The Impact of the Neighborhood Quality on People's Mental Health

Cross-Sectional Study Case of Bogotá, Colombia

A Thesis submitted in the Partial Fulfillment for the Requirement of the Degree
of Master of Science in Integrated Urbanism and Sustainable Design

by

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This dissertation is submitted to Ain Shams University (ASU) and University of Stuttgart - Faculty of Architecture and Urban Planning (USTUTT) for the degree of Integrated Urbanism and Sustainable Design (IUSD), in accordance to IUSD-ASU regulations.

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07/2023

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Acknowledgments

Mental health and built environment

<u>Abstract</u>

This paper is developing quantitative research, implementing qualitative and quantitative variables to establish a measurement tool to indicate the built environment's impact on mental health from the people's perspective in contexts with scarce data availability. For this purpose, the overall structure of the study takes the form of four sections. Beginning with introducing the concepts around well-being, mental health, environment, and built environment, besides the disciplines involved in this realm. Based on the literature review, the research problem and the study background are presented according to the theoretical, the field research, and the stakeholders and actors domain. Chapter two concerns the strategy used for this study, objectives, and research questions. From chapter four onwards, the research document is structured around two purposes: the tool's development and its application in the study case. The final chapter summarizes the entire thesis, weaving together theories and evidence to respond to the assumption presented.

The data collection is based on secondary analysis from official governmental welfare surveys and web pages. The primary data is collected through on-site observations and surveys conducted to residents of three neighborhoods in Bogotá, Colombia.

In conclusion, the development of the tool provides concepts and resources for architects and urban planners interested in adding to the production of knowledge for urban health in contexts where information is scarce. In addition, the case study indicates that of all the variables tested, noise presented the most significant statistical values of correlation with mental health, and the quality of the sidewalks are the aspects that most affect the mental health in the studied population.

Keywords: Environmental psychology, mental health, neighborhood quality, urban health, social environment, correlation tool.

Mental health and built environment

Table of Contents

List of Figures

List of tables

List of annexes

List of Acronyms and Abbreviations

CMD: Common Mental Disorders

CERS: Estrategias de ciudades, entornos y ruralidades saludables

NB: Neighborhood

DAS: Depression, anxiety, and Stress

RR: Relative risk

PR: Prevalence ratio

OR: Odds ratio

Mental health and built environment

Introduction

Since late 1200, it has been theorized about the effect of the environment on the beings that inhabit it. According to the experts Christopher Spencer and Kate Gee, Marco Polo could introduce the concept when saying:

"In 1272, Marco Polo was traveling through the kingdoms of West Asia and noted that the people of Kerman were good, humble, helpful, and peaceable, whereas their immediate neighbors in Persia were wicked, treacherous, and murderous. The king of Kerman had asked his wise men what could be the reason, and they answered that the cause lay in the soil. Splendidly empirical in his approach, the king had ordered quantities of soil from Isfahan ('whose inhabitants surpassed all others in wickedness'), sprinkled it on the floors of his banqueting hall, and then covered it with carpets. As the next banquet started, his guests 'began offending one another with words and deeds, and wounding one another mortally.' The king declared that truly the answer lay in the soil."
(MA, C.E.A. 2018)

Today, 751 years later, the earth that Marco Polo spoke of is expressed in the cities, buildings, populations, temperature, air, and other environmental elements home to 8 billion inhabitants to date (Worldometer, 2023).
However, research that scientifically details this relationship remains scarce due to its vastness, complexity, and the number of factors that come into play when talking about the human mind and its response to the environment, besides the resources and knowledge required for this purpose.
On one side, architects and urban planners are taught to think about the design, structures, materials, and construction of buildings and cities, all of which encompass the physical and material elements that contain the space. However, more needs to be said about how people feel and inhabit the built

environment provided. In response, environmental psychology, among other disciplines, delves into the interplay between the outside world and the interior of the human being from different approaches and understandings. However, adequate methodologies are lacking to demonstrate the association between the environment and mental health. From another perspective, when reflecting on the actors and stakeholders that might be involved in the constellation of this study, it became urgent to call for the union of several entities that strive for the good mental well-being of its population. Layla McCay (2019) suggested recently that "The remit for improving mental health can no longer be simply relegated to mental health professionals."

On the contrary, it concerns every humanistic discipline that relates directly to the growth of the human being. This thesis seeks to develop a measurement tool to indicate The relationship between the environment and mental health from the people's perspective, tailored for contexts with scarce data availability. This empirical approach includes desktop research, site observations, one-to-one surveys, and statistical analysis.

While in 1272, Marco Polo recognized the consequences of poor soil conditions on his population, today, it is recognized that mental health disorders increase the risk of other diseases and contribute to unintentional and intentional injuries. Approximately 20% of the global youth population experiences some form of mental illness, with self-inflicted death ranking as the second highest cause of mortality among individuals between the ages of 15 and 29. One in five individuals inhabiting post-conflict geographic regions exhibit a mental health disorder. Psychological conditions can considerably impact numerous living domains, including academic and occupational functioning, interpersonal relationships with family and friends, and community involvement. Two of the most prevalent psychological disorders, depression, and anxiety, are estimated to result in economic losses totaling US$ 1 trillion annually on a global scale.

Despite these sobering statistics, governments worldwide, on average, dedicate less than 2% of healthcare expenditures toward addressing mental health needs (World Health Organization and Volkov, V., 2023). This dissertation will examine how the built environment's impact on people's mental health, in specific contexts., could be measured and how much the environment affects our mental health.

Mental health and built environment

Chapter 1: Theoretical Framework

1.1 Concepts
1.1.2 Well-being

The definition of well-being is globally questionable due to the complex interplay of factors. However, the Centers for Disease Control and Prevention describes an explicit definition of well-being as "People's overall satisfaction with life"(2008). Due to its complexity, well-being is divided into two fields: objective and subjective well-being. First, objective well-being is assessed by education indicators, physical and built environment, community, and economy. This approach is more societal than individual and is based mainly on tangible and quantitative indicators. On the other hand, psychological, social, and spiritual aspects assess subjective well-being. This perspective is focused on the individual's internal personal assessment based on cognitive judgments and affective reactions to their own life as a whole (Harvard, L.K.S.C. for H. and H. 2017).

Well-being correlates with self-perceived health, longevity, positive health behaviors, physical and mental health conditions, social connectivity, productivity, and various elements in both the physical and social environment. (Centers for Disease Control and Prevention, 2018). Those aspects could be categorized into physical, social, and mental elements intervening in well-being. For this document, this study will approach concepts of mental health, mental illnesses, and some factors of the physical and social environment.

Mental health

According to the definition provided by the World Health Organization (WHO):

"Mental health is a state of mental well-being that enables people to cope with the stresses of life, realize their abilities, learn well and work well, and contribute to their community. It is an integral component of health and

well-being that underpins our individual and collective abilities to make decisions, build relationships, and shape our world." (2022).

Despite this definition, the most common approach to mental health refers to the absence of mental disorders. However, this research wants to revisit a more neutral position, assuring that mental health concerns the mental state, positive or negative, with which a person perceives reality during an estimated period. The complex interplay between social and individual conditions and structural stresses and vulnerabilities are the factors that determine that reality. (WHO, 2022). Therefore, perhaps the most severe disadvantage of discussing mental health is focusing on diseases instead of promoting beneficial practices to gain health.

Mental Illnesses

When reporting on mental illnesses, this paper refers to disorders that affect mood, thinking, and behavior. As these are aspects in which their status constantly changes, it is essential to notice that anyone can have mental concerns from time to time. However, it becomes a mental illness when it becomes a constant and intense factor affecting normal life activities (Mayo Foundation, 2022). Among mental illnesses, there are various degrees of affectation, including. Individual stress, impairment in functioning, psychosocial disabilities, or the risk of self-harm (WHO, 2022). Mental illnesses may also be called mental disorders or mental diseases, and they, in turn, are divided into two categories: psychotic and non-psychotic disorders.

A non-psychotic mental disorder is a mental condition that impacts an individual's emotions, thoughts, or behavior. (Humana, 2023). It could also be called neurosis and includes disorders such as depression, anxiety, phobias, and panic attacks. On the other hand, psychotic disorders are described as the sense of losing contact with reality, resulting in symptoms such as delusions or hallucinations (Humana, 2023).

Among the psychotic and non-psychotic syndromes, some of the most common classes of mental disorders include:

- Neurodevelopmental disorders: autism spectrum disorder, attention-deficit/hyperactivity disorder (ADHD), and learning disorders.
- Psychotic disorders include schizophrenia and other disorders that cause disconnection from reality.
- Anxiety disorders: panic disorder, obsessive-compulsive disorder, and phobias.
- Mood disorders: Depression, bipolar disorder.
- Eating disorders: Binge-eating, Bulimia, Anorexia.
- Personality disorders: paranoid, antisocial PD, obsessive-compulsive, codependency.
- Post-traumatic stress disorder: re-experiencing, avoidance, arousal and reactivity, cognition, and mood symptom.
- Psychotic disorders: including schizophrenia and postpartum psychosis.

(Mayo Foundation for Medical Education and Research, 2022)

No single cause exists to develop any mental illness; on the contrary, its prevalence could be related to individual psychology, biological factors, or environmental circumstances. e.g., one's genes and family history, life experiences, biological factors, traumatic brain injuries, exposure to viruses or chemicals, alcohol or recreational drugs, severe medical conditions, few friends, loneliness, or isolation. (Centers for Disease Control and Prevention, 2021). That is to say, various factors and endless combinations make this as complex as understanding the functioning of the human mind.

Depression, Anxiety, and Stress

The group of mental disorders composed of depression, anxiety, and unexplained somatic symptoms is defined as Common Mental Disorders and nowadays is defined as the worldly most prevalent disorder. Recently,

they have caused 14% of the total disease burden, and it is predicted that by 2030 they will be the 1st cause (Engidaw, N.A. et al. 2020).

Depression

"Continuous feelings of sadness and disinterest characterize depression. It impacts an individual's emotions, thoughts, and actions, giving rise to various emotional and physical challenges. Everyday tasks may become difficult, and life can appear to lack purpose during these periods. (Mayo Clinic, 2022). The American Psychiatric Association reported in 2020 some of the most common symptoms of depression, which can vary from mild to severe:

- The reduced enthusiasm or enjoyment in activities once found pleasurable.
- Fluctuations in appetite result in unintended weight loss or gain, not attributed to intentional dietary changes.
- Trouble sleeping or sleeping too much
- The loss of energy or increased fatigue
- Heightened purposeless physical activity (e.g., restlessness, pacing, handwringing) or slowed movements and speech (to a degree noticeable by others)
- Feeling worthless or guilty
- Difficulty thinking, concentrating, or making decisions
- Thoughts of death or suicide

Symptoms must remain for a minimum of two weeks and demonstrate a noticeable change in the individual's previous level of functioning. Additionally, statistical data reveals that approximately 6.7% of adults (one in 15) experience depression in any given year, while 16.6% (one in six) will encounter depression at some point in their lives. Although depression can manifest at any age, it typically emerges between the late teens and mid-20s. Women are more susceptible to depression than men, with some studies

indicating that about one-third of women will undergo a major depressive episode during their lifetime. Furthermore, there is a significant hereditary component, with a heritability rate of approximately 40%, when depression is present among first-degree relatives (parents, children, siblings). (American Psychiatric Association, 2020).

Anxiety

Anxiety is an emotional state characterized by heightened tension, apprehensive thoughts, and physiological alterations like elevated blood pressure. Those experiencing anxiety disorders often face persistent intrusive thoughts or worries, leading them to avoid certain situations. Furthermore, alongside feelings of anxiety, individuals may experience physical symptoms such as trembling, dizziness, sweating, or a rapid heartbeat. It is important to distinguish anxiety from fear, although these terms are sometimes used interchangeably. (American Psychological Association, 2022). The Mayo Clinic published in 2018 the symptoms and signs that people with anxiety may experience:

• Feeling nervous, restless, or tense
• Having a sense of impending danger, panic, or doom
• Having an increased heart rate
• Breathing rapidly (hyperventilation)
• Sweating
• Trembling
• Feeling weak or tired
• Trouble concentrating or thinking about anything other than this worry
• Having trouble sleeping
• Experiencing gastrointestinal (GI) problems
• Having difficulty controlling worry
• Having the urge to avoid situations that trigger anxiety

After the year of the COVID-19 pandemic, the WHO announced an increase of 25% in the global prevalence of anxiety and depression due to several factors such as social isolation, loneliness, people's ability to work, and financial concerns, among other causes (2022). Furthermore, based on its latest mental health report, The global economy bears an annual burden of US$1 trillion due to the impact of depression and anxiety. Despite these significant figures, the median percentage of government health expenditure allocated to mental health is less than 2%. This shows that mental health is still a topic with little capital investment; nevertheless, due to the COVID pandemic, awareness of the issue has increased, and it is predicted among professionals that there will be an increment in mental health promotion and advocacy (WHO, 2022).

Stress

"Stress is a natural and common human response that affects everyone. The human body is naturally equipped to experience and respond to stress. (Cleveland Clinic, 2021). The physical and mental reactions of the body to changes or challenges are so-called stress. Therefore, certain stress levels can be positive by helping the individual stay alert, energetic, or ready to avoid danger when necessary. For example, when a person should take the last bus, a stress response might provoke the body to run faster and endure a long-distance race. However, stress becomes an issue when the stressor is constant for long periods without intervals of distention.

That prolongated state of stress "can be defined as a state of worry or mental tension caused by a difficult situation" (WHO, 2023). It is a natural human response that everyone experiences at one time or another; therefore, it is commonly confused with anxiety symptoms. The distinction between stress and anxiety lies in their triggers. Stress is the answer to a perceived threat in a particular situation, while anxiety is a stress reaction. (APA 2020, cited by ADAA, 2022). How an individual responds to stress makes a big difference.

According to the Cleveland Clinic (2021), when an individual faces long-term stress episodes, they might develop physical, emotional, and behavioral symptoms like:

- Anxiety or irritability.
- Depression.
- Panic attacks.
- Sadness.

To diagnose any of these illnesses, depression, anxiety, or stress, it is necessary to have a doctor's opinion specializing in mental health. However, to facilitate the attention of people with symptoms of one of these mental health disorders, several resources and tests were developed for public use. For this reason, in this research, the Depression, Anxiety, and Stress Scale (DASS-21) test was used (questions included in the general survey, referenced in Annex 1), which is validated for free use in the Colombian context. This test consists of a questionnaire of 21 questions, each designed to be answered on a scale of zero to four according to the frequency with which the interviewee considers that they feel identified with the statement. Instructions for calculating the results are provided at the end of the test. Each question has a value from zero to four, and according to the sum of points for each answer, it is possible to identify the degree of symptomatology of the respondent for each of the mental illnesses that concern this study (Depression, anxiety, and stress). In addition, with the sum of all the previous results, it is also possible to assess the general symptomatology level of the person who took the test.

1.1.3 Environment

The second central aspect to which this paper refers is the environment, specifically the built environment. Firstly, the environment is defined as "the surrounding in which we live" (Vedantu, 2023). It includes both

physical or non-living and living elements. It encompasses the built environment, natural environment, and social environment; since it is a frequently used term in the literature and among different work fields, it is necessary to clarify exactly what is meant according to the areas of interest for this research.

Built environment

The built environment conveys all man-made physical elements like infrastructure, buildings, public spaces, amenities, and transport networks (US EPA, O. 2017). Moreover, the natural environment refers to the surrounding factors in human life, like the climate, air, soil, earth, rain, and greenery (Lauesen, L.M., 2013). Finally, the social environment compounds the inhabitants, their social relationships, cultural background, and religion, among others (Pathak, E. and Casper, M., 2001).
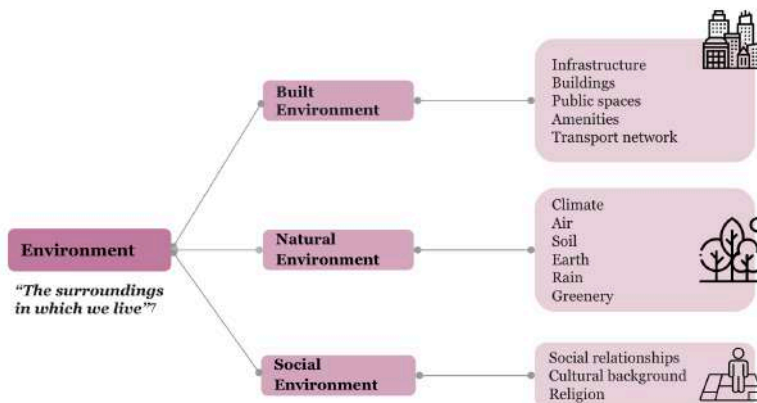
Fig. 1.1 Environment definition and domains. Source: Author, 2022

Environmental stressors

On the other hand, when these aspects collide, their contra part arises in the form of environmental stressors. Those refer to all "environmental characteristics that may lead to disturbances of intended behavior, psychological and physiological discomfort, and health aspects" (Guski, R. 2001). Since 1987, Evans and Cohen have identified four environmental stressors: cataclysmic events, stressful life experiences, ambient stressors, and daily hassles. Cataclysmic events refer to significant impact natural disasters, where big groups of individuals are affected, and people have little power to control or stop directly. Examples are floods, major storms, earthquakes, volcanic eruptions, and nuclear power plant accidents. Stressful life experiences affect people more individually, like starting a new job, moving to a new neighborhood, or evidencing construction work in the area. Ambient stressors are those silent and almost unperceived aspects, present everywhere but rarely noticed by the human senses; some of them are the continuous hum of air conditioning, permanent dust, and central heating system hiss. Daily hassles are the perceived everyday experiences such as safety, crowds, noise, traffic, pollution, and extreme temperatures (Guski, R. 2001). According to Evans, the group of stressors just mentioned is what he defines as non-optimal environmental conditions (1982). Hitherto, two main concepts, mental health, and built environment, that this research will approach have been presented with their definitions, the elements that compound them, and their contra part. From now on, the paper aims to enter a chapter that focuses on the relationship between mental health, the built environment, and social capital—exploring the evidence of this connection and the effects of the built environment on the individual's mental health.
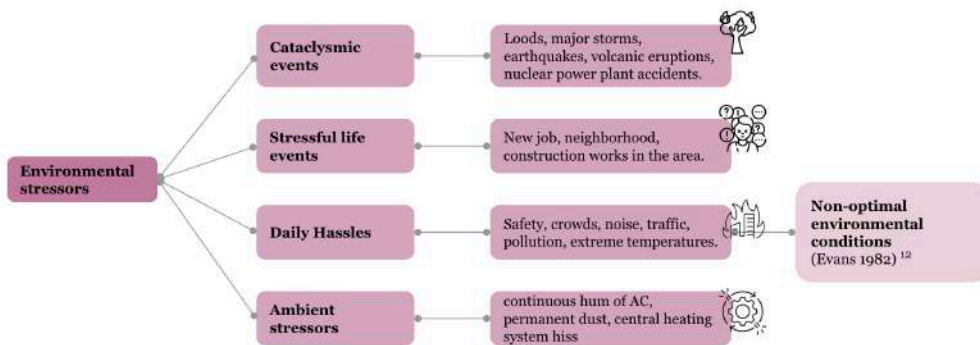
Fig. 1.2 Environmental stressors domains. Source: Author, 2022

1.1.4 Disciplines derived

The response of humans to the built environment is twofold: cognitively and emotionally. Cognitively, it refers to how the human being processes and values perceived information; emotionally, it means the adaptive reactions to the sensed data. (Higuera-Trujillo, J.L., Llinares, C. and Macagno, E., 2021). An example of this tandem work is when one is exposed to loud noise levels, and in addition to living in areas with a reduced exposition of vegetation, both factors would increase the likelihood of stress. At the same time, the combination of stress and the built environment will negatively affect life expectancy. The impact of cognitive-emotional human response has shown in studies that hospital rooms with little view of green or peaceful environments may decrease the recovery speed of patients. Those results ensure the existence of the repercussions of architecture on cognitive and emotional functions in human beings (Higuera-Trujillo, J.L., Llinares, C. and Macagno, E., 2021).
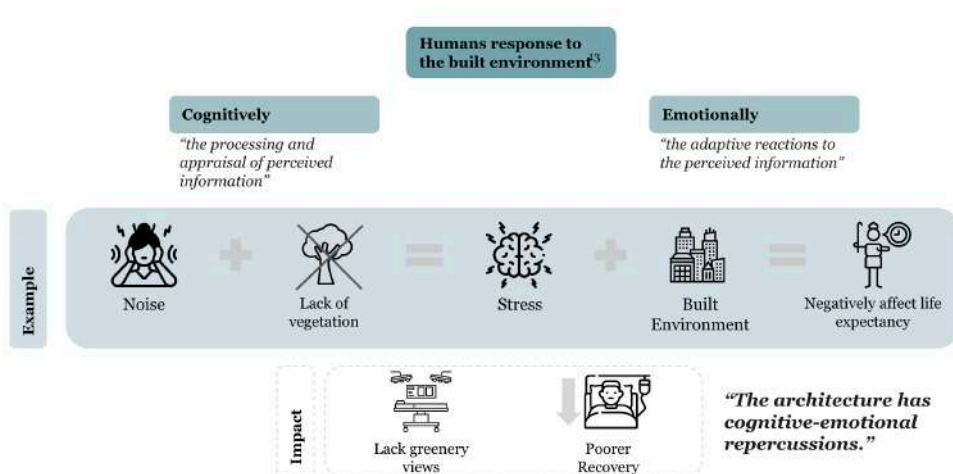
Fig. 1.3 Humans' response to the built environment. Source: Author, 2022. Based on (Higuera-Trujillo, J.L., Llinares, C. and Macagno, E., 2021)

With the necessity of understanding the reactions and behaviors of individuals in physical environments, study fields like neuroscience, psychology, and architecture found a common starting point to join efforts and ground concepts. In essence, neuroscience bases its research on studying the human brain from different fields (Higuera-Trujillo, J.L., Llinares, C. and Macagno, E. (2021). It seeks to understand the biological and chemical processes of emotions, memory, decision-making, embodiment, plasticity, and perception, among others (National Institutes of Health, 2018). Align with this field of work, psychology, on its side, is the scientific discipline in charge of the human mind, its mental states, processes, and behaviors. Some available methods to study verbal and nonverbal behavior and mental processes in humans are questionnaires, ratings, self-reports, case studies, personality tests, attitudes, and intelligence; direct observation; and behavior sampling, among others (Mischel, W., 2023). In other matters, when defining architecture and if it is considered as the mere "composed structural space," it is worth recalling the

values historically associated with it "utilitas, firmitas, et venustas, which means utility, strength, and beauty (Wang, S. et al. 2022).

Since the complex interplay among disciplines, concepts, and methodologies needed for the study of human behavioral response to the built environment, the combination of the abovementioned fields took place to contribute to a new and integrated production of knowledge. New disciplines were born from this fusion, like neuroarchitecture or environmental psychology, among other specialties. The neuroarchitecture from his side comprehends the study of the brain, human behavior, and architecture. It focuses on the human brain dynamics resulting from action and interaction with the built environment. One of the most innovative contributions is the neural activity recording of subjects during exposure to environmental situations, as the example mentioned previously, in hospital rooms (Higuera-Trujillo, J.L., Llinares, C. and Macagno, E. 2021). Thanks to the implementation of such tools, practitioners now have the opportunity to study the effects of their design variables and accommodate them to the human mind's needs.

As neuroscience found points of union with architecture, psychology added a new discipline, environmental psychology, to its study area. Environmental psychology "is an academic discipline that aims to understand multiple aspects of the interrelation between human cognition, emotion behavior, and the surrounding environment." Gifford, R., Steg, L., and Reser, J. (2011). Its main goal is to understand how and why our environment impacts us and what we can do to improve our relationship with the world around us (Ackerman E., C. 2018). Some concepts that this field propone are affordance, attachment, identity, safety, and aesthetic preference (Roessler, K. et al., 2022).

1.2 Literature review

Based on the theoretical framework recently reviewed, three main areas have been identified in which the study has been framed: the theoretical domain, the field research, and stakeholders and actors. Having introduced their concepts and the current knowledge in each area, the following section identifies specific areas of opportunity on which this document would like to shed some light, in addition to presenting the background on which the theoretical structure of this research is based.

1.2.1 Research problem

At the theoretical level, Evans (1982) shows how, in the past, research into environmental psychology was mainly concerned with how "the quality of our physical environment affects our mental health." And that certain environmental conditions are optimal and non-optimal for humans. However, studies on field research have consistently shown that the research is focused on the biological and behavioral dynamics with barely any inclusion of people's outlooks. Referring to the field research domain, there were identified three relevant issues requiring special attention A) There is an unbalance discourse between the methods and the implementation of psycho-environmental field research in the global south. This challenge lay in the lack of studies that show the relationship between the physical environment and mental health, especially in the Latin American context. B) There are scarce systematic research efforts and a lack of training in using a methodology that measures the built environment's impact on its inhabitants (Alarcón, R., D. 2003). Therefore, this paper aims to inspire the increase of interdisciplinary work between students and professionals from different domains and generations to co-create a more holistic and integral understanding of the problems of the 21st century. This approach will generate more sustainable and responsible solutions for current and future generations.

Thirdly, the domain of actors and stakeholders highlights the need for the attention of policymakers, urban planners, and other professionals to have a closer approach to this phenomenon and to include it in the focus of the global urban agenda. As it is interconnected with many different disciplines, it is fundamental to bridge and anchor the interventions and efforts provided by the academic field to benefit individuals. By drawing on the concept of Urban Health, the German Advisory Council on Global Change (WBGU) has shown a claim for a change of mindset from the fight against diseases to promoting health (Kraas, F. 2016). However, for this change to occur, it is equally important to identify the root causes of illness and question what deviates individuals from an optimal mental state.

In conclusion, it is essential to understand that mental health cannot continue being only a problem of the mental health system and the professionals under that scope; on the contrary, Mental health can be influenced by the actions and contributions of policymakers, urban planners, architects, engineers, transport specialists, developers, and various other stakeholders involved in shaping and delivering the urban built environment. (Layla, M, 2017).

1.2.2 Study background

The theoretical perspective recalls two manners of defining the relationship between the environment and human beings. The first one refers to how the human being's behavior affects environmental quality. This relationship might result in challenges like climate change, energy and resource consumption, consumption habits, and economic and political policies affecting environmental conditions. On the other hand, it emphasizes how the quality of our physical environment affects our mental health. This last relationship mode address topics such as quality of life, urban health, or the effects of noise, pollution, or extreme temperatures on people (Evans, 1982).

Fig. 1.4 Humans-environment relationship modes.
Source: Author, 2022. Based on (Evans, 1982)

On the look at place-based experiments that explore the human-environment relationship from the perspective of how environmental quality affects human mental health, the paper introduces a systematic review of the evidence of the mentioned effect. In the research performed by Clark, C. et al. in 2007, 99 studies were identified and published between 1995 and 2007, with more than half of the cases belonging to studies performed in countries of the global north. One-third of the population was examined, and the target person was non-institutionalized adults residing in the United Kingdom. The burden of the built environment on mental health is elucidated by applying four models, each operating at four different levels of influence. The first model indicates the level of individual power and identifies the environment as a source of stress. It is capable of causing physiological changes by increasing the secretion of stress-related hormones, such as cortisol. The second level is the model of influence over social networks and support. Following there are the symbolic effects and social labeling. And finally, there is the impact on the household, community, and area or region. This last is related to the model of action of the planning process. (Clark, C. et al. 2007)

To find the level of evidence that supports the effects of the built environment and people's mental health, the following study aspects were identified: urban birth, population density, housing or neighborhood regeneration, neighborhood violence, neighborhood disorder, chronic noise exposure, the spatial density of households, housing and neighborhood quality, housing tenure, and finally access to green or open residential spaces. From these aspects, the relationships found with mental health issues were related to general psychological well-being, depression, anxiety, schizophrenia, and suicide. (Fig. 1.5 Built environment aspects and mental health outcomes from a systematic review.)
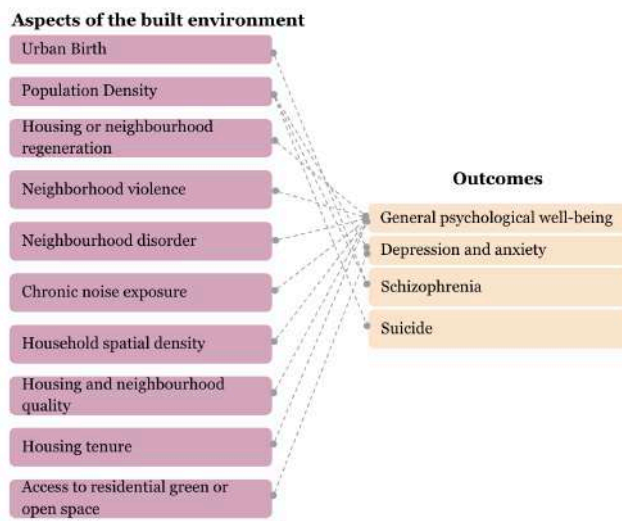
Fig. 1.5 Built environment aspects and mental health outcomes from a systematic review. Source: Author, 2022. Based on (Clark, C. et al. 2007)

Based on the relationships found, three levels of evidence were listed as robust, medium, and low, according to the cases analyzed and the levels of association between the two sets of parameters. The intense level of evidence was characterized by studies that showed consistent results and were mainly obtained from longitudinal evidence. Cross-sectional studies primarily described the second level of association. Finally, the latter studies

represent a low level of evidence due to equivocal results or methodologies limited by study design. Considering the results and the associations between aspects of the built environment and mental health, it is identified that solid evidence shows the effects of specific physical elements on the prevalence of severe mental disorders like schizophrenia and suicide. Other environmental aspects are related to general well-being. In contrast, low evidence is found on the effects of the physical environment on available well-being outcomes, i.e., non-diagnosed illnesses.

