org/10.2105/AJPH.2004.056341>

Barbour, K. A., & Blumenthal, J. A. (2005). Exercise training and depression in older adults.

Neurobiology of Aging, 26(1), 119–123. doi:10.1016/j.neurobiolaging.2005.09.007

Bargai, N., Ben-Shakhar, G., & Shalev, A. Y. (2007). Posttraumatic Stress Disorder and

Depression in Battered Women: The Mediating Role of Learned Helplessness. *Journal of Family Violence*, 22(5), 267–275. <https://doi.org/10.1007/s10896-007-9078-y>

Baumer, T. (1979). Research on Fear of Crime in the United States. *Victimology*, 3, 254–263.

Bargai, N., Ben-Shakhar, G., & Shalev, A. Y. (2007). Posttraumatic stress disorder and

depression in battered women: The mediating role of learned helplessness. *Journal of Family Violence*, 22, 267–275.

- Beasley, R.W. & Antunes, G. (1974). The Etiology of Urban Crime: An analysis of Ecological Analysis , *Criminology*, 11: 439-461.
- Beavon, D.J., Brantingham, P.L., & Brantingham, P.J. (1994) The influence of street networks on the patterning of property offenses. In: R.V. Clarke (ed.) *Crime prevention studies*, vol 2. Willow Tree Press, New York.
- Bechtel, L., Lordan, G., & Rao, D. S. P. (2012). Income Inequality and Mental Health— Empirical Evidence from Australia. *Health Economics*, 21(S1), 4–17.
<https://doi.org/10.1002/hec.2814>
- Bell, A., Fairbrother, M., & Jones, K. (2019). Fixed and random effects models: Making an informed choice. *Quality & Quantity*, 53(2), 1051–1074. <https://doi.org/10.1007/s11135-018-0802-x>
- Bentley, R., Baker, E., & Mason, K. (2012). Cumulative exposure to poor housing affordability and its association with mental health in men and women. *Journal of Epidemiology and Community Health*, 66(9), 761–766. <https://doi.org/10.1136/jech-2011-200291>
- Becker, G. & Rubinstein, Y. (2011). 'Fear and the response to terrorism: an economic analysis', CEP Discussion Paper No. 1079.
- Berke, E. M., Gottlieb, L. M., Moudon, A. V., & Larson, E. B. (2007). Protective association between neighborhood walkability and depression in older men. *Journal of the American Geriatrics Society*, 55(4), 526–533. <https://doi.org/10.1111/j.1532-5415.2007.01108.x>
- Beyer, K. M. M., Kaltenbach, A., Szabo, A., Bogar, S., Javier Nieto, F., & Malecki, K. M. (2014). Exposure to neighborhood green space and mental health: Evidence from the

- survey of the health of Wisconsin. *International Journal of Environmental Research and Public Health*, 11, 3453–3472.
- Birks, D., & Davies, T. (2017). Street network structure and crime risk: An agent-based investigation of the encounter and enclosure hypotheses. *Criminology*, 55(4), 900–937.
- Blaikie, N. (2010). *Designing Social Research*. Malden, MA: Polity Press.
- Bloom, D., Cafiero E, Jane'-Llopis E, Abrahams-Gessel S, Bloom L, Fathima S, et al. The global economic burden of noncommunicable diseases. Geneva, Switzerland: *World Economic Forum*, 2011.
- Boden, J., & Fergusson, D. (2011) Alcohol and depression. *Addiction*. 106: 906– 914.
- Boessen, A., & Hipp, J. R. (2015). Close-Ups and the Scale of Ecology: Land Uses and the Geography of Social Context and Crime. *Criminology*, 53(3), 399–426.
<https://doi.org/10.1111/1745-9125.12074>
- Bowes, D. R., & Ihlanfeldt, K. R. (2001). Identifying the impacts of rail transit stations on residential property values. *Journal of Urban Economics*, 50(1), 1–25.
<https://doi.org/10.1006/juec.2001.2214>
- Bowler, D., Buyung-Ali, L., Knight, T., & Pullin, A. (2010). A systematic review of evidence for the added benefits to health of exposure to natural environments. *BMC Public Health*, 10(456), 1–10.
- Bose, J., Hedden, S., Lipari, R. N., & Park-Lee, E. (2016). Key substance use and mental health indicators in the United States: Results from the 2015 National Survey on Drug Use and Health. Center for Behavioral Health Statistics and Quality. Substance Abuse and Mental

- Health Services Administration. Rockville, MD.
<https://www.samhsa.gov/data/sites/default/files/NSDUH-FFR1-2015/NSDUH-FFR1-2015/NSDUH-FFR1-2015.htm>. Accessed on February, 2021.
- Brantingham, P. L., & Brantingham, P. J. (1995). Criminality of place: Crime generators and crime attractors. *European Journal on Criminal Policy and Research*, 3, 5–26.
- Brereton, F., Clinch, J. P., & Ferreira, S. (2008). Happiness, geography and the environment. *Ecological Economics*, 65(2), 386–396. <https://doi.org/10.1016/j.ecolecon.2007.07.008>
- Browning, C. R., Byron, R. A., Calder, C. A., Krivo, L. J., Kwan, M. P., Lee, J. Y., & Peterson, R. D. (2010). Commercial Density, Residential Concentration, and Crime: Land Use Patterns and Violence in Neighborhood Context. *Journal of Research in Crime and Delinquency*, 47(3), 329–357. doi:10.1177/0022427810365906
- Bryk, A., & Raudenbush, S. (1992). *Hierarchical linear models : applications and data analysis methods* . Sage Publications.
- Buckner, J. C. (1988). The Development of an Instrument to Measure Neighborhood Cohesion. *American Journal of Community Psychology*, 16(6), 771–791.
- Buckner, J. C. (1988). The Development of an Instrument to Measure Neighborhood Cohesion. *American Journal of Community Psychology*, 16(6), 771–791.
- Bullard, R., & Johnson, G. (1997). *Just transportation : dismantling race and class barriers to mobility* . New Society Publishers.
- Bursik Jr., R. J. (1988). Social Disorganization and Theories of Crime and Delinquency: Problems and Prospects*. *Criminology*, 26(4), 519–552. <https://doi.org/10.1111/j.1745-9125.1988.tb00854.x>

Cameron, C., & Trivedi, P., (1990). Regression-Based Tests for Overdispersion in the Poisson Regression Model. *Journal of Econometrics*, 46, pp. 347–364.

Cameron, C., & Trivedi, P., (1998). *Regression Analysis of Count Data*. Cambridge University Press, New York.

Carter, S. P., Carter, S. L., & Dannenberg, A. L. (2003). Zoning Out Crime and Improving Community Health in Sarasota, Florida: “Crime Prevention Through Environmental Design.” *American Journal of Public Health*, 93(9), 1442–1445.
<https://doi.org/10.2105/AJPH.93.9.1442>

Canadian Mental Health Association. (2019). *What’s the difference between mental health and mental illness?* | *Here to Help*. <https://www.heretohelp.bc.ca/q-and-a/whats-the-difference-between-mental-health-and-mental-illness>

Castaneda, R., Sussman, N., Westreich, L., Levy, R., O’Malley, M. (1996). A review of the effects of moderate alcohol intake on the treatment of anxiety and mood disorders. *Journal of Clinical Psychiatry*. 57: 207–212

Cavan, R. S., Burgess, E. W., Havighurst, R. J., & Goldhamer, H. (1949). *Personal adjustment in old age* (pp. xiii, 204). Science Research Associates, Inc.

Cavan, R. S., Burgess, E. W., Havighurst, R. J., & Goldhamer, H. (1949). *Personal adjustment in old age* (pp. xiii, 204). Science Research Associates, Inc.

CDC. (2022). *About Mental Health*. Center for Disease Control and Prevention.
<https://www.cdc.gov/mentalhealth/learn/index.htm>

Ceccato V, Uittenbogaard A, Bamzar R. (2013) Security in Stockholm's underground stations: The importance of environmental attributes and context. *Security Journal*. 2013 Feb 1;26(1):33-59.

- Cervero, R. (2002). Built environments and mode choice: Toward a normative framework. *Transportation Research Part D: Transport and Environment*, 7(4), 265–284.
[https://doi.org/10.1016/S1361-9209\(01\)00024-4](https://doi.org/10.1016/S1361-9209(01)00024-4)
- Cervero, R., & Gorham, R. (1995). Commuting in transit versus automobile neighborhoods. *American Planning Association. Journal of the American Planning Association*, 61(2), 210.
- Chamberlain, A. W., & Wallace, D. (2016). Mass Reentry, Neighborhood Context and Recidivism: Examining How the Distribution of Parolees Within and Across Neighborhoods Impacts Recidivism. *Justice Quarterly*, 33(5), 912–941.
<https://doi.org/10.1080/07418825.2015.1012095>
- Chen, S., Kuhn, M., Prettnner, K., & Bloom, D. E. (2018). The macroeconomic burden of noncommunicable diseases in the United States: Estimates and projections. *PLoS ONE*, 13(11), 1–14. <https://doi.org/10.1371/journal.pone.0206702>
- Choi, N. G., & DiNitto, D. M. (2016). Depressive symptoms among older adults who do not drive: Association with mobility resources and perceived transportation barriers. *The Gerontologist*, 56(3), 432–443. doi:10.1093/geront/gnu116
- Chuang, Y-C., Cubbin, C., Ahn, D., & Winkleby, M. (2005). Effects of Neighbour- hood Socioeconomic Status and Convenience Store Concentration on Individual Level Smoking. *Journal of Epidemiology and Community Health*. 59: 568–573.
- Clarke, R. V. (1997a) Introduction. In: R.V. Clarke (ed.) *Situational Crime Prevention: Successful Case Studies*, 2nd edn. Guilderland, NY: Harrow and Heston.
- Clarke, A. H., & Lewis, M. J. (1982). Fear of Crime among the Elderly: An Exploratory Study. *The British Journal of Criminology*, 22(1), 49–62.

