Density and Built Environments on Suicide Rates: Improving Urban Planning for Mental Health and Well-being

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Abstract

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This thesis examines the relationship between the Built Environment and suicide mortality rates, focusing on improving urban planning standards and practices to promote mental health and well-being in communities. The association between Built Environmental factors in counties and their suicide rates is explored to identify the specific design elements that significantly affect suicide rates in these communities. Additionally, the potential of child-centered design is investigated to reduce socioeconomic gaps and mental or physical health disparities and to increase overall costs for individuals and communities. This research provides a reinvestigation of our built environment features, using suicide mortality rates as a criterion for successful Built Environment implementation. Overall, the findings suggest that the historical assumptions of suicide (mortality risks higher in dense cities, and poorer areas) may be too vague to be correct and not provide the best framework for the built environment of the future.

Keywords: Suicide rates, Built Environment, Mental Health, GIS

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I. Introduction

While looking toward sustainable and equitable planning practices, I discovered a lack of universal standards to apply. After looking towards 'happiness-building', I felt left out of the conversation as a disabled and traumatized individual. The metrics did not seem universal, but slapped-on as historical assumptions and well-wishes for best practices. Alleviating 'depression' seemed a far cry from adjusting the systematic issues that individual might face in getting care, and those issues are generally larger barriers to access and success for people dealing with disabilities and trauma. This research explored the contextual support for increasing community well-being through accessible and functional design choices with all socioeconomic levels in mind. By focusing on the environmental factors related to health, we can bypass individual bias and more intricate cultural differences and provide 'generally good' advice for planning. In that way, determining a very clear metric for success (generally mortality rates) was paramount.

Finding a metric for urban planning has historically been an effort in public policy to regard the safety and habitability of a location with the aesthetic principals of views and local amenities. The 'Built Environment' is any culturally designed space with habitable and working spaces. In this way, urban planners work in development and local government to help direct and organize individual efforts to build and live in these spaces. The conceptualization of this is a long-standing descriptor of civilization efforts, with pre-classical periods leading to recently planned developments in the 1800s.

Urban planners became a professional term around the late 1890s with the Garden City Movement's Sir Ebenezer Howard (Ebenezer Howard 1902), who worked alongside public

health concerns with industrial spaces and habitable zones. Roughly since then, urban planners worked as consultants and in different roles over the last hundred and twenty years, working to determine their role in human growth and development regions. The planner's role became codified during the 1978 American Planning Association (APA) creation. In the last forty years, there has been a resurgence of long-range planners in government offices compared to roles as consultants. Governments now regularly employ planners, policy analysts, public health officials and more to try and determine the best courses of action and provide options for their constituents to vote on.

As we will explore, 2018 marked a year of increased research on the relationships between health-care styles and common social themes. Individual components of care have been researched and studied to provide relief to individuals. However, larger components of society, like access to care and resources, are subjects with a variety of factors at play and are beyond the individual's direct influence and have a variety of factors at play (roads to pave, access to and shelter from the elements). After exploring that relationship, it became apparent that some relationship between the Environment and personal health must be present. Instead of focusing on 'wellness' which is subjective, a more discrete quantifier is the rate and levels of mortality. For the opposite of 'wellness', the best indicator for 'unwellness' would be an individual's desire to not be in that or any environment ever again. Thus, the relationship between the human-attributable Environments which allow for the culture, economics, and wellbeing of an individual is a researchable and possible relationship of suicide mortality.

This thesis discusses the role of the Built Environment on suicide and makes some further inherent assumptions about it as a concept. Suicide is the term used for the action of intentionally causing an individual's own death. The individual thought patterns that lead to the conclusion of

self-harm are varied and come from various instances and circumstances, making this a problematic method of mortality to predict or prepare for. Although the direct cause of suicide is still unknown, we know that mental and physical disorders and substance abuse can increase risk. As this is not a medical paper, the focus will not be on the individual case management but on the greater accessibility of resources. Various historical practices have explored preventing or 'curing' suicidal ideation, including exploring the relationship to the built environment.

The common themes among mental health have included therapies and solutions for depressive states and the overall acceptance of suicide as a mortality function. During World War I, soldiers coined the term 'shell shocked' due to war responses. Years later, in the 1970s, trauma became accepted in the care and rehabilitation efforts discourse, transforming care models. Since then, we have seen a care change from varied styles, including incarceration and shock therapies, to talk therapy and psychedelic drug rehabilitation. In 1980, the leading provision for insurance-based decisions on these care styles (DSM-5, Diagnostic and Statistical Manual of Mental Disorders) was updated to include PTSD (post-traumatic disorder) as a mental disorder resulting from stress-related instances ("DSM-5-TR Fact Sheets" n.d.).

1.1 Overview

A determinant of a community's health has been the population and active capital gain, with some mentions of safety and overall health for children in the same area. We decide where to live and raise our families based on these criteria. However, wellness can look different to many people, as does in the variety of literature on this topic. We can generally say something is 'good' for the community after it has been built and succeeded. Predictions on determining wellness have been based on best practices and adopting cultural and aesthetic components that

may not have otherwise been introduced to the local area if only to try and beget an artifice of ‘wellnesses’. Another way to indicate community wellness's base descriptor is suicide mortality rates. This historically individual decision-making process has been undergoing a revival in research as military and international communities have realized that most suicide incidences occur with people experiencing mental illnesses. By decreasing mental illness, it would follow that suicide can decrease. Although there is a feature internationally on the social and communal prevention methods for mental illness, there are also theories on decreasing mental health's adverse effects, including increased greenery, vegetation, and fresh air. However helpful, it will be interesting to determine if this is helpful when dealing with suicide mortality or if it is a sentiment for greater mental wellness.

Finding a common thread in the Built Environment where features can determine health outcomes is no new trial. In this thesis, the intention is to find some starting points to identify those Built Environment features. For example, an attractive natural experiment updated the environmental theory for suicide using modern definitions and examining Built Environment features in urban districts (Jiang, Shen, et al. 2021). Their research includes socioeconomic factors (SES) and other confounding factors for suicidal ideation in their study area, Hong Kong. This thesis aims to support the chosen variables and existing discussions of health and wealth concerning Built Environment policy and funding direction. These variables will focus on mental health support in cities, ethically rehabilitative health planning, and equity and health standards using children as a focus lens.

1.2 Contribution

The assumptions we create for mental healthcare can change how we handle and build our spaces beyond aesthetic principles. This means we should introduce environmental changes for reasons outside of capital return and historical preferences. By exploring the assumptions made for our historical practices and beliefs about mental health and overall wellness, this thesis provides another opportunity to explore what we know and how that lays against the data we have. By exploring these assumptions against variables to track incidences of suicide (and even how we track these losses), the data can continue to change and provide more valuable contributions.

Although wellness is explored in the broader sphere of research, suicide and its effects are generally held with more intimacy and reluctance. My interests in this topic arise from a series of losses and the exploration of PTSD and mental health treatments across a spectrum of conditions. Although it is fair enough to say that an individual can benefit from the age-old adage of 'getting fresh air' and 'touching some grass', most humans now live a highly complex life in which finding pockets where this advice would be extremely fulfilling is extremely low. Constant noise pollution from cars, non-stop feed from phones and devices, the internet making everything accessible, and increased expectations for 'more productivity' and 'more capital gain' in everything we do lead to the derelict nature of current advice for mental health. I have seen single mothers told to give the children to relatives for a day to 'get a breath' after experiencing extreme losses and depressive responses. Overweight family members are told to 'exercise more' to become attractive to partners when everything they do surrounds a 10hr work day with a commute by car. Friends managing the effects of PTSD are told to 'take a vacation' to manage their fears between intensive therapy visits and various medical procedures. These things take

time, and time is challenging to manage with conflicting needs of transportation, work, healthy food, good sleep, social interactions, and personal reflection.

While working as a long-range planner and emergency planner, I focused on the immediate needs of individuals as well as their long-term needs. Someone might be outrunning a fire today and will need safe and temperature-appropriate accommodations by night, as well as a computer to find resources the next day. Historically, these situations led to the belief that holding emergency campsites near libraries and in school gymnasiums led to a shorter commute for shocked individuals and more access to these resources to handle their needs. At the same time, we, the governmental entities, focused on more extensive scale efforts like fire mitigation and evacuation. After seeing the long-term effects of burnout in military and civilian lives, I looked to national and international communities where health was better after emergency events to create a community that embodied long-term solutions that supported individual health beyond heart health mantras.

People cannot stay in libraries or gymnasiums in emergency accommodations forever and cannot work themselves to death without affecting their communities. Feeling alive and relishing the community was previously seen as incumbent on the individual, but I disagreed that hardship had to lead to increased perseverance and resilience. It relied on many factors in the cases I saw and in my circumstances. Those factors, in turn, relied on my ability to access those factors and their interwoven nature of social and physical support. These are difficult to track at an individual level, and I further questioned equal and cultural access to these factors through a racial and economic lens. What I have noticed as a common theme in all of my experiences with suicide is a distancing of the individual from their community and a belief that they will not be a component of that community due to many intricate concerns.

In urban planning, we pride ourselves on building healthy and thriving communities but primarily do this after something has been built and then remark on things to change – widening paths or increasing visual appeal, creating housing – instead of having a standard to advocate for before construction. With our Comprehensive Master Plans in the US and Lancet Commissions' public health goals (Patel et al. 2018), we are working together to create a vision of the future regarding health and wellness. However, wellness does not look the same for all levels of able-bodiedness, economic levels, or cultural values. Planners have been picking up the torch to try and determine mental wellness and built environment variables with little success at finding a relationship between such a large concept as 'wellness' (Moore et al. 2018). Maybe one standard we can create is a place where someone would want to and have the ability to manage themself instead of believing that suicide is their only answer.

1.3 Research Question

What is the relationship between the Built Environment and suicide rates?

1.4 Overview / Goal of Literature Review

In shaping these assumptions into researchable questions regarding suicide and Built Environment features, there is a need to review current and past research on the topic. Since 2018, there has been a rise in studies and reviews, and research topics to this point. In exploring these, there is an opportunity to create functional research goals. The overarching topics include:

- **Suicide Prevention and Geospatial Analysis** – Regarding suicide prevention, the potential role of urban planning and geospatial analysis in understanding suicide rates and implementing preventive measures.
- **Happiness Building in the Built Environment** – Regarding mental health stigma and promoting mental well-being through urban design, incorporating green spaces and positive social environments, child-friendly designs, and community-based interventions.

- **Mental Health in the Built Environment** – Regarding creating an equitable distribution of design elements in the Built Environment to promote mental health, the role of green spaces and acoustic/visual environments, and the need for localized data and community-based considerations to improve mental health outcomes and reduce suicide rates.

- **Inequity, Happiness, and Design** – Regarding mental health outcomes through Built Environment design elements and the general meaning of 'wellness' as 'happiness'. The individualized nature of happiness perceptions, the challenges of quantifying happiness with statistics, the unequal access to healthcare and housing, and the complex relationship between Built Environments and mental health focus on child-centered design to address disparities in urban planning.

- **Refining Areas of Focus** – Regarding the existing gaps in research on how urban planning can proactively address mental health and suicide prevention methods.

The Third section of this thesis, “Methodology,” includes the methodology and different in approaches to finding sensitive versus public data. Clarifying the complexity and formal processes that stand in the way of access to information is vital to future research efforts.

The Fourth section of this thesis, “Results,” includes the results found by comparing the geographic information decided on through the Metrics of the Literature review and the Methodology chosen. The geographic visualizations serve as the primary analysis method on relationships between the variables and the suicide instances with rates. These visualizations are added as page-sized addendums after the paper.

The Fifth, Sixth and Seventh sections, “Discussion”, “Conclusion” and “References” provide opportunities to discuss the data availability and the results in a short and digestible manner and their references.

These reflections surmise that the information available to compare at the nation level is too vague to draw comparisons, and even counties can only provide vague overviews without more information.

II. Literature Review

Urban Planning is a profession dedicated to the improvement and well-being of their residents. Wellness, health, and mortality rates are metrics used to determine the effectiveness of urban planning and the Built Environment’s positive impact on its residents. Wellness is challenging to measure based on the subjective nature of its survey style, and health relies on access and affordability to healthcare, which is not universal in America. A more useful metric is the mortality rate, which indicates the highest threat levels to human life in order of incidence amounts in rates generally by 100,000 people.