Levels of evidence

Urban birth + Schizophrenia
Population density + suicide
Housing or neighbourhood regeneration
Neighborhood violence
Neighbourhood disorder
Population density + schizophrenia
Population density + psychological well-being
Chronic noise exposure
Household spatial density
Housing and neighbourhood quality
Housing tenure
Access to residential green or open space

Fig. 1.6 Levels on the association of the built environment and mental health.
Source: Author, 2022. Based on (Clark, C. et al. 2007)

From this, it can not be concluded that the effect of the physical environment is highly damaging to the point of reaching levels of severe psychotic disorders. Instead, an explanation of the results could lie in the difficulty of conducting consistent studies that envision these findings and their impact levels. Thus, this is an opportunity to show the significant impact of the physical environment on triggering severe and long-term

mental diseases. To do so, this is an appeal to increase the research and fieldwork on the domain considering various studied populations and geographical locations.

Bringing the perspective of the actors and stakeholders involved in the field, the German Advisory Council on Global Change in 2016 acknowledged that "there is too little attention given" to current city planning challenges in urban health and quality of life. Besides, it points out that "an urban transformation towards sustainability is oriented towards the quality of life and human prosperity" (Kraas, F. 2016). These statements, along with the topics presented at the last urban agenda meeting in Ecuador (Habitat III, 2017), could shed some light on the issues in which the built environment's impact on its inhabitants is being visualized and explored. This is part of the challenge of understanding the dynamics of the 21st century in its totality and delving into its complexities till a level where it can be analyzed and developed into a strategy. (Kraas, F. 2016). Nonetheless, some of the questions that might be raised when talking about urban health subjects could be:

Why is it important to take care of the mental health of the citizens?
Or what do urban planners, architects, or engineers have to do with people's mental health?

Well, these questions can be answered simultaneously by questioning to which extent it is worth having cities with advanced technologies and buildings with sophisticated materials and aesthetics if, in reality, their citizens are ill. Mental health is often attributed solely to the individual's state of mind. Nevertheless, it is ignored that individuals make cities and that economies, education, science, production, and the development of prosperous cities depend on them. Layla McCay refers to this fact by saying that "A thriving city depends on the good mental health of its population,"

and it is necessary to remind ourselves that "the remit for improving mental health can no longer be simply relegated to mental health professionals." (Layla, M. et al. 2017).

It is essential to highlight the significance of environmental stressors on mental health, especially considering statistics revealing a 40% higher risk of depression and a 20% higher risk of anxiety among city dwellers. Additionally, the risk of schizophrenia doubles for individuals living in urban areas. (Centre for Urban Design and Mental Health, 2023). Thus, it is crucial to address the issue by taking one step ahead of the indicators and raising the alarms to all possible actors involved. As professionals engaged in developing thriving cities, a constant reflection should lie on cities' capacity to enhance or weaken their citizens.

Mental health and built environment

Chapter 2: Research Strategy

This study aims to develop quantitative research, combining quantitative and qualitative variables to contribute to a theory. The approach to deductive reasoning is based on previous studies of Corral-Verdugo, V. and Pinheiro, J.Q. (2009), which indicate the "unbalance between the discourse and methods in trying to implement psycho-environmental research" in Latin America, besides the "scarce systematic research efforts and training in the use of methodology." Although, since this declaration, the research field has shown a significant advance, there is still a lack of statistical data and measurement tools supporting the theoretical development. As the Statistical Commission of the 2030 Agenda for Sustainable Development claimed in 2017 (United Nations, 2017), there is a need for a "solid framework of statistical data to monitor progress, inform policy and ensure accountability of all stakeholders." However, this requirement seems more challenging to overcome in developing countries. Therefore, the assumption that will be tested in this research is that insufficient data, methods, and studies measure the built environment's impact on people's mental health in Bogotá, Colombia.

For this reason, a measurement method is developed that includes a literature review, and data collection, complemented by a site visit, cross-checking correspondence, analyzing the collected data, and reporting the results. The method is tested in its first version in a study case that offers complexity and variety in a manageable format. Once the technique is tested and the results analyzed, a second version is presented with different settings in the sample. The method displays the population's perception in a particular context through statistical data expressed in frequency, contingency tables, and binomial logistic regressions, showing the results in proportions.

After this process and according to the results, the aim is to reject or approve the assumption initially exposed.

It is crucial to highlight that this is not a causality study; this means that none of the results obtained from the correlation between variables mean to probe the reason some of the respondents may show symptomatology on any of the mental health issues addressed. On the contrary, the testing of the study is a pilot of the method that looks for correlations between different physical, mental, and social conditions in a specific context, as it is Bogotá, Colombia.
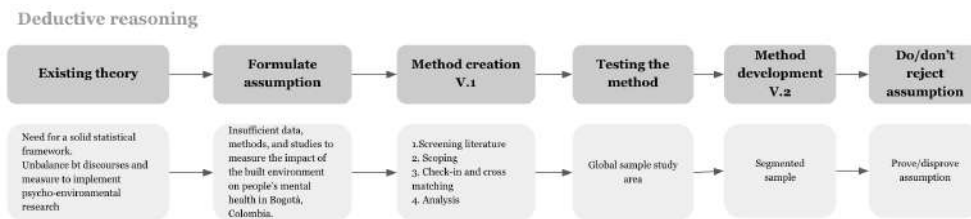
Fig. 2.1. Research strategy diagram. Source: Author, 2022.

2.1 Research objectives

General objective

The primary objective of this study is to develop a research method that measures correlations between physical environment and mental health in contexts with limited availability of information.

Specific objectives

- Collect data from different perspectives to generate an integrated approach to method development.
- Apply fundamental concepts of statistics and epidemiology in developing the research method.
- Test the research method in a context with little available data to measure the correlation and impact of the environment on mental health.

- To identify through the case study the direct and indirect variables of the physical and social environment that indicate a correlation with the mental health of the residents of three neighborhoods in Bogotá.
- To demonstrate to stakeholders who are involved and interested in the influence of the physical environment on individuals' mental health.

2.2 Research questions

General research question
The central question in this research asks the guidelines for a research method that measures the relationship between physical environment and mental health.

Specific research questions
This research seeks to address the following secondary questions:

- What perspectives generate sufficient data and information to measure the impact of the environment on people's mental health?
- What are the concepts of statistics and epidemiology that allow the development of a research method that measures the impact of the environment on people's mental health?
- How does this research method behave in measuring variables in a context with little availability of information?
- Which physical and social environment variables correlate with people's mental health?
- Who are the stakeholders involved and interested in the impact of the physical environment on people's mental health?

Mental health and built environment

Chapter 3: Method Development

3. Method design

From the previous chapter and the literature review, it is possible to visualize the context in which environmental psychology has emerged. Despite the researcher's curiosity, the tools for analyzing such interlinks have been scarce and insufficient due to the complexity of understanding the human mind about the built environment. However, materializing these relationships has become necessary over the years as the effects have made it nearly impossible to ignore. Therefore, a study of this nature will require significant data, resources, and investment to ensure accuracy. Even so, this is not the case in many countries, such as those in the global south, where there is usually the most significant lack of information and in contexts where it is most needed. For this reason, this study provides an important opportunity to advance the understanding of the built environment's impact on people's mental well-being.

The steps in which the method is developed are detailed below:
1) the method begins with identifying Colombia's state of the art of information and literature. From there, the categories and variables related to the method - physical, social, and mental - are extracted.
2) The scope is defined to know the method to categorize and investigate the information in a way that measures the characteristics of each indicator in the case study.
3) The study area is selected, considering there is variety and richness in urban and social dynamics, even without representing unmanageable challenges for this study. For this reason, this research is limited to a small city area with a specific number of participants.
4) Check-in and cross-matching information from the literature review with data collected in the study area through a field visit.

5) A survey is elaborated to collect people's perspectives on previously collected variables. It is applied in a case study, in this case, a specific area in the north of Bogota, Colombia.

6) We proceed to analyze the information where different tools such as descriptive, correlation, and regression analysis are tested to examine the results obtained, reflect, and report on them.

For this reason, starting with this chapter, this document presents the development of the method parallel to its application in the case study.

3.1 Context

3.1.1 The Method
Components

The Iceberg metaphor is proposed as an analysis strategy to introduce the components that the method applies. This metaphor identifies visible aspects, which is equivalent to 10% or 20% of the situation to be analyzed. The part in the middle represents 30% of the iceberg and combines visible and invisible aspects of the structure. The bottom part of the Iceberg corresponds to 50% of its structure, that which is not visible. As referred to by Scharmer (2015), the progressive understanding of the levels of the iceberg, from the surface to the depth, allows for identifying blind spots that, if addressed, can help rebuild society to be more intentional, inclusive, and inspiring (Ministerio de salud y protección social, 2020). These levels of the iceberg are constituted by three factors in this research, neighborhood quality, social capital, and mental health. Similar to the tip of an iceberg, the aspect that represents the quality of the neighborhood is the visible and explicit parts of the physical environment. In the middle are the variables that correspond to the social structures of the neighborhood's residents, and the bottom of the iceberg represents aspects of their mental health, beliefs, and paradigms of thought. (Fig.3.1 Method components).

Neighborhood quality

Throughout this research, the term neighborhood quality will refer to the physical qualities of the area of study, encompassing the urban fabric, accessibility to the site, and the existence and state of certain street facilities. The method to choose the variables of the study was based on the literature review, the guide of strategies for healthy cities, environments, and rural areas developed by the Minister of Health in Colombia (Estrategia de ciudades, entornos y ruralidades saludables. Guía práctica de herramientas, 2020), in cross-matching with the physical aspects validated in the site-visit. According to the literature reviewed on the levels of evidence for the relationship between the built environment and mental health, each element of the built environment for this study was selected regarding the level of proof exposed in that study to relate its applicability to the Colombian context. The variables chosen for this research are population density, air quality, noise exposure, neighborhood insecurity, garbage presence, and sidewalk quality.

Social capital

One of the major contributions of this research is the inclusion of the individual's perception in this type of study. This aspect is present from the selection of the sample according to the socioeconomic factors to the nature of the questions in the survey regarding the social networks of the participant, their outlook on the impact of the neighborhood on their mental health, and their assessment of the neighborhood quality. The social capital variables considered in this research compile the social strata, social networks, age, gender, relative income, birthplace, and people's outlook.

Mental health

One major theoretical issue that has dominated the field is the definition of mental health as the absence of mental disorders. That might occur due to the complexity of measuring such a broad aspect involving different

dimensions. Therefore, despite this research not agreeing with that definition, the mental health variable will be calculated according to the absence of depression, anxiety, stress, or general symptoms. The selection of these medical conditions is based on the information reviewed in the theoretical framework about common mental disorders and the prediction of the increase by 2030 as the cause of 14% of the total disease burden (Engidaw, N.A. et al. 2020). Moreover, in the study case, the test DASS-21 (Psychology Foundation of Australia, 2022) is validated in the country. It allows for identifying the degree of symptomatology of these mental health disorders. In addition, the mental health aspect includes variables such as subjective well-being and personal well-being that report data from the report El Bienestar de los Hogares Bogotanos, 2021.
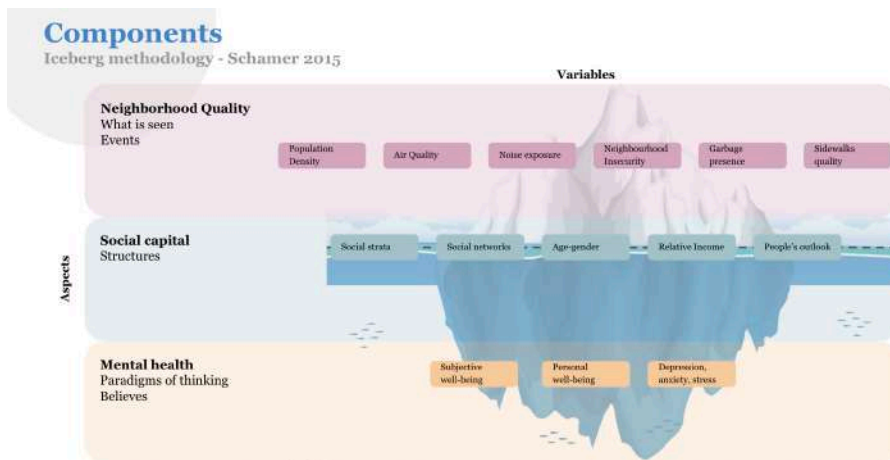
Fig. 3.1. Research components. Source: Author, 2023.

Domains

Throughout this research, the term domain refers to the levels at which information is categorized, presented, and analyzed. The data is classified according to the components and variables of the study, and these, in turn, are organized into geographical and societal strands. In addition, there is a transversal variable that complements the information at all dimensions,

both on the component and domain axes; this variable is the social strata. The geographical category includes data related to the country scale, the city level, and the localities' scope, in this study case, Suba and Usaquén. The UPZ and neighborhood levels are highlighted since, to date, these domains are out of the district measurements, according to the DANE (National Administrative Statistical Department, 2020) in the report carried out in 2020 (La información del DANE en la toma de decisiones de las ciudades capitales, 2020). Nevertheless, according to the same document, a five-year plan was established in 2020 to increase the supply of statistical data at different levels. In the societal domain, the information is presented at the individual level, referring to the data collected in situ according to each variable where information is reported. The following graphic represents the domains in which each variable presents information according to the availability and validity of the resources.
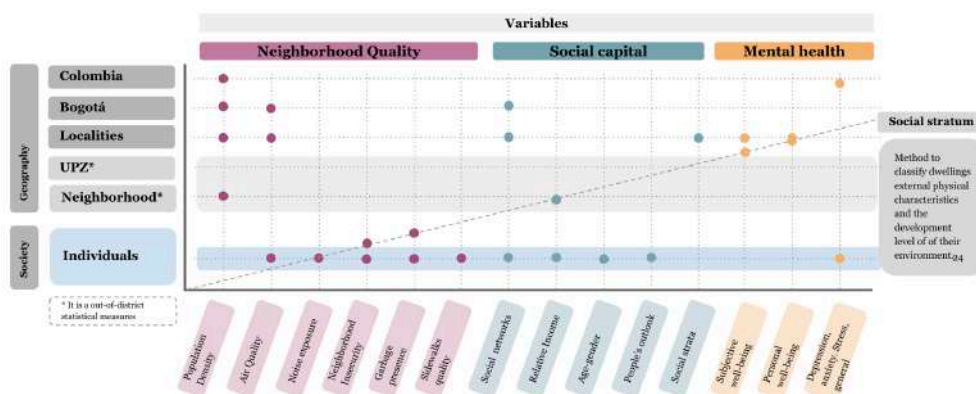
Fig. 3.2. Research domains. Source: Author, 2023.

Sampling process

In Colombia, according to the classification of residential properties to be served by public utilities, there is a system of six social strata distributed into low-low, low, medium-low, medium, medium-high, and high. To provide neutrality and balance to the study, this research focuses on areas and residents located in the medium, medium-high and high strata to

mitigate the influence of other determinant variables. I.e, aspects such as low-income or extremely violent contexts might have more considerable relevance for the residents rather than the mental health and the impact of the physical environment. In addition, the research area selected comprises various social strata that enable the juxtaposition or equivalence between the aspects in different contexts.

From that place, random residents in each neighborhood were approached, and after agreeing with the ethical considerations mentioned below, the survey was conducted. Of the initial cohort of 78 respondents, 16 surveys did not meet the validity requirements due to the respondents' locations or because they were visitors of the area and not residents. Therefore, 62 respondents were eligible, of which 35 were female and 27 were male. All of the participants were aged between 20 and 81 at the time they were interviewed. In addition, to capture the impact of specific aspects, such as noise and air quality, it was intended to survey residents living close to the main highway and residents inside the neighborhood.

Ethical considerations

Before undertaking the field research, ethical clearance was obtained from:

- The participants were provided with information regarding the research's educational objectives and overall purpose.
- Participation in the study was voluntary, and individuals had the right to withdraw wholly or partially from the process if they chose to do so.
- All participants provided their consent first.
- The privacy rights of all individuals involved will be respected, and the data provided by participants will be treated with strict confidentiality to ensure anonymity.

3.1.2 Study case

"On November 15, 2022, the world's population set a record, surpassing 8 billion people for the first time."
Alcalde, S. (2022)

Context Bogotá, Colombia

Population growth and density are constant topics concerning which urban planning, management, governance, and public health professionals are concerned. With more than half of the global population living in cities, high levels of population density increase the risk of the population's exposition to poverty, traffic, noise, and air pollution, among others (Gruebner, O. et al. 2017). That means moving in the opposite direction of cities' sustainable development. Besides the visible consequences that might appear on the top of the iceberg, under the water, overpopulation in cities provokes a particular impact on the mental health of their inhabitants. Syndromes like anxiety, mood disorders, stress, and schizophrenia, among other mental disorders, are associated with increased urban living (McCay, L. 2023). Within the most urbanized regions in the world, more than 80% of the Latin American population is living in urban settlements (Ritchie, H. and Roser, M., 2018), and 67% are located in South America (United Nations, 2019).

According to the World Bank Data Bank, Colombia is the second country in South America most populated, with 51.265.841 inhabitants by 2021 and 80% of its population living in cities. Colombia, situated in the northern part of the continent, shares its borders with the Caribbean Sea to the north and the Pacific Ocean to the west. Its strategic location has made it a significant gateway to the continent from North America and Europe. Throughout the country's history, several events linked to the trafficking of illicit substances and an internal war that has lasted more than 50 years have been crucial factors that mark the country's development. In this context, multiple generations have been raised amidst violence and drug trafficking, profoundly impacting the population, culture, thought patterns,

and interactions with the city. For this reason, when talking about a case study located in the Colombian context, it is necessary to consider the impact of the relentless armed conflict, the violence of diverse nature, the economic situation, and the late COVID-19 pandemic on the mental health of its inhabitants.

Colombia's capital, Bogotá, is located in the middle of the country, with 7 million inhabitants in 2018 and 95% of its population living in urban areas (DANE, 2018). Being the biggest city in the country, Bogotá participates as a member of the UNESCO Creative Cities Network 2012 and the Capital of Culture. In addition, more than 70% of the workforce is predominantly formed by highly qualified young professionals. Despite being a cosmopolitan city, Bogotá has more than 5,000 public parks, including the Simón Bolívar, which

Fig. 3.3 Colombia location.
Source: Author, 2023

has an area of 400 hectares. Aiming to become the center of knowledge and innovation in Latin America, Bogotá has ambitious large-scale urban renewal and innovation programs as a solution to mobility problems and improvement in its infrastructure (El Nuevo Siglo, 2017). However, according to the Comparative Citizen Perception Survey (Sáenz, L.H. and Durán, M.F.C. 2019), Bogotá has less than 60% satisfaction among its inhabitants, a measure far below the national average. Likewise, concerning air quality, among the capital cities, Bogotá ranks second lowest in happiness, and these results are replicated in terms of the perception of safety in the neighborhood and in the city, where 50% of the surveyed consider their neighborhoods to be safer than the city, which has only a 27% positive perception. Locating the capital again in the second worst position.

Figure 3.4 depicts the percentage of dwellings with problems in their surroundings in Bogotá according to the Multipurpose Survey 2021 conducted by the District Secretary of Planning (Alcaldía Mayor de Bogotá and Secretaría Distrital de Planeación (2021). The variables assessed are insecurity, noise, air contamination, foul odors, and excessive advertising. Besides, Figure 3.5 illustrate the percentages of dwellings according to the assessment of the variables per locality.
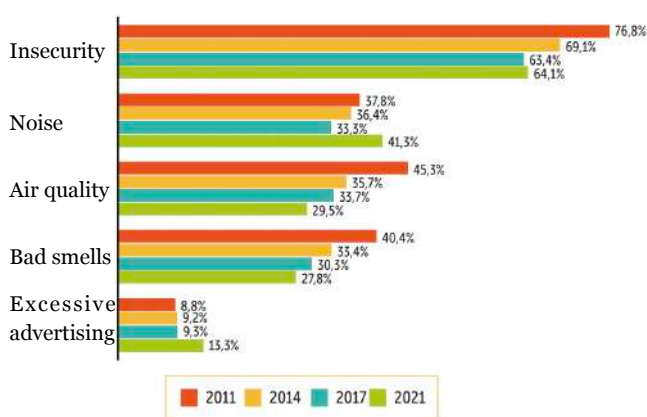
Fig.3.4 Housing with environmental problems.
Source: Alcaldía Mayor de Bogotá and Secretaría Distrital de Planeación, 2021.
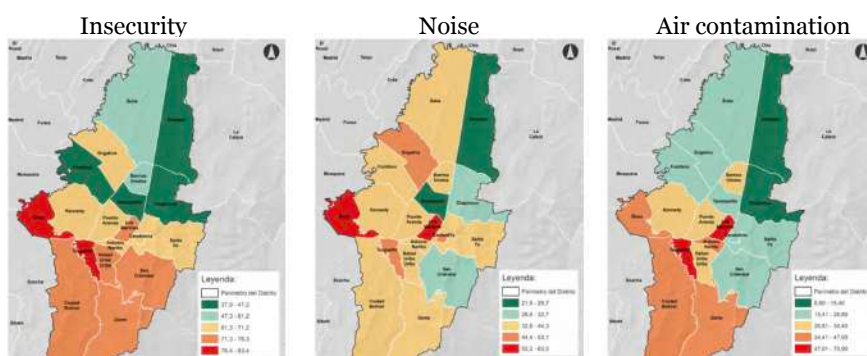
Fig.3.5 Location of variables per locality.
Source: Alcaldía Mayor de Bogotá and Secretaría Distrital de Planeación, 2021.

For 2021, new issues were added, such as improper disposal of garbage, abandonment of debris, contamination of bodies of water, places with urine or human excrement, trees that pose a risk to homes or their inhabitants, and improper disposal of biological waste. Therefore, the variables studied in this research were selected based on this information to measure the residents' perception at the level of the individuals in the study area.

Geographic divisions

To explain the method of selection of the domains in which statistical information is collected and presented in this study, the following is a basic description of the administrative and territorial division system of the city of Bogotá. This is because the categorization and presentation of data and statistical studies of the capital city are based on this system. Bogotá has an administrative, political, and territorial division system that divides the territory into 20 sub-areas called localities (Unidad Administrativa Especial de Catastro Distrital, 2020). However, with the issuance of the new Land Management Plan 'Bogotá Reverdece 2022-2035', a new legal framework for land management in the city is introduced. Thus, the current 20 localities will become 33, of which three will be rural and 30 urban, to specify the formulation of urban projects in the territory and improve the quality of life of all its inhabitants (Secretaría Distrital de Planeación, 2022). To give a measure of reference, the localities currently operate as cities within the capital. For example, the locality of Suba has more than 1.2 million inhabitants, meaning it has more population than intermediate cities in the country, such as Cartagena de Indias (914,552 in.).

For this reason, among many others, a second subdivision of the city is created to achieve less extensive units in which citizens can access services, employment, and health with fewer distances (Infobae, 2021). That is how the localities are once again subdivided into Zonal Planning Units (UPZ), which soon will become Local Planning Units (UPL). Finally, the last subdivision is the neighborhoods, conceived to achieve more efficient urban planning and distribution of services in the city.

Bogota per localities   Bogota per UPZ
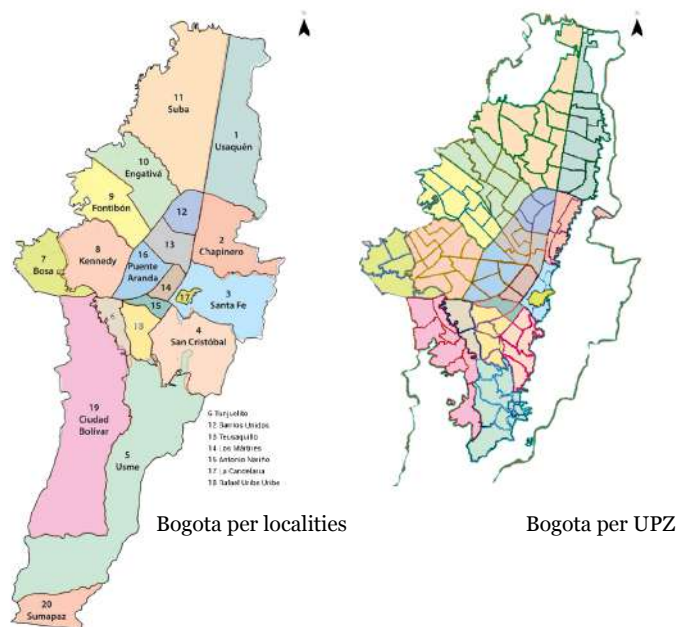
Fig.3.6 Geographic divisions Bogotá.
Source: Author based on Bogotá administrative map, Shutterstock, 2023.

Although this administrative and territorial distribution has been implemented since 2000, there is no statistical data representing the characteristics of the population more detailed than the locality level. For this reason, in this study, secondary data collection is based on the localities level rather than on a more concrete area such as the UPZ or the neighborhood. However, there is another classification based on the cadastral property information named the socio-economic strata.

Socioeconomic strata

Socioeconomic stratification is a classification of residential properties implemented mainly to charge the residential, public utilities according to the strata. In this way, those with more economic capacity pay more for public services and contribute so that the lower strata can pay their bills. The stratification method is based on available cadastral property

information, data collected directly by the municipalities, and classification methods for forming strata. The classification method focuses on the dwellings' external physical characteristics and their environment's development level (DANE, 2023). Although this system is created only to charge utilities, it influences land prices, education costs, health, food, and social perception among its citizens. As mentioned, the stratification is based on urban and dwelling characteristics, each with different parameters to which a property is assessed to be classified. The variables are considered according to each factor - residential, urban environment, and context.

Residential
- Type of construction: house or apartment
- Constructed area
- Structure: frame, roof, walls, and state of structure's preservation
- Finishes
- Facade
- Bathrooms and kitchen: size, tiling, furnishings, and state of conservation
- Number of rooms
- Evaluation according to the building rating score

Urban environment	Context
• Access roads	• Localization zone
• Front house size	• Land use
• Front yard	• Roads
• Sidewalks	• Services
• Garages	• Topography

Based on "Estratificación: todo lo que debe saber", Alcaldía de Bogotá, 2018.

Although the term refers to the social strata, it only considers the dwellings' physical characteristics. It does not fully represent its population's

socioeconomic characteristics or purchasing power. However, although the strata do not depend on the people's monetary income, it impacts the city's physical attributes, which is reflected in how the inhabitants are distributed around it. As the following figure shows (Fig.3.7), the social strata are measured from level one to six, the first being the lowest, and the last is the higher classification. The images show the difference in the physical environmental conditions changing according to the strata. In addition, it indicates the percentages of the population that reside in each of the strata and the Multilevel Poverty Index accordingly.