- Cohen, M. A., & Farrington, D. P. (2021). Appropriate Measurement and Use of “Costs of Crime” in Policy Analysis: Benefit-Cost Analysis of Criminal Justice Policies Has Come of Age. *Journal of Policy Analysis and Management*, 40(1), 284–293.
<https://doi.org/10.1002/pam.22272>
- Cohen, M. A., & Miller, T. R. (1998). The Cost of Mental Health Care for Victims of Crime. *Journal of Interpersonal Violence*, 13(1), 93–110.
<https://doi.org/10.1177/088626098013001006>
- Cozens, P. (2008). Crime prevention through environmental design in Western Australia: Planning for sustainable urban futures. *International Journal of Sustainable Development and Planning*, 3(3), 272–292. <https://doi.org/10.2495/SDP-V3-N3-272-292>
- Cozens, P. M., Saville, G., & Hillier, D. (2005). Crime prevention through environmental design (CPTED): A review and modern bibliography. *Property management*, 23(5), 328–356.
- Coleman, J. S. (1988). Social Capital in the Creation of Human Capital. *American Journal of Sociology*, 94, S95–S120.
- Cornaglia, F., Feldman, N. E., & Leigh, A. (2014). *Crime and Mental Wellbeing*.
- Cornwell, B., Laumann, E. O., & Schumm, L. P. (2008). The Social Connectedness of Older Adults: A National Profile. *American Sociological Review*, 73(2), 185–203.
- Cozens, P., & Love, T. (2015). A Review and Current Status of Crime Prevention through Environmental Design (CPTED). *Journal of Planning Literature*, 30(4), 393–412.
<https://doi.org/10.1177/0885412215595440>
- Culbertson, K. A., VIK, P. W., & KOOIMAN, B. J. (2001). The Impact of Sexual Assault, Sexual Assault Perpetrator Type, and Location of Sexual Assault on Ratings of Perceived

Safety. *Violence Against Women*, 7(8), 858–875.

<https://doi.org/10.1177/10778010122182794>

Creswell, J. W. (2013). *Research design: Qualitative, quantitative, and mixed methods approaches*. Thousand Oaks, CA: Sage.

Culbertson, K. A., VIK, P. W., & KOOIMAN, B. J. (2001). The Impact of Sexual Assault, Sexual Assault Perpetrator Type, and Location of Sexual Assault on Ratings of Perceived Safety. *Violence Against Women*, 7(8), 858–875.

<https://doi.org/10.1177/10778010122182794>

Cunradi, C. B., Mair, C., & Todd, M. (2015). Alcohol Outlet Density, Drinking Contexts and Intimate Partner Violence: A Review of Environmental Risk Factors. *Journal of Drug Education*, 44, 19–31. doi:10.1016/j.physbeh.2017.03.040

Dadvand, P., Bartoll, X., Basagaña, X., Dalmau-Bueno, A., Martinez, D., Ambros, A., ...

Nieuwenhuijsen, M. J. (2016). Green spaces and General Health: Roles of mental health status, social support, and physical activity. *Environment International*, 91, 161–167.

<https://doi.org/10.1016/j.envint.2016.02.029>

De Mello, M. T., Lemos, V. d. A., Antunes, H. K. M., Bittencourt, L., Santos- Silva, R., & Tufik, S. (2013). Relationship between physical activity and depression and anxiety symptoms: A population study. *Journal of Affective Disorders*, 149(1–3), 241–246.

doi:<https://doi.org/10.1016/j.jad.2013.01.035>

de Vries, S., Verheij, R. A., Groenewegen, P. P., & Spreeuwenberg, P. (2003). Natural environments - Healthy environments? An exploratory analysis of the relationship between

greenspace and health. *Environment and Planning A*, 35(10), 1717–1731.

<https://doi.org/10.1068/a35111>

Ding, H., Loukaitou-Sideris, A., & Agrawal, A. W. (2020). Sexual Harassment and Assault in Transit Environments: A Review of the English-language Literature. *Journal of Planning Literature*, 35(3), 267–280. <https://doi.org/10.1177/0885412220911129>

Donovan, G. H., & Prestemon, J. P. (2012). The Effect of Trees on Crime in Portland, Oregon. *Environment and Behavior*, 44(1), 3–30. <https://doi.org/10.1177/0013916510383238>

Durbin, J. (1954). Errors in Variables. *Revue de l'Institut International de Statistique / Review of the International Statistical Institute*, 22(1/3), 23–32. <https://doi.org/10.2307/1401917>

Dustmann, C., & Fasani, F. (2012). The Effect of Local Area Crime on the Mental Health of Residents *, (November), 1–57. Retrieved from http://ec.europa.eu/public_opinion/archives/eb_arch_en.htm.

Earls, M., & Nelson, G. (1988). The relationship between long-term psychiatric clients' psychological well-being and their perceptions of housing and social support. *American Journal of Community Psychology*, 16(2), 279–293. <https://doi.org/10.1007/BF00912527>

Ellen, I. G., Lens, M. C., & O'Regan, K. (2012). American murder mystery revisited: Do housing voucher households cause crime? *Housing Policy Debate*, 22(4), 551–572. <https://doi.org/10.1080/10511482.2012.697913>

Errickson, J. (2021), Stata's Mixed vs Xtreg (block article). Retrieved from: <https://errickson.net/stats-notes/xtsetvsmixed.html> on April 1, 2021.

- Ewing, R. & Cervero, R. (2010). Travel and the Built Environment. *Journal of American Planning Association*. 2010, 76, 265–294.
- Felson, M. & Cohen, L.E. (1980). Human Ecology And Crime: A Routine Activity Approach, *Human Ecology*, 8(4): 389–406. doi:10.1007/BF01561001
- Felson, M., Belanger, M., Bichler, G., Bruzinksi, C., Campbell, G., Fried, C., Grofik, K., Mazur, I., O'Regan, A., Sweeney, P., Ullman, A., & Williams, L., (1996). Redesigning Hell: Preventing Crime and Disorder at the Port Authority Bus Terminal. *In Preventing Mass Transit Crime*, edited by R. V. Clarke. Monsey, NY: Criminal Justice Press.
- Ferraro, K. F. (1994). *Fear of Crime: Interpreting victimization risk*. Albany: State University of New York Press.
- Ferraro, K. & LaGrange, R. (1987). The measurement of fear of crime. *Sociological Inquiry*, 57, 70-101.
- Foster, S., Hooper, P., Knuiman, M., & Giles-Corti, B. (2016). Does heightened fear of crime lead to poorer mental health in new suburbs, or vice versa? *Social Science & Medicine*, 168, 30–34. <https://doi.org/10.1016/j.socscimed.2016.09.004>
- Frank, L., Kerr, J., Chapman, J., & Sallis, J. (2007). Urban Form Relationships with Walk Trip Frequency and Distance among Youth. *American Journal of Health Promotion*, 21(4_suppl), 305–311. <https://doi.org/10.4278/0890-1171-21.4s.305>
- French, S., Wood, L., Foster, S. A., Giles-Corti, B., Frank, L., & Learnihan, V. (2014). Sense of Community and Its Association With the Neighborhood Built Environment. *Environment and Behavior*, 46(6), 677–697. <https://doi.org/10.1177/0013916512469098>

- Friesinger, J. G., Topor, A., Bøe, T. D., & Larsen, I. B. (2019). Studies regarding supported housing and the built environment for people with mental health problems: A mixed-methods literature review. *Health and Place, 57*(March), 44–53.
<https://doi.org/10.1016/j.healthplace.2019.03.006>
- Furr-Holden, C. D. M., Milam, A. J., Nesoff, E. D., Johnson, R. M., Fakunle, D. O., Jennings, J. M., & Thorpe, R. J. (2016). Not In My Back Yard: A Comparative Analysis of Crime Around Publicly Funded Drug Treatment Centers, Liquor Stores, Convenience Stores, And Corner Stores in One Mid-Atlantic City. *Journal of Studies on Alcohol and Drugs, 77*(1), 17–24. doi:10.15288/jsad.2016.77.17
- Garofalo, J. (1979). Victimization and the Fear of Crime. *Journal of Research in Crime and Delinquency, 16*(1), 80–97. <https://doi.org/10.1177/002242787901600107>
- Garofalo, J., & Laub, J. (1979). The fear of crime: Broadening our perspective. *Victimology, 3*, 242–253.
- Gascon, M., Zijlema, W., Vert, C., White, M. P., & Nieuwenhuijsen, M. J. (2017). Outdoor blue spaces, human health and well-being: A systematic review of quantitative studies. *International Journal of Hygiene and Environmental Health, 220*(8), 1207–1221.
<https://doi.org/10.1016/j.ijheh.2017.08.004>
- Gehl, J. (2010). *Cities for People*. London: Island Press.
- Gibbs, J. P., & Martin, W. T. (1962). Urbanization, Technology, and the Division of Labor: International Patterns. *American Sociological Review, 27*(5), 667–677. Retrieved from <https://www.jstor.org/stable/2089624?seq=1>