2.1 Suicide Prevention and Geospatial Analysis

In America, the Centers for Disease Control (CDC) indicates that suicide has been in the top five leading causes of death for Americans aged 1 - 44. This data comes from WISQARS (Web-based Injury Statistics Query and Reporting System), with the other top five cases being unintentional injury, malignant cancer, homicide, and heart disease (CDCMMWR 2022). All of these causes of death are considered 'preventable', and have had research attributed to their prevention or non-fatal resolution. The ways in which causes of death affect an individual vary, and here do not explore the implementation or individual affliction of lethal harm. In any case of suicide, it is preventable due to the nature of choice and the actions it takes to cause lethal harm.

This important component of suicide is the nature of its harm to an individual. In 2010, Kimberly Van Orden mentioned the lack of empirical attention to the theory of why individuals would choose to commit suicide (Van Orden et al. 2010). The interpersonal theory of suicide concluded that risk factors included thwarted belongingness and the perceived burdensomeness of the individual. That is to say, situations leading to individuals being detached from their social group and perceiving an insurmountable problem in their lives lead to desires of escape and hopelessness that escape is ever possible. The author highlights that urban planning designs spaces for community presence and social connections and might inherently include suicide prevention techniques that can ensure survivability in our culture.

One metric of suicide rates is the mortality or incidence rate of suicide attempts. Although the interpersonal theory of suicide recognizes the external situations that lead to suicidal ideation, it does not focus wholly on economic or demographic information. Other risk factors including prior hospitalization, being a female with a psychiatric disorder or a single

male, unemployment, a history of suicidal family, or being in the lower income brackets (Qin, Agerbo, and Mortensen 2003). Even once an individual is identified for suicidal risk, they are recommended for two of the larger forms of therapy – Cognitive Behavioral and Dialectical Behavioral therapy – with the idea that one will give the person enough tools to navigate their situations on their own (Richards et al. 2016). There is no one magical pill solution to preventing long term suicidal ideation or care, unlike other timely medications or treatments with an 'end date'. Given that these focus on the individual's medical background, it is hard to predict when these instances will show up except for those who present with self-identified symptoms or self-harm.

As a leading cause of injury and death worldwide, it is unrealistic to assume that self-reporting behaviors and ideas should forever comprise our metrics on suicide mortality. Nock (2008) reports that suicide rates have remained unchanged over the last decade, while overall population growth has seen suicide incidences increase likewise. As more people commit suicide, it should be easier to predict and model circumstances surrounding prevention methods. Nock suggests that most epidemic research has focused on patterns-finding, but the next generation should focus on modifiable risk and protective factors. Although Nock's plan is to increase types of survey availability and clinical assessments, others recognize the opportunity for environmental modeling.

The most well-regarded facet of suicide prevention includes the means restriction of lethal means. Organizations focus on gun-control as the CDC has mentioned that the leading causes of suicide were using firearms and suffocation in America. Public Health and Urban Planning have had historical crossover since their respective introduction to society. Public Health focuses on lethal means reduction when considering architectural marvels, pedestrian

safety, and many other facets (Pollock 2019). Pollock argued that even as a key intervention for public health, more epidemiological research and surveillance could help to indicate future measures of suicide prevention. Specifically, he mentions that geospatial analysis could lead to indicators on location-based variations in suicide and self-harm instances which could impact service delivery from emergency personnel or policy changes.

International recognition of this data use exists as we move into a wholly digital administrative landscape. Around the same year as Pollock's Journal Article in 2019, the Lancet Commission (Patel et al. 2018) published the Global Mental Health and Sustainable Development Goals (SDGs). This is a continuation of the 2007 documents where inter-disciplinary research and practices called for the global community to increase services for people affected by mental health disorders. Although the Lancet Commission's publication was focused on low- and middle-income countries where human rights of care and dignity were not as accessible, it noted the inadequate investment in care compared to the need and burden of mental health conditions in all countries.

The estimates for the value of this sort of data account for a global 32% of years lived with disabilities (Vigo, Thornicroft, and Atun 2016). Although this is not as high as the percent of global years lived with sleep or working hours, it has been featured as a considerable factor of life that is no longer relegated to the sidelines as a lesser concern of governmental offices. Still, the global burden of mental illness is generally underestimated by governments due to the exclusion of personality disorders from disease burden calculations and the contribution of mental illness to mortality from associated causes. Data collection has been under international review for ethical and legal considerations. This suggests that the impacts of not responding to

mental health as a crisis or global phenomenon can generally result in long-lived wellness disorders and lower quality of life.

One way to measure the cost of healthcare amounts is the resource allocation for Emergency Services to respond to crises (Liddicoat 2019). We have call centers, health outreach coordinators, and research on how to best-respond to self-harm during a crisis event. The user experience is highlighted in Liddicoat's research, focusing on how to best-respond to a person going through emotional distress during a self-harm experience to support them through design practices and practicum at the Emergency Room. The presentation of suicidal distress is usually spatially researched in the hospital environment and considers the reduction of lethal means in that Environment. This focuses on service user violence and triage of clients with mental illnesses in order to navigate them to sterile environments without access to lethal means. This focus highlights the dangerous situation of emergency environments and the need to research more solutions for these care environments but also indicates how people tend to triage suicidal ideation in our culture without long-term focuses.

The question, then, is suicide preventable since it's currently relegated to the interpersonal and non-predictable facet of mortality instances? If our task forces' efforts have not been keeping up with the rate of suicide, even with recent international recognition, how can we hope to increase their influence? With the changes in globalization and data availability, there are many requests for 'more data' down to genetic code and eye movement patterns across phone screens. Without a clear goal and use of any data, it would be hard to sift through 'more data' to find pattern recognition at this scale (or has been so far). The intricacy of patterns to be found would primarily have to be preventative to influence the mortality rate we are concerned with here in this thesis.

2.2 Happiness Building in the Built Environment

However, how can we argue that mental health and wellness disorders are directly related to lower quality of life indicators at such a broad scale? The objective view on 'happiness' or 'enlightenment' is not clear in empirical studies, and moving forward with self-reports of happiness affects planning and policy making. Diener, Oishi, and Tay reviewed the cultural impacts, the current theories of self-reported behaviors, and environmental factors that go into an individual's ability or inability to report happiness for themselves accurately, let alone an audience or survey (Diener, Oishi, and Tay 2018). As policy moves toward adopting 'happiness' measures in American society, it is essential to consider what our determinations of happiness have looked like and whom it has harmed by its creation.

To move from triaging and emergency care toward long-term care, we can cultivate feelings that enhance well-being and alleviate depressive symptoms. This is assessment the case where clinical workers determine their patients to be depressed, relatively older, or highly motivated to improve (Sin and Lyubomirsky 2009). Sin and Lyubomirsky looked at the analysis of 51 styles of interventions to determine the best results. The best results occurred in one-on-one cognitive behavioral therapy instead of group settings, and more extended therapy periods were recommended in the document. However, not everyone has access to the time or resources to seek and successfully participate in long-term one-on-one care. Through the past three years of global pandemic issues, we have seen that one-on-one palliative care is resource intensive and not available to all who seek it at this current time. Sin and Lyubomirsky's research did not

suggest that environmental or group therapy were ineffective but highlighted the individual response and success in interference with individualized care.

In Hsu et al.'s 2015 study, suicide rates increased in communities of depressed socioeconomic status or where social fragmentation led to removing the individual from the group. Again, this remarks on the interpersonal theory where there are conditions of failure to thrive in the individual's Environment and a hopelessness of change in the future. The recommendations from Hsu's research did not include increased individual behavioral health therapy as the primary means of positive interaction. It recommended suicide prevention strategies for overcoming the conditions leading to high-risk communities (like youth and middle-aged males in deprived areas) (Hsu et al. 2015). These suggested that "informed urban planning standards and practices" would promote mental health and well-being in communities, with the added effect of improving the socioeconomic conditions of residents. It's also important to consider the other triage needs in denser cities, as Wang explored in his work on suicide mortality in dense cities (Wang et al. 2020)

The leap from mental health to socioeconomic to individual health and mental wellness has been one of the many barriers to implementing mental health standards in urban planning, even with the APA goals of 'Live, Play, Love where you Plan'. Studies on the health and Built Environment considerations reveal different highlights, like Firdaus' 2017 cross-sectional study in Delhi, India. Self-reports of depression and downtrodden mental conditions were related to overcrowded, loud, and dangerous locations (Firdaus 2017). Unsurprisingly, living in better housing conditions with quieter and safer neighborhoods was associated with positive mental health outcomes across different life stages. The contextual risk factors of mental health have interpersonal and environmental considerations that impact individual decisions to value and live

in areas appropriate to our cultures. However, not everyone has equal decision-making say, especially at the middle, low, and below-poverty income levels.

This touches on the subjective nature of well-being and health and the difficulties in ascertaining the value of aspects of the Built Environment or housing to the individuals who live there. With almost 9 million Americans living in extreme poverty, Ludwig (2012) produced a review of 'Moving to Opportunity' (MTO) as a way to explore which areas supply increasingly positive neighborhood environments and their effect on the populations who move there (Ludwig et al. 2012). The results saw those who leave high-poverty areas to go to low-poverty areas experiencing physical and mental health and subjective well-being. The subjective well-being scores of adults had a direct positive relationship to the increases in household wealth which was reflected in the neighborhood wealth. This study addressed the concerns that MTO could not isolate attributes from the neighborhoods to the best outcomes for residents. It argued that housing, Built Environment, and individual wellness could be affected by planning and policy-related changes and considerations in the future.

With the Move to Opportunity study, there seemed to be an expectation for individuals to raise their households out of poverty and choose better living conditions to take charge of their wellness and futures. In a simplified exploration of access to resources and choice in individual purview, Valladares explores participation-in-design of housing. In Cuba, the Community Architect Program was implemented to allow for expedited housing creation in Old Havana (Valladares 2017). Two of those projects were chosen to display the disparity between housing when it is left unsupported primarily to the community members. Participatory design, an important figurehead in Designing Cities for Children, has been identified as harmful to communities due to its dedicated resources and time requirement. In order to be effective,

participatory design needs to be complimented by community-based initiatives for appropriate access to materials, construction management, and future planning. This challenges the idea that individual circumstances are determinants of health by suggesting the 'village raises a child' model of cooperation and support for community building at its core function – housing.

The concept of social dynamics perpetuating common morals and social functions is not without merit, as it has decidedly been a part of our history of city building since civilization's beginning. Social hierarchies have historically decided the ability of an individuals' participation to be absorbed into the planning process at any level. This is not without its value in modern planning, as difficult as that has been in equitable reasoning in recent years. S. Srinivasan published an article in the American Journal of Public Health titled 'Creating Healthy Communities, Healthy Homes, Healthy People', noting how the ability to get information and data is not only in federal surveys but also in local-level research and alliances among healthcare professions (Srinivasan, O'Fallon, and Dearry 2003). Input can mean various things and ensure that information or data is being collected from various sources with various levels of local intimate knowledge, which otherwise may be lost. This is best explained by the resurgence of including native people's knowledge in current and future planning.

Most of our well-being and mental health metrics come from self-aware individuals participating in surveys. For instance, Galea published in the Journal of Epidemiology & Community Health a survey of 1570 residents in 59 New York City neighborhoods on their quality-of-life metrics. Their findings in 'Urban Built Environments and Depression' suggested that living in Built Environments with poor quality was associated with a greater likelihood of past six-month and lifetime depression (Galea et al. 2005). This study was done in 2005 and has

not had a quality-of-life update since then, further highlighting the difficulty in the continuation of care and metrics from self-proclaimed status updates.

Kan et al. explored this in their 2022 Journal of Environmental Research and Public Health article. Models at an international level are difficult to prescribe value to, as well as non-controlled environments with freedom of selection among participants. Their study in Hong Kong found a weak relationship between the built-environment quality and mental health in high-rise and dense Asian cities (Kan et al. 2022). The focus on housing quality to model predictive statistics had a more straightforward relationship in this study. It did not account for the long-term tracking or individual self-selection of participants.

This does not mean that mental health or Built Environment studies should not or are not be done. Hwang explored this in the 'Association between Neighborhood Environments and Suicidal Ideation among Korean Adults' (Hwang and Ahn 2021). With a sample size of over 220,000 adults over 19 years old, the Korean Community Health Survey found that 9% of individuals experience suicidal ideation. Here, safety and familiarity with neighborhood environments were associated with lower levels of suicidal ideation. Safety was one of the primary values used to prescribe and identify variables for participants personally.