Fig.3.7 Social strata classification. Source: Author, 2023

For a better understanding of the relationships between the social strata and the physical and social environment, figure 3.8 represent the geographical location of the mentioned factors in the city. The first map depicts the administrative distribution of the town per locality; next to it, the second map illustrates the percentage of households in multidimensional poverty distributed according to the localities and UPZ. The third map represents the distribution of social strata according to the localities.
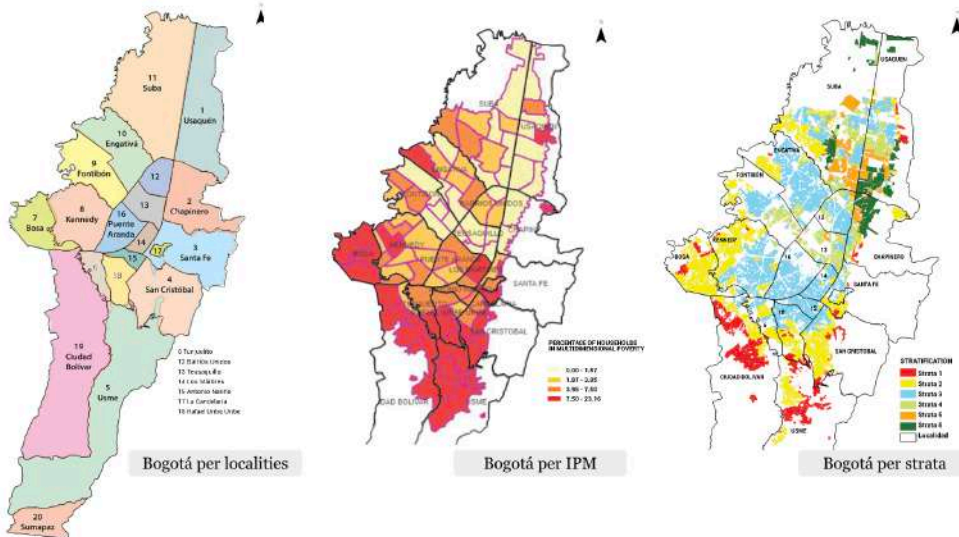
Fig.3.8 Socioeconomic strata, Bogotá. Source: Author based on data from DANE and López, J.A.G., Martínez, H.D.N. and López, L.F.Q. (2022), 2023

By identifying the social strata in the city's cartography, it can be seen that the lowest strata are located in the south and the peripheries of the city; moreover, the highest strata are located in the middle and north. In addition, looking at the Poverty Index map, it could be noticed that stratification is highly related to the results of the poverty index. However, it is assumed that the socioeconomic characteristics of the population do not determine it. Furthermore, statistical data shows that most of Bogota's population is classified within the low and medium-low strata. The medium, medium-high, and high strata (considered those with the best purchasing power) represent 17.5% of Bogota's population. These strata are concentrated in the localities of Chapinero, Teusaquillo, Usaquén, and Suba. Suba is the most populated locality in the city of Bogotá. Suba, Chapinero, and Usaquén have dwellings in all types of strata.
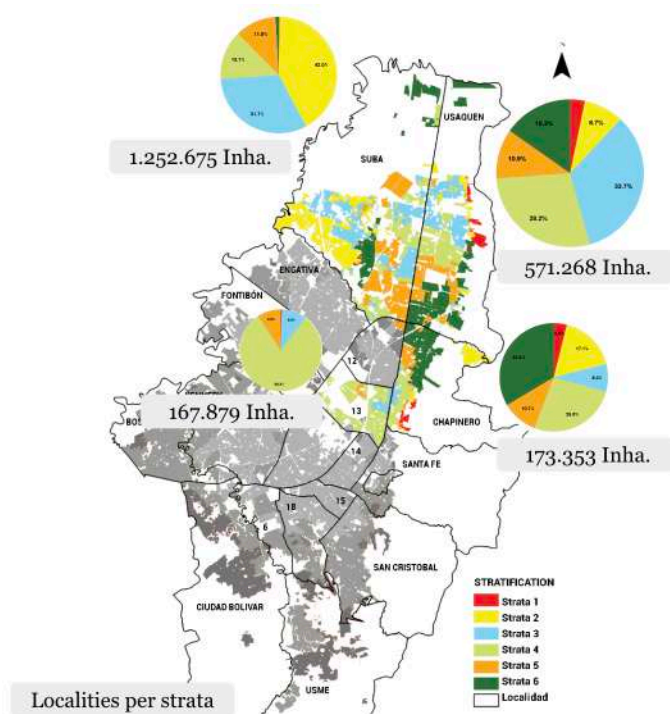
Fig.3.9 Concentration of middle socioeconomic strata, Bogotá.
Source: Author, 2023

In this study, socioeconomic stratification is a variable located in the middle of the iceberg structure since, on the outside, what is seen is what the norm indicates as a system of classification of residences for the payment of public services. However, this classification has stronger effects on social interactions.

Study area

Since mental health is affected by multiple social, economic, biological, and environmental variables, in this case, to focus on the variables of the built environment, it is preferable to choose the social and economic aspects that provide greater stability and neutrality to the case. Therefore, the study area of this research is located in the locality of Suba and Usaquén, formed by various social strata, including middle, upper-middle, and high

strata. Moreover, the northern highway crossing the city from south to north is the element of the built environment that limits each locality. Within those localities, the study area is focused on the neighborhoods: La Calleja, Prado Veraniego, and Canodromo.
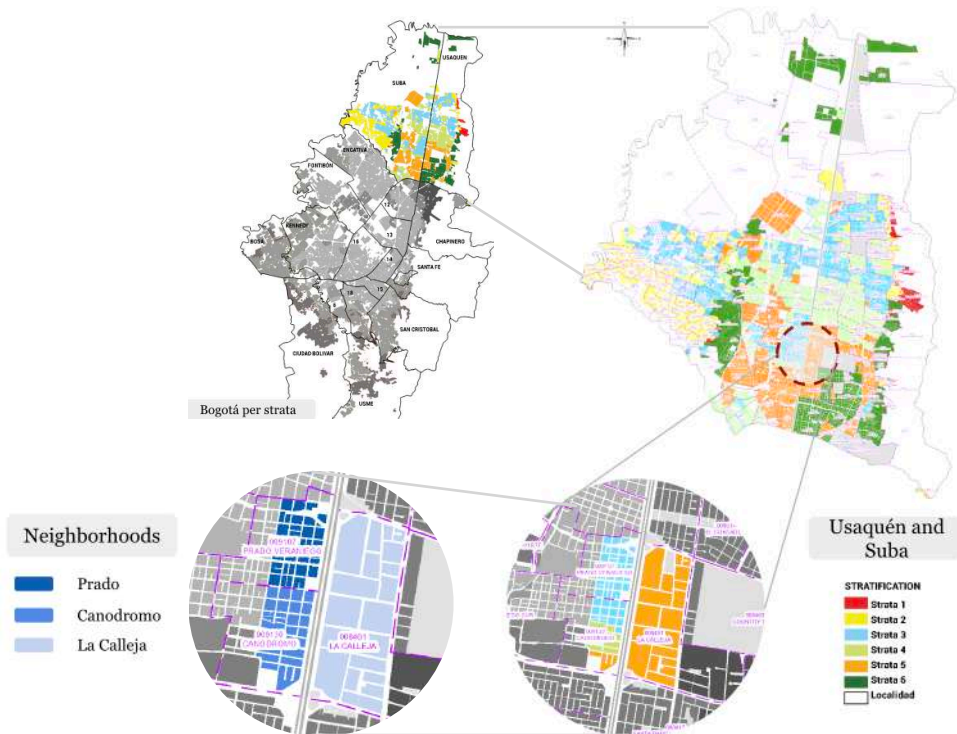
Fig.3.10 Study area definition, Bogotá.
Source: Author, 2023

3.2 Data collection

The process of data gathering starts with the collection of secondary data, afterward validation of this information in situ, and then the recollection of information from people's perspectives through a survey. This step aims to investigate from the perspective of each variable of study the information available as a starting point. According to the information, each aspect's resources come from public resources, field research, or individuals. Fig. 3.11 illustrates the source's distribution according to the variables and domains. This methodology infers a deductive method, which starts by collecting information from the general city to the particular individual level.
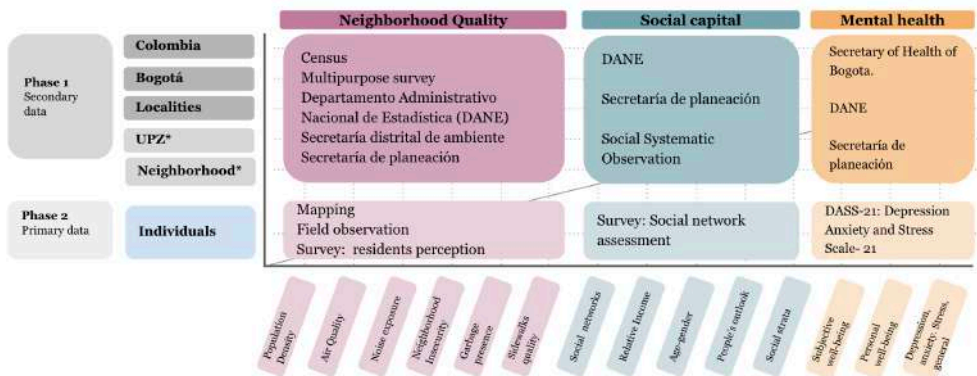
Fig.3.11 Data collection methodology.
Source: Author, 2023

3.2.1 Method

Secondary data

Secondary data were collected from official webpages, documents, and open resources performed by the Secretary of Habitat, the National Administrative Department of Statistics (DANE due to its abbreviations in Spanish), the District Secretary of Planning, and the Secretary of Health and Social Welfare of Colombia. In addition, part of the cartography was collected from the Bogotá Maps and SINUPOT, the official platforms of the District Secretary of Planning. This stage of the method aims to screen the literature publicly available and define the variables to be investigated according to the context. Based on that information, the domains covered are the Bogotá, localities, and social strata levels.

Site visit

Once the first approach to the databases of the territory is made, we validate this information through a field visit. With this visit, the objective is to collect primary data from the researcher's perspective about the behavior of the study variables on the site. To carry out this validation, first, the numbering of the housing blocks within the study area is made, and second, visit forms (Table 1. Site visit form) are elaborated to record the behavior of noise, the elements that generate security or insecurity, the quality of the sidewalks and the air, and the presence of garbage, cigarette butts, empty bottles, glass, windows, or other waste (Annex 1. Site visit observation form). In addition, a first-hand photographic record is collected from this tour.

The following questionnaire is made to be fulfilled by the researcher to get the approach to the neighborhood from the perspective of a professional.

Form No.	Neighborhood No.	Block No.	Date

1. Built Environment Observation		
1. According to the number indicate the answer. 1: Yes, 2: No, 3: Part of the block		
1	Is there a high volume of traffic?	
2	Is there a lot of noise from factors other than traffic?	
3	Is the street free of litter, cigarette butts, empty bottles, glass, broken windows?	
4	Do you observe garbage containers in your neighborhood?	
5	Are there constant obstructions on the sidewalks in your neighborhood (street vendors, parked vehicles, trees, dog feces)?	
6	Is the width of the sidewalk pedestrian friendly?	
7	Are there streetlights in the area?	
8	What elements in the neighborhood contribute to the safety of the area? a. Lighting b. Security cameras c. Pedestrians d. Security guards	
9	Identify air pollutants within the neighborhood	
2. What type of material is the floor of the sidewalks made of?		
1	Paved, tile or paving stone	
2	Uncovered ground	
3	Lawn	
4	Other. Cuál_____	
3. Are the sidewalks in good condition (no cracks, holes, weeds, etc.)?		
1	Yes	
2	No	
3	Under repair	
4	Part of the block	
5	No walkways	
4. Are the sidewalks along the block continuous?		
1	Yes	
2	No	
3	No walkways	

Table 1. Site Visit form. Source: Author, 2023

Primary data

After validating the secondary information in situ, the next step is to conduct a one-to-one cross-check of information at the individual level. Thus, this research surveys 48 questions for approximately 15 minutes per person. The survey aims to gather information about the perception of neighborhood quality, socio-demographic aspects, and the presence of depression, anxiety, stress, and general symptoms. The variables to be assessed by the residents are noise, air pollution, sidewalks quality, neighborhood security, and garbage presence. Additionally, questions about their support networks, age, gender, birthplace, residence location, and type are asked.

Regarding the mental health aspect, the DASS-21 test is conducted to identify the levels of symptomatology for depression, anxiety, stress, and general symptoms. It should be noted that the questions of this questionnaire are freely accessible to anyone, and the results are not an official diagnosis. They only indicate the presence of symptoms. The survey design is based on study cases developed in Colombia related to the topics of this research. It is supervised and approved by a professional epidemiologist specialist in the Colombian context. The order and issues of the survey were structured to make the user feel comfortable talking about their mental health at some point. Therefore, the first questions were based on evaluating the characteristics of the neighborhood, general questions, then questions about the social environment, and ending with mental health questions. Finally, demographic questions were asked since these, due to security issues, are not easy for Colombians to answer.

The survey was conducted one-on-one, starting on April 4, 2023, for three weeks. The presentation format was online through a free-to-use platform called Forms (www.forms.app). Through this link, https://view.forms.app/ mariajosepalacior/fieldresearchsurvey, users could respond with an interactive and user-friendly visual quality to the open survey. Due to security considerations, all interviews were conducted during daylight hours, on weekends and weekdays, in public places, parks, and streets. Table

2 shows an example of the questions asked, categorized by neighborhood quality, social capital, and mental health aspects. (The complete survey can be found in the annexes. Annex 2)

1. Perception of the physical environment				
Please indicate your response based on your perception of the environment before the pandemic... as follows 1= Yes 2= No 3= Don't know, not answered.				
a.	You constantly hear high levels of noise in your neighborhood and near your home.			
b.	The noise in your neighborhood prevents you from concentrating or carrying out any activity inside your home.			
c.	You can go out peacefully in the neighborhood where you live.			
d.	Have you been a victim of violence in your neighborhood?			
e.	Do you know or have you seen people being victims of violence in your neighborhood?			
f.	Please rate the air quality in your neighborhood from 1 to 10, with 1 being very bad and 10 being excellent.			
g.	The air quality in my neighborhood makes it easy for me to do outdoor activities.			
h.	Your neighborhood stays clean most of the time.			
i.	There are enough garbage cans around your neighborhood.			
j.	The sidewalks in your neighborhood are pleasant and suitable for all types of pedestrians.			
k.	The sidewalks in your neighborhood are in good condition and are level.			

2. Perception of the social environment	
a.	When you have a calamity who do you go to? a. Members of your family b. Members of another family c. Neighbors or friends d. Co-workers
b.	Does your primary support network reside in your neighborhood? a. Yes b. No c. Don't Know Not Answered
c.	From 1-10 where 1 is not important at all and 10 is indispensable. How important is it to you that your support network lives close to you (10-15 minutes walking distance)?
d.	Are you generally satisfied with the physical conditions of your neighborhood? a. Yes b. No c. Don't know Not answered
e.	Which of the following physical conditions in your neighborhood do you feel most affect your daily life? a. Noise b. Neighborhood violence c. Air pollution d. Presence of garbage e. Quality of sidewalks
f.	Do you think the conditions in your neighborhood affect your mental health? a. Yes b. No c. Don't know don't answer"
g.	Of the following elements, which do you consider to be the most important for you at this moment? a. Your social environment b. Your mental health c. Your social network
h.	If the physical conditions of your neighborhood put your mental health at risk, would you be willing to move?

3. Mental health				
Please read the following statements and circle a number (0, 1, 2, 3) that indicates to what degree this statement has occurred to you during the past week. The rating scale is as follows:				
0: It has not happened to me; 1: It has happened to me a little, or for some of the time; 2: It has happened to me quite a bit, or for a good part of the time; 3: It has happened to me a lot, or most of the time.				
1.	I had a hard time releasing the tension	0 1 2 3		
2.	I realized I had a dry mouth	0 1 2 3		
3.	I could not feel any positive feelings	0 1 2 3		
4.	It became difficult to breathe	0 1 2 3		
5.	I found it difficult to take the initiative to do things	0 1 2 3		
6.	I overreacted in certain situations	0 1 2 3		
7.	I felt my hands shaking	0 1 2 3		
8.	I felt I was expending a lot of energy.	0 1 2 3		
9.	I was worried about situations in which I might panic or where I might make a fool of myself	0 1 2 3		
10.	I felt that there was nothing to look forward to	0 1 2 3		
11.	I felt restless	0 1 2 3		
12.	I found it difficult to relax	0 1 2 3		
13.	I felt sad and depressed	0 1 2 3		
14.	I did not tolerate anything that did not allow me to continue with what I was doing.	0 1 2 3		

Table 2. Survey example. Source: Author, 2023

The method

Table 3. Global sample socio-demographic characteristics study area, Bogotá, Colombia, 2023

Apects	Number of variables	Variables aim	Segmentation criteria
Social capital	**Socio-demographics 4**	**Gender** Sample selection sought to ensure balanced gender distribution	**Gender** According to survey responses
		Age Survey open question ensuring +18	**Age** According to national demographic framework
		Birthplace Aim to look for relations with urban or rural birthplace	**Birthplace** In further analysis, it is transformed into a dichotomous variable due to response distribution, Urban/Rural
		Marital status Aimed for sample contextualization	**Marital status** According to survey responses, In further analysis, it is transformed into a dichotomous variable due to response distribution, Alone/with company
	Social network 3	**Having a support network** Aimed for contextualization of social capital	**Having a support network** The term support network is clarified as the group of people that helps in difficult situations
		Type of support network Aimed for contextualization of social capital	**Type of support network** Based on secondary data segmentation, the National Wellbeing survey
		Support network residing nearby Aim to relate social capital with the physical location of it	**Support network residing nearby** Closeness clarified within the neighborhood limits
Neighborhood quality	**Physical characteristics 3**	**Type of residence** Aimed for contextualization of residence conditions	**Type of residence** From site-visit observation
		Residence location Aimed for contextualization, distribution, and relation with neighborhood quality variables	**Residence location** From site-visit observation and according to neighborhood quality variables (noise, air) and impact measurement
		Neighborhood Aimed to ensure a balanced distribution	**Neighborhood** Urban fabric Mixed social strata
Mental health	4	Questions stipulated by the DASS-21 test	According to the DASS-21 test, validated in the Colombian context
TOTAL	14		

Table 3. Survey criteria. Source: Author, 2023

Table 3. presents the 14 survey variables, segmented into three categories: social capital, neighborhood quality, and mental health.

Under social capital, the table lists four socio-demographic variables that aim to ensure a balanced sample distribution. These variables include gender, age, birthplace (which is transformed into a dichotomous variable of urban or rural), and marital status (also transformed into a dichotomous variable of alone or with company). Three variables related to social networks were also included: having a support network, type of support network, and support network residing nearby.

The neighborhood quality category includes three variables related to physical characteristics, including the type of residence, residence location, and neighborhood. Finally, four mental health variables were included, derived from the DASS-21 test, and validated for the Colombian context. The table provides a clear and concise overview of the study's variables, their aim, and the segmentation criteria used to ensure a comprehensive approach to understanding the study area's socio-demographic characteristics, social capital, neighborhood quality, and mental health.

Outcome

From the stages described above, the following essential information was generated for the next phase:

- Study area definition
- Variables of study, investigate and correlate
- Validation of the information in situ.
- Characteristics of the physical and social environment from the point of view of the researcher and differentiate them according to neighborhood.
- An Introduction to the user experience perception in their environment.

Findings

Secondary data: Only one source of public statistical information with welfare data was found. This infers that there is no possibility of

corroborating and validating the information with other sources or referents. So far, mental health is only related to the health system, not pathologies. When searching for information about mental health, only results that refer to the absence of diseases are found, but not the factors that contribute to health.

Site visit: The site visit presents a distinct experience depending on the mode of transportation used, with pedestrian and vehicular visits offering different perspectives. Pedestrian visits provide a more detailed view of the neighborhood's characteristics and dynamics, whereas vehicular visits provide a broader outlook to comprehend the overall dynamics. This visit enables a closer observation of the various spectrums in which the study variables unfold. It is advisable to conduct 2-3 visits to the study area, varying between weekdays and weekends, as neighborhood dynamics differ between days.

Primary data: Regarding primary data collection via survey, it is advisable to structure the questions in a sequence that begins with general aspects, followed by specific elements, and finally, very particular ones. For instance, the survey questions could start with evaluating the neighborhood, then inquiries about social aspects and individual perceptions, and finally, about mental health. It is recommended that respondents complete the survey on their own or in private, as due to the sensitive nature of the mental health questions, people may be more communicative and provide more accurate answers when they feel confident and at ease. Respondents must be given sufficient time to answer the research questions examining the relationship between the social, physical, and mental environment. For example, two questions were asked per physical and social variable, and 21 questions related to mental health. Completing the survey takes at least 15 minutes, and respondents are encouraged to bring their time to provide accurate and thoughtful responses.

3.2.2 Study case

Secondary data

According to the study aspects in this research, the secondary data collected describes Bogotá's population behavior regarding aspects of the built environment, social capital, and mental well-being. The availability of this information is registered by official sources disaggregated by social stratum and localities. The data herein presented and analyzed is based on the document "El Bienestar de los hogares colombianos" created by the Alcaldía Mayor de Bogotá and the Secretaría de Planeación (2022).

Physical environment

This section presents a description of the dynamics of the population concerning pollution and safety in urban Bogotá, using the socioeconomic stratum and the locality to show the heterogeneity among its inhabitants. As part of the physical environment, the analysis of environmental policy from the demand side is receiving increasing attention from governments. Still, developing growth strategies that promote greener lifestyles and consumption patterns remains challenging. For this, among many other indicators, an indicator is presented to determine the number of homes that experienced pollution in their environment in urban Bogotá from the four versions of the Multipurpose Survey conducted in 2011, 2014, 2017, and 2021. This indicator considered the presence of the following adverse circumstances around the dwelling: dumps or garbage dumps, sewage pipes, noise, excessive advertising, air pollution, foul odors, and inadequate garbage disposal (Alcaldía Mayor de Bogotá and the Secretaría de Planeación (2022). For this research, the most reported types of contamination were considered: contamination around garbage dumps, air pollution, noise, and foul odors.

In addition, referring to the physical environment, responding to the perception of insecurity is imperative due to the implications and strong presence in the Colombian context. As a response, a victimization indicator is presented that counts the number of households reporting the percentage

of victimized households. That is to say; a family member has been a victim of at least one criminal act, such as robbery or theft, homicide or murder, extortion, or blackmail. In the same way, it is included the percentage of households indicating the insecurity of their neighborhoods. The following graphic shows, in summary, the results of the indicators of environmental and safety factors from the perspective of the socioeconomic stratum and the distribution by localities (Alcaldía Mayor de Bogotá and the Secretaría de Planeación, 2022). The graphic depicts the percentages of dwellings around garbage dumps, air pollution, contamination in their surroundings, noise, and foul odors; besides victimized households and households that indicated that their environment is unsafe by strata, the results behave very similarly concerning all indicators - environmental and safety with the lower strata reporting the poorest percentages and the higher strata having the best scores. There is a variation in the noise reports, where strata one has a better score than strata two and three.

Fig.3.12 Physical environment per socioeconomic strata.
Source: Author based on "El Bienestar de los Hogares Bogotanos, 2011-2021", 2023

According to the results from the perspective of the localities, Usaquén, Teusaquillo, and Chapinero occupy the best positions in the table, with the lowest percentages in pollution and insecurity. On the other hand, the works with the lowest rates vary between Tunjuelito, which occupies the last position in all categories, and Bosa. In these variables, Bosa also represents the most unfavorable position along with Antonio Nariño. It infers that the distribution of aspects is associated negatively with the environmental conditions, i.e., as the stratum increases, this percentage decreases by each variable.
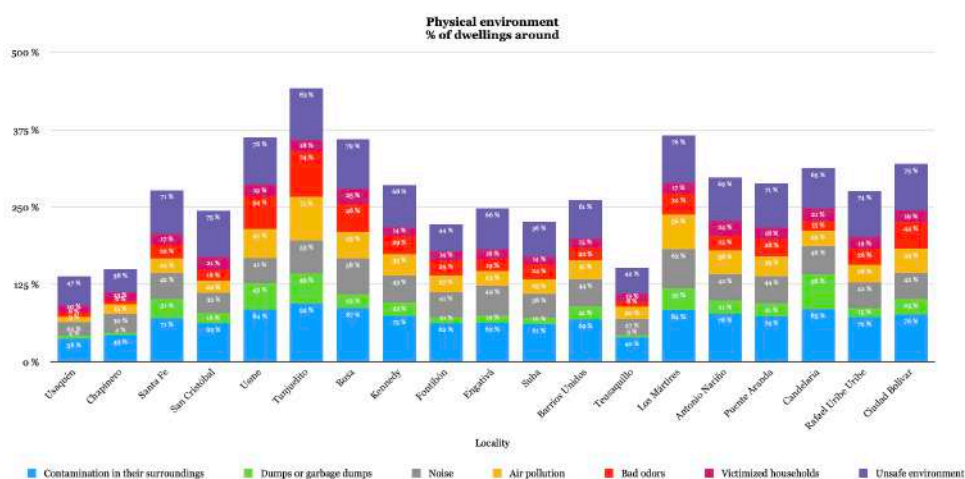
Fig.3.13 Physical environment per locality.
Source: Author based on "El Bienestar de los Hogares Bogotanos, 2011-2021", 2023

Social capital

Based on Durston, J. (2000), social capital can be defined as the collection of norms, institutions, and organizations that promote trust, reciprocal aid, and cooperation. This form of capital resides in social relationships and can be combined with other factors to benefit those who possess it. To evaluate the extent of individuals' support networks, the following factors are considered: individuals in the household, family members from another

home, neighbors or friends, co-workers, congregations, or spiritual groups. However, communities or spiritual groups are not considered due to their low incidence, as stated by the Alcaldía Mayor de Bogotá and the Secretaría de Planeación (2022). The most commonly reported support network in Bogotá is family members, with percentages above 50% in most strata. The differences between strata are minor, except for stratum one, which reports a lower cumulative rate than the others (101%).
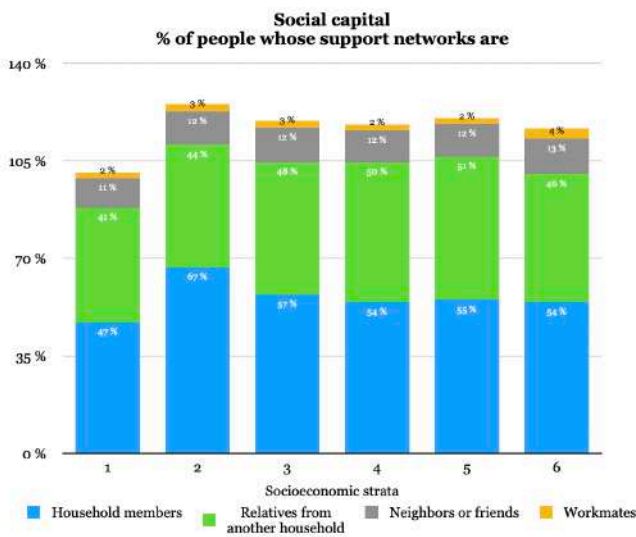
Fig.3.14 Social capital per socioeconomic strata.
Source: Author based on "El Bienestar de los Hogares Bogotanos, 2011-2021", 2023

From the following graph describing the distribution of social capital according to localities, it can be deduced that the support network consisting of household members is the most significant and with the highest presence in Antonio Nariño (63%), Puente Aranda (60%), and Suba (60%). On the other hand, this network is the least reported in Candelaria (41%) and Los Mártires (45%). On the other hand, workmates do not represent a significant percentage, with percentages not exceeding 4% overall.
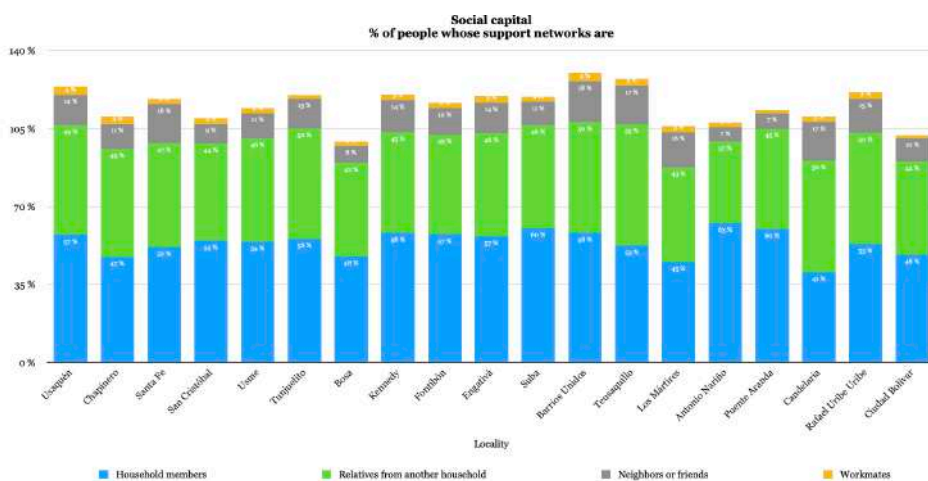
Fig.3.15 Social capital per socioeconomic locality.
Source: Author based on "El Bienestar de los Hogares Bogotanos, 2011-2021", 2023

Well-being

The relationship between health and well-being is not unidirectional: health influences well-being, and well-being itself affects health since well-being and physical health outcomes, better immune system response, greater pain tolerance, greater longevity, cardiovascular health, slower disease progression, and reproductive health are related (Steptoe, A. et al., 2012) (Health Improvement Analytical Team - Department of Health - United Kingdom, 2014). Keyes, C.L.M. (2005) states that well-being and mental illness correlate with depression and anxiety, which are associated with low levels of well-being; Haller, M. and Hadler, M. (2006) note that good health correlates with higher life satisfaction.