- Gilad, M. (2017). Falling Between the Cracks: Understanding Why States Fail in Protecting Our Children From Crime (SSRN Scholarly Paper No. 3014717). *Social Science Research Network*. <https://doi.org/10.2139/ssrn.3014717>
- Gilbreath, A. (2013). A spatial analysis of methamphetamine lab seizures in the Midwest high-intensity drug trafficking area before and after federal precursor legislation. In M. Leitner (Ed.). *Crime modeling and mapping using geospatial technologies* (pp. 297–316). New York: Springer.
- Gong, Y., Palmer, S., Gallacher, J., Marsden, T., & Fone, D. (2016). A systematic review of the relationship between objective measurements of the urban environment and psychological distress. *Environment International*, *96*, 48–57. <https://doi.org/10.1016/j.envint.2016.08.019>
- Gorman, D. M., Speer, P. W., Gruenewald, P. J., & Labouvie. E. W. (2001). Spatial Dynamics of Alcohol Availability, Neighborhood Structure and Violent Crime. *Journal of Studies on Alcohol*, *62*(5), 628-636. doi:10.15288/jsa.2001.62.628
- Greed, C. (1994). *Women and Planning: Creating Gendered Realities* (1st ed.). Routledge. <https://www.routledge.com/Women-and-Planning-Creating-Gendered-Realities/Greed/p/book/9780415079815>
- Groff, E., & McCord, E. S. (2012). The role of neighborhood parks as crime generators. *Security Journal*, *25*(1), 1–24. <https://doi.org/10.1057/sj.2011.1>
- Grubestic, T. H., & Rosso, A. L. (2014). The use of spatially lagged explanatory variables for modeling neighborhood amenities and mobility in older adults. *Cityscape: A Journal of Policy Development and Research*, *16*(2), 205–214. Retrieved from <http://www.huduser.org/portal/periodicals/cityscpe/vol16num2/ch17.pdf>

- Gruenewald, P. J., & Remer, L. (2006). Changes in Outlet Densities Affect Violence Rates. *Alcoholism: Clinical and Experimental Research*, 30(7), 1184–1193. doi: 10.1111/j.1530-0277.2006.00141.x
- Gundelach, B., & Freitag, M. (2014). Neighbourhood Diversity and Social Trust: An Empirical Analysis of Interethnic Contact and Group-specific Effects. *Urban Studies*, 51(6), 1236–1256. <https://doi.org/10.1177/0042098013495578>
- Guo, G., & Zhao, H. (2000). Multilevel modeling for binary data. *Annual Review of Sociology*, 26, 441–462. <https://doi.org/10.1146/annurev.soc.26.1.441>
- Hall, G., Nelson, G., & Fowler, H. (1987). “Housing for the Chronically Mentally Disabled: Part I—Conceptual Framework and Social Context.” *Canadian Journal of Community Mental Health*. 6 (2): 65–78.
- Halpern, D. (1995). *Mental Health and The Built Environment: More Than Bricks And Mortar?* (1st ed.). Routledge. <https://doi-org.ezproxy.uta.edu/10.4324/9781315041131>
- Handy, S., Cao, X., & Mokhtarian, P. L. (2006). Self-Selection in the Relationship between the Built Environment and Walking. *American Planning Association. Journal of the American Planning Association*, 72(1), 55–74.
- Handy, S. L. (1996). Understanding the Link Between Urban Form and Nonwork Travel Behavior. *Journal of Planning Education and Research*, 15(3), 183–198. <https://doi.org/10.1177/0739456X9601500303>
- Hannon, L. E. (2005). Extremely poor neighborhoods and homicide. *Social Science Quarterly*, 86(SPEC. ISS.), 1418–1434. <https://doi.org/10.1111/j.0038-4941.2005.00353.x>

- Hannon, L., & Knapp, P. (2003). Reassessing non-linearity in the urban disadvantage/violent crime relationship: An example of methodological bias from log transformation.
- Hansen, H., Riano, N. S., Meadows, T., & Mangurian, C. (2018). Alleviating the Mental Health Burden of Structural Discrimination and Hate Crimes: The Role of Psychiatrists. *American Journal of Psychiatry*, *175*(10), 929–933.
<https://doi.org/10.1176/appi.ajp.2018.17080891>
- Harkness, J., Newman, S. J., & Salkever, D. (2004). The cost-effectiveness of independent housing for the chronically mentally ill: Do housing and neighborhood features matter? *Health Services Research*, *39*(5), 1341–1360. <https://doi.org/10.1111/j.1475-6773.2004.00293.x>
- Harris, B., Larson, L., & Ogletree, S. (2018). Different Views From The 606: Examining the Impacts of an Urban Greenway on Crime in Chicago. *Environment and Behavior*, *50*(1), 56–85. doi:10.1177/0013916517690197
- Hausman, J. A. (1978). Specification Tests in Econometrics. *Econometrica*, *46*(6), 1251–1271.
<https://doi.org/10.2307/1913827>
- Hawley, A. (1950). *Human Ecology: A Theory of Community Structure*. Ronald Press, New York.
- Hay, G., Whigham, P., Kypri, K., & Langley, J. (2009). Neighbourhood deprivation and access to alcohol outlets: A national study. *Health & Place*, *15*: 1086–1093.
- He, Q., & Li, J. (2022). The roles of built environment and social disadvantage on the geography of property crime. *Cities*, *121*, 103471. <https://doi.org/10.1016/j.cities.2021.103471>

- Hein, L. C., & Scharer, K. M. (2013). Who Cares If It Is a Hate Crime? Lesbian, Gay, Bisexual, and Transgender Hate Crimes—Mental Health Implications and Interventions. *Perspectives in Psychiatric Care*, 49(2), 84–93. <https://doi.org/10.1111/j.1744-6163.2012.00354.x>
- Herek, G. M., GILLIS, J. R., COGAN, J. C., & GLUNT, E. K. (1997). Hate Crime Victimization Among Lesbian, Gay, and Bisexual Adults: Prevalence, Psychological Correlates, and Methodological Issues. *Journal of Interpersonal Violence*, 12(2), 195–215. <https://doi.org/10.1177/088626097012002003>
- Hill, T. D., Trinh, H. N., Wen, M., & Hale, L. (2016). Perceived neighborhood safety and sleep quality: A global analysis of six countries. *Sleep Medicine*, 18, 56–60. <https://doi.org/10.1016/j.sleep.2014.12.003>
- Hipp, J. R. (2007). Income Inequality, Race, and Place: Does the Distribution of Race and Class within Neighborhoods affect Crime Rates? *Criminology*, 45(3).
- Hipp, J. R., Tita, G. E., & Greenbaum, R. T., (2009). Drive-Bys and Trade-Ups: Examining the Directionality of the Crime and Residential Instability Relationship. *Social Forces*, 87(4): 1777-1812.
- Hipp, J. R., & Yates, D. K. (2011). Ghettos, thresholds, and crime: Does concentrated poverty really have an accelerating increasing effect on crime? *Criminology*, 49(4), 955–990. <https://doi.org/10.1111/j.1745-9125.2011.00249.x>
- Hoch, C. (2006). Emotions and Planning. *Planning Theory & Practice*, 7(4), 367–382. <https://doi.org/10.1080/14649350600984436>

- Hong, J., & Chen, C. (2014). The role of the built environment on perceived safety from crime and walking: Examining direct and indirect impacts. *Transportation*, *41*(6), 1171–1185. <https://doi.org/10.1007/s11116-014-9535-4>
- House, J. S., Landis, K. R., & Umberson, D. (1988). Social relationships and health. *Science*, *241*(4865), 540–546.
- Ige, J., Pilkington, P., Orme, J., Williams, B., Prestwood, E., Black, D., ... Scally, G. (2019). The relationship between buildings and health: A systematic review. *Journal of Public Health (United Kingdom)*, *41*(2), E121–E132. <https://doi.org/10.1093/pubmed/fdy138>
- Irvin-Erickson Y, La Vigne N. A spatio-temporal analysis of crime at Washington, DC metro rail: Stations' crime-generating and crime-attracting characteristics as transportation nodes and places. *Crime science*. 2015 Dec 1;4(1):14.
- Jackson, J., & Stafford, M. (2009). Public health and fear of crime: A prospective cohort study. *British Journal of Criminology*, *49*(6), 832–847. <https://doi.org/10.1093/bjc/azp033>
- Jackson, R. & Kochtitzky, C. (2000). *Creating A Healthy Environment: The Impact of the Built Environment on Public Health*. Centers for Disease Control and Prevention.
- Jacobs, J. (1961). *The death and life of great American cities*. New York, NY: Vintage Books.
- Jackson, R. & Kochtitzky, C. (2000). *Creating A Healthy Environment: The Impact of the Built Environment on Public Health*. Centers for Disease Control and Prevention.
- Jackson, J., & Stafford, M. (2009). Public health and fear of crime: A prospective cohort study. *British Journal of Criminology*, *49*(6), 832–847. <https://doi.org/10.1093/bjc/azp033>