The psychiatric aspects of self-harm and intention are varied, with many intricate details that are not explored here. Vaz populated 'A Geographical Exploration of Environmental and Land Use Characteristics' where they attempted to build a relational model to assess techniques and prevention tactics to prevent such thoughts and suicide instances (Vaz, Shaker, and Cusimano 2020). This was a case where the spatial distribution of suicide using geospatial modeling and statistical methods analyzed disparities in suicide and self-harm intention.

An opposing view to the subjective happiness of individuals is an individual's access and ability to commit or desire to commit suicide. The socioeconomic factors and access to transportation were highlighted in a 13-year study in over 151 rent-only public housing complexes in Hong Kong (Jiang, Shen, et al. 2021). Things related to better outcomes: nearby urban centers with a litany of things available and distance with access to the nearest mass transit railway station. Their main concern was removing the self-selection bias associated with cities and unique mechanisms. The distance to the nearest urban center, distance to the nearest Mass Transit Railway station, and gross flat area per person demonstrate a significant association between features of the Built Environment and suicide rates. They also suggest possible interventions to reduce suicide by designing or redesigning the Built Environment.

Happiness is subjective, but individual care needs to be accessible because socioeconomic and built environment wellness is linked by larger systems of economic and distribution-based operations to remove the selection bias for those closer to poverty. Participatory design is intensive and good at localized populations, where data is needed for larger areas of analysis. Our data is from subjective self-reports, but one common theme is safety. Geospatial data can provide more insight away from surveys to supplement self-selection criteria that we built into the built environment intentionally or unintentionally.

Which factors influence mental health, suicide rates, and well-being in communities, and which of those are reliant on the Built Environment?

2.3 Mental Health in the Built Environment

While exploring the stigma and experimental designs around mental health, it became apparent that there are some active vocabulary wars. It is well-regarded that the ethics and end-user need for care in urban design and policy-making (mainly design) must be implemented as current best-practice interventions (Vaughan 2018). However, the phrase 'Careful Design' became misused, and exploring differences between end-user care and careful design often led to worse results. Further studies have been approached in other countries, namely Australia/New Zealand/ Sweden regarding the language and development surrounding the vocabulary and intent behind 'helpful' policies otherwise borne out of fear. Metrics and use of positive language were found to be corrupted mainly with positive intent, and a trend similar to 'greenwashing' removed the vitality of arguments. Therefore, finding an alternative and unstigmatized design pattern was paramount. In order to not create a new subset of planning, the environmental theory of suicide could serve to benefit the Interpersonal Theory of Suicide.

If life expectancy increases, happiness or overall and subjective well-being increases are expected in the same society. Ni et al. (2020) claim that exposure to natural environments and greenery led to decreased adverse pandemic effects and increased health resiliency over three years, with positive psychology interventions being a major boon to all who lived nearby greenery (Ni et al. 2020). The historical concept is that a free asset like a public park or entertainment would lead to economic class-irrespective enjoyment and improvements. This case study agrees, suggesting public good does the most benefit within a certain distance to individuals' living arrangements. However, assumptions about increased life expectancy leading to increased subjective well-being were found to be false. Specific locations' priority and mass use of social and environmental components, as well as policy directives and alternative self-

supporting techniques, seemed to be more significant determinants in the increased personal subjective well-being, with the added benefit of increased life expectancy.

Another experiment by Bin Jiang et al. (2021) highlighted green space's acoustic and visual components in high-density Illinois and Hong Kong locations. This study's failure rested on the participant's familiarity or cultural unfamiliarity with the chosen locations and using audio-visual technology instead of being present in the location to record results (Jiang, Xu, et al. 2021). The Likert scale and mood questionnaire were recorded and compared using two-way ANOVA tests. The results suggested that green spaces standalone and amid mechanical and ambient noise are not as beneficial as quieting spaces of greenery and breaks in the *manufactured* Environment. Provided that these results would be duplicated depending on the physical presence of the participants, this study concluded with new evidence to support planning and high-density city requirements. Using a Likert scale seems like a common way to evaluate subjective well-being. The same group that created the ANOVA results in the buffer experiment above, created *this* experiment. The ability to find the correlation between qualitative and quantitative subjects does not seem lost using these statistical methods and analysis.

In Yang et al. (2022) report, the six types of green spaces and their respective buffers resulted in increased health outcomes and lower mortality rates during the COVID pandemic. This was an effective use of ArcGIS mapping and their experience with "adjusted for sociodemographic, pre-existing chronic disease, policy, and regulation, behavioral, and environmental factors," which could be used to template a basis for my research reports here in Seattle. Being 1km away from a forest outside the park was optimal, and 400m had positive influences. The study found a greater exposure to forested areas was associated with lower COVID-19 mortality rates, with optimal exposure at 1km or closer. Although ecological studies

like this recognize they cannot be used to guide medical interventions directly, they bring up the historical and medical value of greenspaces to heal from urban plights. This additional variable could be the focus for accessible green space compared to the assumptive 'visual appeal' of green spaces from earlier research. It should be noted that the lack of vegetation is not considered to be a cause of suicide mortality increases. However, the situational existence is present and might reveal a positive or negative relationship upon further reflection.

One place that received much attention for childhood independence and respect was south-eastern China. The long-lived multi-generational households created more access to equity and happiness by design. Thus, Life expectancy increases should relate to happiness or well-being increases. According to an article on 'The Determinants of physical, mental and social well-being', China has not improved mental/social well-being indicators but increased longevity, and Denmark stagnated longevity and has the highest mental/social well-being scores (Ni et al. 2020). Would public health interventions be able to improve the current conditions, or were mental health issues unrelated to the quality-of-life indicators? A longitudinal environment-wide association study (EWAS) was conducted, with a training and test approach, with a false discovery rate control (Ni et al. 2020). They modeled a multivariate multilevel regression for the association of exposure to three outcomes. Almost 200 exposures were recorded, and five were identified with depressive symptoms/life satisfaction and happiness as a guide for placing mental health at the forefront of the public health agenda. This supported or bolstered the other Hong Kong study's other Built Environment claims and supported the idea that policy interventions helped with overall mental health and child-friendly designs.

This research on green space within 1km of a living arrangement and buffer from artificial sounds of transit or industry provides standards for happiness-building in generally

dense cities. Provided overall health leads to increased mood and long-term health benefits like increased well-being, focusing on built-environment structures leading to these outcomes is preferable to other economic choices. The standards for building environments have social, cultural, and environmental distinctions for every municipality and individual who progresses through them. In general, Sustainable Development Goals (SDGs) provided by the 'Lancet Commission's (Patel et al. 2018) review of mental health provided standards that would affect all nations and require coordinated global actions to fulfill. In High-Income Counties like King County in Washington, intensive community-level discussions surrounding sustainable development can lead to discovering localized needs and health determinants at the intimate scale in which policy is used.

This thesis does not intend to isolate and make-preferential the treatment of well-off or extremely poor polarities in our country. Cultural and social expectations have allowed many people to explore their identities while immigrating to this country and challenge the mental health stigma they come up against. For many, it is still a factor in successful immigration outcomes to identify and work on solutions for their mental health. Without the resources to do it, positive outcomes decrease, and overall challenges increase. Immigrants' challenges include worsening health and well-being with a lack of social support upon arrival leading to additional long-term challenges (Chadwick and Collins 2015). A mixed-methods design from 2009-2010 by Canadian Community Health Survey (CCHS) and analyzed using Chi-square and Mann-Whitney U Tests to determine a correlation between urban center size, social supports, and 'self-perceived mental health (SPMH). The higher positive association between these variables is in small urban centers and more dense urban centers. The importance of urban centers was the logistic considerations to offer intensive social support, with settlement services including

translation and language support and cultural competency leading to job opportunities, according to Chadwick and Collins (Chadwick and Collins 2015). More research was requested for smaller urban centers since, overall, the mental health of immigrants was twice as high in urban centers as compared to rural locations lacking support compared to their urban counterparts. This could be an opportunity for further thesis work. However, I feel like the social and cultural components of growing up pose a more significant problem than I could hope to solve by addressing those concerns. Instead, I prefer a bottom-up approach to childhood development and, thus, globally safe and active care for all.

In 2007, the services and practices of people affected by mental disorders and those in low/middle-income countries related to attaining human rights and care were compared. The social determinants of health were identified, and Cambridge attempted to set standards for mental health resources across economic situations. The Sustainable Development Goals (SDGs) affect all nations and require coordinated global actions. This document further explains and normalizes the discussion around mental health stigma. The four pillars state that:

1. Mental health is a global public good relevant to sustainable development in all countries.
2. Mental health exists in a continuum environment.
3. Mental health is a unique social product.
4. Mental health is a fundamental welfare and human right to promote.

Countries across the globe decided to handle this information differently, and reached different experiential conclusions. High-income countries used ‘The Friendship Bench,’ in Zimbabwe, ‘The Thinking Healthy Program’, and Pakistan to promote overall feelings of ease

with the discussions surrounding mental health. Intensive community-level suicide prevention programs (access to means of self-harm, hotlines, and media training) are the primary suicide or evidence-based scopes of most psychology research (Patel et al. 2018). This describes a move into an era of sustainable development, including mental health discussions, and to center all designs on human-based thought processes in the Built Environment, where others have been stagnant.

As we discuss the normalization of mental health and destigmatize its actual effects on us as individuals, it is essential to remember the social and environmental considerations that create compounding problems. By suggesting possible interventions, we might reduce suicide risk. The issue has always been 'how' to reduce suicide risk and remove suicidal apertures for individuals' access. In the "Impacts of Nature and Built Acoustic-Visual Environments on Human's Multidimensional Mood States: A Cross-Continent Experiment.", visual and sound environmental considerations in high-density locations affect locals versus nonlocals differently and may lead to increased social and emotional toil (Jiang, Xu, et al. 2021). These studies are generally concerned with green spaces and natural environments rather than an exact location involving audio-visual or nonlocal residents. Can nature exposure restore attention, reduce stress, promote recovery and unconscious mood responses, and increase the perception of survivability, the sound effects on these visual methods?

"First, the acoustic and visual environments have significant independent and interactive effects on mood states. Second, the acoustic environments have stronger effects on mood states than the visual environments. Third, in general, effects of acoustic-visual environments are more positive and stronger for local participants than nonlocal participants. Fourth, evidence suggests

a universal restorative effect that grows from exposure to natural acoustic-visual environments. This study provides new and specific evidence to support planning and design of healthy high-density cities." (Jiang, Xu, et al. 2021).

Similar experiments revolved around the solutions for PTSD, explored in 'The Body Keeps the Score' (Van der Kolk 2015). In addition to green pathways and natural-sound-baths, resilient community care was an effective deterrent to repetitive PTSD symptoms. The solutions were community-strengthening, focusing on mind-body awareness, not traditional meditation, and healthy interpersonal connections (Van der Kolk 2015). These relied on having solid communities with access to all resources and fulfilling the baser needs of self-care and independence within a community. The ways we do this seem to change depending on the populations and cultural backgrounds explored, barring one age group. Some effective greenspace and community ties were found in Built Environments favoring strong Child-Centered design.

The United Nations Children's Fund (UNICEF) identifies the need for positive growth and child engagement in the Built Environment as adequate access and care. Children's participation outcomes rely on these four components: public and civic engagement, decision-making, being taken seriously, and a sense of self/esteem/worth/efficacy (Lansdown and Sedletzki 2022). Although the article provided by Lansdown and Sedletzki was not rooted in a quantitative study, the lessons-learned provide insight on exploring the equitable distribution of design elements.

While we discuss the importance of using words carefully and considering the impact of this research, it should be reminded that suicide is the 8th leading cause of death for all adults in

their late 50's, and 16th leading cause for those 65 years and older. The cost for Washington State alone in lifetime medical cost and work lost was estimated to be over one million dollars, and in 2017 suicide was seven times more common than alcohol related motor vehicle accidents ("About AFSP" n.d.). School districts adopt plans to respond to suicide and Washington law requires training for anyone who might come into contact with the youth. Having training and intention around how to discuss these concepts in the wider audience is drastically important, as it affects all walks of life and all age groups, and all voting patterns. So how can we take this monumental task and create something manageable?

Suppose we cannot use current terms created out of 'greenwashing', and life expectation does not equal greater health outcomes. How can we create new terms to fuel policy decisions and outcomes, as they will, regardless of the structural decision to do so? Immigrant research shows the possibility of using such data for global review and with a migrant focus, but this and health with greenspace are not our only options. Policy directed towards wellness and internationally agreed upon SDG metrics with current prevention of lethal means could bolster community health and offer resistance.

What measurement features are used for well-being in communities where urban planning and design practices have been optimized to promote better outcomes and reduce suicide mortality rates?