As the theoretical framework outlines, various approaches to assessing population well-being incorporate objective and subjective measures. This is because both measures provide valuable information on people's situations, directly or indirectly. Direct measurements are those in which the individual responds, while indirect measures are obtained from predefined standards

established by observers or entities external to the individual. In this context, a set of indicators is presented that captures various dimensions contributing to a comprehensive overview of the well-being of citizens of Bogotá, as stated by the Alcaldía Mayor de Bogotá and the Secretaría de Planeación (2022). The first approach to subjective well-being is from the perspective of people's location within a defined scale that reflects whether people are thriving or whether they are in difficulties (Alcaldía Mayor de Bogotá and the Secretaría de Planeación, 2022). (Fig.3.16)
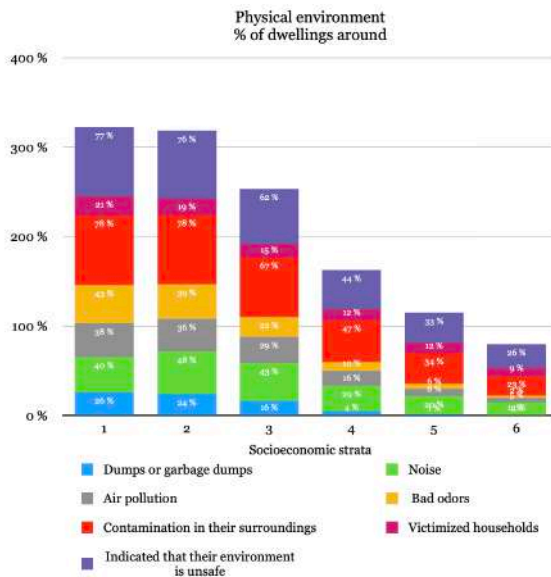

Fig.3.16 Well-being scale, per socioeconomic strata.
Source: Author based on "El Bienestar de los Hogares Bogotanos, 2011-2021", 2023

Those presented in the report indicate a positive evaluation of the scale reached since most of the population is thriving (averages above 7). However, According to the graphic, some results should be highlighted when disaggregating the analysis by socioeconomic strata or localities. First, the proportion of people thriving is more pronounced in the higher strata of the population (between 88% and 93%). In contrast, strata 1 to 3 have a

higher proportion of those who are struggling or suffering (Alcaldía Mayor de Bogotá and the Secretaría de Planeación, 2022). Strata 5 has a lower percentage of people thriving, compared to strata 4 and 6, because it has more people suffering and struggling. The point differences are more significant among the lower strata.

Analyzing the results from the perspective of the localities (Figure 3.17), it was found that the most significant difference in the proportion of people prospering is between Teusaquillo and Santafé in 2017 (18%). The localities that exhibit lower percentages of individuals experiencing suffering include Teusaquillo, Usaquén, Puente Aranda, Chapinero, Barrios Unidos, Engativa, and Suba, reporting values ranging between 1.9% and 3%, respectively. Contrariwise, localities reporting higher percentages of individuals experiencing suffering include Ciudad Bolivar, Rafael Uribe, Usme, and Tunjuelito, with values ranging between 6% and 8%, respectively. Concerning the results of individuals thriving, the top-performing localities are Suba, Chapinero, Usaquén, and Teusaquillo. At the same time, lower rates are observed in Tunjuelito, Rafael Uribe Uribe, Usme, and Antonio Nariño.
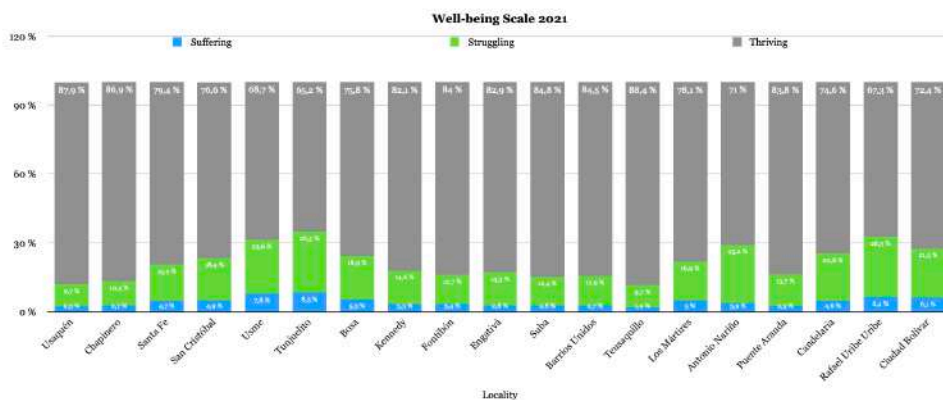
Fig.3.17 Well-being scale per locality.
Source: Author based on "El Bienestar de los Hogares Bogotanos, 2011-2021", 2023

In Bogotá, indicators have been developed to capture different aspects contributing to an overview of citizens' well-being. The analysis of suffering and thriving percentages across various localities in the city reveals significant differences. While some localities report lower percentages of individuals experiencing suffering and higher rates of individuals thriving, others report higher percentages of individuals experiencing grief and lower portions of individuals thriving. Moreover, the differences observed in the prospering population increase with the socioeconomic stratum and between localities typically characterized by higher per capita incomes.

The second component of well-being inquires about the affective balance between the population's positive and adverse circumstances. This indicator is scored between 10 and - 10. It has a maximum value of 10 when feeling happy and not worried or angry. On the contrary, it will equal -10 when you feel unhappy, anxious, and angry. According to Kahneman and Krueger (2006) (referenced by the Alcaldía Mayor de Bogotá and the Secretaría de Planeación, 2022), it is possible to use the following indicator to measure the effective balance:

$$Affective\ balance_i = Happy_i - \frac{Concerned_i + Angry_i}{2}$$

Fig.3.18 Effective balance formula.
Source: Author based on "El Bienestar de los Hogares Bogotanos, 2011-2021", 2023

When the behavior of this balance is analyzed according to the socioeconomic stratification of the households, it is found that there is a positive association between the affective balance rating and the conditions of the housing environment; that is, as the socioeconomic stratum increases, a higher average rating is found (Fig.3.19). Stratum 1 has an average score of 4.39, and Stratum 6 surpasses it by about 1.4 points. It is noteworthy that stratum four scores higher than stratum 5 in this indicator.
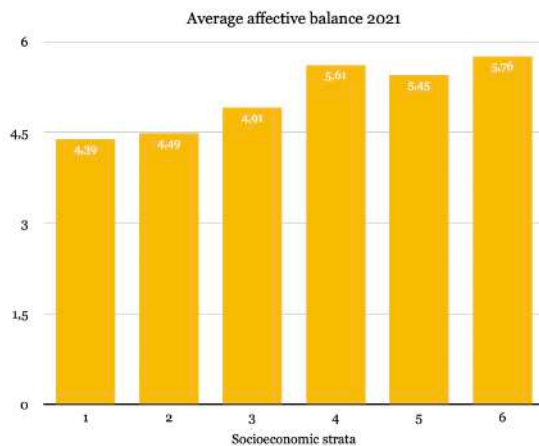
Fig.3.19 Effective balance per socioeconomic strata.
Source: Author based on "El Bienestar de los Hogares Bogotanos, 2011-2021", 2023

By localities, it was found that the localities with the highest affective balance are Teusaquillo, Usaquén, and Suba, with scores around 5.3 and 5.8. And the localities with the lowest scores are Usme, Santa Fe, and Tunjuelito, with scores under 4.
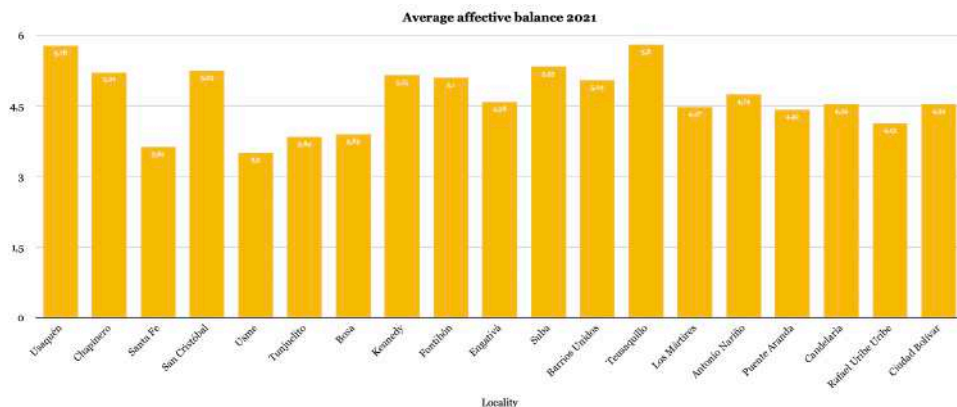
Fig.3.20 Well-being scale per locality.
Source: Author based on "El Bienestar de los Hogares Bogotanos, 2011-2021", 2023

The methodology used to calculate the personal well-being index generates weights for the dimensions considered and groups them into three components. The first component includes the possibility of making decisions and having control over one's life, family relationships, friends, and the health and education components. The second component is the economic capacity represented equally between income and work. The third component includes the relationship of the household with the environment in the dimensions of housing, neighborhood, or community and safety in the places it frequents. The final score of the index will have a maximum level of 1, indicating the highest level of well-being in the variables considered (Alcaldía Mayor de Bogotá and the Secretaría de Planeación, 2022).

In the socioeconomic strata domain, the indicator's value indicates a favorable situation independent of the stratum because its average score is above 0.7, and there is a positive association between the physical conditions of the environment and personal well-being (Fig.3.21). There is a minor score difference between strata of 0,13; this means that people's valuation is not unrelated to the physical conditions where they live.

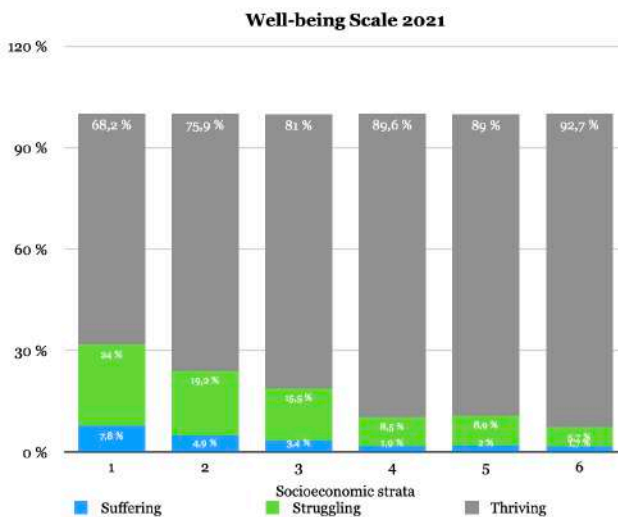*Fig.3.21 Personal well-being per socioeconomic strata.*
Source: Author based on "El Bienestar de los Hogares Bogotanos, 2011-2021", 2023

Estimates at the locality level show a set of localities with much higher conditions than the others (Usaquén, Chapinero, and Teusaquillo). The residents of Chapinero and Teusaquillo have a welfare situation similar to that found in stratum five and six households. The difference between these and the localities with the lowest indicators (Santa Fe, Bosa, Rafael Uribe, and Ciudad Bolivar) is approximately nine points.
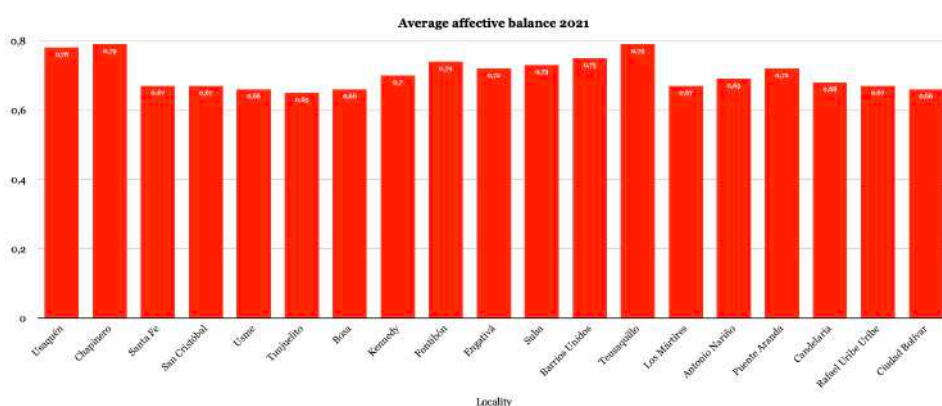
Fig.3.22 Personal well-being per locality.
Source: Author based on "El Bienestar de los Hogares Bogotanos, 2011-2021", 2023

Site visit

A total of 41 residential blocks were identified in the study area, with 34 located on the western side of the avenue and seven on the eastern side. In terms of the built environment characteristics, the study found no significant differences regarding noise, air pollution, and sidewalk quality between the houses on the avenue and those in the Prado neighborhood's interior. However, in the La Calleja neighborhood, although not many places are on the highway side, the residential complexes nearby have certain features that help mitigate noise pollution. These include the presence

of green barriers, distances between the avenue and the first line of houses within the complex, and entertainment spaces that act as a buffer zone.

The urban density is significantly higher on the western side, specifically in the Prado and Canodromo neighborhoods; however, Prado has a higher density within these two neighborhoods. The Prado neighborhood has a more significant presence of areas for commerce and services, resulting in a higher number of people on the streets during the week and on weekends. On the other hand, the La Calleja neighborhood has the least availability of commerce and services, reducing the traffic of people around. In terms of housing, the Prado neighborhood mainly consists of single-family homes, ranging from one to three floors, with direct access from the street. In Canodromo, the houses are primarily single houses with a larger area featuring front gardens or garages in front of the house. In contrast, the La Calleja neighborhood mainly comprises houses or building complexes.

To cross-check the characteristics of the neighborhood, a validation process was conducted based on the variables extracted from the literature review and their status in the study area. As a result, relationships were discovered between the density of urban fabric in each neighborhood and the presence of uses and services that generate noise, affect air quality, produce garbage, and influence the quality of the sidewalks. Additionally, elements representing the safety of the neighborhood were identified.

In the Prado neighborhood, car repair shops, and auto parts stores are highly associated with noise from handling tools and testing sound equipment. This, in turn, affects the quality of the air and sidewalks due to the use of oils and chemicals from automobiles and poorly parked cars occupying the sidewalks and leading to their deterioration. In terms of security, the presence of elements such as barbed wire, high walls, and fences in front of houses indicates the presence of insecurity in the neighborhood or the fear of inhabitants becoming victims inside their homes.

In contrast, in the La Calleja neighborhood, the elements indicating insecurity were almost imperceptible, although still present. However, they were approached differently, using green barriers between the street and the complexes and less aggressive or noticeable wire fences. The absence of services and commerce in this neighborhood could be linked to the lack of pedestrians and automobiles on the streets, resulting in low noise levels and optimal air quality. Garbage is minimal, and according to specific points, garbage collection is controlled and organized. However, the sidewalks, although in good condition in particular areas, deteriorated due to the growth of nearby trees.

Regarding the Canódromo neighborhood, the air, noise, and sidewalks were in acceptable condition, possibly due to the limited presence of commerce and services on the streets. Security elements were related to low walls surrounding the houses and the company of wires. The fact of garbage containers indicates the existence of a collection system. Still, these places became focal points of waste and even insecurity due to separating and recycling materials in situ. The figure below depicts the density of buildings in each neighborhood through images. Additionally, in the map of uses, orange and green dots represent the presence of commerce and services. Besides, the figure includes some pictures that describe the situation of the variables according to each neighborhood grouped according to the collinearity among them.
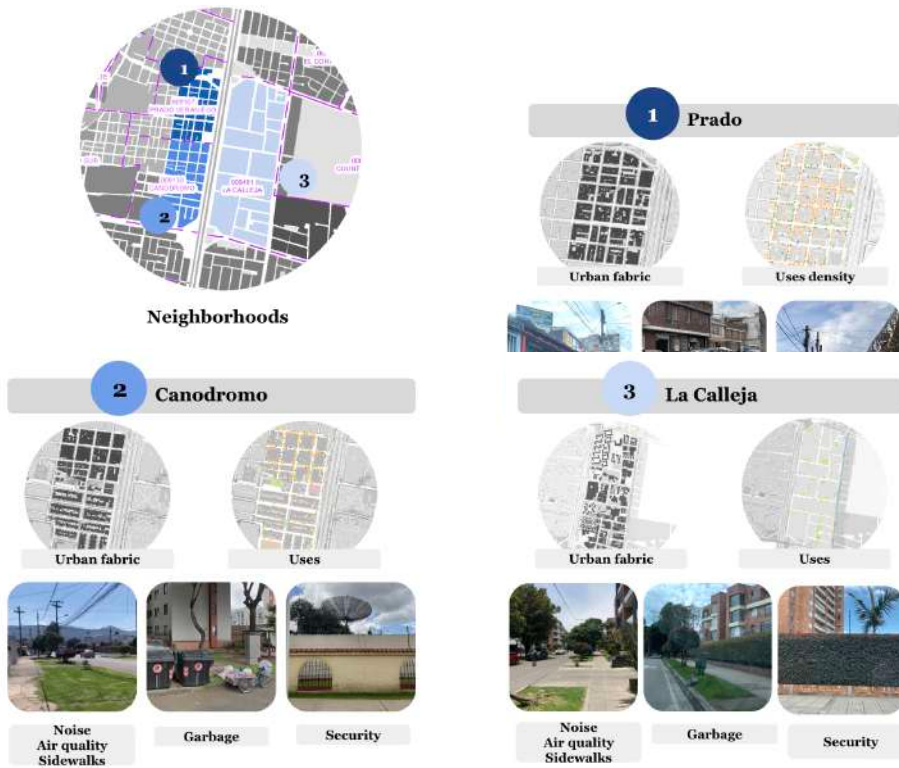
Fig.3.23 Site-visit observation. Source: Author, 2023.

Primary data

The survey results indicate the socio-demographic characteristics of the 62 participants that the global sample covers. Table 3.1 shows their gender, age, birthplace, marital status, and social network characteristics. The table also includes variables related to neighborhood quality, such as type of residence, residence location, and the neighborhood where the participant resides. Furthermore, the table presents the symptomatology of depression, anxiety, stress, and general symptoms in the study participants.

The data in Table 3.1 indicates that 56% of the sample are female and 44% are male. Canodromo had the highest percentage of females (65.0%), while Prado had the highest rate of males (60.0%). The age distribution is 4.84% for 18-26 years, 74.19% for 27-59 years, and 20.97% for 60 years or older.

Nearly 79.03% of the sample were born in Bogotá or another urban area, while 20.97% were from rural areas. Regarding marital status, 53.23% are married or living with someone, while 46.77% are single, divorced, or widowed. Most of the sample (50%) live in single houses, while the rest (50%) live in residential complexes. Most participants (88.71%) lived in their neighborhood, while 11.29% lived near the highway. Regarding social support, 72.58% of participants had a support network, with the majority (53.23%) consisting of family members. The proportion of participants reporting symptomatology is depression (20.97%), anxiety (32.26%), stress (25.81%), and general symptoms (45.16%). The sociodemographic, physical, and social attributes varied across the three study neighborhoods.

In summary, table 3.1 provides insights into the study sample's demographic data, allowing for a better understanding of the socio-demographic factors that may influence social capital, neighborhood quality, and mental health in the study area.

Study case

Table 3.1 Global sample socio-demographic characteristics study area, Bogotá, Colombia, 2023				
Variables		n=62	Total %	Cumulative %
Gender	Female	35	56,5	56,5
	Male	27	43,5	100,0
Age*	18 - 26 years	3	4,8	4,8
	27 - 59 years	46	73,6	78,4
	≥ 60 years	13	20,8	99,2
Birth place**	Bogotá	42	67,7	67,7
	Another urban area	7	11,3	79,0
	Rural area	13	21,0	100,0
Marital status*	Married	23	37,1	37,1
	Free union	6	9,7	46,8
	Single	21	33,9	80,7
	Divorced	9	14,5	95,2
	Widowed	3	4,8	100,0
Having a support network	Yes	45	72,6	72,6
	No	17	27,4	100,0
Type of support network	Family members	33	73,3	73,3
	Others (friends, neighbors, co-workers)	12	26,6	99,9
Support network residing nearby*	Yes	29	64,4	64,4
	No	16	35,6	100,0
Type of residence*	Single house	31	50,0	50,0
	Residential complex	31	50,0	100,0
Residence location*	Within the neighborhood	55	88,7	88,7
	In front of the highway	7	11,3	100,0
Neighborhood*	Prado	20	32,3	32,3
	Canodromo	20	32,3	64,6
	La Calleja	22	35,5	100,1
Depression symptomatology	No symptoms	49	79,0	79,0
	With symptoms	13	20,9	99,9
Anxiety symptomatology	No symptoms	42	67,7	67,7
	With symptoms	20	32,3	100,0
Stress symptomatology	No symptoms	46	74,2	74,2
	With symptoms	16	25,8	100,0
General symptomatology	No symptoms	34	54,8	54,8
	With symptoms	28	45,2	100,0

Table 3.1 Global socio-demographic characteristics. Source: Author, 2023

Outcome

- Validate that the variables extracted from the literature review were present in the study area.
- Identify the situation and behavior of each variable in the territory.
- Identify the characteristics of the neighborhood and their relationship with social dynamics.
- Collinearity between variables, such as noise with garbage, and air quality. Or garbage and sidewalk quality.
- People's perspective on neighborhood quality, social capital, and mental health.

Findings

Secondary data: the distribution of aspects is associated negatively with the environmental conditions, i.e., as the stratum increases, the percentage decreases with each variable, air pollution, noise, garbage presence, and insecurity risk. This dynamic is repetitive when measuring the well-being variables, where the lower stratum reports more individuals suffering than the higher stratum and similar situations concerning the population thriving. However, regarding social capital, the differences between social networks are indifferent to the stratum level. In addition, there are no significant differences between localities, and all believe that the family is Bogota residents' most important social network. It is relevant to emphasize that concerning well-being, the assessment of population well-being requires a comprehensive approach that considers both objective and subjective measures.

Site visit: There were notable differences in the dynamics of each neighborhood during off-peak and peak hours. Additionally, the hours available for field visits were impacted by security concerns, requiring visits during daylight hours and primarily via motorized vehicles. The urban fabric of each neighborhood proved distinct, resulting in a more linear route through La Calleja and a more fragmented route through Prado. These

differences were attributed to variances in the size of residential blocks and the prevalence of mixed activities, including residential, commercial, and service-oriented establishments or only a limited number of services.

Primary data: The survey structure allowed access to intimate topics for the user, achieving a conversation and a certain level of trust around their mental health. However, it was evident that women tend to take longer to reflect on more intimate questions. In contrast, men resist these questions and respond more quickly or with an answer that indicates normality.

From the interviewer's position, people from the lower-middle strata were more willing to engage in conversation and take the time to respond to the survey. This was an opportunity to talk with respondents about their satisfaction, frustrations, and anecdotes about the neighborhood. On the other hand, people of higher socioeconomic levels showed less apathy when approached by the interviewer. Due to this attitude, it was necessary to contact people nearby who could recommend us to be well-received within the neighborhood and the residential complexes. For this same reason, it is essential to approach residents in public spaces during their leisure time after work and on weekends. It is necessary that the researcher should be willing to have several hours and have the attitude available to hold long conversations since people open up to communicate their problems or those of the community by allowing themselves to be questioned about their mental health.

Due to the experience with the questions that required prioritization or levels of importance between the physical environment, social environment, and mental health, it is necessary to formulate them in such a way that the user does not have to choose between their priorities, as this assumes that one variable is more important than another. People with dogs and children are more familiar with the characteristics of the neighborhood since they spend more time around the area, in the streets, or in public spaces. Other residents prefer to avoid walking around the neighborhood, mainly in the

Calleja neighborhood. The researcher in the study area perceived high levels of noise, the presence of graffiti, elements that generated insecurity, and air pollution. However, for the residents, several of these elements went unnoticed; the naturalization of these elements in the space was evident.

In conclusion, the collection of information from the point of view of public sources, the visit of the researcher, and the opinion of individuals allow the creation of a solid base of information from different scales. This base comprises a literature review and data at the city, locality, and stratum level, a second step in which this information is validated through the field visit, and finally, cross-matching that combination with the people's perspective. This way, the pure information necessary for the subsequent analysis stage and the search for correlations between variables was generated.

3.3 Data analysis.
Version 1. Global analysis
To analyze the information, the reader should bear in mind that the study is based on developing a method that searches for correlations between neighborhood quality and mental health—the opposite of indicating the causes that produce the appearance of symptoms of mental health deterioration.

3.3.1 The method
   Analysis strategy
The first version of the analysis is a pilot of the method to correlate the information of the variables previously collected. This analysis is based on the primary data and is conducted in three phases. The first is a descriptive analysis with the total sample data for each aspect - physical environment, social capital, and mental health. The outcome is presented in frequency tables with the proportion of residents' perceptions according to each variable. The second phase is a bi-variate analysis, in the first stay

conducted to explore the relationships of characteristics in each neighborhood that seem to influence symptoms of depression, anxiety, and stress. Due to the general objective of this study and the range of interest, the dependent variables correspond to those related to mental health, depression, anxiety, stress, and general symptomatology. As outlined in the theoretical framework, the current understanding of mental health pertains to the lack of symptoms. Therefore, in the context of this research, mental health refers to the absence of depression, anxiety, stress, and general symptomatology. Thereby, the independent variables in this analysis are certain variables grouped within the aspect of the physical environment and social capital:

Physical environment:	Social capital:
• Noise	• Social networks,
• Air quality	• Age,
• Garbage presence,	• Gender
• Sidewalks quality,	• Birthplace,
• Neighborhood insecurity.	• People's perception.

Descriptive analysis

Understanding that this document will be reviewed mainly by architecture and urban planning professionals, this section aims to briefly explain the statistical methodology supporting this study and find the probability of relationships between variables.

In many questions containing multiple responses, these options were grouped and transformed into dichotomous and polytomous three-choice variables for analysis. Each grouping system is explained appropriately in the chapter devoted to the research and results. The qualities of this type of study are based on having a larger sample since it allows to obtain responses with more significant variability, and therefore, the opportunity to find relationships increases.

To analyze the only quantitative variable of the questionnaire, the Shapiro-Wilk test was carried out to test the normality in the distribution of the responses. In this way, it was possible to verify that age was normally distributed, with values less than 1, among the people who showed symptomatology for any of the disorders tested. Moreover, T-tests were used to analyze if age is a factor that could suggest its relationship with any mental health disorder related hitherto.

The P-value refers in the statistics to the probability of a relationship between one variable or another. According to Dahiru, T. (2008), it is defined more specifically as The term "P-value," which represents the likelihood, under the assumption of no effect or difference (null hypothesis), of obtaining a result equal to or more extreme than the one observed. This P-value measures the probability that any observed difference between groups is merely due to chance. In this study, the P-value has a level of significance of 0.05, i.e., higher values than 0.05 (> 0.05) indicate strong evidence to support the null hypothesis. Thus, the relationship tested is not statistically significant. On the other hand, p-values less than or equal to 0.05 (≤ 0.05) reject the null hypothesis and, therefore, indicate that the relationship tested is statistically significant. In other words, It provides compelling evidence contradicting the null hypothesis, as the probability of the null hypothesis being correct (and the results being random) is less than 5%. (Mcleod, 2023).

Some of the factors that influence the P-value and that were experienced in this study are:

- The sample size: the aim of having a significant sample size is because it is more likely to generate different responses, resulting in a higher probability of finding relationships among variables.
- The spread of the data: "In a data set, it is measured commonly with standard deviation. The bigger the standard deviation, the more the spread of observations and the lower the P value." (Dahiru, T. (2008)

- Cluster effect: refers to the "potential for correlation of outcomes among patients in similar groups, which can result in a loss of independence of observations." (Oltean, H. and Gagnier, J.J., 2015)

A frequency test was conducted with independent samples and X^2 tests of association to analyze qualitative variables. Since this study seeks a positive outcome, which is mental health, the related factors are linked to the number of people who responded that they were free of any of the mental disorders studied here. The frequency test aimed to identify the p-value in the relationships between the proposed variables. With that in mind, the variables that yield p-values less or equal to 0.05 were considered to be analyzed in the next step through an association measurement. The association measurement refers to the Odds ratio, which enables an understanding of the degree of association between 2 variables. Herewith, it was possible to find the higher or lower probability that one or another group of respondents have according to certain conditions. The Odds ratio is obtained through the frequency tables.

Table 4 describes the methodology ruling the p-value tests in this research, identifying the correlations between mental health, neighborhood quality, and social capital. The table presents the variables related to the physical and social environment as the independent variables and depression, anxiety, stress, and general symptomatology as the dependent variables. The P-values were obtained from the correlation analysis between each independent and dependent variable. The possible number of correlations between each independent variable and each dependent variable is also presented, as well as the total number of correlations found between all independent and dependent variables. Moreover, the number of independent variables that found a correlation with a mental health condition is provided, along with the total number of independent variables. The table also indicates whether the responses of each variable were grouped due to better statistical analysis and results.

Mental health and built environment

Mental health and built environment

Bivariate analysis

Epidemiology is a field of medical science that explores all the factors that influence the occurrence or absence of diseases and disorders. (National Institute of Deafness and Other Communication Disorders, 2011). It aims to find the degree of association between a condition or health event (dependent variable) and a given exposure factor (independent variable). Therefore, in this study, the dependent variables are those associated with mental health, and the independent variables are those related to the physical and social environment.

Thanks to measures of association, these relationships can be quantified. This can be quantified by calculating a hypothesis test (P-Value) explained previously. However, this value needs to provide information about the magnitude of the effect and whether the product is relevant.