- Janssen, I. (2014). Crime and perceptions of safety in the home neighborhood are independently associated with physical activity among 11–15year olds. *Preventive Medicine*, 66, 113–117. <https://doi.org/10.1016/j.ypmed.2014.06.016>
- Joh, K., Nguyen, M. T., & Boarnet, M. G. (2012). Can Built and Social Environmental Factors Encourage Walking among Individuals with Negative Walking Attitudes? *Journal of Planning Education and Research*, 32(2), 219–236. <https://doi.org/10.1177/0739456X11427914>
- Johnson, S. D., & Bowers, K. J. (2010). Permeability and Burglary Risk: Are Cul-de-Sacs Safer? *Journal of Quantitative Criminology*, 26(1), 89–111. <https://doi.org/10.1007/s>
- Jones, R. W., & Pridemore, W. A. (2018). Toward an Integrated Multilevel Theory of Crime at Place: Routine Activities, Social Disorganization, and The Law of Crime Concentration. *Journal of Quantitative Criminology*, (0123456789). doi:10.1007/s10940-018-9397-6
- Kawachi, I., & Berkman, L. F. (2001). Social ties and mental health. *Journal of Urban Health*, 78(3), 458–467. doi:10.1093/jurban/78.3.458
- Keane, C. (1998). Evaluating the Influence of Fear of Crime as an Environmental Mobility Restrictor on Women’s Routine Activities—Carl Keane, 1998. *Environment and Behavior*. <https://doi.org/10.1177/0013916598301003>
- Kearns, A., Livingston, M., Galster, G., & Bannister, J. (2019). The effects of neighbourhood offender concentrations on the number, type and location of crimes committed by resident offenders. *British Journal of Criminology*, 59(3), 653–673. <https://doi.org/10.1093/bjc/azy065>

Kikuchi, G., & Desmond, S. A. (2010). A Longitudinal Analysis of Neighborhood Crime Rates Using Latent Growth Curve Modeling. *Sociological Perspectives*, 53(1), 127–149.

<https://doi.org/10.1525/sop.2010.53.1.127>

Kim, Y. A. (2018). Examining the Relationship Between the Structural Characteristics of Place and Crime by Imputing Census Block Data in Street Segments: Is the Pain Worth the Gain?

Journal of Quantitative Criminology, 34(1), 67–110. <https://doi.org/10.1007/s10940-016-9323-8>

Koskela, H., & Pain, R. (2000). Revisiting fear and place: Women’s fear of attack and the built environment. *Geoforum*, 31(2), 269–280. [https://doi.org/10.1016/S0016-7185\(99\)00033-](https://doi.org/10.1016/S0016-7185(99)00033-0)

0

Kunst, M. J. J. (2012). Mental health problems and satisfaction with amount of state compensation for intentional violent crime victimization in the netherlands. *Community*

Mental Health Journal, 48(4), 527–534. <https://doi.org/10.1007/s10597-011-9443-4>

Kuo, F. E., & Sullivan, W. C. (2001). Environment and Crime in the Inner City. *Environment and Behavior*, 33(3), 343–367. doi:10.1177/0013916501333002

Kypri, K., Bell, M., Hay, G., & Baxter, J. (2008). Alcohol outlet density and university student drinking: a national study. *Addiction*. 103: 1131–1138.

La Vigne, N. (1997), “Safe transport: security by design on the Washington Metro”, in Clarke, R.V. (Ed.), Preventing Mass Transit Crime. Crime Prevention Studies, Vol. 6, Criminal Justice Press, Monsey, NY.

- LaGrange, R. & Ferraro, K. (1989). Assessing Age and Gender Differences in Perceived Risk and Fear of Crime. *Criminology*, 27(4), 697–720. <https://doi.org/10.1111/j.1745-9125.1989.tb01051.x>
- Langton, S. H., & Steenbeek, W. (2017). Residential burglary target selection: An analysis at the property-level using Google Street View. *Applied Geography*, 86, 292–299. <https://doi.org/10.1016/j.apgeog.2017.06.014>
- LaVeist, T., & Wallace, J. (2000). Health risk and inequitable distribution of liquor stores in African American neighborhood. *Social Science & Medicine*. 51: 613– 617
- Lawton, M. P., & Nahemow, L. (1973). Ecology and the aging process. In C. Eisdorfer, & M. P. Lawton (Eds.), *Psychology of adult development and aging* (pp. 619e674). Washington, DC: American Psychological Association.
- Layard, R. (2005). ‘Mental health: Britain’s biggest social problem?’, presented at the No. 10 *Strategy Unit Seminar on Mental Health*, 20th January.
- Lee, I., Jung, S., Lee, J., & Macdonald, E. (2019). Street crime prediction model based on the physical characteristics of a streetscape: Analysis of streets in low-rise housing areas in South Korea. *Environment and Planning B: Urban Analytics and City Science*, 46(5), 862–879. <https://doi.org/10.1177/2399808317735105>
- Le, H., Engler-Stringer, R., Muhajarine, N. (2016). Walkable home neighbourhood food environment and children’s overweight and obesity: proximity, density or price? *Canadian Journal of Public Health*, 107(1).

- Lemon, B. W., Bengtson, V. L., & Peterson, J. A. (1972). An exploration of the activity theory of aging: Activity types and life satisfaction among in-movers to a retirement community. *Journal of Gerontology, 27*(4), 511–523. <https://doi.org/10.1093/geronj/27.4.511>
- Leventhal, T., & Brooks-Gunn, J. (2003). Moving to Opportunity: An Experimental Study of Neighborhood Effects on Mental Health. *American Journal of Public Health, 93*(9), 1576–1582. <https://doi.org/10.2105/AJPH.93.9.1576>
- Lewis, D. A., & Maxfield, M. G. (1980). Fear in the Neighborhoods: An Investigation of the Impact of Crime. *Journal of Research in Crime and Delinquency, 17*(2), 160–189. <https://doi.org/10.1177/002242788001700203>
- Lewis, D. A. & Riger, S. ,(1986). Crime as stress: On the internalization of a social problem. In E. Seidman & J. Rappaport (Eds.), *Redefining social problems*. New York: Plenum Press.
- Lindström, M., Hanson, B. S., & Östergren, P.-O. (2001). Socioeconomic differences in leisure-time physical activity: The role of social participation and social capital in shaping health related behaviour. *Social Science & Medicine, 52*(3), 441–451. [https://doi.org/10.1016/S0277-9536\(00\)00153-2](https://doi.org/10.1016/S0277-9536(00)00153-2)
- Liska, A. E., & Baccaglini, W. (1990). Feeling safe by comparison: Crime in the newspapers. *Social Problem, 37*, 360-374.
- Livingston M. (2011). Alcohol outlet density and harm: Comparing the Impacts on Violence and Chronic Harms. *Drug Alcohol, 30*, 515–523. doi: 10.1111/j.1465-3362.2010.00251.x.
- Lorenc, T., Clayton, S., Neary, D., Whitehead, M., Petticrew, M., Thomson, H., Cummins, S., Sowden, A., & Renton, A. (2012). Crime, fear of crime, environment, and mental health

- and wellbeing: Mapping review of theories and causal pathways. *Health & Place*, 18(4), 757–765. <https://doi.org/10.1016/j.healthplace.2012.04.001>
- Loukaitou-Sideris, A. (2005). Is It Safe to Walk Here? Design and Policy Responses to Women’s Fear of Victimization in Public Places. *Transportation Research Board Conference Proceedings*, 35. <https://trid.trb.org/view/773073>
- Loukaitou-Sideris, A., & Fink, C. (2009). Addressing Women’s Fear of Victimization in Transportation Settings: A Survey of U.S. Transit Agencies. *Urban Affairs Review*, 44(4), 554–587. <https://doi.org/10.1177/1078087408322874>
- Loukaitou-Sideris, A., Taylor, B. D., & Fink, C. N. Y. (2006). Rail Transit Security in an International Context: Lessons from Four Cities. *Urban Affairs Review*, 41(6), 727–748. <https://doi.org/10.1177/1078087406287581>
- Lucassen, M. F., Stasiak, K., Samra, R., Frampton, C. M., & Merry, S. N. (2017). Sexual minority youth and depressive symptoms or depressive disorder: A systematic review and meta-analysis of population-based studies. *The Australian and New Zealand Journal of Psychiatry*, 51(8), 774–787. <https://doi.org/10.1177/0004867417713664>
- Lyles, W., & White, S. S. (2019). Who Cares? *Journal of the American Planning Association*, 85(3), 287–300. <https://doi.org/10.1080/01944363.2019.1612268>
- Lynch, G., & Atkins, S. (1988). The influence of personal security fears on women’s travel patterns. *Transportation*, 15(3), 257–277. <https://doi.org/10.1007/BF00837584>
- MacKerron, G., & Mourato, S. (2013). Happiness is greater in natural environments. *Global Environmental Change*, 23(5), 992–1000. <https://doi.org/10.1016/j.gloenvcha.2013.03.010>