2.4 Inequity, Happiness, and Design

The individual concepts of life lead to very different and individualized perceptions of happiness. With current technologies, we know that statistics of any form are less likely to explain a human condition in its complex entirety and stand to prove reductionist and culture-

deprived insights. However, we strive for happiness to fulfill a general need for equality and equal access to resources without the modern trappings of slavery.

It has been identified that people do not get equal access to healthcare in America (Patel et al. 2018), where those with insurance can receive healthcare checkups compared to those without insurance. We know that housing commodifies a primary sustenance resource, as food is. There are fears that more 'socialist' plans of equitable care or access and condolences in the form of appropriate reparations will destroy the country. To that effect, it is both statistically improbable and unlikely that I will be able to explore the happiness rate in human society, much less a developed and urban structure like Seattle. The opposite of happiness could be seen as despair, and the opposite of thriving toward life is suicide. This sensitive discussion across every cultural group causes distress to many people each year. Since the number of suicides is low each year (less than 1% of the American population), we will not explore the direct prevention methods explored in other discussions (Nock et al. 2008).

Let us say we will build a structure meant to enable happiness, but it is inaccessible and inequitably used. There is a likelihood that elsewhere a lesser building has been made to provide resources for those who do not constitute the initial body of 'happy' people. Thus, there may be a difference in Built Environments, which may further affect the mental state of those living there. In Hong Kong, communities' rate of suicide was linked to an inability to access personal transit or have mobility aids, metropolitan resources, and care associated with metro districts, and the social components of wealth and relationship social success as they relate to individuals (Hsu et al. 2015).

There are various design elements and approaches to examine, and each has its value in expected future development. Cases and examples of these two will be illustrated below in successful contexts.

1. Child-centered design: Explain how child-centered design is expected to reduce socioeconomic gaps that lead to mental or physical health disparities. There will be two examples from existing research to support this concept.
2. Overall costs: Acknowledgement of the potential costs associated with implementing any new design in dense cities, including but not exceptional to child-centered design.

By addressing these concerns in my research, I will help ensure that my study is thorough, well-supported, and relevant to a wide range of stakeholders in architecture, urban planning, and public health.

Which indicators of success in pursuing health and wellness or suicide mortality reductions are best?

2.5 Refining Areas of Focus

Creating an equitable categorization of design elements is the primary end goal for determining variables to compare against current Built Environment factors and suicide instances. To add to the environmental, behavioral theory of suicide, I needed to focus on one component of the Built Environment or select definable characteristics between them to compare. This makes three significant assumptions for the determination of possible factors to consider looking for, regardless of the current availability of data.

1. The impact of the Built Environment on mental health and well-being is an essential study area for urban planners and designers, with potential implications for suicide rates.
2. There are challenges in conducting quantitative studies around equity, but experimental research can provide valuable insights into the impact of different acoustic and visual environments on mood states.
3. Participation in community engagement and decision-making processes can be complex, and it is essential to carefully consider the different levels and styles of participation to avoid issues of control and representation.

Global studies are too complex for interpersonal considerations like the current modality of suicide understanding. This is because they cannot calculate and accurately identify biodiversity, regional considerations, and preferences of cultural significance. In general, Asri's study 'Examining the Benefits of Greenness on Reducing Suicide Mortality Rate' explored country-level data using MODIS-NDVI imagery at 1x1 km^2 resolution for land cover assessments to prove green space value associated with suicide mortality (Asri et al. 2022). An overall reduction in suicide mortality was found in mainly environmentally green areas, providing the idea that this can mitigate the global health burden of suicide directly. This could be and has been used as a country-level assessment for health considerations, but not for reducing mental health of suicide mortality, as we will see shortly.

Published in 2012, Ahrentzen's semantic Scholar article, "Is Green Housing Healthy Housing", offered an opposing viewpoint and focused on asking for increased data collection. The impact of green-washing has led to positive and active marketing styles for any new

technology. The data collection panels for the team were concerned with the ethical and logistical evaluations available for indoor environmental quality (IEQ) and health outcomes for low-income seniors in Phoenix, Arizona (Ahrentzen et al. 2012). As greenwashing becomes more commonplace and greenspaces are historically well-known for perceived and sometimes genuine health benefits, urban planning is expected to continue to argue for these measures to be implemented. Greenspaces do not necessitate good air quality on their own, as we have historically expected them to. This reflects that greenspace and air quality are not good standalone criteria or indicators at a broad sense, like county-levels or higher.

As the construction of houses improved, external stimuli were considered environmental concerns for well-being. Open-access journals were also reviewed by a team for the Journal of Cognitive Sciences and Human Development 8 from 2000 to 2021 (Zainal and Hosni 2022). Post-2014 research was focused on the urban Environment's impact on mental health. Moving away from housing studies is more difficult as the accessibility of researchable data is a security and ethical threat at state-wide and national levels.

One component of greenspace planning focused on the patch area, fragmentation, and patch distance of greenspaces from individual instances of suicide mortality (Shen and Lung 2018). The further distances of greenspace patches or the broken and fragmented locations of patches saw favorable increases in instances of suicide for females in urban settings. Larger, uninterrupted patches closer to walking distances were associated with lower instances of suicide mortality for both genders in the article "Identifying Critical Green Structure Characteristics". Smaller patches of greenspace did not qualify for the addition into theoretical frameworks, but the sizing varies on what constitutes 'small'. Although the type of 'patch' makeup was not

explored for other regional preferences, this shows the importance of greenspace inclusion in planning.

While the types and values attributed to greenspace and natural beauty are varied and regionally distinct, there is an overwhelming and well-known desire for these areas. Having a tool to evaluate and set the preference for these styles of greenspace creation could eventually be implemented along with public health measures for heart health and ecological considerations for local habitats. An article in Science Advances explored ecosystem service assessments' use and individual use to identify and further develop community-based needs for their area (Bratman et al. 2015). Bratman's 'Nature and Mental Health' prescribes using digital tools to assess the use and implementation of localized ecosystems for this benefit. At a time when water rights across America are in heated discussions, having low-impact areas without greenspace might be a logistical necessity as well as a newfound positive and localized answer. For instance, Austin is now well-known for its yucca and river amenities but is visualized as a dry and urban zone with minimal greenery compared to the Pacific Northwest region. Creating a survey-based tool or digitally (and universally) accessible tool to develop localized greenspace preferences could help to balance this in any theoretical framework.

Green spaces are seen as restorative components of a society's needs. This cannot be a universal metric, as individuals and preferences take different turns in priority based on the stimulus and circumstances of the individual. Hartig and Staats' article in the Journal of Environmental Psychology explored different levels of emotionally heightened states (known as nonsexual arousal), which can change individuals' priorities and needs. College students preferred walks through the quiet, contemplative green spaces to busy city streets on campus when stressed during exams or outside stimuli (Hartig and Staats 2006). This is mainly

situational to the community but does highlight the individual's preference for environmental evaluations and indicate further considerations for their relationship. Localized preferences can change depending on the stress and awareness (tiredness) of the individual community, which could be critical in the relationship to traumatizing events at the community and individual levels.

There is, of course, existing literature surrounding the exploration of the Built Environment and mental health regarding occupancy access to different resources valued at different well-being metrics. In a literature review, one group took articles from PubMed and ScienceDirect and reviewed 24 publications until 2017 (Krefis et al. 2018). Their assessment included the General Health Questionnaire and the Warwick-Edinburgh Mental Well-Being Scales. The considerations were for household well-being metrics and valued access to greenery through planned urban greenspace, temperature and sound control, and appropriate ventilation.

In the Environment-Behavior Proceedings Journal 5 (Marzukhi et al. 2020) , 109 international publications were reviewed from SCOPUS, Web of Science, and PubMed. A theoretical framework was developed to support the implementation of the New Urban Agenda and Sustainable Development Goals to create healthier living environments. As we have seen, due to the subjective and likely cultural nature of the Built Environments, it would not be easy to create a universal solution based on the data and surveys we currently have. A more comprehensive and holistic review may be done by adding localized data and different markers of the Built Environment. This is an excellent example of where this has been explored in other areas and research focuses.

The UN Convention on the Rights of the Child (CRC) has evolved into programs globally for increasing positive childhood experiences. The two countries that did not ratify the

CRC are Somalia and the USA. Denver, Colorado, hosts an initiative to reflect the UN Convention's goals and to become the 'number one child-friendly city in the USA' (Kingston et al. 2007). Public health and quality of life statements include components integral to child welfare and experiences, which were previously not prioritized in Denver. The 2006 Children, Youth, and Environments Center (CYE) proposed the Child/Youth Friendly Cities Initiative (CYFC). This report included a review of the organizational structure, learning landscapes, safe school routes, and lessons-learned using published documents (Kingston et al. 2007). The most significant impediments to effective teamwork were social impact and the need for a cooperative framework. The article believes this program will continue to be in place and effectively change Denver for the CYFC.

The teamwork between municipal departments in the same geographic area seems more complicated than determining how students see teamwork and collaboration. Student self-identity and success relates to an individual's ability to continue to do well in life and school. Although the Robinson Center's article focused on gifted students due to their high visibility, this case study shows that identity is essential at all levels and shaped by open-ended questions teachers or community members may make. While it is natural to take this as a cue to disengage and parent implicitly, parents must provide explicit support for teenagers as they figure out who they are, what they will do as adults, and what makes them happy (Grubbs, 2018). As children have the self-confidence to self-determine their preferences, they can work together and evaluate their needs in a team environment.

A literature review covering thirteen studies determined three themes to maintain when developing a theoretical framework for mental health and Built Environment considerations (Friesinger et al. 2019). It included 'well-being' as it relates to housing location, neighborhood

quality, ‘social identity’ as the perceived value of housing and standing, and ‘privacy’ as a metric of architectural designs. Mental health recovery could be improved by having places meaningful to these values, with a sense of control for those values as determined by the tenants. This was done outside the scope of homelessness in Denmark/Netherlands, where socialized housing is being implemented at a cost to the social systems and government assistance, resulting in near-zero homelessness rates.

These assessments show that greenspace is a satellite-enabled and now broadly accessible metric to support criteria in determining relational successes. It does not equate to good air quality, and the size and density differences without global standardization in criteria make this not a perfect standalone indicator. Smaller zones and non-localized (green vegetation versus grassland vegetation) metrics, as well as individual stressors and situational differences (students, traumatized individuals, migrants), affect the usefulness of greenspace as a primary positive impact on suicide mortality decreases. Although a few other theoretical frameworks have been proposed, there is not a uniform set of variables chosen to represent success in preventing mortality decreases.

What are metrics other researchers use outside of Greenspace analysis?

2.6 Metrics

The most inclusive standard for the emotional health of humans uses the UN Conventions on the Rights of the Child as a basis for making cities more supportive of all its citizen’s needs. Accessibility to walking, public transportation for extended trips, and safety to pursue leisure and employment were highlighted in Denver’s nomination for the Child-Friendly City. Some community-based efforts include Learning Landscapes and Safe Routes to School, accessible to

the disabled community beyond the demographic need of early childhood development (Kingston et al. 2007). These position cities planning for a balanced approach to young children and geriatric care as it is accessible and can be created for all.

As we talk about quality-of-life indexes and metrics, and the sensitive nature of asking about these in our culture, we can look for other metrics to reclaim some information. The effect of ignoring child well-being is seen in a failure or success to thrive, with physical, social and cognitive development locally tracked through healthcare and education professionals across America. Urban Planners regularly implement greenspaces, play spaces, and street adjustments to improve the residents' quality of life (Krishnamurthy 2019). The city of Eindhoven in the Netherlands is one place where family and child-directed consumption spaces are prominent and well-regarded. By focusing on Child Centered Design, accessibility and perceived measures of well-being were increased across generational survey respondents.

In some surveys, the relationship between socio-economic status and use of Center of Epidemiologic Studies Depression Scales was explored at county-equivalent scales (Weich et al. 2002). Having a living and subjective study participant may lead to the finding (or in that case lack of finding) relationships between the Built Environment where there are none. Some individuals perceived their political boundaries as different compared to other study participants, and some *liked* the presence of graffiti in their community (the main built environment features decided to determine safety and reliability). In another case, there was exploration on window size for architectural constraints to the Built Environment as well as nature or oxygen exposure and personal control (Beemer et al. 2021).