Therefore, a measure of association is needed to evaluate the strength of the correlation between variables. Seeing the large picture, these measures can be divided into relative effect measures (based on coefficients) and absolute effect measures (based on differences) (Fuentes Ferrer, M.E. and Prado González, 2013). For this study, a brief explanation of relative effect measures will be given since they are referred to in this paper. Comparable effect measures include relative risk (RR), prevalence ratio (PR), and odds ratio (OR).

Relative risk (RR) and prevalence ratio (PR): Both relative risk and prevalence ratios indicate the number of times a disease is more likely to develop in the exposed group than in the non-exposed group (Fuentes Ferrer, M.E. and Prado González, 2013). They differ in that relative risk is the measure of choice in observational cohort studies and experimental studies. Prevalence ratios, on the other hand, measure the association that can be calculated in cross-sectional or prevalence studies, i.e., the risk of suffering the disease at the time of the survey.

An example of how measures of association are presented is the contingency tables (2x2) used in this study to calculate the ratio

	Diseased	Not Diseased	Total
Exposed	A	B	A+B
Not exposed	C	D	C+D
Total	A+C	B+D	A+B+C+D

Table 5. 2x2 table calculation of association. Source: Author based on 'Medidas de frecuencia y de asociación en epidemiología clínica'. Fuentes Ferrer, M.E. and Prado González, 2013, 2023

Boxes A, B, C, and D represent different combinations between disease and exposure:

A: number of exposed persons who have the disease;

B: number of exposed persons who do not have the disease;

C: number of non-exposed persons who have the disease;

D: number of non-exposed persons who do not have the disease.

The variable in the graph's first column is defined according to the study's objective. In the case of this study, the non-presence of symptoms will be expressed in the first column.

The relative risk and prevalence ratios are calculated by dividing the risk or prevalence of disease in those exposed (nominator) by the majority of infection in those not exposed (denominator) (Fig.3.24).

$$Risk\ Ratio = \frac{Risk\ of\ disease\ in\ exposed\ group}{Risk\ of\ disease\ in\ unexposed\ group} = \frac{\frac{a}{(a+b)}}{\frac{c}{(c+d)}}$$

Fig.3.24 Risk ratio formula. Source: Barratt, H., Kirwan, M. and Shantikumar, S. 2018

Results with values greater than 1 indicate that the exposure is a risk factor for that disease, while values less than 1 indicate that the exposure is a protective factor for the disease. If the RR or PR result is 1, there is no association between exposure and disease since the incidence of those

exposed is the same as those not exposed. The numerical quantitative interpretation is very similar to the RR or rate ratio. Its qualitative performance differs from that of the RR because in a cross-sectional study, no statement can be made about the risk of becoming ill, but only about the risk of suffering the disease (prevalence) at the time of the study (Fuentes Ferrer, M.E. and Prado González, 2013).

Odds ratio (OR): According to Magdalena Szumilas: The odds ratio (OR) is a measure that indicates the probability of an outcome occurring based on a specific exposure, relative to the likelihood of the same outcome in the absence of that exposure. While predominantly used in case-control studies, odds ratios can be adapted for cross-sectional and cohort designs with appropriate adjustments and assumptions (2010).

In other words, the OR explains how much more opportunity for exposure a group of healthy people has versus the opportunity for a group of diseased people. It is interpreted on a multiplicative scale as the number of times the probability of exposure is higher in the exposed group than in the unexposed group (Fuentes Ferrer, M.E. and Prado González, 2013).

$$\textbf{Odds Ratio} = \frac{Odds\ of\ disease\ in\ exposed\ group}{Odds\ of\ disease\ in\ unexposed\ group} = \frac{\frac{a}{b}}{\frac{c}{d}} = \frac{ad}{bc}$$

Fig.3.25 Odds ratio formula. Source: Barratt, H., Kirwan, M. and Shantikumar, S. 2018

To summarize, the relationship between variables is done through a hypothesis test (P-value) that tells how likely two variables are related. Significant differences exist in their categories, starting from a null hypothesis and complemented by an alternative idea. Secondly, after finding a relationship, it proceeds to find the probability that one group has compared to another according to frequency and regression analysis.

Table 6 describes the method to interpret the global bivariate analysis proposed in the study case. It focuses on the variables directly correlating

with mental health conditions, specifically depression, anxiety, stress, and general symptomatology. The table provides the number of correlations for each mental health condition and social capital variable. For social capital, the odds ratio (OR) is presented, indicating the odds of presenting symptoms of a mental health illness for the group with higher exposure compared to the group with no exposure, worse conditions vs. better conditions, or in polygamous variables, the correlation with a valid p-value. The confidence interval (CI) is also provided, indicating that 95 times out of 100, the OR will fall between those values. Narrowed values indicate better results, while weak sample sizes may limit the accuracy of estimations.

Regression analysis

With the bivariate analysis and according to the P-values, this study categorized the variables according to the level of correlation. The variables with correlations with P-values ≤ 0.05 refer to the direct relations, and the P-values > 0.05 refer to the indirect correlations. The following analysis is conducted only with explicit variables, demonstrating more accuracy in the level of correlation.

The regression analysis aims to calculate the behavior of a value in Y for each increment of a deal in X. In this study, the variables in Y are the non-presence of depression, anxiety, stress, or general symptoms, and the variables in X are neighborhood security, high noise levels, garbage presence, and social network, among others. In other words, the regression analysis was used to compare the people with a higher perception of noise levels and those with a low perception of noise levels correlated with the non-presence of any mental disorder hitherto studied.

Finally, through an association measurement, it is possible to conclude what is the probability that one sample group or another has less or more likelihood of not presenting depression, anxiety, stress, or general symptomatology.

Mental health and built environment

Mental health and built environment

Analysis tools

A national and international literature review was conducted on the tools used for this research's multivariate analysis. Studies carried out in the Colombian context regarding subjects related to this investigation have revealed that a portion of the discussion revolves around the built environment's quality and its effects on the elderly population in cities such as Medellin. Some examples of the studies are:

Friendly Residential Environments That Generate Autonomy in Older Persons. (Segura Cardona, A. et al. 2022).
Salud y bienestar mental de la persona mayor en cinco ciudades de Colombia. (Cardona, D. et al. 2022).
Social Network of Friends and Physical Activity in University Students: 2613 Board #277 May 31, 9:30 AM - 11:00 AM. (Arango, C. et al. 2019).

From that literature review, the analysis method adopted in the studies was taken as a reference since it demonstrated validity and applicability in the Colombian context. After "training" in the software and statistical analysis, all the work on the computer was carried out using the JAMOVI platform, as free and open statistical and scientific software.

On top of that, an international example was studied to provide an objective perspective on the subject to obtain a closer understanding of the implementation of environmental psychology.   The study presented evidence of the methods and strategies implemented in place-based research. Thus, the review referenced the structure, the sources, and the tools employed when assessing aspects of the built environment, mental health measurements, and their relation. The research report entitled "Urban Built Environment and Depression: a Multilevel Analysis" (Galea, S. et al. 2005). She was referring to a study conducted in 2005 in New York City in 59 community districts.

Findings

To analyze the information collected in this research, it was considered essential to incorporate knowledge from various areas of study to establish the relationships initially proposed. Given that this research and measurement methodology seeks to establish links between topics from fields such as architecture, urban design, social sciences, and psychology, the inclusion of concepts from epidemiology allows for more precise and complex results to be obtained. Despite searching for references of studies that include similar aspects associated with this research in comparable contexts, no previous model was found that instructs a similar analysis process to be developed. Therefore, this research method is empirical from the data collection stage through to the ideation of the analysis. The present document reports on the results of the piloting of the method in its first and second versions. It is important to note that there is no established unit of measurement for mental health; instead, it is measured by the absence of symptoms related to mental disorders. This lack of a standardized unit of measurement affects the relationship between the health system, academia, and private institutions concerning research, treatment, and investment of resources in mental health. Currently, this relationship is only established to address mental illnesses and their treatments, not to address the origin, prevention, and promotion of mental health.

Limitations

The present study highlights the lack of a previous process that outlines the steps to identify correlations between the built environment and mental health. This is combined with the absence of validated methods and trained professionals with expertise in conducting this type of research in the Colombian context. In addition, limited training is available in measurement tools that indicate these types of relationships in scarce data availability. Consequently, research in this area is often empirical and limited. Furthermore, there is no pre-established guide for these studies, so the analysis process is characterized by a constant need to engage in trial

and error. This factor can significantly influence the duration of the research project execution. Given the intervention of multiple disciplines and the use of basic concepts from each of them in the different stages of the research process, the researcher is often faced with uncertainty and the need to consult professionals from each discipline. This makes the research process more complex and highlights the importance of interdisciplinary collaboration in this area of study.

Conclusions

For this type of research, an optimal team would consist of diverse experts, including statisticians, epidemiologists, urban planners, and professionals keen to comprehend the connection between the built environment and mental health. Or, failing that, it is a necessity that the professional who undertakes this type of research should have a previous study of the basic concepts of these areas. In addition, with the lack of information and resources, few professionals are willing to investigate and produce knowledge on the subject, especially in contexts where investment in this type of research has not been sufficient. At the same time, it is necessary that specialists in the use of statistical tools train professionals interested in interpreting data that indicate the relationships between different variables.

The development of this tool is expected to open the opportunity for other professionals to approach this topic and contribute knowledge to the development of the device from different contexts.

3.3.2 Study case

Analysis

The first phase of the data analysis methodology consists of a descriptive analysis performed with the variables assessed by the respondents. The variables are grouped into three aspects - social capital, neighborhood quality, and mental health. The outcome is presented in frequency tables with the proportion of residents' perceptions according to each variable. This analysis aims to test the investigation method and measurement tool in

the study area and indicate the relations between physical and social traits in the respondents' mental health. Table 4.1 describes the perceived neighborhood and social attributes concerning depression, anxiety, and stress. The table has 26 variables grouped into social capital and neighborhood quality, containing 12 and 14 variables, respectively. It is presented in a tabular format with rows and columns. The rows represent social capital and neighborhood quality variables, while the columns represent mental health variables and their correlations with the outcome measures. The correlations are presented in terms of P-value, indicating direct and indirect correlations. A mark represents direct correlations in the checkbox, and indirect correlations are identified by bold numbers in the table, representing P-values between 0,05 and 0,1. The analysis found that out of the total number of social capital variables, 58% exhibited a correlation. Further, out of all possible combinations, 14 associations were discovered between the 12 social capital variables and the four mental health variables. The statistical analysis indicated eight direct and six indirect associations, as evidenced by the P-values. The study revealed that 71% of the variables correlated with the physical environment. The P-values indicated nine direct associations and ten indirect associations.

In conclusion, the variables that indicated direct correlations are age, marital status, having a support network, physical attribute that affects the most, neighborhood's impact on mental health perception, and importance of a support network nearby, residence location, area, high noise, high noise affectation, and cleanliness frequency. The variables included in the indirect correlations section are birthplace, marital status, having a support network, neighborhood's impact on mental health perception, type of residence, neighborhood, high noise, high noise affectation, insecurity cases to the respondent, hearing or witnessing insecurity cases, insecurity due to graffitis, cleanliness frequency, and air quality. With that information, the following analysis measures the degree of association between these variables.

Mental health and built environment

Mental health and built environment

Table 6.1 summarizes the global bivariate analysis of the relationship between neighborhood quality perception, social capital, and mental health in the study area in Bogotá. The table is divided into two sections: social capital correlations and correlations with neighborhood quality. In addition, Odds ratios (OR) and confidence intervals (CI) are also reported. The confidence interval (CI) values represent the range of values where the proper population parameter is likely to lie. CI values that express 0.00 - inf. Indicate that the sample size's strength is insufficient for more accurate estimations. Narrowed values indicate better results. In addition, the table describes the relations found by each variable according to one or various mental disorders.

It concerns the sociodemographic variables that indicated direct correlations, age correlated with stress, and marital status with depression and anxiety. Variables that reported association with general symptomatology are having a support network, the physical attribute that affects the most, and the neighborhood's impact perception on mental health. The importance of having a support network nearby indicates an association with anxiety and general symptomatology. Among the variables of the physical environment, residence location and the type of neighborhood are related to depression and stress. The perception of high noise levels found correlations with anxiety, stress, and general symptoms. In addition, perceiving the affectation of noise and the cleanliness frequency of the neighborhood is related to present general symptoms.

In summary, the variable that indicates a more significant number of direct correlations was the perception of high noise levels with three out of four possible associations. Moreover, the physical environment variables showed more correlations with a mental disorder since three out of five presented two or more correlations. The mental disorder more associated with physical and social variables is general symptomatology.

Indirect correlations refer to variables that, in combination with a directly correlated variable, may also affect the presence of a mental disorder. Table 6.2 summarizes the global bivariate analysis of the indirect variables that describe the correlations between neighborhood quality, social capital, and mental health. The table is divided into social capital and neighborhood quality variables.

The social capital variables section shows that birthplace and marital status displayed correlations with general symptomatology. Not having a support network indicated associations with symptoms of depression and stress. Additionally, the perception of the neighborhood's impact on the resident's mental health was associated with anxiety and stress. The neighborhood quality variables section shows that the type of residence, high noise levels, hearing or witnessing insecurity cases, and the cleanliness frequency of the neighborhood indicate indirect correlations with anxiety. Furthermore, the type of neighborhood showed an association with anxiety and general symptomatology. The affectation of noise in the resident's routines is associated with anxiety, the respondent's insecurity, and air quality with general symptoms. Lastly, the perception of insecurity due to graffiti indicates a correlation with stress symptoms.

In summary, Table 6.1 and 6.2 provides a detailed analysis of the direct and indirect correlations between social capital, neighborhood quality, and mental health in the study area in Bogotá, Colombia. The table's structure clearly explains the relationships between variables and their impact on mental health outcomes.

After obtaining the results from the bivariate analysis, regression analysis is conducted only with those variables that showed direct relationships with a mental illness (Bivariate analysis for indirect variables is presented in annex 3). The purpose of this analysis is to calculate the levels of relationship between variables by comparing the group of affected people with those of unaffected people exposed to certain conditions, such as noise, air pollution,

or insecurity, among others. The regression analysis allows for a more in-depth examination of the relationships between variables, considering potential confounding factors and controlling for other variables that may affect the outcome. This analysis is crucial for identifying the most significant factors contributing to mental health outcomes in the study area. Tables 7 and 7.1 present the interpretation and results of contingency tables and logistic regressions for the relationship between neighborhood quality perception, social capital, and mental health, respectively.

The left side of the table presents the interpretation of the contingency tables and regression analysis of each variable with the pathology to which it was found to be related. The right side of the table shows the results of these two statistical analyses between the same variable and pathology. Unlike the qualitative variables, an independent samples t-test was conducted to examine the correlation between quantitative and mental health variables. This test allows for comparing means between two groups, one with the mental health condition of interest and the other without it. The t-test results provide information on whether there is a statistically significant difference between the means of the two groups and the magnitude of this difference. For variables with more than two response options (dummy variables), the analysis takes the group of people most exposed to the evaluated factor compared to the least exposed group and the neutral group. Only the dummy variable showing a p-value of less than 0.05 is taken to interpret these variables.

In summary, the variables that infer more representative statistical values are the correlations between the location of the residence and the type of neighborhood with depression and stress, in addition to high noise levels perception with anxiety, stress, and general symptomatology.

The Method

Table 7. Results interpretation contingency tables and logistic regressions of neighborhood quality perception, social capital, and mental health study area in Bogotá, Colombia, 2023.

Age and stress						
Independent Samples T-Test				**Model Coefficients - Stress symptomatology**		
	Statistic	df	p	Predictor		95% Confidence Interval
Age	T test: statistical analysis method used in this research to correlate a dichotomous dependent variable (each aspect of mental health) and an independent numeric variable (age).			Age	For each unit increase in age, the probability of having stress increases by 4%.	This study is 95% confident that the correlation between age and stress in the population of the study area is between 1.00 and 1.10.

Marital status and depression				
Contingency table			**Binomial Logistic Regression**	
Direct correlations P<0,05	**Depression - dependent variable**		**Model Coefficients - Depression_dichotomous**	
	No symptoms	With symptoms	People living alone are 33% more likely to have symptoms of depression than people living with others.	95% Confidence Interval
Marital status dichotomous - independent variable				The probability, with 95% confidence, that the relationship between marital status and depression lies between 1.47 and 36.7
Alone		Of the total number of people who presented symptoms of depression, more than 80% of people live without a partner and 15% live with a sentimental partner.		
With company	Of those who did not present depression symptoms, 42% live alone and 57% live with someone else.			

Marital status and anxiety				
Contingency table			**Binomial Logistic Regression**	
Direct correlations P<0,05	**Anxiety**		**Model Coefficients - Anxiety_dichotomous**	
	No symptoms	With symptoms	People who live alone are 50% more likely to have anxiety symptoms compared to people who have a partner.	95% Confidence Interval
Marital status dichotomous				The 95% confidence that this relationship will resurface between 1.8 to 22.9.
Alone		Of the total number of people who presented symptoms of anxiety, the 80% of people live without a partner and 20% live with a sentimental partner.		
With company	Of those who did not present anxiety symptoms, 38% live alone and almost 62% live with someone else.			

Having a support network and general symptomatology				
Contingency table			**Binomial Logistic Regression**	
Direct correlations P<0,05	**General symptomatology**		**Model Coefficients - General_dichotomous**	
	No symptoms	With symptoms	Not having a support network has 35% more probability to present general symptomatology of depression, anxiety, and stress.	95% Confidence Interval
Having a support network				This study is 95% confident that this correlation in the population of the study area is between 1.3 and 14.6.
No	Of the total number of people who do not have a support network, 29% did not present general symptoms and more than 70% presented general symptoms of depression, anxiety and stress.			
Yes	Of the total number of people who do have a support network, more than 60% had no symptoms of depression, anxiety and stress, and less than 40% had general symptoms.			

Perception of the physical attribute that affect the most and general symptomatology				
Contingency table			**Binomial Logistic Regression**	
Direct correlations P<0,05	**General symptomatology**		**Model Coefficients - General_dichotomous**	
	No symptoms	With symptoms	The values taken into account are those for which the p-value of the regression analysis shows the strongest correlation.	95% Confidence Interval
Physical attribute that affects the most			People who perceive high levels of noise are 11 times more likely to have general symptoms of depression, anxiety and stress, compared to people who perceive constant presence of garbage.	The 95% confidence that this correlation between high noise and general symptoms will resurface in future research lies between 1.17 to 108.41.
Sidewalk quality	Of the people most affected by the quality of the sidewalks, 50% did not present general symptoms and 50% did present symptoms.			
Air quality	Of the total number of people most affected by the quality of the air, 100% presented general symptoms.			
Garbage presence	Of the total number of people most affected by the presence of garbage, 90% did not present general symptoms.			
Noise	Of the total number of people affected by noise, 47% had no general symptoms and more than 50% had general symptoms.			
Insecurity	Of the total number of people more affected by insecurity than other aspects, 53% did not present general symptoms and 46% did present general symptoms of depression, anxiety, and stress.			

Neighborhood impact on mental health perception and general symptomatology				
Contingency table			**Binomial Logistic Regression**	
Direct correlations P<0,05	**General symptomatology**		**Model Coefficients - General_dichotomous**	
	No symptoms	With symptoms	People who do not perceive the impact of neighborhood quality on mental health are almost 17% more likely to have general symptoms of depression, anxiety and stress.	95% Confidence Interval
Neighborhood's Impact on mental health perception				This study is 95% confident that this correlation in the population of the study area is between 0.055 and 0.50.
No	Of the total number of people who did not present general symptoms, 70% did not consider that the quality of the neighborhood had an impact on their mental health. On the other hand, 29% do consider that it does have an impact.	Of the total number of people who presented general symptoms, 71% considered that the neighborhood affected their mental health and 28% considered the opposite.		
Yes				
Total				

Table 7. Interpretation of contingency tables and regression analysis
Source: Author, 2023

Study case

Table 7.1 Contingency tables and logistic regressions of neighborhood quality perception, social capital, and mental health study area in Bogotá, Colombia, 2023

Age and stress

Independent Samples T-Test				Model Coefficients - Stress symptomatology				
	Statistic	df	p				95% Confidence Interval	
				Predictor	p	Odds ratio	Lower	Upper
Age	Student's t	2,16	60,0	0,034				
				Age	0,040	1,040	1,002	1,100

Marital status and depression

Contingency table					Binomial Logistic Regression				
Direct correlations P<0,05		Depression			Model Coefficients - Depression_dichotomous				
		No symptoms	With symptoms	Total				95% Confidence Interval	
					Predictor	p	Odds ratio	Lower	Upper
Marital status dichotomous					Marital status dichotomous				
Alone	Observed	21	11	32	With company - Alone	0,015	7,330	1,467	36,660
	% within column	42,9 %	84,6 %	51,6 %					
With company	Observed	28	2	30					
	% within column	57,1 %	15,4 %	48,4 %					
Total	Observed	49	13	62					
	% within column	100,0 %	100,0 %	100,0 %					

Marital status and anxiety

Contingency table					Binomial Logistic Regression				
Direct correlations P<0,05		Anxiety			Model Coefficients - Anxiety_dichotomous				
		No symptoms	With symptoms	Total				95% Confidence Interval	
					Predictor	p	Odds ratio	Lower	Upper
Marital status dichotomous					Marital status dichotomous				
Alone	Observed	16	16	32	With company - Alone	0,004	6,500	1,843	22,920
	% within column	38,1 %	80,0 %	51,6 %					
With company	Observed	26	4	30					
	% within column	61,9 %	20,0 %	48,4 %					
Total	Observed	42	20	62					
	% within column	100,0 %	100,0 %	100,0 %					

Having a support network and general symptomatology

Contingency table					Binomial Logistic Regression				
Direct correlations P<0,05		General symptomatology			Model Coefficients - General_dichotomous				
		No symptoms	With symptoms	Total				95% Confidence Interval	
					Predictor	p	Odds ratio	Lower	Upper
Having a support network					Having a support network				
No	Observed	5	12	17	Yes - No	0,017	4,350	1,299	14,570
	% within row	29,4 %	70,6 %	100,0 %					
Yes	Observed	29	16	45					
	% within row	64,4 %	35,6 %	100,0 %					
Total	Observed	34	28	62					
	% within row	54,8 %	45,2 %	100,0 %					

Perception of the physical attribute that affect the most and general symptomatology

Contingency table					Binomial Logistic Regression				
Direct correlations P<0,05		General symptomatology			Model Coefficients - General_dichotomous				
		No symptoms	With symptoms	Total				95% Confidence Interval	
					Predictor	p	Odds ratio	Lower	Upper
Physical attribute that affects the most					Physical attribute that affects the most				
Sidewalk quality	Observed	9	9	18	Sidewalk quality + Noise	0,862	1,125	0,298	4,240
	% within row	50,0%	50,0%	100,0 %	Air quality + Noise	0,991	7,19E-08	0,000	Inf
Air quality	Observed	0	3	3	Garbage presence + Nois	0,036	11,250	1,157	108,410
	% within row	0,0 %	100,0 %	100,0 %	Insecurity + Noise	0,713	1,313	0,309	5,580
Garbage presence	Observed	10	1	11					
	% within row	90,9%	9,1%	100,0 %					
Noise	Observed	8	9	17					
	% within row	47,1%	52,9%	100,0 %					
Insecurity	Observed	7	6	13					
	% within row	53,8%	46,2%	100,0 %					
Total	Observed	34	28	62					
	% within row	54,8 %	45,2%	100,0 %					

Neighborhood impact on mental health perception and general symptomatology

Contingency table					Binomial Logistic Regression				
Direct correlations P<0,05		General symptomatology			Model Coefficients - General_dichotomous				
		No symptoms	With symptoms	Total				95% Confidence Interval	
					Predictor	p	Odds ratio	Lower	Upper
Neighborhood's Impact on mental health perception					Neighborhood's Impact on mental health perception				
No	Observed	24	8	32	Yes - No	0,001	0,167	0,055	0,502
	% within column	70,6 %	28,6 %	51,6 %					
Yes	Observed	10	20	30					
	% within column	29,4 %	71,4 %	48,4 %					
Total	Observed	34	28	62					
	% within column	100,0 %	100,0 %	100,0 %					

Table 7.1. Contingency tables and regression analysis study case.
Source: Author, 2023

Importance of support network nearby and anxiety				
Contingency table			**Binomial Logistic Regression**	
Direct correlations P<0,05	Anxiety		Model Coefficients - Anxiety_dichotomous	
	No symptoms	With symptoms		95% Confidence Interval
Importance of support network nearby			In terms of a more detailed analysis, the system lack of data to find correlations	The system cannot calculate the CI, thus the sample size lacks the power to make more accurate estimations.
Low				
Neutral	Of the total number of people who did not present symptoms of anxiety, almost 70% considered it very important to have their support network living nearby, and 21% considered the opposite.	Of the total number of people who presented anxiety symptoms, 61% considered it important to live close to the support network, and 38% were indifferent. None of the people who presented symptoms did not consider this aspect important.		
High				
Total				

Importance of support network nearby and general symptomatology				
Contingency table			**Binomial Logistic Regression**	
Direct correlations P<0,05	General symptomatology		Model Coefficients - General_dichotomous	
	No symptoms	With symptoms		95% Confidence Interval
Importance of support network nearby			People who do not consider it important to have their support network close by are 5% more likely to suffer from general symptoms of depression, anxiety and stress, compared to people who are indifferent to it.	This study is 95% confident that this OR in the population of the study area is between 0,003 and 0,78.
Low				
Neutral	Of those who did not present general symptoms, 72% considered it important to have a support network nearby, and only 20% did not consider it important.	Of those who did present symptoms, only one person considered that having a support network nearby was not important and 56% considered the opposite to be true. For 37% it is indifferent		
High				
Total				

Residence location and depression				
Contingency table			**Binomial Logistic Regression**	
Direct correlations P<0,05	Depression		Model Coefficients - Depression_dichotomous	
	No symptoms	With symptoms		95% Confidence Interval
Residence location			People who live across the highway are 81% more likely to have symptoms of depression compared to people who live in the neighborhood.	The probability, with 95% confidence, that this correlation lies between 1.29 and 35.7
Inside the neighborhood	Of the people residing in the neighborhood 83% did not present symptoms of depression and 16% did present symptoms.			
In front of the highway				
Total	Of the people living in front of the avenue, 57% presented symptoms of depression and 42% did not present symptoms.			

Residence location and stress				
Contingency table			**Binomial Logistic Regression**	
Direct correlations P<0,05	Stress		Model Coefficients - Stress_dichotomous	
	No symptoms	With symptoms		95% Confidence Interval
Residence location			People who live across the highway are 10 times more likely to experience stress than people who live in the neighborhood.	The probability, with 95% confidence, that this correlation lies between 1.70 and 58,5
Inside the neighborhood	Of the people residing inside the neighborhood, 80% did not present symptoms of anxiety and 20% did present symptoms.			
In front of the highway				
Total	Of the people living in front of the avenue, 71% presented symptoms of anxiety and 28% did not present any symptoms.			