- Mammen, G., & Faulkner, G. (2013). Physical activity and the prevention of depression: A systematic review of prospective studies. *American Journal of Preventive Medicine*, 45(5), 649–657. doi:<https://doi.org/10.1016/j.amepre.2013.08.001>
- Mason, P., Kearns, A., & Livingston, M. (2013). “Safe Going”: The influence of crime rates and perceived crime and safety on walking in deprived neighbourhoods. *Social Science & Medicine*, 91, 15–24. <https://doi.org/10.1016/j.socscimed.2013.04.011>
- Mason, W. , Wong, G. & Entwisle, B. (1983). Contextual Analysis through the Multilevel Linear Model. *Sociological Methodology*, 14, 72–103. <https://doi.org/10.1088/1751-8113/44/8/085201>
- McCormick, R. (2017). Does Access to Green Space Impact the Mental Well-being of Children: A Systematic Review. *Journal of Pediatric Nursing*, 37, 3–7. <https://doi.org/10.1016/j.pedn.2017.08.027>
- Mears, D. P., & Bhati, A. S. (2006). No community is an Island: The effects of resource deprivation on urban violence in spatially and socially proximate communities. *Criminology*, 44(3), 509–548. <https://doi.org/10.1111/j.1745-9125.2006.00056.x>
- Mehta, V., & Bosson, J. K. (2018). Revisiting Lively Streets: Social Interactions in Public Space. *Journal of Planning Education and Research*. <https://doi.org/10.1177/0739456X18781453>
- Melis, G., Gelormino, E., Marra, G., Ferracin, E., & Costa, G. (2015). The effects of the urban built environment on mental health: A cohort study in a large northern Italian city. *International Journal of Environmental Research and Public Health*, 12(11), 14898–14915. <https://doi.org/10.3390/ijerph121114898>

- Meyer, I. H. (1995). Minority Stress and Mental Health in Gay Men. *Journal of Health and Social Behavior*, 36(1), 38–56. <https://doi.org/10.2307/2137286>
- Michael, S. E., Hull, R. B., & Zahm, D. L. (2001). Environmental factors influencing auto burglary a case study. *Environment and Behavior*, 33(3), 368–388. <https://doi.org/10.1177/00139160121973034>
- Miller, T. R., Cohen, M. A., Swedler, D. I., Ali, B., & Hendrie, D. V. (2021). Incidence and Costs of Personal and Property Crimes in the USA, 2017. *Journal of Benefit-Cost Analysis*, 12(1), 24–54. <https://doi.org/10.1017/bca.2020.36>
- McCormick, R. (2017). Does Access to Green Space Impact the Mental Well-being of Children: A Systematic Review. *Journal of Pediatric Nursing*, 37, 3–7. <https://doi.org/10.1016/j.pedn.2017.08.027>
- McLean, R., Sanders, W., & Stroup, W. (1991). A Unified Approach to Mixed Linear Models. *The American Statistician*, 45(1), 54-64. doi:10.2307/2685241
- Melis, G., Gelormino, E., Marra, G., Ferracin, E., & Costa, G. (2015). “The effects of the urban built environment on mental health: a cohort study in a large northern Italian city,” *International Journal of Environmental Research and Public Health*, vol. 12, no. 11, pp. 14898–14915.
- Mills, C. (2018). From ‘Invisible Problem’ to Global Priority: The Inclusion of Mental Health in the Sustainable Development Goals. *Development and Change*, 49(3), 843–866. <https://doi.org/10.1111/dech.12397>

- Miranda, J. J., Kinra, S., Casas, J. P., Davey Smith, G., & Ebrahim, S. (2008). Non-communicable diseases in low- and middle-income countries: Context, determinants and health policy. *Tropical Medicine and International Health*, 13(10), 1225–1234. <https://doi.org/10.1111/j.1365-3156.2008.02116.x>
- Moore, M. H., & Trojanowicz. (1988). Policing and the Fear of Crime. *Perspectives on Policing*, 8.
- Morenoff, J. D., Sampson, R. J., & Raudenbush, S. W. (2001). Neighborhood inequality, collective efficacy, and the spatial dynamics of urban violence. *Criminology*, 39(3), 517–558. <https://doi.org/10.1111/j.1745-9125.2001.tb00932.x>
- Muhammad, K. (2011). *The Condemnation of Blackness: Race, Crime, and the Making of Modern Urban America*. Harvard University Press. <https://www.hup.harvard.edu/catalog.php?isbn=9780674238145>
- Mulvey, A., Turro, G., Cutter, T., & Pash, J. (1995). Crime, communities, and qualities of lives: women and men in Lowell, 1982-1994. Presented at the *Biennial Conference on Community Research & Action*, Chicago, IL.
- Nagy, M., Fisher, G., & Tessler, R. (1988). Effects of facility characteristics on the social adjustment of mentally ill residents of board-and-care homes. *Hospital & Community Psychiatry: a Journal of the American Psychiatric Association*. 39(12), 1281–1286. <https://doi.org/10.1176/ps.39.12.1281>
- National Institute of Mental Health. (2021). Mental illness. <https://www.nimh.nih.gov/health/statistics/mental-illness.shtml>. Accessed on February 9, 2021

- Nasar, J. L., & Fisher, B. (1993). “Hot spots” of fear and crime: A multi-method investigation. *Journal of Environmental Psychology*, 13(3), 187–206. [https://doi.org/10.1016/S0272-4944\(05\)80173-2](https://doi.org/10.1016/S0272-4944(05)80173-2)
- Natarajan, M. (2011). *Crime opportunity theories : routine activity, rational choice and their variants*. London, UK ; New York, NY : Routledge.
- Nelson, G., Hall, G. B., & Walsh-Bowers, R. (1998). The relationship between housing characteristics, emotional well-being and the personal empowerment of psychiatric consumer/survivors. *Community Mental Health Journal*, 34(1), 57–69. <https://doi.org/10.1023/A:1018764229147>
- Newman, O. (1972). *Defensible Space: Crime Prevention Through Urban Design*. New York: Macmillan.
- Newman, S., Reschovsky, J., Kaneda, K., & Hendrick, A. (1994). The Effects of Independent Living on Persons with Chronic Mental Illness: An Assessment of the Section 8 Certificate Program. *The Milbank Quarterly*, 72(1), 171-198. doi:10.2307/3350343
- Nieuwenhuijsen, M.J., Khreis, H., Triguero-Mas, M., Gascon, M., Dadvand, P., (2017). Fifty shades of green: pathway to healthy urban living. *Epidemiology* 28, 63–71.
- Nordbø, E. C. A., Nordh, H., Raanaas, R. K., & Aamodt, G. (2018). GIS-derived measures of the built environment determinants of mental health and activity participation in childhood and adolescence: A systematic review. *Landscape and Urban Planning*, 177(May), 19–37. <https://doi.org/10.1016/j.landurbplan.2018.04.009>

- Norris, F. H., & Kaniasty, K. (1994). Psychological distress following criminal victimization in the general population: Cross-sectional, longitudinal, and prospective analyses. *Journal of Consulting and Clinical Psychology, 62*(1), 111–123. <https://doi.org/10.1037//0022-006x.62.1.111>
- Novak, S., Reardon, S., Raudenbush, S., & Buka, S. (2006). Retail Tobacco Outlet Density and Youth Cigarette Smoking: A Propensity-Modeling Approach. *American Journal of Public Health, 96*: 670–676.
- Nowak, A. L., & Giurgescu, C. (2017). The Built Environment and Birth Outcomes: A Systematic Review. *MCN The American Journal of Maternal/Child Nursing, 42*(1), 14–20. <https://doi.org/10.1097/NMC.0000000000000299>
- Núñez-González, S., Delgado-Ron, J., Gault, C., Lara-vinueza, A., Calle-celi, D., Porreca, R., & Simancas-racines, D. (2020). Overview of “ Systematic Reviews ” of the Built Environment’s Effects on Mental Health. *Journal of Environmental and Public Health, 2020*, 1–10.
- Orth, U., Cahill, S. P., Foa, E. B., & Maercker, A. (2008). Anger and Posttraumatic Stress Disorder Symptoms in Crime Victims: A Longitudinal Analysis. *Journal of Consulting and Clinical Psychology, 76*(2), 208–218. <https://doi.org/10.1037/0022-006X.76.2.208>
- Osgood, D. W. (2000). Poisson-based regression analysis of aggregate crime rates. *Quantitative Methods in Criminology, 16*(1), 577–599.