Surveys are expensive, dependent on willingness and ability to participate, and unable to be representative of the entire population based on these restrictions. However, a study on street

layout and elderly cognitive function was published in the American Journal of Alzheimer's Disease and Other Dementias (Koohsari et al. 2019). It used the Mini-Mental State Examination to evaluate 277 elderly walkers for cognitive function. They found that those who could walk their neighborhood streets based on integrated walkways and maintained pathing had lower mental illness incidences like dementia. Those who could not walk based on unmaintained roads had a higher degree of relationship to mental illness than to physical activity. The suggestion was to reevaluate the need to redesign streets to support mental illness, which would have wide-reaching effects on walkability for the disabled and other consideration groups. This building concept does not have a name but follows the same design principals as creating 'walkable' spaces.

Another metric was the Urban Environmental stressors Scale (UES) and the Urban Hassle Index. This found that the pleasant city of Bhopal, India associated with high-stress levels due to environmental hazards like air pollution, noise pollution, and waste accumulation (Rishi and Khuntia 2012). Roswall's findings in 'Residential Exposure to Traffic Noise and Health-Related Quality of Life' found similar results (Roswall et al. 2015). The holistic planning methods developed in response to these considerations looked like natural resource management and options for functional coping and environmental resilience.

We have discussed housing quality, noise and air pollution, and access to socially supportive community care to provide positive mental health outcomes for individuals. The Encyclopedia of Environmental Health (Evans 2003), provided an opportunity to explore these areas with a resounding request for more data. While this thesis progresses, I understand that the data availability will improve as we take better stock of what we think we know and how we handle sensitive data. Through examining historical preferences and research focuses, we have

determined that there is a need and will be a path to determining positive outcomes based on structural and environmental changes.

Thus, we can now agree that current barriers to suicide prevention include access to education and supportive behavioral health. By deciding on definable variables within the Built Environment features, I hoped to determine a relationship between the Built Environment variable and suicide mortality instances. These variables include data that represents these five factors:

1. ***Urban planning and design:*** The impact of urban planning and design on suicide rates, including the design of buildings, public spaces, and transportation systems. This could include topics such as the role of green spaces, the impact of high-rise buildings on suicide rates, and the design of transportation systems.
2. ***Housing***: The impact of different housing types on suicide rates, including public housing, private housing, and transitional housing. This could include topics such as the impact of housing density, the role of social connections within housing communities, and the impact of environmental factors within housing units.
3. ***Socioeconomic factors***: The impact of socioeconomic factors on suicide rates, including poverty, unemployment, and social isolation. This could include topics such as the impact of urban planning and design on socioeconomic factors and the potential for targeted interventions to address socioeconomic factors and reduce suicide rates.
4. ***Mental health services***: The impact of mental health services on suicide rates, including access to mental health care, the effectiveness of different types of mental

health services, and the role of stigma in existing cultural structures or political environments preventing individuals from seeking help.

5. ***Prevention strategies***: The effectiveness of different suicide prevention strategies within the Built Environment, including interventions such as suicide barriers on bridges and other structures, crisis hotlines, and community-based interventions.

III. Methodology

This thesis attempts to determine a process to replicate a city comparison to a Hong Kong study on suicide rates related to Built Environment forms.

American communities have less published research than other countries. Our studies prioritize economic gain and imply that child engagement in planning or children's focus in design is a lesser goal. Child-centered research feature walkable paths, degrees of independence, and socially-minded grouping, leading to better mental health results. The relationship between certain variables in the Built Environment and our dependent variable, suicide mortality rates, should clarify if these design choices increase or decrease mortality rates from completed suicide attempts.

An in-depth literature review was needed to contribute to a built framework for the Built Environment, psychology implementation, or policy changes. The focus was to find all available research leading up until now, which involved the statistical reasoning for evaluating behavioral health and Built Environment features and policy implementation. It was assumed that personal beliefs led to different valuations on Built Environment feature, and a historical change in data collection would mean different levels of data across the last 30 years of research. Some questions guided the data collection and analysis based on the reviewed literature:

- Q.1: Markers for controlling for socioeconomic variables and factors at the county level of aggregate data?
- Q.2: Which uses of Geospatial Information could measure the impact on suicide mortality?

- Q.3: What measurement features are used for well-being in communities where urban planning and design practices have been optimized to promote better outcomes and reduce suicide mortality rates?
- Q.4: Which indicators of success in pursuing health and wellness or suicide mortality reductions are best?

These questions surrounding data accessibility were accurate, and all published literature commented on the need for more data in the future to be practical. I looked for common uses of spatial and aggregate survey data for Built Environment features and distinct feature characteristics that could translate across different country and state borders. Specialty surveys were engaging but not included if they were not replicable.

The conceptual framework for variable determination is child-centered or universal-design, to include all physical and mental ableness. A universal standard is 'child-centered planning and design' for our policy standards and decision-making rigor. The studies related to this have been focused on the amorphous mental health considerations in our communities, suggesting a high rate of self-determination among personal health decisions. With difficulty in identifying 'happiness' due to the rate of self-determination and personalized ideals across our population, the criteria for successful Built Environment implementation as identified in suicide mortality rates. Not to minimize the other factors in a mental health crisis or situation, I provide a minimum and less subjective view of success than a happiness modifier or restriction of freedom policy. A critical case study in Hong Kong asked other cities to complete the same natural experiment and include a comparative study. This research also focuses on other outcome criteria for child-engagement designs in metropolitan areas to bring accessible change to city planning.

The issue was that data is handled differently at different levels. There is so much data that there is formatting, duplicate, and corruption issues at the technical level. There is also a bureaucratic process to attain the most sensitive data, which is explored later.

The goal was to use Seattle proper as a comparison with other cities. Survey data was kept at the county-level instead of neighborhood and street level. This changed the boundary to focus on county-level data, which is how suicide data was kept within the state-held database aggregate. The suicide rate was meant to be an independent variable to be compared with same-name county identifiers across the country's other datasets.

As explained before, using sensitive data is very ethically precise work – no researcher wants to compromise the living situation of those dealing with mental health crises while stigma is still upheld. It is also challenging to determine if someone has had an attempt without a lethal reaction or had thoughts of suicide based on the stigmatized and sensitive nature of that information. The mortuary teams in America are fantastic at their jobs, and generally do not misrepresent the loss of life occasion for an individual without religious or moral severe influences. This is expected to be so low that the cases in which it happens are shocking and well-discussed, compared to commonplace or frequent.

Due to the sensitive nature of suicide, it is held as a person's choice and distanced from services outside of emergency medical treatment. This further encases the stigma and reluctancy to discuss, which is a significant component of suicide prevention – discussion. The documented reasons listed in the literature review suggest that there is consideration across each professional field for how to manage and mitigate suicide attempts. It is also one of the most significant reasons for loss of life in America and globally. Thus, providing suicide prevention methods in

considering Built Environment characteristics already being reevaluated for their effectiveness has been a theme in planning discourse communities since 2008.

Evaluating design elements required the literature review to expose what had already been found. Currently, well-known suicide prevention work includes architectural lethal prevention methods and access to refreshing visages like green spaces. This could be due to the location of greenspace or its size and type or finding alternative lethal access not preventable via architecture (weapons, drugs). The design elements were evaluated based on recorded and available datasets (surveys, geospatially related data, maps) and historical impact from studies.

The limitations of a non-case study and statistical consideration included the interpersonal reflections of individuals and an inability to follow up on their medical care. There is no way to ask a dead person why they completed an act. The size of available datasets and the scale at which they were recorded was also an issue due to the transitionary nature of American households (moving every 2-4 years). The access to data was the most significant limitation, with this thesis providing the basis for a proposal to request sensitive suicide data.

3.1 Locating / Accessing Sensitive Data:

Suicide mortality data is available at the county level across the country and in some states, available at crossroads and date levels. The CDC holds this latter data under the National Violent Death Reporting System (NVDRS). The data has a two-stage request form which undergoes inspection for appropriate transmission and management of this sensitive data. Sensitive data is any data that can be used to directly identify an individual, which may negatively affect their lives or the lives of their community with that information. There are modules and training segments for individuals to partake in order to gain access to sensitive material and appropriately

handle it, which is why it is not publicly and open-source available. The request process for NVDRS data generally takes 2-8 months from processing to approval. Some States within America also feature by-county data available in aggregate by year. The data in this thesis was from the Washington State Department of Health's All-Death's of Intentional self-harm (suicide) data from 2005-2021.

Other studies had access to further auditory experiments, and explored objectively measured traffic noise and health-related quality of life. In one study, traffic noise was recorded by-decibel, timing, and instance and found to have a relationship with multiple health metrics to include wellness (Roswall et al. 2015). The study was found to not be a clinically relevant relationship, and in this research, we have neither access to the population to control for an experiment nor decibel information related to the instance of suicide mortality or their livelihoods.

The NHCS also hosts by-year rate and death aggregates for each state, at a rate of by-100,000 people. Other manipulators of the information for Washington State include state-based suicide prevention organizations or collegiate research institutes as follows:

- Communities Count hosts the yearly aggregate of suicide mortalities in Washington by-County, preventative hotlines, and seminars. It is a data-sharing and visualization site meant to be accessible to Washingtonians in exploring Health, Housing, or other content. Their contact information did not lead to a student's request for collaboration or further information without cause.

- Harborview Injury Prevention & Research Center hosts a Pacific Northwest Suicide Prevention Research Center, which features prevention and warning sign information like Firearm restrictions and vulnerable group considerations. By their numbers, there are “more than 1,000 Washington residents [who] die by suicide each year… and 20 percent of tenth-grade students…. [who] have seriously considered suicide.” As their research center is dedicated to injury prevention, many available documents focus on Firearm handling and processing. Harborview Injury was open to the offer to collaborate with student requests but did not follow up on any emails without cause.

- Forefront is the University of Washington’s Suicide Prevention resource center for outreach and education to prevent suicide. It also lists the leading cause of suicide in Washington via firearm usage and thus promotes weapon safety and training. Their primary championship and goal to restore hope include the comprehensive suicide-prevention state plan, programs, and webinars to change language and mental processes around suicide and increase crisis response funding and resources. Their contact information did not lead to a student's request for collaboration or further information without cause.

- GAPMINDER is a Swedish organization hosting data collection from World Bank, provided freely to the public. The included mortality instances are by country and gender, also feature rates to indicate suicide mortality by 100,000. These were not available at the united states county level upon request.

- AFSP is the American Foundation for Suicide Prevention. Their Washington chapter hosts volunteer events and seminars and is a placement for research on suicide where Washington residents may be concerned. They also work to engage the public in helpful dialogue to change the stigma and provide funding for support programs to survivors or families of mortality victims. Their data was not available upon request.

- The WHO World Health Organization delegates the maintenance and retrieval of suicide data to individual countries and their related health organizations. Their gathered data was not available upon request.

To varying degrees, these organizations and research centers focus on prevention techniques and adopting best practices to support prevention hotlines and frontline workers. They do not widely disseminate information on the economic or social factors of suicide.

3.1 Locating / Identifying Public Data:

Public data is not maintained uniformly across America, despite federal recommendations and handling best practices. This means there is no 'set of years' standards for data review, compiling, or maintenance. Some data sources may be outdated by several years or updated with the wrong metadata (descriptive information to disclose its last update).

Local and federal governments make most geospatially referenced data publicly available. This data needs to be reformatted to work with statistical processing programs.

- The data chosen included GSS Survey data from 2018 across America, intending to reference each county from the point of retrieval.

- Department of Natural Resource's County-level LANDSAT data provided vegetation and Built Environment feature information in five-year increments.
- Smart Location Database is federally funded spatial distribution calculations on varying social, physical, and economic factors.
- Washington State Department of Agriculture provides drive-by and satellite interpretations of vegetated areas and their ability to provide current provisions of crops.