Neighborhood and depression				
Contingency table			**Binomial Logistic Regression**	
Direct correlations P<0,05	Depression		Model Coefficients - Depression_dichotomous	
	No symptoms	With symptoms		95% Confidence Interval
Neighborhood			People living in the Prado neighborhood are 67% more likely to have symptoms of depression compared to people living in the La Calleja neighborhood.	The probability, with 95% confidence, that this OD between La Calleja and Prado lies between 1.21 and 36.7
Canodromo				
La Calleja	Of the total number of people who did not present symptoms of depression, 34% live in Canodromo, 40% in La Calleja and 24% live in Prado.	Of the total number of people who presented depression symptoms, 61% live in Prado, 23% in Canodromo, and 15% in La Calleja.		
Prado				
Total				

Neighborhood and stress				
Contingency table			**Binomial Logistic Regression**	
Direct correlations P<0,05	Stress		Model Coefficients - Stress_dichotomous	
	No symptoms	With symptoms		95% Confidence Interval
Neighborhood			People living in Prado are 9 times more likely to have symptoms of stress compared to residents of Canodromo and 4 times more likely compared to residents of La Calleja.	This study is 95% confident that this correlation in the population of the study area is between 1,16 - 99,4 for Canodromo and Prado. And 1,17-18 for La calleja y Prado.
Canodromo				
La Calleja	Of the total number of people who did not show symptoms of stress, the majority of people live in both Canodromo and La Calleja (39% in each) and 21% live in Prado.	Of the total number of people who presented symptoms of stress, 62% resided in Prado, 25% in La Calleja, and 12% in Prado. In Prado, 50% of the people presented symptoms of stress and the other 50% did not.		
Prado				
Total				

Table 7. Interpretation of contingency tables and regression analysis
Source: Author, 2023

Importance of support network nearby and anxiety

Contingency table					Binomial Logistic Regression				
Direct correlations P<0,05		Anxiety			Model Coefficients - Anxiety_dichotomous				
		No symptoms	With symptoms	Total				95% Confidence Interval	
Importance of support network nearby					Predictor	p	Odds ratio	Lower	Upper
Low	Observed	7	0	7	Importance of support network nearby				
	% within column	21,9 %	0,0 %	15,6 %	Neutral - low	0,994	5,19e-9	0,000	Inf
Neutral	Observed	3	5	8	High - low	0,994	2,38e-8	0,000	Inf
	% within column	9,4 %	38,5 %	17,8 %					
High	Observed	22	8	30					
	% within column	68,8 %	61,5 %	66,7 %					
Total	Observed	32	13	45					
	% within column	100,0 %	100,0 %	100,0 %					

Importance of support network nearby and general symptomatology

Contingency table					Binomial Logistic Regression				
Direct correlations P<0,05		General symptomatology			Model Coefficients - General_dichotomous				
		No symptoms	With symptoms	Total				95% Confidence Interval	
Importance of support network nearby					Predictor	p	Odds ratio	Lower	Upper
Low	Observed	6	1	7	Importance of support network nearby				
	% within column	20,7 %	6,3 %	15,6 %	Neutral - low	0,033	0,055	0,003	0,789
Neutral	Observed	2	6	8	High - low	0,412	0,388	0,040	3,713
	% within column	6,9 %	37,5 %	17,8 %					
High	Observed	21	9	30					
	% within column	72,4 %	56,3 %	66,7 %					
Total	Observed	29	16	45					
	% within column	100,0 %	100,0 %	100,0 %					

Residence location and depression

Contingency table					Binomial Logistic Regression				
Direct correlations P<0,05		Depression			Model Coefficients - Depression_dichotomous				
		No symptoms	With symptoms	Total				95% Confidence Interval	
Residence location					Predictor	p	Odds ratio	Lower	Upper
Inside the neighborhood	Observed	46	9	55	Residence location				
	% within row	83,6 %	16,4 %	100,0 %	Inside the Neigh. - In front highway	0,023	6,815	1,298	35,790
In front of the highway	Observed	3	4	7					
	% within row	42,9 %	57,1 %	100,0 %					
Total	Observed	49	13	62					
	% within row	79,0 %	21,0 %	100,0 %					

Residence location and stress

Contingency table					Binomial Logistic Regression				
Direct correlations P<0,05		Stress			Model Coefficients - Stress_dichotomous				
		No symptoms	With symptoms	Total				95% Confidence Interval	
Residence location					Predictor	p	Odds ratio	Lower	Upper
Inside the neighborhood	Observed	44	11	55	Residence location				
	% within row	80,0 %	20,0 %	100,0 %	Inside the Neigh. - In front highway	0,011	10,000	1,706	58,590
In front of the highway	Observed	2	5	7					
	% within row	28,6 %	71,4 %	100,0 %					
Total	Observed	46	16	62					
	% within row	74,2 %	25,8 %	100,0 %					

Neighborhood and depression

Contingency table					Binomial Logistic Regression				
Direct correlations P<0,05		Depression			Model Coefficients - Depression_dichotomous				
		No symptoms	With symptoms	Total				95% Confidence Interval	
Neighborhood					Predictor	p	Odds ratio	Lower	Upper
Canodromo	Observed	17	3	20	Neighborhood				
	% within column	34,7 %	23,1 %	32,3 %	Canodromo – Prado	0,086	3,780	0,827	17,250
La Calleja	Observed	20	2	22	La Calleja – Prado	0,029	6,670	1,210	36,730
	% within column	40,8 %	15,4 %	35,5 %					
Prado	Observed	12	8	20					
	% within column	24,5 %	61,5 %	32,3 %					
Total	Observed	49	13	62					
	% within column	100,0 %	100,0 %	100,0 %					

Neighborhood and stress

Contingency table					Binomial Logistic Regression				
Direct correlations P<0,05		Stress			Model Coefficients - Stress_dichotomous				
		No symptoms	With symptoms	Total				95% Confidence Interval	
Neighborhood					Predictor	p	Odds ratio	Lower	Upper
Canodromo	Observed	18	2	20	Neighborhood				
	% within column	39,1 %	12,5 %	32,3 %	Canodromo – Prado	0,011	9,000	1,638	49,440
La Calleja	Observed	18	4	22	La Calleja – Prado	0,034	4,500	1,117	18,130
	% within column	39,1 %	25,0 %	35,5 %					
Prado	Observed	10	10	20					
	% within column	21,7 %	62,5 %	32,3 %					
Total	Observed	46	16	62					
	% within column	100,0 %	100,0 %	100,0 %					

Table 7.1. Contingency tables and regression analysis study case.
Source: Author, 2023

High noise and anxiety				
Contingency table			**Binomial Logistic Regression**	
Direct correlations P<0,05	Anxiety		Model Coefficients - Anxiety_dichotomous	
	No symptoms	With symptoms		95% Confidence Interval
High noise dichotomous Low			People who perceive high levels of noise are 81% more likely to have anxiety symptoms compared to people who perceive low levels of noise and 36% more likely than people who are indifferent to it.	This study is 95% confident that this correlation in the population of the study area is between 1,0 - 13,7 for low and high levels and 2,3-178,1 for neutral and high
Neutral	Of the total number of people who had no anxiety symptoms, 38% perceived medium levels of noise, 35% low levels and 26% high levels.	Of the total number of people who presented anxiety symptoms, 70% perceived high levels of noise, and 25% perceived low levels.		
High				
Total				

High noise and stress				
Contingency table			**Binomial Logistic Regression**	
Direct correlations P<0,05	Stress		Model Coefficients - Stress_dichotomous	
	No symptoms	With symptoms		95% Confidence Interval
High noise dichotomous Low			People who perceive high levels of noise are 45% more likely to experience stress than people who perceive low levels of noise and 89% more likely to experience stress compared to those who are indifferent to noise.	This study is 95% confident that this correlation in the population of the study area is between 1,0 - 19,6 for low and high levels and 1,10-31,1 for neutral and high
Neutral	Of the total number of people who did not present symptoms of stress, 37% perceived low levels of noise in the neighborhood, 32% medium levels and 30% high levels of noise.	Of the total number of people who presented symptoms of stress in relation to noise, 69% perceived high noise levels and 18% low noise.		
High				
Total				

High noise and general symptomatology				
Contingency table			**Binomial Logistic Regression**	
Direct correlations P<0,05	General symptomatology		Model Coefficients - General_dichotomous	
	No symptoms	With symptoms		95% Confidence Interval
High noise dichotomous Low			People who hear high levels of noise are 6 times more likely to have general symptoms of depression, anxiety and stress than people who perceive low levels of noise and 8 times more likely than those who are indifferent to noise.	This study is 95% confident that this correlation in the population of the study area is between 1,64 - 21,9 for low and high levels and 2,01-34,5 for neutral and high
Neutral	Of the total number of people who had no symptoms of depression, anxiety or noise-related stress, 41% perceived low levels of noise, 38% medium levels and 20% high levels.	Of the total number of people who presented general symptoms, 64% considered the neighborhood to have high noise levels 21% low.		
High				
Total				

High noise affectation and general symptomatology				
Contingency table			**Binomial Logistic Regression**	
Direct correlations P<0,05	General symptomatology		Model Coefficients - General_dichotomous	
	No symptoms	With symptoms		95% Confidence Interval
High noise affectation dichotomous Little	Of the total number of people who consider that noise affects them little, 66% did not present general symptoms of depression, anxiety and stress, and 33% did present symptoms.		People who feel that noise greatly affects their daily lives are 6 times more likely to have general symptoms of depression, anxiety and stress compared to people who are not affected by noise.	This study is 95% confident that this correlation in the population of the study area is between 1,39 - 25,7 for affectation of noise low and high.
Neutral	Of those who are indifferent to the effects of noise, 37% had no symptoms and 62% had symptoms.			
A lot	Of the total number of people who consider that noise affects their daily life, 75% presented general symptoms of pressure, anxiety, and stress, and 25% did not present any symptoms.			
Total	Of the total number of people who did not present general symptoms, 82% considered that noise affected them a little and 8% considered that noise affected them a lot.	Of the total number of people who presented general symptoms, 32% considered that the noise affects them a lot, however, 50% considered that the noise does not affect them.		

Cleanliness and general symptomatology				
Contingency table			**Binomial Logistic Regression**	
Direct correlations P<0,05	General symptomatology		Model Coefficients - General_dichotomous	
	No symptoms	With symptoms		95% Confidence Interval
Cleanliness frequency Low			People who perceive the neighborhood to be clean rarely are 25% more likely to have general symptoms of depression, anxiety and stress compared to people who perceive the neighborhood to be clean most of the time.	This study is 95% confident that this correlation in the population of the study area is between 1,48 - 18,7 for the affectation of noise low and high.
Neutral	Of the total number of people who did not present general symptoms, 61% considered the neighborhood to be clean and 17% considered the opposite.	Of the total number of people who presented general symptoms of depression, anxiety and stress, 42% consider that their neighborhood is not clean.		
High				
Total				

Table 7. Interpretation of contingency tables and regression analysis
Source: Author, 2023

High noise and anxiety

Contingency table					Binomial Logistic Regression				
Direct correlations P<0,05		Anxiety			Model Coefficients - Anxiety_dichotomous				
		No symptoms	With symptoms	Total				95% Confidence Interval	
					Predictor	p	Odds ratio	Lower	Upper
High noise dichotomous					High noise dichotomous				
Low	Observed	15	5	20	Low – high	0,041	3,818	1,058	13,780
	% within column	35,7 %	25,0 %	32,3 %	Neutral – high	0,006	20,364	2,327	178,190
Neutral	Observed	16	1	17					
	% within column	38,1 %	5,0 %	27,4 %					
High	Observed	11	14	25					
	% within column	26,2 %	70,0 %	40,3 %					
Total	Observed	42	20	62					
	% within column	100,0 %	100,0 %	100,0 %					

High noise and stress

Contingency table					Binomial Logistic Regression				
Direct correlations P<0,05		Stress			Model Coefficients - Stress_dichotomous				
		No symptoms	With symptoms	Total				95% Confidence Interval	
					Predictor	p	Odds ratio	Lower	Upper
High noise dichotomous					High noise dichotomous				
Low	Observed	17	3	20	Low – high	0,045	4,450	1,035	19,160
	% within column	37,0 %	18,8 %	32,3 %	Neutral – high	0,038	5,890	1,106	31,410
Neutral	Observed	15	2	17					
	% within column	32,6 %	12,5 %	27,4 %					
High	Observed	14	11	25					
	% within column	30,4 %	68,8 %	40,3 %					
Total	Observed	46	16	62					
	% within column	100,0 %	100,0 %	100,0 %					

High noise and general symptomatology

Contingency table					Binomial Logistic Regression				
Direct correlations P<0,05		General symptomatology			Model Coefficients - General_dichotomous				
		No symptoms	With symptoms	Total				95% Confidence Interval	
					Predictor	p	Odds ratio	Lower	Upper
High noise dichotomous					High noise dichotomous				
Low	Observed	14	6	20	Low – high	0,007	6,000	1,644	21,904
	% within column	41,2 %	21,4 %	32,3 %	Neutral – high	0,003	8,357	2,019	34,595
Neutral	Observed	13	4	17					
	% within column	38,2 %	14,3 %	27,4 %					
High	Observed	7	18	25					
	% within column	20,6 %	64,3 %	40,3 %					
Total	Observed	34	28	62					
	% within column	100,0 %	100,0 %	100,0 %					

High noise affectation and general symptomatology

Contingency table					Binomial Logistic Regression				
Direct correlations P<0,05		General symptomatology			Model Coefficients - General_dichotomous				
		No symptoms	With symptoms	Total				95% Confidence Interval	
					Predictor	p	Odds ratio	Lower	Upper
High noise affectation dichotomous					High noise affectation dichotomous				
Low	Observed	28	14	42	Low – high	0,016	6,000	1,390	25,720
	% within row	66,7 %	33,3 %	100,0 %	Neutral – high	0,055	1,800	0,250	12,500
	% within column	82,4 %	50,0 %	67,7 %					
Neutral	Observed	3	5	8					
	% within row	37,5 %	62,5 %	100,0 %					
	% within column	8,8 %	17,9 %	12,9 %					
High	Observed	3	9	12					
	% within row	25,0 %	75,0 %	100,0 %					
	% within column	8,8 %	32,1 %	19,4 %					
Total	Observed	34	28	62					
	% within row	54,8 %	45,2 %	100,0 %					
	% within column	100,0 %	100,0 %	100,0 %					

Cleanliness and general symptomatology

Contingency table					Binomial Logistic Regression				
Direct correlations P<0,05		General symptomatology			Model Coefficients - General_dichotomous				
		No symptoms	With symptoms	Total				95% Confidence Interval	
					Predictor	p	Odds ratio	Lower	Upper
Cleanliness frequency					Cleanliness frequency				
Low	Observed	6	12	18	Neutral – low	0,437	1,750	0,427	7,170
	% within column	17,6 %	42,9 %	29,0 %	High – low	0,011	5,250	1,468	18,770
Neutral	Observed	7	8	15					
	% within column	20,6 %	28,6 %	24,2 %					
High	Observed	21	8	29					
	% within column	61,8 %	28,6 %	46,8 %					
Total	Observed	34	28	62					
	% within column	100,0 %	100,0 %	100,0 %					

Table 7.1. Contingency tables and regression analysis study case.
Source: Author, 2023

Findings

This case study investigates the relationship between the built environment and mental health in three neighborhoods of varying socioeconomic strata and physical and social characteristics. The study draws several conclusions based on its findings. Physical variables presented a stronger correlation with the impact on mental health than social variables. Particularly, noise was identified as the most significant aspect of the physical environment impacting mental health, with relationships observed between noise and three mental disorders: anxiety, stress, and general symptomatology.

The study found that perceiving a clean neighborhood, having a support network, and having that support network living in proximity, were factors that contributed to good mental health. Additionally, when combined with other factors, variables such as insecurity posed a considerable risk to the mental health of residents in the study area. The quality of sidewalks was identified as the second most significant characteristic impacting people's mental health, according to residents' perceptions. Conversely, garbage did not significantly affect the development of general symptoms of depression, anxiety, and stress.

The study also found that the La Calleja neighborhood had the lowest number of people with symptoms of depression, followed by the Canodromo neighborhood, and then Prado, which had the highest number of people with symptoms of depression. There is a significant association between residence location and both depression and stress. People living across the highway are more likely to have symptoms of depression and experience stress compared to people living inside the neighborhood.

The analysis found a positive association between age and stress, indicating that stress symptoms increase by 4% for each unit increase in age. The study revealed a significant association between marital status and depression, and anxiety. Individuals living alone were found to be 33% more likely to experience symptoms of depression and 50% more likely to experience anxiety symptoms than those with a partner. The results imply that the

quality of the physical environment can have a noteworthy impact on mental health outcomes.

Limitations

As part of the built environment characteristics, the neighborhood in the high strata area, La Calleja, is occupied mainly by gated communities with limited access, resulting in difficulties in gathering a more representative sample. Respondents were approached in public spaces to have a sample representing residents of buildings and dwellings complexes to mitigate those limitations. Therefore, due to the sample size, this paper only provides a representative review of residents' perceptions of an entire neighborhood. Due to security reasons, people were hesitant to collaborate, fearing stopping on the street and being attacked by thieves or sharing personal information. Likewise, the interviews had to be conducted in daylight and not during after-work hours to avoid security risks.

People felt surprised to be approached and questioned about their mental health. Talking about these matters with a stranger generates two opposite types of responses, including taking the opportunity to vent or shutting down entirely and providing politically correct answers.

The lack of variety in responses reduces the likelihood of generating significant findings for the researcher. The tool found few correlations where the sample was small, and the results were within assumptions. It did not produce substantial statements about the impact of variables on mental health. Moreover, this study highlights that the number of variables to be investigated may compromise the depth and breadth of data collected. The limited scope may prevent the researcher from comprehensively understanding each variable's behavior and its impact on mental health.

Conclusions

According to the methodology theory, the criterion for selecting neighborhoods to investigate was based on choosing a study area that offered complexity, variety, and little influence of external factors on its

physical and social characteristics, such as violence or extreme poverty. However, in practice, this choice generated contrary effects in the results since the proximity between neighborhoods, the similarity between the profiles of residents, and the collective imagination, did not cause the expected and required variety of responses.

The sample must represent the neighborhood and study area for the results to be conclusive. This influences the variety of responses and the number of relationships that can be found between the physical and social environment and mental health.

This study should be conducted in a space of trust where the interviewee does not feel judged and feels free to discuss all the variables that affect their mental health.

Suppose a deeper understanding of the impact of any variable is required. In that case, asking more questions regarding the topic of interest is advisable instead of investigating many variables with few specific questions. This allows that by applying the methodology and using the tool on a single variable, the impact of this variable and its behavior on people's health can be understood in depth.

Thus, the present study highlights the challenges of mental health research and the importance of methodological considerations to obtain meaningful results.

3.4 Version 2.
Segmented analysis

Based on the results of version 1 of the research and measurement method indicate that people living in the Prado neighborhood are 67% more likely to present symptoms of depression compared to people living in the La Calleja neighborhood, and in addition, residents of the neighborhood considered lower-middle stratum (Prado) are nine times more likely to present symptoms of depression compared to residents of the middle-middle stratum (Canodromo) and four times more likely compared to residents of the upper-middle stratum (La Calleja), are nine times more likely to present symptoms of stress compared to residents of the middle-middle stratum (Canodromo) and four times more likely compared to residents of the high stratum (La Calleja), it was decided to apply the measurement method developed in this study, to identify the physical and social characteristics that could be generating these differences.

This stage is an explorative analysis, testing the analysis tool by neighborhoods and exploring the relations between physical and social traits in the respondents' mental health.

3.4.1 Study case
Analysis

The descriptive analysis was performed with the variables assessed by the respondents and categorized by neighborhoods. The variables are grouped into three aspects - neighborhood quality, social capital, and mental health. The graphic depicts the sociodemographic characteristics of the sample divided by neighborhood. The sample size is 62 adults, with 20 from Prado, 20 from Canodromo, and 22 from La Calleja. Table 8 shows that females represent the majority of participants in all three neighborhoods, with La Calleja having the highest percentage. Most participants in all three neighborhoods were between 27-59 years old, with La Calleja having the highest rate. Participants in all three neighborhoods were predominantly from an urban area, with La Calleja having 100% of participants from a

metropolitan area. Most participants reported having a support network, with family members being the most common type of support network. Furthermore, a higher percentage of participants in Prado said that their support network resided nearby. The table also presents data on mental health outcomes, with a higher percentage of participants in Prado presenting symptoms of depression and stress, whereas a higher rate of participants in Canodromo showing signs of anxiety. Finally, a higher percentage of participants in La Calleja gave general symptomatology.

Table 8. Sample sociodemographic characteristics and physical and social attributes of adults by neighborhoods of Bogotá, Colombia, 2023		Prado		Canodromo		La Calleja		Total	
Variables		n=20	%	n=20	%	n=22	%	n=62	%
Gender*	Female	8	40,0	13	65,0	14	63,6	35	56,45
	Male	12	60,0	7	35,0	8	36,4	27	43,55
Age	18 - 26 years	2	10,0	0	0,0	1	4,5	3	4,84
	27 - 59 years	15	75,0	14	70,0	17	77,3	46	74,19
	≥ 60 years	3	15,0	6	30,0	4	18	13	20,97
Birth place*	Bogotá or another urban area	10	50,0	17	85,0	22	100	49	79,03
	Rural area	10	50,0	3	15,0	0	0	13	20,97
Marital status	Single, divorced or widowed	12	60,0	12	60,0	9	40,9	33	53,23
	Married or living with someone	8	40,0	8	40,0	13	59,1	29	46,77
Type of residence*	Single house	17	85,0	13	65,0	1	4,5	31	50,00
	Residential complex	3	15,0	7	35,0	21	95,5	31	50,00
Residence location*	Within the neighborhood	17	85,0	19	95,0	19	86,4	55	88,71
	In front of the highway	3	15,0	1	5,0	3	13,6	7	11,29
Having a support network	Yes	10	50,0	16	80,0	19	86,4	45	72,58
	No	10	50,0	4	20,0	3	13,6	17	27,42
Type of support network	Family members	9	90,0	10	62,5	14	73,7	33	53,23
	Others (friends, neighbors, co-workers)	1	10,0	6	37,5	5	26,4	12	19,35
Support network residing nearby*	Yes	7	70,0	10	62,5	12	63,2	29	46,77
	No	3	30,0	6	37,5	7	36,8	16	25,81
Depression symptomatology	Without symptoms	12	60,0	17	85,0	20	90,9	49	79,03
	With symptoms	8	40,0	3	15,0	2	9	13	20,97
Anxiety symptomatology	Without symptoms	10	50,0	14	70,0	18	81,8	42	67,74
	With symptoms	10	50,0	6	30,0	4	18,2	20	32,26
Stress symptomatology	Without symptoms	10	50,0	18	90,0	18	81,8	46	74,19
	With symptoms	10	50,0	2	10,0	4	18,2	16	25,81
General symptomatology	Without symptoms	7	35,0	12	60,0	15	68,2	34	54,84
	With symptoms	13	65,0	8	40,0	7	31,8	28	45,16
* With significant P-values $p<0.05$									
** With P-values $p>0.05$ and $p<0.1$									

Table 8. Sociodemographic characteristics by neighborhood. Source: Author, 2023

The present findings suggest that although the prevalence of depression symptoms was not substantial, the results of anxiety and stress symptoms among participants in the studied neighborhoods could indicate a potential risk of depression. Specifically, the category with the highest prevalence of symptoms was stress, which could mean the threat it represents as an initial stage of some mental disorders.

According to the resident's perception of neighborhood quality and social attributes, Table 9 summarizes the number and percentages of respondents who reported on the study variables. The table also highlights the variables with significant P-values, indicating whether there is a statistically significant association with a mental disorder to be reviewed in further analysis.

The results show that regarding noise, Prado had the highest percentage of participants reporting that noise was often a problem. In contrast, Canodromo had the highest percentage of participants reporting that noise was a frequent issue. In contrast, La Calleja had the lowest rate of participants reporting noise as a problem. Regarding security perception, La Calleja had the highest percentage of participants reporting a high level of security perception. In contrast, Prado had the highest percentage of participants reporting low-security perception. In connection with the report of security cases, all three neighborhoods had a similar rate of participants reporting few insecurity cases to themselves. However, La Calleja had the highest percentage of participants reporting insecurity perception due to graffiti and the highest percentage of participants reporting sidewalks in optimal condition. Likewise, La Calleja had the highest percentage of participants reporting high air quality. In contrast, Prado had the highest rate of participants reporting noise as the physical attribute that affects mental health perception the most.

Regarding cleanliness frequency, Calleja has the best score in cleanliness perception, while Prado and Canodromo present similar results. Regarding

garbage container presence, all three neighborhoods had a similar percentage of participants reporting positive presence. However, La Calleja had the lowest rate of participants reporting their absence.

Regarding sidewalks, Prado and Canodromo had more participants reporting their presence than La Calleja. However, La Calleja had the highest rate of participants reporting sidewalks in optimal condition. Regarding air quality, most participants in all three neighborhoods reported medium or high air quality. However, Prado had the highest percentage of participants reporting low air quality.

In general, the residents of La Calleja are the most satisfied with their neighborhood, with a percentage of 100% of satisfaction; Prado has the worst score, with 60% of dissatisfaction. The physical attribute that most affect the resident's daily life is noise and the less sidewalk quality. In Canodromo, 60% of the residents consider that their neighborhood affects their mental health, while 68% believe the contrary in La Calleja.

In conclusion, the results of the previous descriptive analyses suggest significant differences in the physical and social characteristics of the studied neighborhoods, which may have potential implications for the mental health outcomes of their residents.

Consequently, further analysis is necessary to explore the relationships between the identified physical and social environmental variables and the mental health of residents in each neighborhood. Building on the initial global analysis performed in the first version, the current study evaluates 26 variables related to the physical environment and social capital, which are then associated with each mental health variable in this case study. The resulting bivariate analysis of the variables found to have significant relationships with each neighborhood is presented in Table 10.

Table 9. Sample perceived neighborhood and social attributes, among adults in three neighborhoods of Bogotá, Colombia, 2023

Perceived neighborhood and attributes	Prado		Canodromo		La Calleja		Total	
	n=20	%	n=20	%	n=22	%	n=62	%
High noise*								
Few	3	15,0	11	55,0	6	27,0	20	32,26
Occasionally	3	15,0	4	20,0	10	46,0	17	27,42
Often	14	70,0	5	25,0	6	27,0	25	40,32
High noise affectation**								
Few	10	50,0	16	80,0	16	72,7	42	67,74
Occasionally	3	15,0	1	5,0	4	18,2	8	12,90
Often	7	35,0	3	15,0	2	9,1	12	19,35
Security perception*								
Low	4	20,0	4	20,0	6	27,3	14	22,58
Medium	13	65,0	6	30,0	5	22,7	24	38,71
High	3	15,0	10	50,0	11	50,0	24	38,71
Insecurity cases to the respondent*								
Few	17	85,0	18	90,0	16	72,7	51	82,26
Occasionally	2	10,0	1	5,0	2	9,1	5	8,06
Often	1	5,0	1	5,0	4	18,2	6	9,68
Hearing or witnessing insecurity cases*								
Few	4	20,0	9	45,0	8	36,4	21	33,87
Occasionally	6	30,0	4	20,0	7	31,8	17	27,42
Often	10	35,0	7	35,0	7	31,8	24	38,71
Insecurity due to graffitis*								
Yes	4	20,0	2	10,0	2	9,0	8	12,90
No	16	80,0	18	90,0	20	91,0	54	87,10
Cleanliness frequency								
Few	7	35,0	6	30,0	5	22,7	18	29,03
Occasionally	7	35,0	7	35,0	1	4,5	15	24,19
Often	6	30,0	7	35,0	16	72,7	29	46,77
Garbage containers presence								
Yes	15	75,0	17	85,0	13	59,1	45	72,58
No	5	25,0	3	15,0	9	40,9	17	27,42
Air quality**								
Low	5	25,0	1	5,0	2	9,1	8	12,90
Medium	11	55,0	7	35,0	5	22,7	23	37,10
High	4	20,0	12	60,0	15	68,2	31	50,00
Sidewalks presence*								
Yes	5	25,0	9	45,0	7	31,8	21	33,87
No	15	75,0	11	55,0	15	68,2	41	66,13
Sidewalks optimal condition*								
Yes	2	10,0	6	30,0	14	63,6	22	35,48
No	18	90,0	14	70,0	8	36,3	40	64,52
Neighborhood satisfaction								
Yes	12	60,0	15	75,0	22	100,0	49	79,03
No	8	40,0	5	25,0			13	20,97
Physical attribute that affects the most*								
Sidewalk quality	5	25,0	5	25,0	8	36,4	18	29,03
Air Quality	1	5,0	1	5,0	1	4,5	3	4,84
Garbage presence	1	5,0	6	30,0	4	18,2	11	17,74
Noise	10	50,0	3	15,0	4	18,2	17	27,42
Insecurity	3	15,0	5	25,0	5	22,7	13	20,97
Neighborhood's Impact on mental health perception*								
Yes	11	55,0	12	60,0	7	31,8	30	48,39
No	9	45,0	8	40,0	15	68,2	32	51,61
Disposition to relocate								
Yes	7	63,6	6	50,0	6	85,7	19	30,65
No	4	36,4	6	50,0	1	14,3	11	17,74
Importance of support network nearby**								
Low	1	10,0	2	12,5	4	21,1	7	11,29
Medium	1	10,0	4	25,0	3	15,8	8	12,90
High	8	80,0	6	37,5	12	63,2	26	41,94

* With significant P-values p<0.05
** With P-values p>0.05 and p<0.1

Table 9. Neighborhood and social attributes by neighborhood.
Source: Author, 2023

Table 10. Bivariate analysis of neighborhood quality perception, social capital and mental health among adults in three neighborhoods of Bogotá, Colombia, 2023

Environmental correlate	Anxiety			Stress			General		
	P-Value	OR	95% CI	P-Value	OR	95% CI	P-Value	OR	95% CI
Prado									
Insecurity due to graffitis				0,025	14,50	0,667 - 3,17			
Sidewalks presence				0,010	21,00	0,972 - 454			
Neighborhood's impact on mental health perception				0,025	0,11	0,0137 - 838			
High noise							0,021	1,27	0,00 - inf
High noise affectation**							0,058	9,00	0,7641-106
Sidewalks presence							0,015	16,00	1,27 - 201
Sidewalks optimal condition							0,042	12,30	0,503 - 299
Support network residing nearby							0,038	15,50	0,557 - 426
Canodromo									
Air quality**	0,057	3,00	0,00 - inf						
Physical attribute that affects the most				0,025	1,72	0,00 - inf			
Residence location				0,002	37,00	1,00 - 1364			
Hearing or witnessing insecurity cases							0,017	0,33	0,0265 - 4,19
Importance of support network nearby**							0,055	1,27	0,00 - inf
Gender							0,035	8,33	1,03 - 67,100
La Calleja									
High noise	0,053	3,14	0,00 - inf						
Security perception	0,026	5,80	0,00 - inf						
Insecurity cases to the respondent	0,024	28,00	1,20 - 648,81				0,020	2,04	0,00 - inf
Hearing or witnessing insecurity cases	0,032	1,28	0,00 - inf				0,024	17,50	1,22 - 250,36
Type of residence	0,030	15,90	0,530 - 474						
Birth place							0,030	14,10	0,581 - 342

CI = Confidence Interval.
* Depression results are not presented due to insignificant correlations resulting in all neighborhood
* IC values expressing 0,00 - inf. Indicate that it is missing strength to the sample size to give more accurate estimations. Narrowed values indicate better results.
* With significant P-values p<0.05
** With P-values p>0.05 and p<0.1. I.e in combination with another variable could have a significant relation with the requested outcome

Table 10. Bivariate analysis by neighborhood. Source: Author, 2023

Findings

In Prado, significant correlations were found between stress and insecurity due to graffiti, sidewalk presence, and the neighborhood's impact on mental health perception. High noise, sidewalks, optimal conditions, and the nearby support network significantly correlated with general mental health. The P-Value obtained in high noise affectation indicates that this variable, in combination with another, might influence the general level of symptomatology in the residents of Prado. Canodromo presented correlations between anxiety and air quality. The physical attribute that affects the most and the residence location indicated correlations with stress symptoms. Correlations were found between general symptomatology and hearing or witnessing insecurity cases, the importance of a support network nearby, and gender. In La Calleja, correlations were found between anxiety, high noise, security perception, and type of residence. In addition, insecurity cases to the respondent and hearing or witnessing insecurity cases were also connected to anxiety and general symptomatology. Birthplace was also correlated with this symptom. It is worth noting that the results for

depression are not presented in this analysis due to the lack of significant correlations across all neighborhoods. The confidence interval (CI) values expressed as 0.00 - infinity indicate the limitations of the correlation results, as narrower values would suggest more reliable outcomes. These findings highlight the importance of considering the complexity of mental health outcomes and the need for comprehensive and nuanced approaches to their measurement and analysis.