- Owens, P. M., Titus-Ernstoff, L., Gibson, L., Beach, M. L., Beauregard, S., & Dalton, M. A. (2010). *Smart density: A more accurate method of measuring rural residential density for health-related research*. 8.
- Park, R. E., & Burgess, E. W. (1921). *Introduction to the Science of Sociology*. University of Chicago.
- Pasanen, T. P., Tyrväinen, L., & Korpela, K. M. (2014). The Relationship between Perceived Health and Physical Activity Indoors, Outdoors in Built Environments, and Outdoors in Nature. *Applied Psychology: Health and Well-Being*, 6(3), 324–346.
<https://doi.org/10.1111/aphw.12031>
- Pereira, G., Wood, L., Foster, S., & Haggart, F. (2013). Access to Alcohol Outlets, Alcohol Consumption and Mental Health. *PLoS ONE*, 8(1).
<https://doi.org/10.1371/journal.pone.0053461>
- Perkins, D. D., & Taylor, R. B. (1996). Ecological Assessments of Community Disorder: Their Relationship to Fear of Crime and Theoretical Implications. *American Journal of Community Psychology*, 24(1), 63–107. <https://doi.org/10.1007/BF02511883>
- Perkins, D. Florin, P., Rich, C., Wandersman, A., & Chavis, M. (1990). Participation and the social and physical environment of residential blocks: Crime and community context. *American Journal of Community Psychology*, 18, 83-115.
- Peterson, R. D., & Krivo, L. J., (2010). *Divergent Social Worlds: Neighborhood Crime and the Racial-spatial Divide*. Russell Sage Foundation.

- Perkins, D. D., Meeks, J. W., & Taylor, R. B. (1992). The physical environment of street blocks and resident perceptions of crime and disorder: implications for theory and measurement. *Journal of Environmental Psychology, 12*(1), 21–34. [https://doi.org/10.1016/S0272-4944\(05\)80294-4](https://doi.org/10.1016/S0272-4944(05)80294-4)
- Phillips, D. C., & Sandler, D. (2015). Does public transit spread crime? Evidence from temporary rail station closures. *Regional Science and Urban Economics, 52*, 13–26. doi:10.1016/j.regsciurbeco.2015.02.001
- Pilot, S. (2015). *The Fear that Stalks: Gender-based Violence in Public Spaces* (L. Prabhu, Ed.). Zubaan.
- Plano, S. L. (1993). Transit generated crime: Perception versus reality --- A sociogeographic study of neighborhoods adjacent to section B of Baltimore Metro, *Public Transit: Current Research in Planning, Marketing, Operations, and Technology*, edited by Transportation Research Board, National Research Council. Washington, DC: National Academy Press, 59-62.
- Poister, T. H. (1996). Transit-related Crime in Suburban Areas. *Journal of Urban Affairs, 18*, 163–175.
- Popova, S., Giesbrecht, N., Bekmuradov, D., & Patra, J. (2009). Hours and Days of Sale and Density of Alcohol Outlets: Impacts on Alcohol Consumption and Damage: A Systematic Review. *Alcohol and Alcoholism, 44*: 500–516.
- Raleigh, E., & Galster, G.C. (2015). "Neighborhood Disinvestment, Abandonment and Crime Dynamics," *Journal of Urban Affairs, 37* (no. 4, 2015): 367-396.

- Rautio, N., Filatova, S., Lehtiniemi, H., & Miettunen, J. (2018). Living environment and its relationship to depressive mood: A systematic review. *International Journal of Social Psychiatry*, 64(1), 92–103. <https://doi.org/10.1177/0020764017744582>
- Ridgeway, G., & Macdonald, J. M. (2017). Effect of Rail Transit on Crime: A Study of Los Angeles from 1988 to 2014. *Journal of Quantitative Criminology*, 33, 277–291. <https://doi.org/10.1007/s10940-016-9296-7>
- Romley, J. (2007). Alcohol and environmental justice: the density of liquor stores and bars in urban neighborhoods in the United States. *Journal of Studies On Alcohol And Drugs*. 68: 48.
- Roncek, W. D. (2004), Research on Crimes in Small Areas: Traps and Tricks , Paper presented to the Seventh Annual *International Crime Mapping Research Conference* in Boston, Massachusetts, National Institute of Justice of the United States Department of Justice, Website: <http://www.ojp.usdoj.gov/nij/maps/boston2004/papers/Roncek.pdf>.
- Roncek, D. and Maier, P. (1991), Bars, Blocks, and Crimes Revisited: Linking the Theory of Routine Activities to the Empiricism of Hot Spots , *Criminology*, 29: 725-753.
- Rosin, H. 2008. "American Murder Mystery." *The Atlantic* July/August. Retrieved from <http://www.theatlantic.com/magazine/archive/2008/07/american-murder-mystery/6872/1>.
- Ross, C. E., & Mirowsky, J. (2001). Neighborhood Disadvantage, Disorder, and Health. *Journal of Health and Social Behavior*, 42(3), 258–276. <https://doi.org/10.2307/3090214>
- Rotolo, T. & Tittle, C.R. (2006), Population Size, Change, and Crime in U.S. Cities , *Journal of Quantitative Criminology*, 22: 341-367.

- Rountree, P. & Land, K. (1996). Perceived Risk versus Fear of Crime : Empirical Evidence of Conceptually Distinct Reactions in Survey Data. *Social Forces*, 74(4), 1353–1376.
Retrieved from <https://www.jstor.org/stable/2580354>
- Rull, R. P., Gunier, R., Von Behren, J., Hertz, A., Crouse, V., Buffler, P. A., & Reynolds, P. (2009). Residential proximity to agricultural pesticide applications and childhood acute lymphoblastic leukemia. *Environmental Research*, 109(7), 891–899.
<https://doi.org/10.1016/j.envres.2009.07.014>
- Rundle, A., Quinn, J., Lovasi, G., Bader, M. D. M., Yousefzadeh, P., Weiss, C., & Neckerman, K. (2013). Associations between body mass index and park proximity, size, cleanliness, and recreational facilities. *American Journal of Health Promotion*, 27(4), 262–269.
<https://doi.org/10.4278/ajhp.110809-QUAN-304>
- Saarloos, D., Alfonso, H., Giles-Corti, B., Middleton, N., & Almeida, O. P. (2011). The built environment and depression in later life: The health in men study. *American Journal of Geriatric Psychiatry*, 19(5), 461–470. <https://doi.org/10.1097/JGP.0b013e3181e9b9bf>
- Saelens, B. E., Glanz, K., Sallis, J. F., & Frank, L. D. (2007). Nutrition Environment Measures Study in Restaurants (NEMS-R). Development and Evaluation. *American Journal of Preventive Medicine*, 32(4), 273–281. <https://doi.org/10.1016/j.amepre.2006.12.022>
- Sampson, R. J., & Groves, W. B. (1989). Community Structure and Crime : Testing Social-Disorganization. *American Journal of Sociology*, 94(4), 774–802.
- Sampson, R. J., Raudenbush, S. W., & Earls, F. (1997). "Neighborhoods and Violent Crime: A Multilevel Study of Collective Efficacy." *Science*, V. 277: 918-924.

- Sandler, D. H. (2017). Externalities of public housing: The effect of public housing demolitions on local crime. *Regional Science and Urban Economics*, 62(October 2016), 24–35.
<https://doi.org/10.1016/j.regsciurbeco.2016.10.007>
- Sallis, J. F., Fisher, E. B., & Owen, N. (1990). Ecological Models of Health Behavior. *Health Behavior and Health Education*, 465–485.
- Saraceno, B., van Ommeren, M., Batniji, R., Cohen, A., Gureje, O., Mahoney, J., Sridhar, D., & Underhill, C. (2007). Global Mental Health 5: Barriers to improvement of mental health services in low-income and middle-income countries. *The Lancet*, 370(9593), 1164–1174.
- Segal, S., & Aviram, U. (1978). “Toward a Better System of Sheltered Care.” In *The Mentally Ill in Community Based Sheltered Care: A Study of Community Care and Social Integration*, pp. 277–87. New York: Wiley.
- Segal, S., Silverman, C., & Baumohl, J. (1989). “Seeking Person-Environment Fit in Community Care Placement.” *Journal of Social Issues* 45 (3): 49–64
- Shach-Pinsly, D. (2019). Measuring security in the built environment: Evaluating urban vulnerability in a human-scale urban form. *Landscape and Urban Planning*, 191(August 2017). <https://doi.org/10.1016/j.landurbplan.2018.08.022>
- Shaffer, G. S., & Anderson, L. M. (1985). Perceptions of the security and attractiveness of urban parking lots. *Journal of Environmental Psychology*, 5(4), 311–323.
[https://doi.org/10.1016/S0272-4944\(85\)80001-3](https://doi.org/10.1016/S0272-4944(85)80001-3)
- Shaw, C. & McKay, H. (1942). *Juvenile delinquency and urban areas*. Chicago: University of Chicago Press.