IV. Results

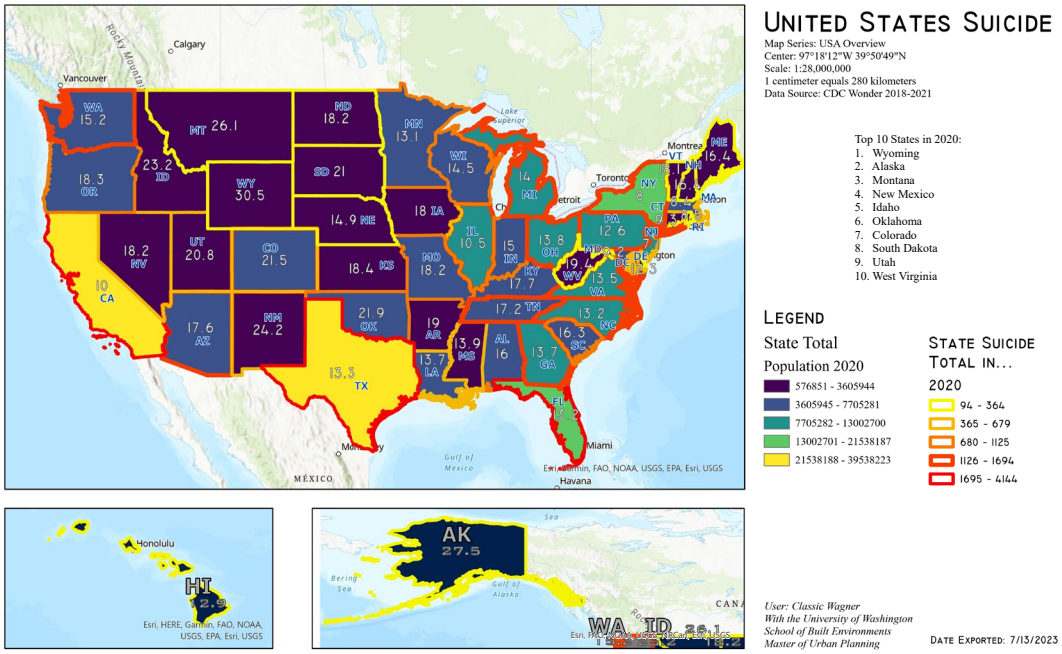
The access and manipulation of spatially-referenced Built Environment feature data was difficult to import and manipulate in the R processing. The reformatting of any spatial data, or large-scale data on suicide was also difficult due to the volume of instances for each county, each year, each type. A larger team with a dedicated statistician would have been able to mitigate this issue.

A more uniform data set is available by request and through the process detailed above. Having three to four months appropriated to gain access via a proposal to suicide data for research use was required for this process to work. Due to technology and data access issues, the regional manipulation of spatial data to conflate relationships between the two took much longer than expected.

Therefore, these geographic visualizations attempt pattern recognition for areas of further research. The United States has a wide variety of population densities, distinct environmental concerns, and economic differences. Determining the state with the highest number of people lost to suicide would be valuable if all populations were standardized in size, density, economic makeup, and physical locations. The top 10 states with the highest incidences of people lost to suicide are not the top 10 states with the highest population. The top 10 states with the highest rates of suicide included some of the states with the lowest overall population.

One study suggested that more rural areas have higher rates of suicide related to their population size. Since there is no uniform ‘more populated’ versus ‘less populated’ state makeup, this was an interesting theory to explore at more minor state-wide scales. In a similar affect, the discussions around populations of people handling situations like poverty or mental health crisis has become a very considerate discussion. To that effect, the populations discussed

as a section of another population will be in terms of ‘saturation’. For a population to be described as ‘saturated’ with a characteristic illustrates the situational relationship of the characteristic being discussed. To say this reflects the same shift toward consideration of a situation than a characteristic representation of an individual.



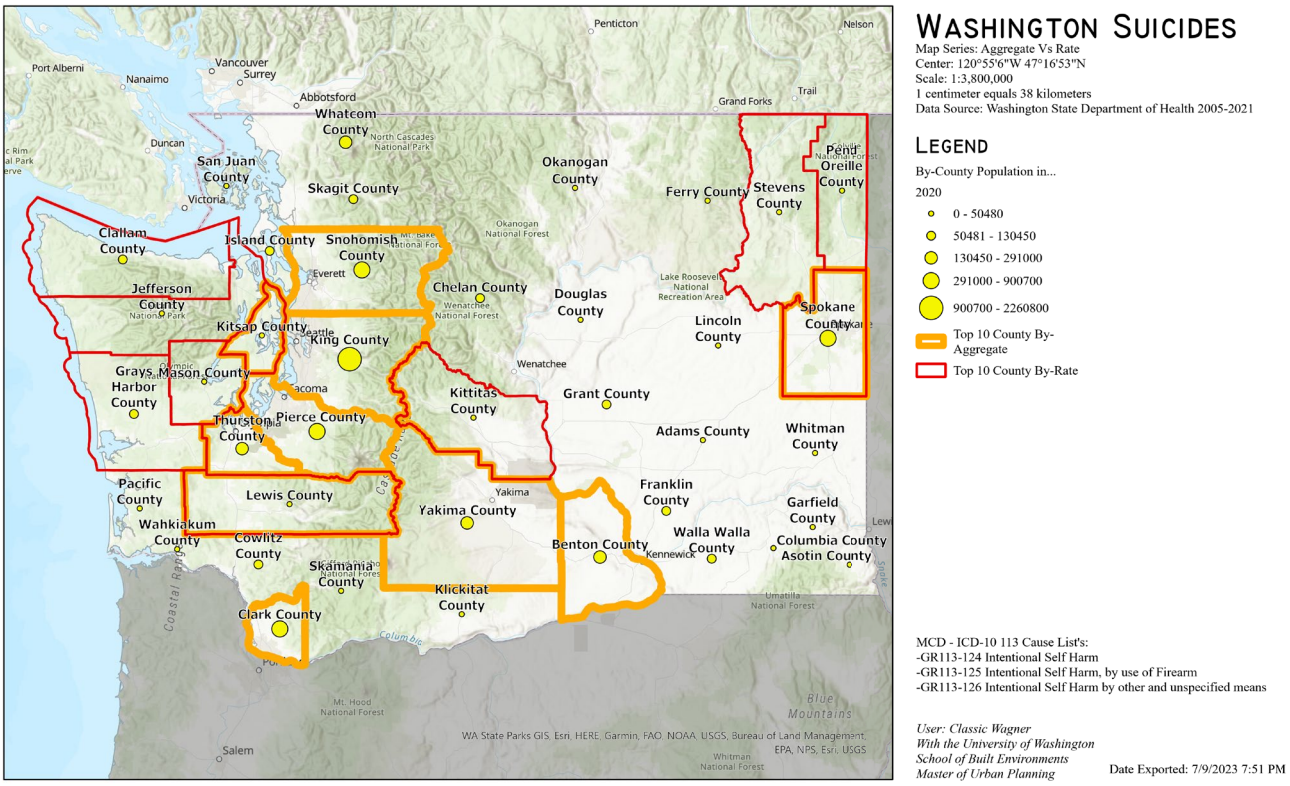
These top 10 states have varying degrees of data accessibility, depending on the year of interest. Washington state (one of the top 10 states with overall high instances of suicide, but not top 10 rates of suicide), Colorado State, West Virginia state, and Alaska state have high amounts of information in their well-populated areas. Washington state, although it has a moderate population size, high instances of suicide, and a moderate rate of suicide instances, has LANDSAT and social information for the state readily available. More information is available for more in-depth research and will be researched during a secondary attempt at this topic.

Looking at Washington State’s information by county revealed a similar concept. High instances of suicide did not relate to high rates, the latter of which is focused on in prevention matrixes around the world. The instances of suicide largely remain the same year after year,

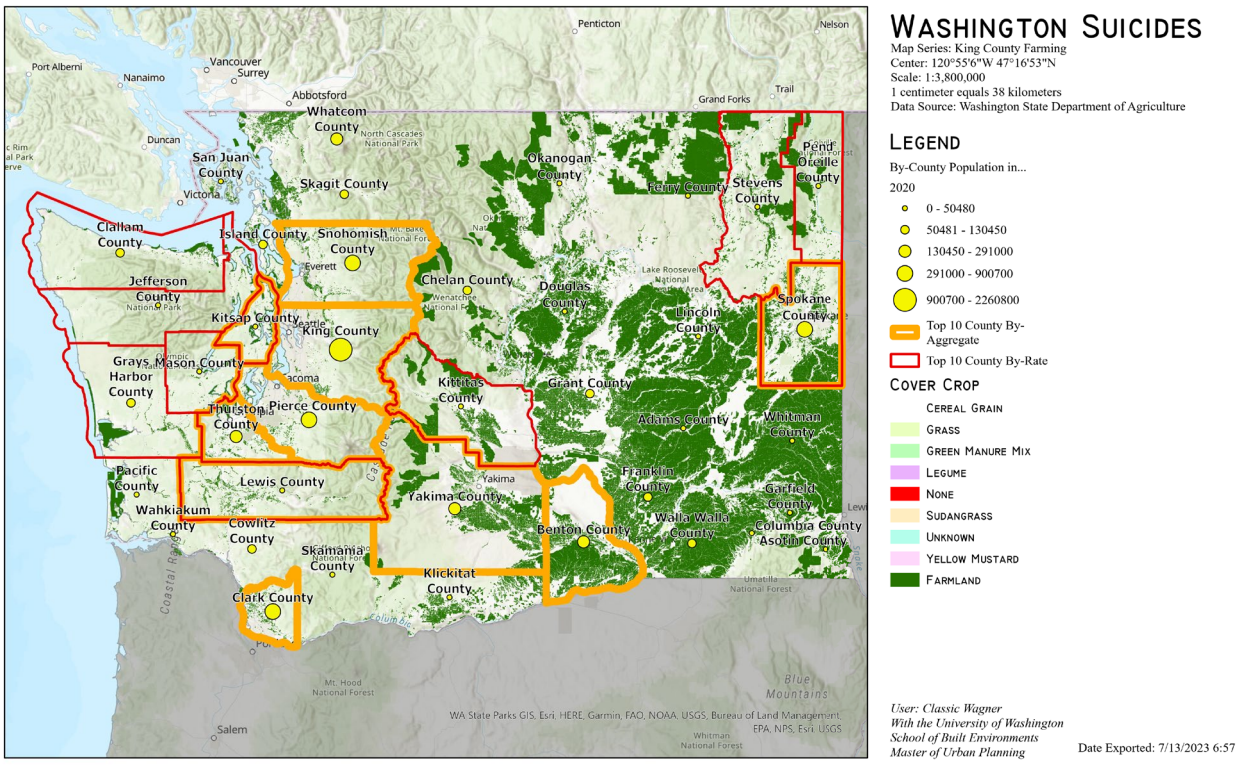
indicating some standard of loss based on external factors that do not directly relate to population size. If the instances of suicide were reliant on population size, then Chelan County would have lost a similar number of people to Clallam County or Grays Harbor. Conversely, if the instances of suicide were utterly independent of population size, then King County could have the same as Pend Oreille County or Klickitat County.

To prove that the Built Environment affects an individual's fight with suicide, there needed to be some distinction between the population size and metropolitan development or standardization of variables. The two methods of reasoning so far are that suicide relates to higher densities of populations, where more individuals will attempt suicide in larger populations (for interpersonal and para-social reasons and assumptive inescapability), or that more individuals will attempt suicide regardless of their population density, as they face challenges accessing resources which could alleviate their difficult circumstances or feeling trapped.

Looking at Washington's Aggregate instances of lives lost to suicide in 2020, we see that the most populated areas have the highest instances. These patterns are not reflected in instances as a ratio to population. Let us look at the top 10 instances of suicide related to their population size (less than .1% of the populations in each Washington County). The value aligns with the 1:10,000 rate recognized by the CDC at the national level. The counties with the highest rate of suicide align with less populated and coastal counties.



It does not perfectly align with population sizes, making the theory about population density fit incorrectly into this assumption. The counties with the highest 'rates' of lives lost to suicide are Kitsap, Lewis, and Spokane County, and they vary in population size and urbanized areas immensely. For instance, Spokane County has the highest values of low-wage workers accessible by public transit. King County has the highest values of population accessible by transit. Lewis County scores less than a marked amount (the lowest being under 2.5%). In other cases, we see that Whatcom County and Skagit County (both featuring metropolitan and highway access) have lower rates and instances of suicide than the incredibly walkable and accessible King and Thurston Counties or Kitsap County. Grays Harbor and Clallam Counties both are evaluated at low overall % of population accessible by transit in the National Walkability Index's 2020 data, but this does not reflect the large national forest or populations of people who live there.