Limitations

The following analysis of correlations and regressions was not performed due to the limited number of associations identified among the physical, social, and mental environmental variables. To proceed with the subsequent stages of the analysis, it is essential to consider that comparative studies require a sample size considerably more significant than 20 individuals. Smaller sample sizes impede the identification of relationships between variables and yield inconclusive and statistically unsupported results. However, a larger sample size entails a more significant investment of resources, execution time, and qualified professionals.

A more pronounced heterogeneity among residents and neighborhood locations would produce qualitative and quantitative differences that could be analyzed with greater depth and richness. Given the multidisciplinary nature of the study, professionals from fields other than epidemiology or statistics should be open to learning and interpreting a language that may be unfamiliar to those used in the domain of urban planning.

In summary, the importance of having a sufficient sample size for comparative studies to avoid inconclusive results is high. It emphasizes the potential benefits of a more diverse and heterogeneous sample. Additionally, it stresses the need for professionals from different fields to be receptive to learning and interpreting unfamiliar terminologies to facilitate interdisciplinary collaboration.

Conclusions

Although no statistically conclusive results were obtained, the findings suggest that physical and social-environmental characteristics may be associated with mental disorders symptoms. The comparative analysis between neighborhoods revealed that the area with a lower socioeconomic status had physical factors that could potentially impact its residents' mental health compared to the community with a higher socioeconomic status. However, it is essential to note that these results may be influenced by the more significant number of needs in one neighborhood compared to the other. In contexts with evident deprivation, residents are more likely to voice their concerns to receive assistance. In contrast, residents of communities in better physical condition tend to be more reserved with their criticisms.

The results of this study suggest that while many correlations were identified, a significant portion of them may be insignificant, as indicated by the effects of the p-values and Odds ratio. This may be due, in part, to the limited variety of responses and the sample size, as larger samples would increase the probability of detecting differences and potential correlations. Additionally, the response similarity among neighborhoods may be attributed to a cluster effect, whereby individuals living in the same context tend to form similar opinions and resemble each other due to collective correspondence.

Moreover, depression was not included in the bivariate analysis due to its almost constant presence across all neighborhoods, which resulted in a lack of significant variability to identify potential correlations. However, evidence of symptoms of anxiety and stress suggests a potential risk for depression, as reported in the literature. These findings stress the importance of conducting comprehensive and detailed analyses to account for the complexity of mental health outcomes and their potential relationships with physical and social environmental factors. Further research with more diverse samples is necessary to explore these relationships more deeply.

Chapter 4: Conclusions

4.1 Conclusion

The primary aim of this research was to identify correlations between the built environment and mental health. However, the researcher soon discovered that in contexts such as Colombia, there needs to be more information and professionals consistently engaged in knowledge production that bridges the fields of urban planning and psychology. Consequently, the researchers proposed an investigation to develop a method that measures the correlation between variables from these disciplines. With the implementation of this method, it is now conceivable to define the steps to collect data, categorize it, and analyze it in contexts with inadequate availability of information. Therefore, the findings of this study contribute to gaining greater awareness and training in the use of tools that measure the built environment's impact on mental health. In addition, this method offers tools typically unavailable to architects and urban planners, making a valuable contribution to urban planning.

The findings of the case study corroborated the results of the secondary data. The distribution of factors such as noise, presence of garbage, security risk, and air pollution were found to have a negative association with the socioeconomic conditions of the neighborhoods. I.e., as the social stratum increases, the percentage of these variables decreases. This relationship is evident in measuring the physical environment and mental health variables.

Interestingly, the residents' responses demonstrated that individuals tend to normalize suboptimal conditions of the environment, adapt to them, and are often unaware of their impact on health. However, raising awareness about these conditions highlights their significance and stimulates residents' interest. Nevertheless, the case study confirmed a correlation between the physical environment and mental health, even in cases where the resident is unaware of it. The catalog of questions that capture the various social dimensions in a given study area or neighborhood needs to be expanded to obtain more conclusive statistical data regarding social capital.

Finally, it is noteworthy that the case study analysis results are a pilot to demonstrate the method's efficacy, and there were limitations of information, time, and resources that influenced the methodology. Nevertheless, with additional effort, this method has the potential to compensate for the scarcity of information in the future.

4.2 Discussion

This document mainly provides basic guidelines to investigate and measure the relationship between the physical environment and mental health. The proposed methodology and the use of the tool propose an option to approach the research; however, this approach is not unique or absolute. On the contrary, this is an open and flexible proposal to constant updates.

This method includes different perspectives to generate sufficient data and information to measure the relationships of interest. From the secondary data, references, antecedents, previous studies, and literature are sought to visualize the theoretical framework of the research in the context. This stage's primary outcome is defining the variables to be investigated.

The multidisciplinary essence of this study is an immersion into the world of statistics and epidemiology from the researcher's point of view. In this case, as an architect and urban planner, the researcher understands and learns to apply these concepts in the context of urban health, focusing on the relationship between the physical environment and mental health. The study addresses basic concepts of statistics and epidemiology such as descriptive analysis, Shapiro-wilk, p-value, interclass correlation, bivariate analysis, t-test, frequency analysis, null hypothesis, alternate hypothesis, measures of association, odds ratio, prevalence ratios, regression analysis, collinearity, confidence intervals, dichotomous and polytomous variables, contingency tables, and relative risk.

These are the fundamental statistical concepts that this methodology proposes to approach this type of study in contexts with limited data availability. However, as well as this method, this list is open and flexible to include additional concepts that future research may deem necessary.

By applying the method to the case study, the valuable and significant characteristics of this method for urban health research in contexts with limited availability of information are evident. This methodology is unique, characterized by various sources that provide data, multidisciplinary analysis processes, complexity due to the contexts it addresses, and mixed variables it correlates. Furthermore, in its initial version, this quantitative method includes both qualitative and quantitative variables, and it can adapt to different scenarios as long as the fundamental requirements are met. Its behavior in the measurement of variables is flexible, depending on the needs of the context, the availability of resources, and the quality of the data to be entered. For instance, in the case study, the tool was tested in analyzing quantitative variables such as age, dichotomous (yes or no answers), and polytomous (multiple answer options), and it provided results despite its limitations. The user perception as the primary source of information and object of study makes this methodology unique and intelligent in its behavior.

The present study investigated the relationship between 26 variables, including seven social and ten physical variables, and their association with mental health pathologies. Among the sociodemographic variables, a direct relationship was found with age, marital status, having a support network, the physical attribute that affects the most, the neighborhood's impact perception on mental health, and the importance of having a support network nearby. Similarly, among the physical environment variables, a direct relationship was observed with residence location, type of neighborhood, high noise levels perception, the perceived affectation of noise, and the cleanliness frequency of the neighborhood.

Besides the researcher, the leading actor involved in this study is the user, who, with his perception and first-hand experience with the environment, becomes the primary source of data and one of the objects of study. At the same time, this study is aimed at architecture and urban planning professionals who want to investigate the process of researching and

measuring the built environment's impact on people's mental health. So far, the impact and potential of the urban environment to support mental health has been largely ignored.

Finally, Shifting the current perspective towards mental health from a system-centered approach, emphasizing treatment to a more comprehensive approach focused on identifying the origin, prevention, and promotion of mental well-being is imperative. This approach should incorporate diverse disciplines and sectors to broaden the field of action and potential solutions. Based on the conclusions of this study, mental health must become a priority for urban planners, as the development of prosperous and resilient environments in the face of future challenges is contingent upon addressing mental health needs.

4.3 Further research

This study is a response to the 2017 call by the Statistical Commission of the 2030 Agenda for Sustainable Development, which called for the development of a robust "framework of statistical data to monitor progress, inform policy, and ensure accountability" (United Nations, 2017) of all stakeholders in the urban development sector. The results of this study highlight the need to continue investing resources in the development of tools and training of multidisciplinary professionals seeking to understand the impact of the built environment on its inhabitants.

Despite the widely acknowledged problem of a lack of information in resource-poor countries, the reality is that these countries are the ones most at risk of experiencing mental health deterioration due to the built environment's impact. Therefore, there is an urgent need to prioritize the development of tools and training programs that can be adapted and implemented in low-resource settings. Such efforts would be critical in improving the mental health outcomes of vulnerable populations and promoting sustainable development in these regions.

The development of this type of study represents a significant contribution to a new area of research in urban planning and health. Each question that arises throughout the research process presents an opportunity to understand the complex interaction between the individual and the environment, analyze it from multiple disciplines, and generate relevant knowledge.

To build upon this study's findings, future research could test the method in neighborhoods with the same social strata but in distinct areas. This approach would enable researchers to compare the built environment's impact on mental health across different parts of the city and identify any variations in the results of the correlation analysis. Additionally, future research could test the method in neighborhoods with varying levels of social stratification. While taking relevant safety measures into account, this approach helps to ascertain whether external factors influence the correlation between the built environment and mental well-being.

Acknowledging that the study only provides associations between variables and cannot establish causality is essential. While the research findings indicate valuable insights into the built environment's potential impact on mental health, further research is necessary to establish the causal relationships between these factors and mental health outcomes.

In conclusion, urban planners interested in this study can benefit from the variables analyzed, identified as factors that deteriorate mental health, and transform them into qualities that promote mental well-being and enhance the overall quality of life. By incorporating the insights gained from this study into future research and practice, urban planners can work towards developing more effective interventions and policies aimed at improving mental health outcomes within urban environments.

Mental health and built environment

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Mental health and built environment

Annexes

1. Site visit observation forms

El siguiente cuestionario está hecho para ser completado por el investigador para tener la aproximación al barrio desde la perspectiva de un profesional.

Nº Formulario	Barrio	Nº Manzana	Fecha

1. Observación Entorno Construido

1. Según el numero indique la respuesta.
1. Si, 2. No, 3. Parte de la manzana

1	¿Hay mucho volumen de tráfico?	3 colegio
2	¿Hay mucho ruido por parte de otros factores aparte del tráfico?	Si
3	¿La calle está libre de basuras, colillas de cigarrillos, botellas vacías, vidrios, ventanas rotas?	NO
4	¿Observa contenedores de basura en el area?	NO
5	¿Hay obstrucciones constantemente en los andenes del área (vendedores callejeros, vehículos estacionados, árboles, heces de perros)?	NO
6	¿El ancho del andén es amigable con el peatón?	Si
7	¿Hay lámparas o farolas de iluminación en la zona?		
8	¿Qué elementos en el barrio aportan a la seguridad de la zona? a. Iluminación b. Cámaras de seguridad c. Transeuntes d. Celadores	potreras
9	Identifique los contaminantes de aire dentro del barrio	NO

2. ¿De qué tipo de material está hecho el piso de las aceras o andenes?

1	Pavimentado, baldosa o adoquín	x
2	Terreno destapado	
3	Césped	x
4	Otro. Cuál	

3. ¿Están en buen estado los andenes? (no hay grietas, agujeros, maleza)

1	Si	x
2	No	
3	En reparación	
4	Parte de la manzana	
5	No hay andenes para caminar	

4. ¿Los andenes a lo largo de la manzana son continuos?

1	Si	x
2	No	
3	No hay andenes	

El siguiente cuestionario está hecho para ser completado por el investigador para tener la aproximación al barrio desde la perspectiva de un profesional.

Nº Formulario	Barrio	Nº Manzana	Fecha

1. Observación Entorno Construido

1. Según el numero indique la respuesta.
1. Si, 2. No, 3. Parte de la manzana

1	¿Hay mucho volumen de tráfico?	NO
2	¿Hay mucho ruido por parte de otros factores aparte del tráfico?	aviones
3	¿La calle está libre de basuras, colillas de cigarrillos, botellas vacías, vidrios, ventanas rotas?	Si
4	¿Observa contenedores de basura en el area?	Si
5	¿Hay obstrucciones constantemente en los andenes del área (vendedores callejeros, vehículos estacionados, árboles, heces de perros)?	NO
6	¿El ancho del andén es amigable con el peatón?	Si
7	¿Hay lámparas o farolas de iluminación en la zona?	Si
8	¿Qué elementos en el barrio aportan a la seguridad de la zona? a. Iluminación b. Cámaras de seguridad c. Transeuntes d. Celadores	alumbra
9	Identifique los contaminantes de aire dentro del barrio	

2. ¿De qué tipo de material está hecho el piso de las aceras o andenes?

1	Pavimentado, baldosa o adoquín	x
2	Terreno destapado	
3	Césped	
4	Otro. Cuál	

3. ¿Están en buen estado los andenes? (no hay grietas, agujeros, maleza)

1	Si	x
2	No	
3	En reparación	
4	Parte de la manzana	
5	No hay andenes para caminar	

4. ¿Los andenes a lo largo de la manzana son continuos?

1	Si	x
2	No	
3	No hay andenes	

El siguiente cuestionario está hecho para ser completado por el investigador para tener la aproximación al barrio desde la perspectiva de un profesional.

Nº Formulario	Barrio	Nº. Manzana	Fecha

1. Observación Entorno Construido

1. Según el numero indique la respuesta.
1. Si, 2. No, 3. Parte de la manzana

1 ¿Hay mucho volumen de tráfico?
2 ¿Hay mucho ruido por parte de otros factores aparte del tráfico?
3 ¿La calle está libre de basuras, colillas de cigarrillos, botellas vacías, vidrios, ventanas rotas?
4 ¿Observa contenedores de basura en el area?
5 ¿Hay obstrucciones constantemente en los andenes del área (vendedores callejeros, vehiculos estacionados, árboles, heces de perros)?
6 ¿El ancho del andén es amigable con el peatón?
7 ¿Hay lámparas o farolas de iluminación en la zona?
8 ¿Qué elementos en el barrio aportan a la seguridad de la zona?
a. Iluminación
b. Cámaras de seguridad
c. Transeuntes
d. Celadores
9 Identifique los contaminantes de aire dentro del barrio

2. ¿De qué tipo de material está hecho el piso de las aceras o andenes?
1 Pavimentado, baldosa o adoquín
2 Terreno destapado
3 Césped
4 Otro. Cuál _____

3. ¿Están en buen estado los andenes? (no hay grietas, agujeros, maleza)
1 Si
2 No
3 En reparación
4 Parte de la manzana
5 No hay andenes para caminar

4. ¿Los andenes a lo largo de la manzana son continuos?
1 Si
2 No
3 No hay andenes

El siguiente cuestionario está hecho para ser completado por el investigador para tener la aproximación al barrio desde la perspectiva de un profesional.

N° Formulario	Barrio	N°. Manzana	Fecha

1. Observación Entorno Construido

1. Según el número indique la respuesta.
1. Si, 2. No, 3. Parte de la manzana

1	¿Hay mucho volumen de tráfico?	NO
2	¿Hay mucho ruido por parte de otros factores aparte del tráfico?	NO
3	¿La calle está libre de basuras, colillas de cigarrillos, botellas vacías, vidrios, ventanas rotas?	SI
4	¿Observa contenedores de basura en el área?	SI
5	¿Hay obstrucciones constantemente en los andenes del área (vendedores callejeros, vehículos estacionados, árboles, heces de perros)?	SI
6	¿El ancho del andén es amigable con el peatón?	
7	¿Hay lámparas o farolas de iluminación en la zona?	SI
8	¿Qué elementos en el barrio aportan a la seguridad de la zona? — vida libre a. Iluminación b. Cámaras de seguridad c. Transeúntes ⊕ Celadores	
9	Identifique los contaminantes de aire dentro del barrio	

2. ¿De qué tipo de material está hecho el piso de las aceras o andenes?

1	Pavimentado, baldosa o adoquín	X
2	Terreno destapado	
3	Césped	
4	Otro. Cuál	

3. ¿Están en buen estado los andenes? (no hay grietas, agujeros, maleza)

1	Si	X
2	No	
3	En reparación	
4	Parte de la manzana	
5	No hay andenes para caminar	

4. ¿Los andenes a lo largo de la manzana son continuos?

1	Si	X
2	No	
3	No hay andenes	

El siguiente cuestionario está hecho para ser completado por el investigador para tener la aproximación al barrio desde la perspectiva de un profesional.

Nº Formulario	Barrio	Nº. Manzana	Fecha

1. Observación Entorno Construido
1. Según el número indique la respuesta.
1. Sí, 2. No, 3. Parte de la manzana

1. ¿Hay mucho volumen de tráfico?
2. ¿Hay mucho ruido por parte de otros factores aparte del tráfico?
3. ¿La calle está libre de basuras, colillas de cigarrillos, botellas vacías, vidrios, ventanas rotas?
4. ¿Observa contenedores de basura en el área?
5. ¿Hay obstrucciones constantemente en los andenes del área (vendedores callejeros, vehículos estacionados, árboles, heces de perros)?
6. ¿El ancho del andén es amigable con el peatón?
7. ¿Hay lámparas o farolas de iluminación en la zona?
8. ¿Qué elementos en el barrio aportan a la seguridad de la zona?
   a. Iluminación
   b. Cámaras de seguridad
   c. Transeúntes
   d. Celadores
9. Identifique los contaminantes de aire dentro del barrio

2. ¿De qué tipo de material está hecho el piso de las aceras o andenes?
1. Pavimentado, baldosa o adoquín
2. Terreno destapado
3. Césped
4. Otro, Cuál _____

3. ¿Están en buen estado los andenes? (no hay grietas, agujeros, maleza)

4. ¿Los andenes a lo largo de la manzana son continuos?
1. Sí
2. No
3. No hay andenes

4. ¿Los andenes para caminar
1. Sí
2. No
3. En reparación
4. Parte de la manzana
5. No hay andenes para caminar

Mental health and built environment

El siguiente cuestionario está hecho para ser completado por el investigador para tener la aproximación al barrio desde la perspectiva de un profesional.

Nº Formulario	Barrio	Nº. Manzana	Fecha

1. Observación Entorno Construido

1. Según el número indique la respuesta.
1. Sí, 2. No, 3. Parte de la manzana

1	¿Hay mucho volumen de tráfico?	
2	¿Hay mucho ruido por parte de otros factores aparte del tráfico?	
3	¿La calle está libre de basuras, colillas de cigarrillos, botellas vacías, vidrios, ventanas rotas?	
4	¿Observa contenedores de basura en el área?	
5	¿Hay obstrucciones constantemente en los andenes del área (vendedores callejeros, vehículos estacionados, árboles, heces de perros)?	
6	¿El ancho del andén es amigable con el peatón?	
7	¿Hay lámparas o farolas de iluminación en la zona?	
8	¿Qué elementos en el barrio aportan a la seguridad de la zona? a. Iluminación b. Cámaras de seguridad c. Transeúntes d. Celadores	
9	Identifique los contaminantes de aire dentro del barrio	

2. ¿De qué tipo de material está hecho el piso de las aceras o andenes?

1	Pavimentado, baldosa o adoquín	
2	Terreno destapado	
3	Césped	
4	Otro. Cuál	

3. ¿Están en buen estado los andenes? (no hay grietas, agujeros, maleza)

1	Si	
2	No	
3	En reparación	
4	Parte de la manzana	
5	No hay andenes para caminar	

4. ¿Los andenes a lo largo de la manzana son continuos?

1	Si	
2	No	
3	No hay andenes	

El siguiente cuestionario está hecho para ser completado por el investigador para tener la aproximación al barrio desde la perspectiva de un profesional.

N° Formulario	Barrio	N°. Manzana	Fecha

1. Observación Entorno Construido

1. Según el número indique la respuesta.
1. Sí; 2. No; 3. Parte de la manzana

1	¿Hay mucho volumen de tráfico?	NO
2	¿Hay mucho ruido por parte de otros factores aparte del tráfico?	Avisones
3	¿La calle está libre de basuras, colillas de cigarrillos, botellas vacías, vidrios, ventanas rotas?	Sí
4	¿Observa contenedores de basura en el área?	X
5	¿Hay obstrucciones constantemente en los andenes del área (vendedores callejeros, vehículos estacionados, árboles, heces de perros)?	Sí
6	¿El ancho del andén es amigable con el peatón?	X
7	¿Hay lámparas o faroles de iluminación en la zona?	
8	¿Qué elementos en el barrio aportan a la seguridad de la zona? a. Iluminación b. Cámaras de seguridad c. Transeúntes d. Celadores	seguridad nombre
9	Identifique los contaminantes de aire dentro del barrio	

2. ¿De qué tipo de material está hecho el piso de las aceras o andenes?
1. Pavimentado, baldosa o adoquín
2. Terreno destapado
3. Césped
4. Otro. Cuál

3. ¿Están en buen estado los andenes? (no hay grietas, agujeros, maleza)
1. Sí
2. No
3. En reparación
4. Parte de la manzana
5. No hay andenes para caminar

4. ¿Los andenes a lo largo de la manzana son continuos? X
1. Sí
2. No
3. No hay andenes

El siguiente cuestionario está hecho para ser completado por el investigador para tener la aproximación al barrio desde la perspectiva de un profesional.

N° Formulario	Barrio	N°. Manzana	Fecha
		4	

1. Observación Entorno Construido

1. Según el número indique la respuesta.
1. Sí, 2. No, 3. Parte de la manzana

1	¿Hay mucho volumen de tráfico?		
2	¿Hay mucho ruido por parte de otros factores aparte del tráfico?		
3	¿La calle está libre de basuras, colillas de cigarrillos, botellas vacías, vidrios, ventanas rotas?		
4	¿Observa contenedores de basura en el área?		
5	¿Hay obstrucciones constantemente en los andenes del área (vendedores callejeros, vehículos estacionados, árboles, heces de perros)?		
6	¿El ancho del andén es amigable con el peatón?		
7	¿Hay lámparas o farolas de iluminación en la zona?		
8	¿Qué elementos en el barrio aportan a la seguridad de la zona? _LUCES del CARROS_ a. Iluminación b. Cámaras de seguridad c. Transeúntes d. Celadores		
9	Identifique los contaminantes de aire dentro del barrio		

2. ¿De qué tipo de material está hecho el piso de las aceras o andenes?

1	Pavimentado, baldosa o adoquín	
2	Terreno destapado	
3	Césped	
4	Otro. Cuál	

3. ¿Están en buen estado los andenes? (no hay grietas, agujeros, maleza)

1	Sí	
2	No	
3	En reparación	
4	Parte de la manzana	
5	No hay andenes para caminar	

4. ¿Los andenes a lo largo de la manzana son continuos?

1	Sí	
2	No	
3	No hay andenes	

La siguiente cuestionario está hecho para ser completado por el investigador para tener la aproximación al barrio desde la perspectiva de un profesional.

N° Formulario	Barrio	N°. Manzana	Fecha
		4	

1. Observación Entorno Construido

1. Según el número indique la respuesta.
1. Sí, 2. No, 3. Parte de la manzana

1	¿Hay mucho volumen de tráfico?	
2	¿Hay mucho ruido por parte de otros factores aparte del tráfico? _TALLERES CARROS_	NO
3	¿La calle está libre de basuras, colillas de cigarrillos, botellas vacías, vidrios, ventanas rotas?	NO
4	¿Observa contenedores de basura en el área?	
5	¿Hay obstrucciones constantemente en los andenes del área (vendedores callejeros, vehículos estacionados, árboles, heces de perros)?	SI
6	¿El ancho del andén es amigable con el peatón?	NO
7	¿Hay lámparas o farolas de iluminación en la zona?	SI
8	¿Qué elementos en el barrio aportan a la seguridad de la zona? a. Iluminación b. Cámaras de seguridad c. Transeúntes d. Celadores	
9	Identifique los contaminantes de aire dentro del barrio	X

2. ¿De qué tipo de material está hecho el piso de las aceras o andenes?

1	Pavimentado, baldosa o adoquín	
2	Terreno destapado	
3	Césped	
4	Otro. Cuál	

3. ¿Están en buen estado los andenes? (no hay grietas, agujeros, maleza)

1	Sí	
2	No	X
3	En reparación	
4	Parte de la manzana	
5	No hay andenes para caminar	

4. ¿Los andenes a lo largo de la manzana son continuos?

1	Sí	
2	No	X
3	No hay andenes	

El siguiente cuestionario está hecho para ser completado por el investigador para tener la aproximación al barrio desde la perspectiva de un profesional.

N° Formulario	Barrio	N°. Manzana	Fecha

1. Observación Entorno Construido

1. Según el numero indique la respuesta.
1. Sí, 2. No, 3. Parte de la manzana

1 ¿Hay mucho volumen de tráfico?

2 ¿Hay mucho ruido por parte de otros factores aparte del tráfico?

3 ¿La calle está libre de basuras, colillas de cigarrillos, botellas vacías, vidrios, ventanas rotas?

4 ¿Observa contenedores de basura en el área?

5 ¿Hay obstrucciones constantemente en los andenes del área (vendedores callejeros, vehículos estacionados, árboles, heces de perros)?

6 ¿El ancho del andén es amigable con el peatón?

7 ¿Hay lámparas o farolas de iluminación en la zona?

8 ¿Qué elementos en el barrio aportan a la seguridad de la zona?
a. Iluminación
b. Cámaras de seguridad
c. Transeúntes
d. Celadores

9 Identifique los contaminantes de aire dentro del barrio

2. ¿De qué tipo de material está hecho el piso de las aceras o andenes?
1 Pavimentado, baldosa o adoquín
2 Terreno destapado
3 Césped
4 Otro, Cuál

3. ¿Están en buen estado los andenes? (no hay grietas, agujeros, maleza)
1 Sí
2 No
3 En reparación
4 Parte de la manzana
5 No hay andenes para caminar

4. ¿Los andenes a lo largo de la manzana son continuos?
1 Sí
2 No
3 No hay andenes

Mental health and built environment

El siguiente cuestionario está hecho para ser completado por el investigador para tener la aproximación al barrio desde la perspectiva de un profesional.