- Shen, Y. (2014). Community building and mental health in mid-life and older life: Evidence from China. *Social Science and Medicine*, 107, 209–216.
<https://doi.org/10.1016/j.socscimed.2013.12.023>
- Schulz, A. J., Israel, B. A., Zenk, S. N., Parker, E. A., Lichtenstein, R., Shellman-Weir, S., & A.B., L. K. (2006). Psychosocial stress and social support as mediators of relationships between income, length of residence and depressive symptoms among African American women on Detroit's eastside. *Social Science & Medicine*, 62(2), 510–522.
<https://doi.org/10.1016/j.socscimed.2005.06.028>
- Skogan, W. G. (1986). The Fear of Crime and its Behavioral Implications. In E. A. Fattah (Ed.), *From Crime Policy to Victim Policy: Reorienting the Justice System* (pp. 167–188). Palgrave Macmillan UK. https://doi.org/10.1007/978-1-349-08305-3_9
- Small, M. L. (2009). 'How many cases do I need?' on science and the logic of case selection in field-based research. *Ethnography*, 10(1), 5-38. <https://doi.org/10.1177/1466138108099586>
- Smith, M., Hosking, J., Woodward, A., Witten, K., MacMillan, A., Field, A., ... Mackie, H. (2017). Systematic literature review of built environment effects on physical activity and active transport - an update and new findings on health equity. *International Journal of Behavioral Nutrition and Physical Activity*, 14(1), 1–27. <https://doi.org/10.1186/s12966-017-0613-9>
- Snowden, A. J. (2016). Neighborhood characteristics contribute to urban alcohol availability: Accounting for race/ethnicity and social disorganization. *Journal of Ethnicity in Substance Abuse*, 15(4), 346–366. doi:10.1080/15332640.2015.1073644

- Sohn, D. W. (2016). Do all commercial land uses deteriorate neighborhood safety?: Examining the relationship between commercial land-use mix and residential burglary. *Habitat International*, 55, 148–158. <https://doi.org/10.1016/j.habitatint.2016.03.007>
- Sohn, D. W., Yoon, D. K., & Lee, J. (2018). The impact of neighborhood permeability on residential burglary risk: A case study in Seattle, USA. *Cities*, (May), 1–7. doi:10.1016/j.cities.2018.05.002
- Stafford, M., Chandola, T., & Marmot, M. (2007). Association Between Fear of Crime and Mental Health and Physical Functioning. *American Journal of Public Health*, 97(11), 2076–2081. <https://doi.org/10.2105/AJPH.2006.097154>
- Stanko, E., A. (1997). Safety Talk: Conceptualizing Women’s Risk Assessment as a ‘Technology of the Soul’. *Theoretical Criminology*, 1(4), 479–499. <https://doi.org/10.1177/1362480697001004004>
- Steward, D., Perkins, D., & Brown, B. (1995). Community social ties and fear of crime, Presented at the *Biennial Conference on Community Research & Action*, Chicago, IL.
- Stucky, T. D., & Ottensmann, J. R. (2009). Land use and violent crime. *Criminology*, 47(4), 1223–1264. doi:10.1111/j.1745-9125.2009.00174.x
- Su, M., Du, Y. K., Liu, Q. M., Ren, Y. J., Kawachi, I., Lv, J., & Li, L. M. (2014). Objective assessment of urban built environment related to physical activity - Development, reliability and validity of the China Urban Built Environment Scan Tool (CUBEST). *BMC Public Health*, 14(1). <https://doi.org/10.1186/1471-2458-14-109>
- Takeuchi, D. T., & Williams, D. R. (2003). Race, Ethnicity and Mental Health: Introduction to the Special Issue. *Journal of Health and Social Behavior*, 44(3), 233–236.

- Tate, L. (2021). *Post-Rational Planning: A Solutions-Oriented Call to Justice* (1st ed.).
Routledge. <https://www.routledge.com/Post-Rational-Planning-A-Solutions-Oriented-Call-to-Justice/Tate/p/book/9780367257538>
- Taylor, R. B. (1988). *Human Territorial Functioning*. Cambridge, England: Cambridge University Press.
- Taylor, R. B., & Hale, M. (1986). Testing Alternative Models of Fear of Crime. *The Journal of Criminal Law and Criminology (1973-)*, 77(1), 151. <https://doi.org/10.2307/1143593>
- Taylor, R. B., Koons, B. A., Kurtz, E. M., Greene, J. R., & Perkins, D. D. (1995). Street Blocks with more Nonresidential Land Use have more Physical Deterioration: Evidence from Baltimore and Philadelphia. *Urban Affairs Review*, 31(1), 120–131.
[doi:10.1177/107808749503100106](https://doi.org/10.1177/107808749503100106)
- Taylor, R. B., & Shumaker, S. A. (1990). Local crime as a natural hazard: Implications for understanding the relationship between disorder and fear of crime. *American Journal of Community Psychology*, 18, 619-641
- Taylor, R.B., Schumaker, S. & Gottfredson, S. (1985), “Neighborhood-level links between physical features and local sentiments: deterioration, fear of crime, and confidence”, *Journal of Architectural Planning and Research*, Vol. 2 No. 2, pp. 261-75.
- Taylor, R. B., & Shumaker, S. A. (1990). Local crime as a natural hazard: Implications for understanding the relationship between disorder and fear of crime. *American Journal of Community Psychology*, 18, 619-641

- Tolnay, S., & Crowder, K. (1999). Regional Origin and Family Stability in Northern Cities: The Role of Context. *American Sociological Review*, 64(1), 97-112. Retrieved March 23, 2021, from <http://www.jstor.org/stable/2657280>
- Toomey, T. L., Erickson, D. J., Carlin, B. P., Lenk, K. M., Quick, H. S., Jones, A. M., & Harwood, E. M. (2012). The Association between Density of Alcohol Establishments and Violent Crime within Urban Neighborhoods. *Alcoholism: Clinical and Experimental Research*, 36(8), 1468–1473. doi:10.1038/jid.2014.371
- Trangenstein, P. J., Curriero, F. C., Webster, D., Jennings, J. M., Latkin, C., Eck, R., & Jernigan, D. H. (2018). Outlet Type, Access to Alcohol, and Violent Crime. *Alcoholism: Clinical and Experimental Research*, 42(11), 2234–2245. <https://doi.org/doi:10.1111/acer.13880>
- Triguero-Mas, M., Dadvand, P., Cirach, M., Martínez, D., Medina, A., Mompert, A., ... Nieuwenhuijsen, M. J. (2015). Natural outdoor environments and mental and physical health: Relationships and mechanisms. *Environment International*, 77, 35–41. <https://doi.org/10.1016/j.envint.2015.01.012>
- Turley R, Saith R, Bhan N, Rehfuess E, C. B. (2013). Slum upgrading strategies involving physical environment and infrastructure interventions and their effects on health and socio-economic outcomes. *Cochrane Database of Systematic Reviews*, (1). <https://doi.org/DOI:10.1002/14651858.CD010067.pub2>.
- Trute, B., & Segal, S. P. (1976). Census tract predictors and the social integration of sheltered care residents. *Social Psychiatry*, 11(4), 153–161. <https://doi.org/10.1007/BF00578103>

- Ulrich, R. S., Simons, R. F., Losito, B. D., Fiorito, E., Miles, M. A., & Zelson, M. (1991). Stress recovery during exposure to natural and urban environments. *Journal of Environmental Psychology*, 11(3), 201–230. doi: [https://doi.org/10.1016/S0272-4944\(05\)80184-7](https://doi.org/10.1016/S0272-4944(05)80184-7)
- Valentine, G. (1990). Women's Fear and the Design of Public Space. *Built Environment (1978-)*, 16(4), 288–303.
- van den Berg, M., Wendel-Vos, W., van Poppel, M., Kemper, H., van Mechelen, W., & Maas, J. (2015). Health benefits of green spaces in the living environment: A systematic review of epidemiological studies. *Urban Forestry and Urban Greening*, 14(4), 806–816. <https://doi.org/10.1016/j.ufug.2015.07.008>
- van den Bosch, M., & Ode Sang. (2017). Urban natural environments as nature-based solutions for improved public health – A systematic review of reviews. *Environmental Research*, 158(November 2016), 373–384. <https://doi.org/10.1016/j.envres.2017.05.040>
- Värnik, A., Kõlves, K., Väli, M., Tooding, L. M., & Wasserman, D. (2007). Do alcohol restrictions reduce suicide mortality? *Addiction*, 102(2), 251–256. <https://doi.org/10.1111/j.1360-0443.2006.01687.x>
- Village of Euclid vs. Ambler Realty Co.. 272 U.S. 365 (1926) (USSC+).
- Villarreal, A., & Yu, W.-H. (2017). Crime, Fear, and Mental Health in Mexico. *Criminology*, 55(4), 779–805. <https://doi.org/10.1111/1745-9125.12150>
- Vos, T., Barber, R.M., Bell, B., Bertozzi-Villa, A., Biryukov, S., Bolliger, I., Charlson, F., Davis, A., Degenhardt, L., Dicker, D., Duan, L., Erskine, H., Feigin, V.L., Ferrari, A.J., Fitzmaurice, C., Fleming, T., Graetz, N., Guinovart, C., Haagsma, J., Hansen, G.M.,