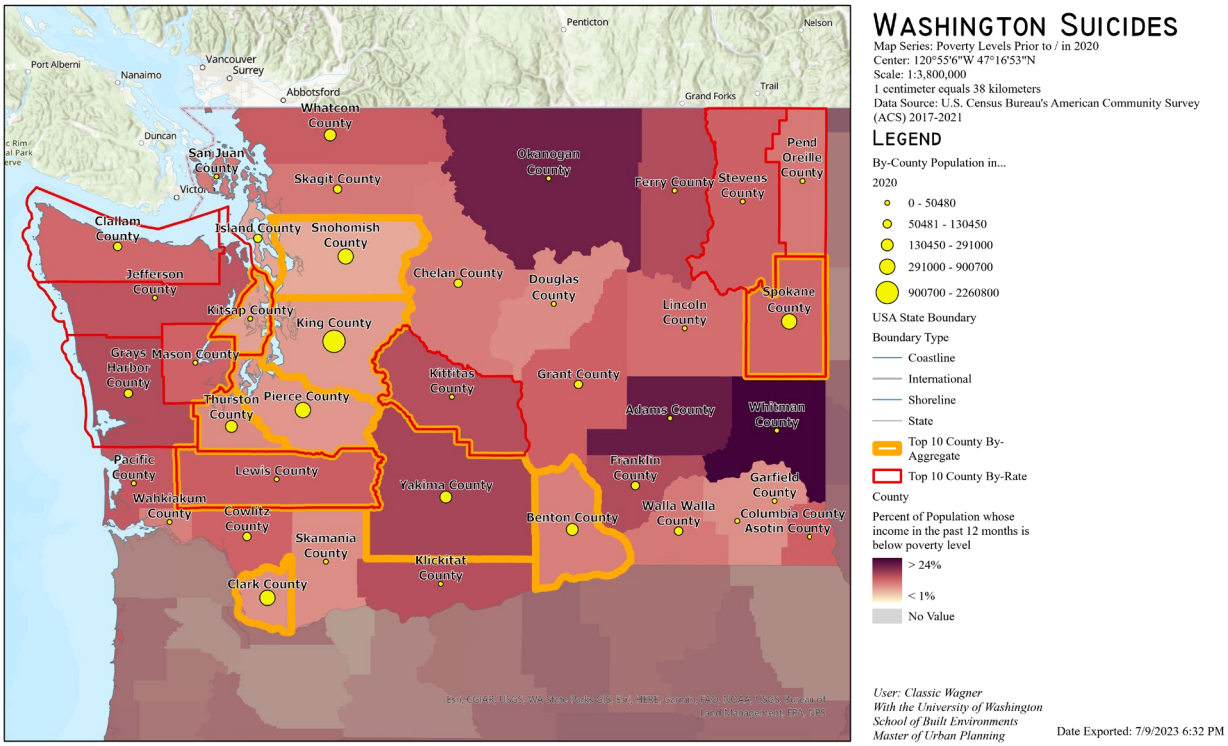


The Washington State Department of Agriculture's data shows a wide range of crop-growing abilities in the state's southeastern region. This could indicate an ability to be self-reliant or cultural differences to areas with larger populations. However, according to this information, Benton, Yakima, Kittas, and Spokane have large amounts of farmland available and still list high in the aggregate and rates of suicide instances for the same year of crop availability. This does not quantify years of inactive farming, wildfire devastation, or poor crop turnout among any variables that play into farmland utilization or industrial uses of the same areas. An assumption to explore was whether suicide was found in poorer areas compared to wealthier areas. That included some factors which made some assumptions on access to resources or environmental factors.

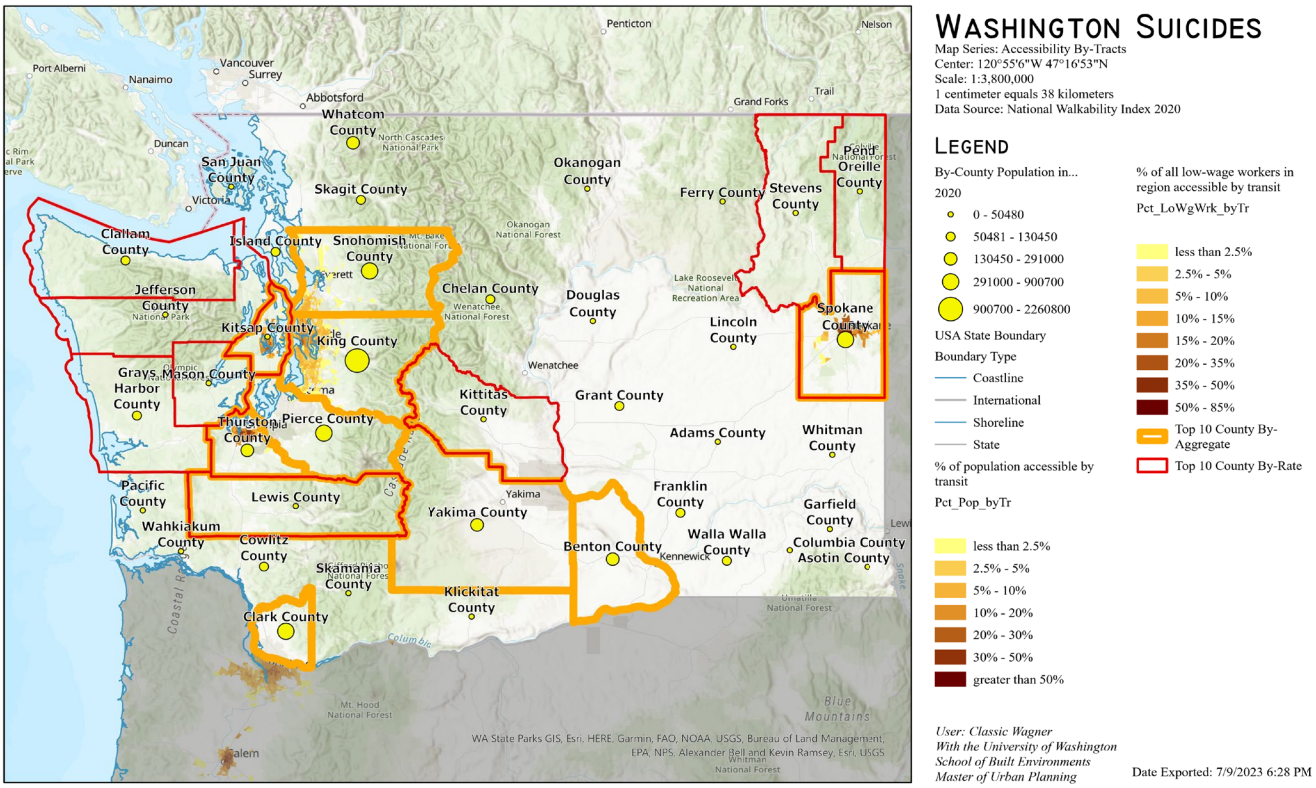
When comparing the above farmland map to the poverty saturation levels for the 12 months before 2020, there is no perfect comparison. Not all counties in higher poverty densities

have wide ranges of various farmland, but neither are they distinguished by grassland or areas devoid of hunting options. We can also see that the areas with the highest instances of the highest rates of suicide instances are not the counties with the highest saturation of population with income below the poverty level.

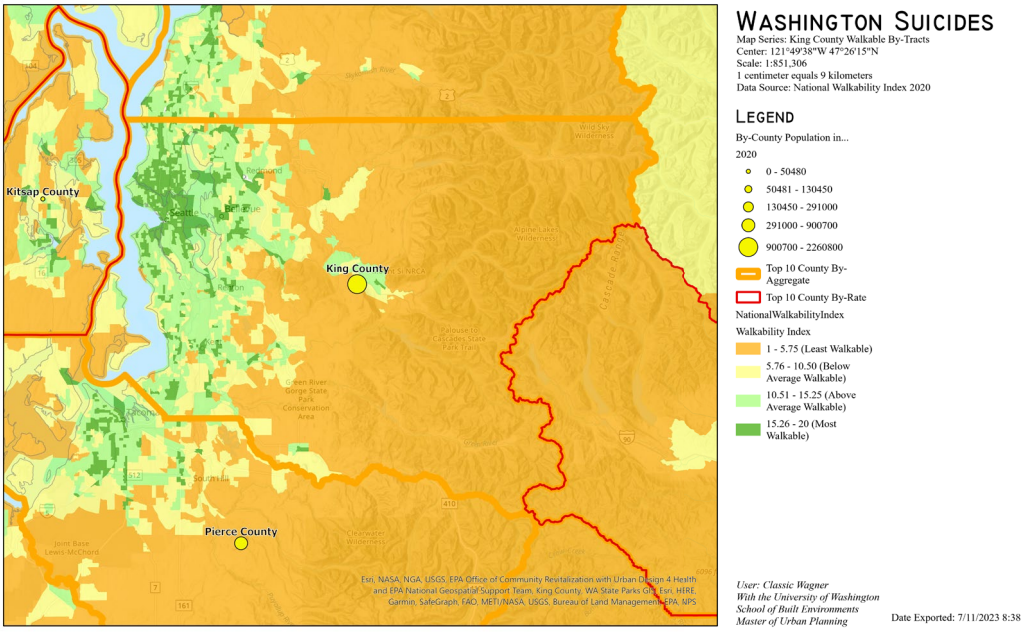
It was assumed, based on the research from Hong Kong's data (data set within poverty populations as a standardization technique using their welfare system), that areas in greater poverty concentration would have higher rates and instances of suicide based on the social and physical attributes which contribute to an individual's ability to handle and mitigate or leave their entrapped and complicated situation. Then again, the Counties with lower population percentages in poverty do not have higher rates of suicide, nor aggregate in the cases of Wahkiakum, Skamania, Garfield, and Columbia Counties. In my personal experience, this is not the case, although the exploration of 'why' is yet unanswered. This is based on the United State's American Community Survey (ACS) for years 2017-2021 aggregates over the years, and as such, may not even be a reliable indicator of the dynamic changes over those five years (including the COVID-19 global crisis).



There is also a component that suicide was found to be higher in women by the coast, and we see a large set of our suicides on the coastlines (although Whatcom, Skagit, Pacific, Wahkiakum, and Cowlitz are all reasonably low on the list compared to Klickitat and Adams/Douglas Counties.



It is thought that walkability is an indicator of accessibility under the conditions set by the national walkability index (to include slops, vegetation, flat and stable or paved areas, and manufactured interferences like roadways or transit). Also interesting is that at the county level, not all top-10 (for either aggregate or by-rate) counties have ‘least walkable’, as we see Spokane/Clalfam/Grays Harbor/King/Kitsap/Jefferson/Thurston have ‘Most Walkable’ zones in their primarily populated areas. This is a valuable place to explore the Pacific Northwest vegetation overlays for anyone unfamiliar. However, exploration of the National Walkability Index provides largely assumptive indicators on the area and are not perfect instances of ‘walkability’ at the individual level, of which suicide is recorded. This means that a generalization on the walkability and accessibility of a region is not perfectly indicative of an individual’s experience or ability to experience that assumption.



A closer look at the Landcover data available for Washington State's urban areas shows how detailed the information is. To extrapolate any assumptions about the larger instance and ratio of individual lives lost to suicide would be statistically inaccurate by maintaining the larger variable of data (instances of suicide) compared to using neighborhood-level information.

VI. Discussion

As we look to return to cooperative planning from our enhanced and primarily digital silos, we are once again exploring the interrelated nature of policy and land use with water rights, individual property rights, and interpersonal relationships, as well as community and individual health. Asserting that one variable is 'better' for a community has led to a statistically lacking and divisive set of evaluations on Built Environment needs that regularly clash with developer and real estate priorities and environmental and engineering practicalities. Access to information and effective utilization is a fantastic opportunity to evaluate these claims and explore the reprioritization of these goals in policy and individual planning. With a clear relationship between instances of suicide and the Built Environment, it seems a perfect opportunity to access and explore these relationships to the impact of very specialized emergency life-saving opportunities before they become first-responder instances.