Nº Formulario	Barrio	Nº. Manzana	Fecha
1. Observación Entorno Construido			
1. Según el número indique la respuesta. 1. Si, 2. No, 3. Parte de la manzana			
1	¿Hay mucho volumen de tráfico?		
	¿Hay mucho ruido por parte de otros factores aparte del tráfico?		
3	¿La calle está libre de basuras, colillas de cigarrillos, botellas vacías, vidrios, ventanas rotas?		
4	¿Observa contenedores de basura en el área?		
5	¿Hay obstrucciones constantemente en los andenes del área (vendedores callejeros, vehículos estacionados, árboles, heces de perros)?		
6	¿El ancho del andén es amigable con el peatón?		
7	¿Hay lámparas o faroles de iluminación en la zona?		
8	¿Qué elementos en el barrio aportan a la seguridad de la zona? a. Iluminación b. Cámaras de seguridad c. Transeúntes d. Celadores		
9	Identifique los contaminantes de aire dentro del barrio		
	2. ¿De qué tipo de material está hecho el piso de las aceras o andenes?		
1	Pavimentado, baldosa o adoquín		
2	Terreno destapado		
3	Césped		
4	Otro. Cuál		
	3. ¿Están en buen estado los andenes? (no hay grietas, agujeros, maleza)		
1	Si		
2	No		
3	En reparación		
4	Parte de la manzana		
5	No hay andenes para caminar		
	4. ¿Los andenes a lo largo de la manzana son continuos?		
1	Si		
2	No		
3	No hay andenes		

Mental health and built environment

Formulario 1

Nº Formulario	Barrio	Nº. Manzana	Fecha

1. Observación Entorno Construido

1. Según el numero indique la respuesta.
1. Sí, 2. No, 3. Parte de la manzana

#	Pregunta	Respuesta
1	¿Hay mucho volumen de tráfico?	0
2	¿Hay mucho ruido por parte de otros factores aparte del tráfico?	vradej
3	¿La calle está libre de basuras, colillas de cigarrillo, botellas vacías, vidrios, ventanas rotas?	talleres
4	¿Observa contenedores de basura en el area?	
5	¿Hay obstrucciones constantemente en los andenes del área (vendedores callejeros, vehículos estacionados, árboles, heces de perros)?	Si
6	¿El ancho del andén es amigable con el peatón?	Si
7	¿Hay lámparas o faroles de iluminación en la zona?	
8	¿Qué elementos en el barrio aportan a la seguridad de la zona? a. Iluminación b. Cámaras de seguridad c. Transeúntes d. Celadores	+talleres - mercado, pintura, madera
9	Identifique los contaminantes de aire dentro del barrio	

2. ¿De qué tipo de material está hecho el piso de las aceras o andenes?
1	Pavimentado, baldosa o adoquín
2	Terreno destapado
3	Césped
4	Otro, Cuál

3. ¿Están en buen estado los andenes? (no hay grietas, agujeros, maleza)
1	Sí
2	No
3	En reparación
4	Parte de la manzana
5	No hay andenes para caminar

4. ¿Los andenes a lo largo de la manzana son continuos?
1	Sí
2	No
3	No hay andenes

Formulario 2

Nº Formulario	Barrio	Nº. Manzana	Fecha

1. Observación Entorno Construido

1. Según el numero indique la respuesta.
1. Sí, 2. No, 3. Parte de la manzana

#	Pregunta	Respuesta
1	¿Hay mucho volumen de tráfico?	
2	¿Hay mucho ruido por parte de otros factores aparte del tráfico?	
3	¿La calle está libre de basuras, colillas de cigarrillo, botellas vacías, vidrios, ventanas rotas?	
4	¿Observa contenedores de basura en el area?	
5	¿Hay obstrucciones constantemente en los andenes del área (vendedores callejeros, vehículos estacionados, árboles, heces de perros)?	
6	¿El ancho del andén es amigable con el peatón?	Si
7	¿Hay lámparas o faroles de iluminación en la zona?	
8	¿Qué elementos en el barrio aportan a la seguridad de la zona? a. Iluminación b. Cámaras de seguridad c. Transeúntes d. Celadores	
9	Identifique los contaminantes de aire dentro del barrio	

2. ¿De qué tipo de material está hecho el piso de las aceras o andenes?
1	Pavimentado, baldosa o adoquín	X
2	Terreno destapado	
3	Césped	
4	Otro, Cuál	

3. ¿Están en buen estado los andenes? (no hay grietas, agujeros, maleza)
1	Sí	X
2	No	
3	En reparación	
4	Parte de la manzana	
5	No hay andenes para caminar	

4. ¿Los andenes a lo largo de la manzana son continuos?
1	Sí	X
2	No	
3	No hay andenes	

Mental health and built environment

El siguiente cuestionario está hecho para ser completado por el investigador para tener la aproximación al barrio desde la perspectiva de un profesional.

Nº Formulario	Barrio	Nº Manzana	Fecha

1. Observación Entorno Construido

1. Según el número indique la respuesta.
1. Sí, 2. No, 3. Parte de la manzana

1	¿Hay mucho volumen de tráfico?	
	¿Hay mucho ruido por parte de otros factores aparte del tráfico?	
3	¿La calle está libre de basuras, colillas de cigarrillos, botellas vacías, vidrios, ventanas rotas?	
4	¿Observa contenedores de basura en el área?	
5	¿Hay obstrucciones constantemente en los andenes del área (vendedores callejeros, vehículos estacionados, árboles, heces de perros)?	
6	¿El ancho del andén es amigable con el peatón?	
7	¿Hay lámparas o farolas de iluminación en la zona?	
8	¿Qué elementos en el barrio aportan a la seguridad de la zona? a. Iluminación b. Cámaras de seguridad c. Transeúntes d. Celadores	
9	Identifique los contaminantes de aire dentro del barrio	

2. ¿De qué tipo de material está hecho el piso de las aceras o andenes?

1	Pavimentado, baldosa o adoquín	
2	Terreno destapado	
3	Césped	
4	Otro. Cuál	

3. ¿Están en buen estado los andenes? (no hay grietas, agujeros, maleza)

1	Sí	
2	No	
3	En reparación	
4	Parte de la manzana	
5	No hay andenes para caminar	

4. ¿Los andenes a lo largo de la manzana son continuos?

1	Sí	
2	No	
3	No hay andenes	

El siguiente cuestionario está hecho para ser completado por el investigador para tener la aproximación al barrio desde la perspectiva de un profesional.

Nº Formulario	Barrio	Nº. Manzana	Fecha

1. Observación Entorno Construido

1. Según el numero indique la respuesta.
1. Sí; 2. No, 3. Parte de la manzana

Nº. Manzana: 14

1	¿Hay mucho volumen de tráfico?	
2	¿Hay mucho ruido por parte de otros factores aparte del tráfico?	talleres no
3	¿La calle está libre de basuras, colillas de cigarrillos, botellas vacías, vidrios, ventanas rotas?	no
4	¿Observa contenedores de basura en el área?	no
5	¿Hay obstrucciones constantemente en los andenes del área (vendedores callejeros, vehículos estacionados, árboles, heces de perros)?	Sí
6	¿El ancho del andén es amigable con el peatón?	Sí
7	¿Hay lámparas o farolas de iluminación en la zona?	Sí talleres

2. ¿De qué tipo de material está hecho el piso de las aceras o andenes?

8	a. Iluminación b. Cámaras de seguridad c. Transeúntes d. Celadores
9	Identifique los contaminantes de aire dentro del barrio

1	Pavimentado, baldosa o adoquín	X
2	Terreno destapado	
3	Césped	
4	Otro. Cuál. ___	X

3. ¿Están en buen estado los andenes? (no hay grietas, agujeros, maleza)

1	Sí	
2	No	
3	En reparación	
4	Parte de la manzana	
5	No hay andenes para caminar	

4. ¿Los andenes a lo largo de la manzana son continuos?

1	Sí	X
2	No	
3	No hay andenes	

El siguiente cuestionario está hecho para ser completado por el investigador para tener la aproximación al barrio desde la perspectiva de un profesional.

Nº Formulario	Barrio	Nº. Manzana	Fecha

1. Observación Entorno Construido

1. Según el numero indique la respuesta.
1. Si, 2. No, 3. Parte de la manzana

1	¿Hay mucho volumen de tráfico?	
2	¿Hay mucho ruido por parte de otros factores aparte del tráfico?	
3	¿La calle está libre de basuras, colillas de cigarrillos, botellas vacias, vidrios, ventanas rotas?	
4	¿Observa contenedores de basura en el área?	
5	¿Hay obstrucciones constantemente en los andenes del área (vendedores callejeros, vehículos estacionados, árboles, heces de perros)?	
6	¿El ancho del andén es amigable con el peatón?	
7	¿Hay lámparas o farolas de iluminación en la zona?	
8	¿Qué elementos en el barrio aportan a la seguridad de la zona? a. Iluminación b. Cámaras de seguridad c. Transeúntes d. Celadores	
9	Identifique los contaminantes de aire dentro del barrio	

2. ¿De qué tipo de material está hecho el piso de las aceras o andenes?

1	Pavimentado, baldosa o adoquín
2	Terreno destapado
3	Césped
4	Otro. Cuál

3. ¿Están en buen estado los andenes? (no hay grietas, agujeros, maleza)

1	Si
2	No
3	En reparación
4	Parte de la manzana
5	No hay andenes para caminar

4. ¿Los andenes a lo largo de la manzana son continuos?

1	Si
2	No
3	No hay andenes

131

Formulario 1

El siguiente cuestionario está hecho para ser completado por el investigador para tener la aproximación al barrio desde la perspectiva de un profesional.

N° Formulario	Barrio	N° Manzana	Fecha
		73	

1. Observación Entorno Construido

1. Según el numero indique la respuesta.
1. Si, 2. No, 3. Parte de la manzana

1	¿Hay mucho volumen de tráfico?	X
2	¿Hay mucho ruido por parte de otros factores aparte del tráfico?	Si
3	¿La calle está libre de basuras, colillas de cigarrillos, botellas vacías, vidrios, ventanas rotas?	Si
4	¿Observa contenedores de basura en el área?	No
5	¿Hay obstrucciones constantemente en los andenes del área (vendedores callejeros, vehículos estacionados, árboles, heces de perros)?	X
6	¿El ancho del andén es amigable con el peatón?	X
7	¿Hay lámparas o farolas de iluminación en la zona?	X
8	¿Qué elementos en el barrio aporta a la seguridad de la zona? a. Iluminación b. Cámaras de seguridad c. Transeúntes d. Celadores	6
9	Identifique los contaminantes de aire dentro del barrio	insto. n.hay gente

2. ¿De qué tipo de material está hecho el piso de las aceras o andenes?

1	Pavimentado, baldosa o adoquín	X
2	Terreno destapado	
3	Césped	
4	Otro. Cuál	ancho anden

3. ¿Están en buen estado los andenes? (no hay grietas, agujeros, maleza)

1	Si	✓
2	No	
3	En reparación	
4	Parte de la manzana	
5	No hay andenes para caminar	

4. ¿Los andenes a lo largo de la manzana son continuos?

1	Si	
2	No	X
3	No hay andenes	

Formulario 2

El siguiente cuestionario está hecho para ser completado por el investigador para tener la aproximación al barrio desde la perspectiva de un profesional.

N° Formulario	Barrio	N° Manzana	Fecha
		71	

1. Observación Entorno Construido

1. Según el numero indique la respuesta.
1. Si, 2. No, 3. Parte de la manzana

1	¿Hay mucho volumen de tráfico?	✓
2	¿Hay mucho ruido por parte de otros factores aparte del tráfico?	no
3	¿La calle está libre de basuras, colillas de cigarrillos, botellas vacías, vidrios, ventanas rotas?	Si
4	¿Observa contenedores de basura en el área?	Si
5	¿Hay obstrucciones constantemente en los andenes del área (vendedores callejeros, vehículos estacionados, árboles, heces de perros)?	Si
6	¿El ancho del andén es amigable con el peatón?	Si
7	¿Hay lámparas o farolas de iluminación en la zona?	Si
8	¿Qué elementos en el barrio aporta a la seguridad de la zona? a. Iluminación b. Cámaras de seguridad c. Transeúntes d. Celadores	1
9	Identifique los contaminantes de aire dentro del barrio	En veces.

2. ¿De qué tipo de material está hecho el piso de las aceras o andenes?

1	Pavimentado, baldosa o adoquín	X
2	Terreno destapado	
3	Césped	
4	Otro. Cuál	

3. ¿Están en buen estado los andenes? (no hay grietas, agujeros, maleza)

1	Si	X
2	No	
3	En reparación	privado
4	Parte de la manzana	
5	No hay andenes para caminar	

4. ¿Los andenes a lo largo de la manzana son continuos?

1	Si	
2	No	X
3	No hay andenes	

El siguiente cuestionario está hecho para ser completado por el investigador para tener la aproximación al barrio desde la perspectiva de un profesional.

N° Formulario	Barrio	N°. Manzana	Fecha

1. Observación Entorno Construido

1. Según el numero indique la respuesta.
1. Si, 2. No, 3. Parte de la manzana

1	¿Hay mucho volumen de tráfico?	
2	¿Hay mucho ruido por parte de otros factores aparte del tráfico?	
3	¿La calle está libre de basuras, colillas de cigarrillos, botellas vacías, vidrios, ventanas rotas?	
4	¿Observa contenedores de basura en el área?	
5	¿Hay obstrucciones constantemente en los andenes del área (vendedores callejeros, vehículos estacionados, árboles, heces de perros)?	
6	¿El ancho del andén es amigable con el peatón?	
7	¿Hay lámparas o farolas de iluminación en la zona?	
8	¿Qué elementos en el barrio aportan a la seguridad de la zona? a. Iluminación b. Cámaras de seguridad c. Transeúntes d. Celadores	
9	Identifique los contaminantes de aire dentro del barrio	

2. ¿De qué tipo de material está hecho el piso de las aceras o andenes?

1	Pavimentado, baldosa o adoquín	
2	Terreno destapado	
3	Césped	
4	Otro. Cuál	

3. ¿Están en buen estado los andenes? (no hay grietas, agujeros, maleza)

1	Si	
2	No	
3	En reparación	
4	Parte de la manzana	
5	No hay andenes para caminar	

4. ¿Los andenes a lo largo de la manzana son continuos?

1	Si	
2	No	
3	No hay andenes	

El siguiente cuestionario está hecho para ser completado por el investigador para tener la aproximación al barrio desde la perspectiva de un profesional.

Nº Formulario	Barrio	Nº. Manzana	Fecha

1. Observación Entorno Construido

1. Según el número indique la respuesta.
1. Si, 2. No, 3. Parte de la manzana

1	¿Hay mucho volumen de tráfico?	*(handwritten)*
2	¿Hay mucho ruido por parte de otros factores aparte del tráfico?	
3	¿La calle está libre de basuras, colillas de cigarrillos, botellas vacías, vidrios, ventanas rotas?	*(handwritten)*
4	¿Observa contenedores de basura en el área?	
5	¿Hay obstrucciones constantemente en los andenes del área (vendedores callejeros, vehículos estacionados, árboles, heces de perros)?	
6	¿El ancho del andén es amigable con el peatón?	
7	¿Hay lámparas o farolas de iluminación en la zona?	
8	¿Qué elementos en el barrio aportan a la seguridad de la zona? a. Iluminación b. Cámaras de seguridad c. Transeúntes d. Celadores	
9	Identifique los contaminantes de aire dentro del barrio	

2. ¿De qué tipo de material está hecho el piso de las aceras o andenes?

1. Pavimentado, baldosa o adoquín
2. Terreno destapado
3. Césped
4. Otro. Cual _____

3. ¿Están en buen estado los andenes? (no hay grietas, agujeros, maleza)

1. Sí
2. No
3. En reparación
4. Parte de la manzana
5. No hay andenes para caminar

4. ¿Los andenes a lo largo de la manzana son continuos?

1. Sí
2. No
3. No hay andenes

El siguiente cuestionario está hecho para ser completado por el investigador para tener la aproximación al barrio desde la perspectiva de un profesional.

Nº Formulario	Barrio	Nº. Manzana	Fecha
		16	

1. Observación Entorno Construido

1. Según el número indique la respuesta.
1. Si, 2. No, 3. Parte de la manzana

1	¿Hay mucho volumen de tráfico?	
2	¿Hay mucho ruido por parte de otros factores aparte del tráfico?	
3	¿La calle está libre de basuras, colillas de cigarrillos, botellas vacías, vidrios, ventanas rotas?	
4	¿Observa contenedores de basura en el área?	
5	¿Hay obstrucciones constantemente en los andenes del área (vendedores callejeros, vehículos estacionados, árboles, heces de perros)?	
6	¿El ancho del andén es amigable con el peatón?	
7	¿Hay lámparas o farolas de iluminación en la zona?	
8	¿Qué elementos en el barrio aportan a la seguridad de la zona? a. Iluminación b. Cámaras de seguridad c. Transeúntes d. Celadores	
9	Identifique los contaminantes de aire dentro del barrio	

2. ¿De qué tipo de material está hecho el piso de las aceras o andenes?

1. Pavimentado, baldosa o adoquín
2. Terreno destapado
3. Césped
4. Otro. Cual _____

3. ¿Están en buen estado los andenes? (no hay grietas, agujeros, maleza)

1. Sí
2. No
3. En reparación
4. Parte de la manzana
5. No hay andenes para caminar

4. ¿Los andenes a lo largo de la manzana son continuos?

1. Sí
2. No
3. No hay andenes

El siguiente cuestionario está hecho para ser completado por el investigador para tener la aproximación al barrio desde la perspectiva de un profesional.

Nº Formulario	Barrio	Nº. Manzana 48	Fecha

1. Observación Entorno Construido

1. Según el numero indique la respuesta.
1. Si, 2. No, 3. Parte de la manzana

1	¿Hay mucho volumen de tráfico?	Si
2	¿Hay mucho ruido por parte de otros factores aparte del tráfico?	No
3	¿La calle está libre de basuras, colillas de cigarrillos, botellas vacías, vidrios, ventanas rotas?	Si
4	¿Observa contenedores de basura en el área?	Si
5	¿Hay obstrucciones constantemente en los andenes del área (vendedores callejeros, vehículos estacionados, árboles, heces de perros)?	No
6	¿El ancho del andén es amigable con el peatón?	Si
7	¿Hay lámparas o farolas de iluminación en la zona?	Si
8	¿Qué elementos en el barrio aportan a la seguridad de la zona? a. Iluminación b. Cámaras de seguridad c. Transeuntes d. Celadores	graffiti solo
9	Identifique los contaminantes de aire dentro del barrio	no

2. ¿De qué tipo de material está hecho el piso de las aceras o andenes?

1	Pavimentado, baldosa o adoquín	X
2	Terreno destapado	
3	Césped	
4	Otro. Cuál	

3. ¿Están en buen estado los andenes? (no hay grietas, agujeros, maleza)

1	Si	X
2	No	
3	En reparación	
4	Parte de la manzana	
5	No hay andenes para caminar	

4. ¿Los andenes a lo largo de la manzana son continuos?

1	Si	X
2	No	
3	No hay andenes	

El siguiente cuestionario está hecho para ser completado por el investigador para tener la aproximación al barrio desde la perspectiva de un profesional.

Nº Formulario	Barrio	Nº. Manzana 21	Fecha

1. Observación Entorno Construido

1. Según el numero indique la respuesta.
1. Si, 2. No, 3. Parte de la manzana

1	¿Hay mucho volumen de tráfico?	Si
2	¿Hay mucho ruido por parte de otros factores aparte del tráfico?	Si
3	¿La calle está libre de basuras, colillas de cigarrillos, botellas vacías, vidrios, ventanas rotas?	Si
4	¿Observa contenedores de basura en el área?	No
5	¿Hay obstrucciones constantemente en los andenes del área (vendedores callejeros, vehículos estacionados, árboles, heces de perros)?	Si
6	¿El ancho del andén es amigable con el peatón?	Si
7	¿Hay lámparas o farolas de iluminación en la zona?	Si
8	¿Qué elementos en el barrio aportan a la seguridad de la zona? a. Iluminación b. Cámaras de seguridad c. Transeuntes d. Celadores	parcial
9	Identifique los contaminantes de aire dentro del barrio	Si

2. ¿De qué tipo de material está hecho el piso de las aceras o andenes?

1	Pavimentado, baldosa o adoquín	X
2	Terreno destapado	
3	Césped	
4	Otro. Cuál	

3. ¿Están en buen estado los andenes? (no hay grietas, agujeros, maleza)

1	Si	Si
2	No	
3	En reparación	
4	Parte de la manzana	
5	No hay andenes para caminar	

4. ¿Los andenes a lo largo de la manzana son continuos?

1	Si	Si
2	No	
3	No hay andenes	

1.

2. Survey

Health and mental well-being of the inhabitants of 3 neighborhoods in Bogotá. 2023

Confidential. I agree that the information provided in the following form will be used only for educational purposes and the data requested in this form are strictly confidential and in no case will the identity of the persons be disclosed to third parties.

Objective: To analyze the mental health and mental well-being of people, according to their place of residence in three neighborhoods of Bogota, Colombia, in the year 2023.

This study is being conducted by Maria Jose Palacio. You are invited to participate in a research study entitled The Impact of the Built Environment on People's Mental Health. Cross-Sectional Study Case of Bogotá, Colombia (The Impact of the Built Environment on People's Mental Health. Cross-Sectional Study Case of Bogotá, Colombia).
Name of research institution Ain Shams University and the University of Stuttgart. The purpose of this research study is for educational purposes.

1. Perception of the physical environment	
Please indicate your response based on your perception of the environment before the pandemic... as follows 1= Yes 2= No 3= Don't know, not answered.	
a.	You constantly hear high levels of noise in your neighborhood and near your home.
b.	The noise in your neighborhood prevents you from concentrating or carrying out any activity inside your home.
c.	You can go out peacefully in the neighborhood where you live.
d.	Have you been a victim of violence in your neighborhood?
e.	Do you know or have you seen people being victims of violence in your neighborhood?
f.	Please rate the air quality in your neighborhood from 1 to 10, with 1 being very bad and 10 being excellent.
g.	The air quality in my neighborhood makes it easy for me to do outdoor activities.
h.	Your neighborhood stays clean most of the time.
i.	There are enough garbage cans around your neighborhood.
j.	The sidewalks in your neighborhood are pleasant and suitable for all types of pedestrians.
k.	The sidewalks in your neighborhood are in good condition and are level.
2. Perception of the social environment	
a.	When you have a calamity who do you go to? a. Members of your family b. Members of another family c. Neighbors or friends d. Co-workers
b.	Does your primary support network reside in your neighborhood? a. Yes b. No c. Don't Know Not Answered
c.	From 1-10 where 1 is not important at all and 10 is indispensable. How important is it to you that your support network lives close to you (10-15 minutes walking distance)?

3. Bivariate analysis of indirect variables

Anexo 3, Global bivariate analysis, indirect correlations of neighborhood quality perception, social capital and mental health study area in Bogotá, Colombia, 2023

Birthplace and general symptomatology / Insecurity cases to the respondent and general symptomatology

Indirect correlations p>0,05 and p<0,1		General			Indirect correlations p>0,05 and p<0,1		General		
		P-Value	OR	95% CI			P-Value	OR	95% CI
Birth place					**Insecurity cases to the respondent**				
Bogotá	Observed	27	15	42	Low	Observed	31	20	51
	% within column	79,4 %	53,6 %	67,7 %		% within column	91,2 %	71,4 %	82,3 %
Rural area	Observed	5	8	13	Neutral	Observed	2	3	5
	% within column	14,7 %	28,6 %	21,0 %		% within column	5,9 %	10,7 %	8,1 %
Other city	Observed	2	5	7	High	Observed	1	5	6
	% within column	5,9 %	17,9 %	11,3 %		% within column	2,9 %	17,9 %	9,7 %
Total	Observed	34	28	62	Total	Observed	34	28	62
	% within column	100,0 %	100,0 %	100,0 %		% within column	100,0 %	100,0 %	100,0 %

Having a support network and depression / Having a support network and stress

Indirect correlations p>0,05 and p<0,1		Depression			Indirect correlations p>0,05 and p<0,1		Stress		
		P-Value	OR	95% CI			P-Value	OR	95% CI
Having a support network					**Having a support network**				
No	Observed	11	6	17	No	Observed	10	7	17
	% within column	22,4 %	46,2 %	27,4 %		% within column	21,7 %	43,8 %	27,4 %
Yes	Observed	38	7	45	Yes	Observed	36	9	45
	% within column	77,6 %	53,8 %	72,6 %		% within column	78,3 %	56,3 %	72,6 %
Total	Observed	49	13	62	Total	Observed	46	16	62
	% within column	100,0 %	100,0 %	100,0 %		% within column	100,0 %	100,0 %	100,0 %

Neighborhood and anxiety / Neighborhood and general symptomatology

Indirect correlations p>0,05 and p<0,1		Anxiety			Indirect correlations p>0,05 and p<0,1		General		
		P-Value	OR	95% CI			P-Value	OR	95% CI
Neighborhood					**Neighborhood**				
Canodromo	Observed	14	6	20	Canodromo	Observed	12	8	20
	% within column	33,3 %	30,0 %	32,3 %		% within column	35,3 %	28,6 %	32,3 %
La Calleja	Observed	18	4	22	La Calleja	Observed	15	7	22
	% within column	42,9 %	20,0 %	35,5 %		% within column	44,1 %	25,0 %	35,5 %
Prado	Observed	10	10	20	Prado	Observed	7	13	20
	% within column	23,8 %	50,0 %	32,3 %		% within column	20,6 %	46,4 %	32,3 %
Total	Observed	42	20	62	Total	Observed	34	28	62
	% within column	100,0 %	100,0 %	100,0 %		% within column	100,0 %	100,0 %	100,0 %

High noise and depression / High noise affectation and anxiety

Indirect correlations p>0,05 and p<0,1		Depression			Indirect correlations p>0,05 and p<0,1		Anxiety		
		P-Value	OR	95% CI			P-Value	OR	95% CI
High noise					**High noise affectation**				
Low	Observed	18	2	20	Low	Observed	32	10	42
	% within column	36,7 %	15,4 %	32,3 %		% within column	76,2 %	50,0 %	67,7 %
Neutral	Observed	15	2	17	Neutral	Observed	5	3	8
	% within column	30,6 %	15,4 %	27,4 %		% within column	11,9 %	15,0 %	12,9 %
High	Observed	16	9	25	High	Observed	5	7	12
	% within column	32,7 %	69,2 %	40,3 %		% within column	11,9 %	35,0 %	19,4 %
Total	Observed	49	13	62	Total	Observed	42	20	62
	% within column	100,0 %	100,0 %	100,0 %		% within column	100,0 %	100,0 %	100,0 %

Neighborhood impact on mental health and anxiety / Neighborhood impact on mental health and stress

Indirect correlations p>0,05 and p<0,1		Anxiety			Indirect correlations p>0,05 and p<0,1		Stress		
		P-Value	OR	95% CI			P-Value	OR	95% CI
Neighborhood's impact on mental health perception					**Neighborhood's impact on mental health perception**				
No	Observed	25	7	32	No	Observed	27	5	32
	% within column	59,5 %	35,0 %	51,6 %		% within column	58,7 %	31,3 %	51,6 %
Yes	Observed	17	13	30	Yes	Observed	19	11	30
	% within column	40,5 %	65,0 %	48,4 %		% within column	41,3 %	68,8 %	48,4 %
Total	Observed	42	20	62	Total	Observed	46	16	62
	% within column	100,0 %	100,0 %	100,0 %		% within column	100,0 %	100,0 %	100,0 %

Type of residence and anxiety / Insecurity due to graffitis on mental health and stress

Indirect correlations p>0,05 and p<0,1		Anxiety			Indirect correlations p>0,05 and p<0,1		Stress		
		P-Value	OR	95% CI			P-Value	OR	95% CI
Type of residence					**Insecurity due to graffitis**				
Residential complex	Observed	24	7	31	No	Observed	42	12	54
	% within column	57,1 %	35,0 %	50,0 %		% within column	91,3 %	75,0 %	87,1 %
Single residence	Observed	18	13	31	Yes	Observed	4	4	8
	% within column	42,9 %	65,0 %	50,0 %		% within column	8,7 %	25,0 %	12,9 %
Total	Observed	42	20	62	Total	Observed	46	16	62
	% within column	100,0 %	100,0 %	100,0 %		% within column	100,0 %	100,0 %	100,0 %

1

تأثير جودة الحي على الصحة النفسية للسكان

حالة دراسة مقطعية مستعرضة لبوغوتا، كولومبيا

ملخص

هذه الورقة هـي تطوير البحث الكمي ، وتنفيذ المتغيرات النوعية والكمية ، لتطوير أداة قياس للإشارة إلى تـأثير البيئة المبنية على الصحة العقلية مـن مـنظور النـاس ، فـي سياقات مـع تـوافر البيانـات الشحيحة. لهذا الغرض ، يأخذ الهيكل العام للدراسة شكل أربعة أقسام. بدءا من مقدمة المفاهيم حول الرفاهية والصحة العقلية والبيئة والبيئة المبنية ، إلى جانب التخصصات المشاركة في هذا المجال. بناء على مراجعة الأدبيات ، يتم تقديم مشكلة البحث وخلفية الدراسة وفقا للنظرية والبحث الميداني ومجال أصحاب المصلحة والجهات الفاعلة. ويتناول الفصل الثاني الاستراتيجية المستخدمة في هذه الدراسة وأهدافها وأسئلة البحث. من الفصل الرابع فصاعدا ، تتمحور وثيقة البحث حول غرضـين ، تطوير الأداة ، وثانيا ، تطبيقها فـي حالة الدراسـة. يعتمد الفصل الأخير على الأطروحة بـأكملها ، ويربط مختلف الخيوط النظرية والتجريبية للرد على الافتراض المقدم.

ويستند جمع البيانات إلى تحليل ثانوي للبيانات من الدراسات الاستقصائية الحكومية الرسمية وصفحات الويب. يتم جمع البيانات الأولية من خلال الملاحظات والاستطلاعات في الموقع التي أجريت لسكان ثلاثة أحياء في بوغوتا ، كولومبيا

في الختام ، يوفر تطوير الأداة مفاهيم وموارد للمهندسين المعماريين والمخططين الحضريين المهتمين بالمساهمة فـي إنتاج المعرفة للصحة الحضرية ، فـي السياقات التي يكون فيها تـوافر المعلومات نادرا. بالإضافة إلى ذلك ، تشير دراسة الحالة إلى أنه من بين جميع المتغيرات التي تم اختبارها ، قدمت الضوضاء أهم القيم الإحصائية للارتباط بالصحة العقلية ، وإلى جانب جودة الأرصفة هـي الجوانب الأكثر تأثيرا على الصحة العقلية في السكان المدروسين.

الكلمات المفتاحية: علم النفس البيئي ، الصحة العقلية ، جودة الحي ، الصحة الحضرية ، البيئة الاجتماعية ، أدوات الارتباط.

Mental health and built environment