Hanson, S.W., Heuton, K.R., Higashi, H., Kassebaum, N., Kyu, H., Laurie, E., Liang, X., Lofgren, K., Lozano, R., Macintyre, M.F., Moradi-Lakeh, M., Naghavi, M., Nguyen, G., Odell, S., Ortblad, K., Roberts, D.A., Roth, G.A., Sandar, L., Serina, P.T., Stanaway, J.D., Steiner, C., Thomas, B., Vollset, S.E., Whiteford, H., Wolock, T.M., Ye, P., Zhou, M., Ávila, M.A., Aasvang, G.M., Abbafati, C., Ozgoren, A.A., Abd-Allah, F., Aziz, M.I.A., Abera, S.F., Aboyans, V., Abraham, J.P., Abraham, B., Abubakar, I., Abu-Raddad, L.J., Abu-Rmeileh, N.M.E., Aburto, T.C., Achoki, T., Ackerman, I.N., Adelekan, A., Ademi, Z., Adou, A.K., Adsuar, J.C., Arnlov, J., Agardh, E.E., Al Khabouri, M.J., Alam, S.S., Alasfoor, D., Albittar, M.I., Alegretti, M.A., Aleman, A.V., Alemu, Z.A., Alfonso-Cristancho, R., Alhabib, S., Ali, R., Alla, F., Allebeck, P., Allen, P.J., Almazroa, M.A., Alsharif, U., Alvarez, E., Alvis-Guzman, N., Ameli, O., Amini, H., Ammar, W., Anderson, B.O., Anderson, H.R., Antonio, C.A.T., Anwari, P., Apfel, H., Arsenijevic, V.S.A., Artaman, A., Asghar, R.J., Assadi, R., Atkins, L.S., Atkinson, C., et al., (2015). Global, regional, and national incidence, prevalence, and years lived with disability for 301 acute and chronic diseases and injuries in 188 countries, 1990–2013: a systematic analysis for the Global burden of disease study 2013. *Lancet* 386, 743–800.

Walsh, A. & Ellis, L. (2006). *Criminology: An Interdisciplinary Approach*. Thousand Oaks, CA: SAGE Publications.

Ward, M. H., Lubin, J., Giglierano, J., Colt, J. S., Wolter, C., Bekiroglu, N., Camann, D., Hartge, P., & Nuckols, J. R. (2006). Proximity to crops and residential to agricultural herbicides in Iowa. *Environmental Health Perspectives*, 114(6), 893–897.

<https://doi.org/10.1289/ehp.8770>

- Warr, M. (2000). Fear of Crime in the United States: Avenues for Research and Policy. *Criminal Justice, 4*, 39.
- Weitzman, E., Folkman, A., Folkman, M., & Wechsler, H. (2003). The relationship of alcohol outlet density to heavy and frequent drinking and drinking-related problems among college students at eight universities. *Health & Place, 9*: 1–6.
- Wekerle, G., & Whitzman, C. (1995). *Safe Cities: Guidelines for Planning, Design, and Management*. Van Nostrand Reinhold.
https://books.google.com/books/about/Safe_Cities.html?id=e2BPAAAAMAAJ
- West, B., Welch, K., Galecki, A., & Gillespie, B. (2015). *Linear mixed models : a practical guide using statistical software* (Second edition.). CRC Press, Taylor & Francis Group.
- White, M. P., Alcock, I., Wheeler, B. W., & Depledge, M. H. (2013) a. Would You Be Happier Living in a Greener Urban Area? A Fixed-Effects Analysis of Panel Data. *Psychological Science, 24*(6), 920–928. <https://doi.org/10.1177/0956797612464659>
- White, Marni, Kasl, Stanislav V., Zahner, G. E. P., & Will, J. C. (1987). Perceived Crime in the Neighborhood and Mental Health of Women and Children. *Environment and Behavior, 19*(5), 588–613. <https://doi.org/10.1177/0013916587195003>
- White, M. P., Pahl, S., Ashbullby, K., Herbert, S., & Depledge, M. H. (2013) b. Feelings of restoration from recent nature visits. *Journal of Environmental Psychology, 35*, 40–51.
<https://doi.org/10.1016/j.jenvp.2013.04.002>

- Whitley, R., & Prince, M. (2005). Fear of crime, mobility and mental health in inner-city London, UK. *Social Science & Medicine*, 61(8), 1678–1688.
<https://doi.org/10.1016/j.socscimed.2005.03.044>
- White, G. F., Gainey, R. R., & Triplett, R. A. (2015). Alcohol outlets and neighborhood crime: A longitudinal analysis. *Crime and Delinquency*, 61(6), 851–872.
<https://doi.org/10.1177/0011128712466386>
- WHO, (2012). Action Plan for Implementation of the European Strategy for the Prevention and Control of Noncommunicable Diseases 2012–2016. WHO Regional Office for Europe, Copenhagen.
- WHO. (1948). *Definition of Health*. Definition of Health. <https://www.who.int/about/who-we-are/frequently-asked-questions>
- Wilson, C., & Cariola, L. A. (2020). LGBTQI+ Youth and Mental Health: A Systematic Review of Qualitative Research. *Adolescent Research Review*, 5(2), 187–211.
<https://doi.org/10.1007/s40894-019-00118-w>
- Wilson, J. Q., & Kelling, G. L. (1982). Broken windows: The police and neighborhood safety. *The Atlantic Magazine*. March, 29–38.
- Wilson-Genderson, M., & Pruchno, R. (2013). Effects of neighborhood violence and perceptions of neighborhood safety on depressive symptoms of older adults. *Social Science & Medicine*, 85, 43–49. <https://doi.org/10.1016/j.socscimed.2013.02.028>
- Willits, D., Broidy, L., Gonzales, A., & Denman, K. (2011). Place and Neighborhood Crime: Examining the Relationship between Schools, Churches and Alcohol Related Establishments and Crime. *Justice Research and Policy*, (March), 1–44. Retrieved from http://www.jrsa.org/ibrcc/background-status/New_Mexico/NM_PlaceCrime.pdf

- Winkel, F. W. (2009). Fear of crime (type A) revisited: Predicting panic disorder and persistent panic and fear symptoms following criminal victimization. *International Perspectives in Victimology*, 4, 35-42.
- Wittebrood, World Health Organization (WHO). (1948). *Definition of Health*. Definition of Health. <https://www.who.int/about/who-we-are/frequently-asked-questions>
- Wo, J. C. (2019). Mixed land use and neighborhood crime. *Social Science Research*, 78(July 2018), 170–186. <https://doi.org/10.1016/j.ssresearch.2018.12.010>
- Wolfe, M. K., & Mennis, J. (2012). Does vegetation encourage or suppress urban crime? Evidence from Philadelphia, PA. *Landscape and Urban Planning*, 108(2–4), 112–122. <https://doi.org/10.1016/j.landurbplan.2012.08.006>
- Wooldridge, J. M., (2012). *Introductory Econometrics : A Modern Approach*. Mason, Ohio: South-Western Cengage Learning.
- Wu, D.-M. (1974). Alternative Tests of Independence between Stochastic Regressors and Disturbances: Finite Sample Results. *Econometrica*, 42(3), 529–546.
- Yang, T. C., & Matthews, S. A. (2010). The role of social and built environments in predicting self-rated stress: A multilevel analysis in Philadelphia. *Health and Place*, 16(5), 803–810. <https://doi.org/10.1016/j.healthplace.2010.04.005>
- Yang, Y., Langellier, B. A., Stankov, I., Purtle, J., Nelson, K. L., & Diez Roux, A. V. (2019). Examining the possible impact of daily transport on depression among older adults using an agent-based model. *Aging and Mental Health*, 23(6), 743–751. <https://doi.org/10.1080/13607863.2018.1450832>

- Yen, I. H., Michael, Y. L., & Perdue, L. (2009). Neighborhood Environment in Studies of Health of Older Adults. *American Journal of Preventive Medicine*, 37(5), 455–463.
<https://doi.org/10.1016/j.amepre.2009.06.022>
- Yin, R. (20014). *Case Study Research: Design and Methods*. Fifth Edition. Sage Publication.
- Zagorskis, Jurgis. (2016). GIS-based Modelling and Estimation of Land Use Mix in Urban Environment, *International Journal of Environmental Science*
<http://iaras.org/iaras/journals/ijes>,
<https://www.iaras.org/iaras/filedownloads/ijes/2016/008-0044.pdf>
- Zhang, G., Poulsen, D. V., Lygum, V. L., Corazon, S. S., Gramkow, M. C., & Stigsdotter, U. K. (2017). Health-promoting nature access for people with mobility impairments: A systematic review. *International Journal of Environmental Research and Public Health*, 14(7).
<https://doi.org/10.3390/ijerph14070703>
- Zhang, H., & Peterson, M. P. (2007). A spatial analysis of neighborhood crime in Omaha, Nebraska using alternative measures of crime rates. *Internet Journal of Criminology*, (October), 1–28.
- Zhang, Y., Wei. W., He, Q., & Li, C. (2018). Public transport use among the urban and rural elderly in China : Effects of personal , attitudinal , household , social-environment and built-environment factors. *Journal of Transportation and Land Use*, 11(1), 701–719.
- Zhao, J., Scheider, M. C. & Thurman, Q. (2002), Funding Community Policing To Reduce Crime: Have Cops Grants Made A Difference?. *Criminology & Public Policy*, 2, 7-32.
[doi:10.1111/j.1745-9133.2002.tb00104.x](https://doi.org/10.1111/j.1745-9133.2002.tb00104.x)