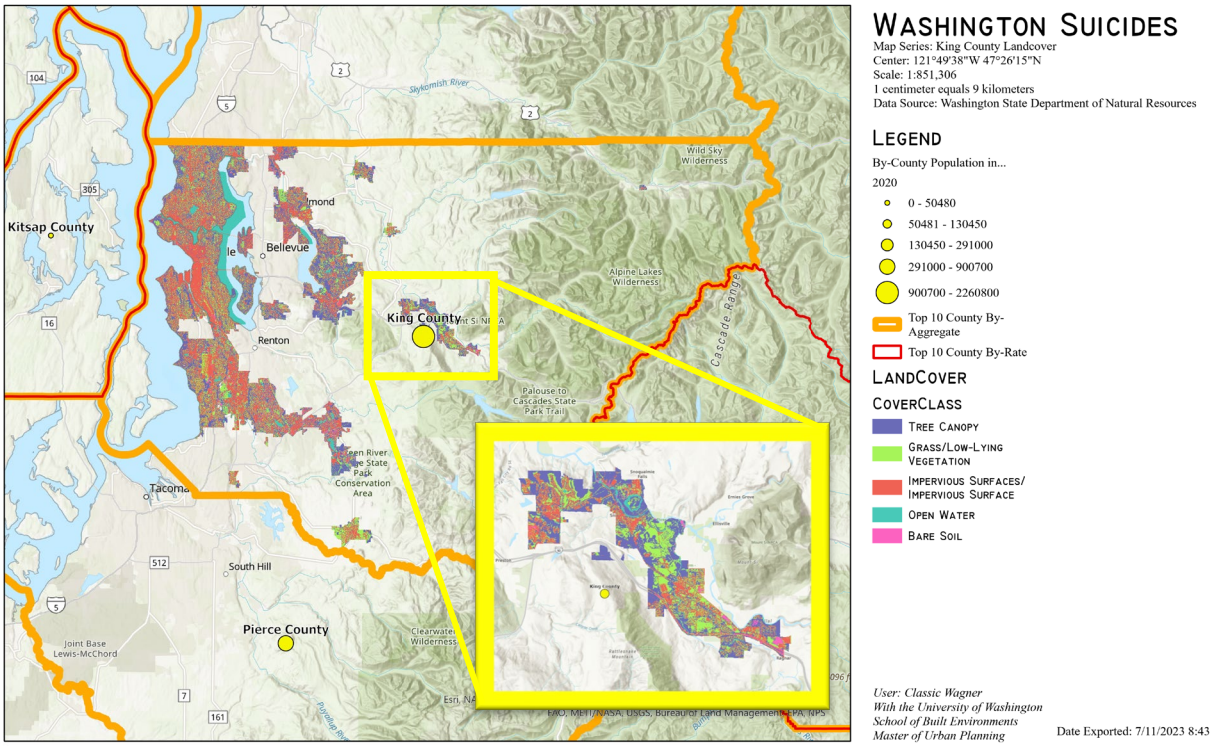
The strength of doing this exploration is that it allows for the visualization of patterns that may not be readily available in data or as a first-thought exploration method. The data available to a graduate student was not information that is more available to any normally unfunded citizen of the world beyond technological, time, and resource-intensive exploration of the readily available data.

A limitation of the data includes the accessibility and cooperation of any entity who may otherwise hold more information as the more localized scales, which may open the door to exploration of specific Built Environments characteristics like satellite inferences on permeable and paved surfaces, vegetation and water availability, or land-uses. Having the suicide instance data at a more localized level would provide the ability to infer lethal harm from environmental

factors at the time of instance as well as some better generalizations. Although individuals may travel to their final destination, it is assumed here that the average range of the majority of the population does not include cross-county travel daily.

V. Conclusion

The differences between a high rate and high instance of suicide mortality for any given political boundary or regional area make an extreme difference in research focus. Rates better reflect the population density variations and resolve spatial distortions at larger scales when comparing entire states in the United States. The rate of suicide mortality did not always reflect the most populous states or cities with the highest densities, which was against expectations that mortality would evenly increase as areas become denser or change in wealth. In Washington State, coastal counties had higher rates of suicide than in-land counties with the exception of Spokane County. The difference in work or poverty saturation (agriculture vs. service vs. office) was not as impactful as transportation access, and vegetation did not have as high of an impact as historically believed. The individual nature of tree canopy and relational access to resources would be better explored within county boundaries in zones of 10-15 miles of the mortality instance location. This would provide more relationship between the very distinct land cover data that is available. By focusing on more discrete data, the relationships between built environment and historical assumptions on vegetation and access become less reassuring, and the opportunity to explore these relationships provides better assumptions for modern planning.



This final illustration shows the dangers of completing analysis on an individual-level instance at such a large scale with such a wide variety of data. Exploring general trends in the instance of lives lost to suicide, we can see a relationship between low-and-middle income populations with a moderate saturation of their population below the poverty level. We can also see that areas with possible farmland have a lower probability of having the highest rate or instances of suicide. Walkability at the by-tract level may not be a good enough indicator of suicide reduction, given that King County experiences the highest walkability index but still features the highest instances of suicide. Furthermore, we can see that coastal regions with or without port activity also feature high rates of suicide, while inland areas generally have lower populations and lower rates and instances of suicide.

Question One related to Suicide Prevention and the use of Geospatial analysis. Specifically, which uses of Geospatial Information could measure the impact on suicide mortality? I could not control for these variables at the county level but attempted exploration

with poverty saturation, crop availability, and walkability indexes from federal satellite and drive-by assertions. Public housing communities were not readily available in GIS or statistical format at the county and state levels. It could not be used against an uncontrolled set of variables. Barring the data availability, geospatial analysis is still a valid option for identifying patterns in data across wide spreads of geographic information, but requires access and coordination to achieve.

Question Two related to the relationship of the Built Environment and mental health or wellbeing. Specifically, it was which factors influence mental health, suicide rates, and well-being in communities, and which of those are reliant on the Built Environment? A variety of answers came from the literature review, but access to care and an ability to provide self-sufficiency was key. This meant that communities in higher saturation of poverty might not be at high of risk for suicide compared to places where self-sufficiency is impractical or unexpected, if the relationship did indeed reflect a self-sufficiency.

Question Three related to the specific features where success has been found elsewhere. What measurement features are used for well-being in communities where urban planning and design practices have been optimized to promote better outcomes and reduce suicide mortality rates? I found evidence of a human relationship between suicide and the Built Environment, where instances were found in urban areas in higher saturation than in less urban areas. Beyond this general modern assertion, specific factors or variables were unexplored. Other research attempted similar questions, and made very broad assumptions about their survey results and selected variables (graffiti being a positive or negative connotation in their area, or ability to walk anywhere by themselves), and disregarded physical components by themselves.

Question Four related to the indicators of success that we currently use, or could use in the future. Which indicators of success in pursuing health and wellness or suicide mortality reductions are best? The assumptions about population sizes having the highest rates of suicide were explored in a way other than using the square footage of building sizes or political boundaries, and these patterns revealed higher rates in coastal regions of Washington State. This was reflective of other research (not explored here) on gender differences and age distributions for suicide mortality rates. Indicators where suicide rates are used still seemed to be appropriate for the huge differences in population across a United States political boundary, and would not necessarily benefit from incidence research. The indicators of vegetation, poverty, and walkability seem to have a relationship that differs from our assumptions around suicide mortality depending on if instance or rates are used.

I hope to use this preliminary exploration of data and literature to engage a team in further exploring this research topic. The data provided here is recorded and held by federal and state-based operations, which may provide more data after pursuing their data collection request processes. With more data, the intent is to explore and identify more variables with readily available geographic or statistical data to find the precise relationships between both.

VII. References

"About AFSP." n.d. American Foundation for Suicide Prevention. Accessed August 16, 2023. https://afsp.org/about-afsp/.

Ahrentzen, S., J. Ball, Hugo Destaillets, E. Fonseca, M. Fraser, W. Johnson, M. Patel, and K. Shea. 2012. "IS GREEN HOUSING HEALTHY HOUSING? A QUESTION FOR SENIORS." In . https://www.semanticscholar.org/paper/IS-GREEN-HOUSING-HEALTHY-HOUSING-A-QUESTION-FOR-Ahrentzen-Ball/e0f78c78164c6fb1905a109f460efdd3c1edcf1d.

Asri, Aji Kusumaning, Hui-Ju Tsai, Pei-Yi Wong, Hsiao-Yun Lee, Wen-Chi Pan, Yue-Leon Guo, Chi-Shin Wu, Huey-Jen Su, Chih-Da Wu, and John D. Spengler. 2022. "Examining the Benefits of Greenness on Reducing Suicide Mortality Rate: A Global Ecological Study." *Frontiers in Public Health* 10: 902480. https://doi.org/10.3389/fpubh.2022.902480.

Beemer, Cody J., Kelly A. Stearns-Yoder, Steven J. Schuldt, Kerry A. Kinney, Christopher A. Lowry, Teodor T. Postolache, Lisa A. Brenner, and Andrew J. Hoisington. 2021. "A Brief Review on the Mental Health for Select Elements of the Built Environment." *Indoor and Built Environment* 30 (2): 152–65. https://doi.org/10.1177/1420326X19889653.

Bratman, Gregory N., J. Paul Hamilton, Kevin S. Hahn, Gretchen C. Daily, and James J. Gross. 2015. "Nature Experience Reduces Rumination and Subgenual Prefrontal Cortex Activation." *Proceedings of the National Academy of Sciences* 112 (28): 8567–72. https://doi.org/10.1073/pnas.1510459112.

CDCMMWR. 2022. "QuickStats: Age-Adjusted Suicide Rates for the Three Leading Methods of Suicide, by Race and Ethnicity — National Vital Statistics System, United States, 2020." *MMWR. Morbidity and Mortality Weekly Report* 71. https://doi.org/10.15585/mmwr.mm7130a6.

Chadwick, Kathryn A., and Patricia A. Collins. 2015. "Examining the Relationship between Social Support Availability, Urban Center Size, and Self-Perceived Mental Health of Recent Immigrants to Canada: A Mixed-Methods Analysis." *Social Science & Medicine* 128 (March): 220–30. https://doi.org/10.1016/j.socscimed.2015.01.036.

Diener, Ed, Shigehiro Oishi, and Louis Tay. 2018. "Advances in Subjective Well-Being Research." *Nature Human Behaviour* 2 (4): 253–60. https://doi.org/10.1038/s41562-018-0307-6.

"DSM-5-TR Fact Sheets." n.d. Organizational Resource Webpage. American Psychiatric Association. Accessed August 12, 2023. https://www.psychiatry.org:443/psychiatrists/practice/dsm/educational-resources/dsm-5-tr-fact-sheets.

Ebenezer Howard. 1902. *Garden Cities of Tomorrow*. Swan Sonnenschein & Co., Ltd. http://archive.org/details/gardencitiestom00howagoog.

Evans, Gary W. 2003. "The Built Environment and Mental Health." *Journal of Urban Health* 80 (4): 536–55. https://doi.org/10.1093/jurban/jtg063.

Firdaus, Ghuncha. 2017. "Built Environment and Health Outcomes: Identification of Contextual Risk Factors for Mental Well-Being of Older Adults." *Ageing International* 42 (1): 62–77. https://doi.org/10.1007/s12126-016-9276-0.

Friesinger, Jan Georg, Alain Topor, Tore Dag Bøe, and Inger Beate Larsen. 2019. "Studies Regarding Supported Housing and the Built Environment for People with Mental Health

Problems: A Mixed-Methods Literature Review." *Health & Place* 57 (May): 44–53. https://doi.org/10.1016/j.healthplace.2019.03.006.
Galea, Sandro, Jennifer Ahern, Sasha Rudenstine, Zachary Wallace, and David Vlahov. 2005. "Urban Built Environment and Depression: A Multilevel Analysis." *Journal of Epidemiology and Community Health* 59 (10): 822–27. https://doi.org/10.1136/jech.2005.033084.
Hartig, Terry, and Henk Staats. 2006. "The Need for Psychological Restoration as a Determinant of Environmental Preferences." *Journal of Environmental Psychology* 26 (3): 215–26. https://doi.org/10.1016/j.jenvp.2006.07.007.
Hsu, Chia-Yueh, Shu-Sen Chang, Esther S. T. Lee, and Paul S. F. Yip. 2015. "'Geography of Suicide in Hong Kong: Spatial Patterning, and Socioeconomic Correlates and Inequalities.'" *Social Science & Medicine* 130 (April): 190–203. https://doi.org/10.1016/j.socscimed.2015.02.019.
Hwang, In Cheol, and Hong Yup Ahn. 2021. "Association between Neighborhood Environments and Suicidal Ideation among Korean Adults." *Journal of Affective Disorders* 295 (December): 488–91. https://doi.org/10.1016/j.jad.2021.08.107.
Jiang, Bin, Ke Shen, William C. Sullivan, Yiyang Yang, Xueming Liu, and Yi Lu. 2021. "A Natural Experiment Reveals Impacts of Built Environment on Suicide Rate: Developing an Environmental Theory of Suicide." *The Science of the Total Environment* 776 (July): 145750. https://doi.org/10.1016/j.scitotenv.2021.145750.
Jiang, Bin, Wenyan Xu, Wenqi Ji, Gunwoo Kim, Mathew Pryor, and William C. Sullivan. 2021. "Impacts of Nature and Built Acoustic-Visual Environments on Human's Multidimensional Mood States: A Cross-Continent Experiment." *Journal of Environmental Psychology* 77 (October): 101659. https://doi.org/10.1016/j.jenvp.2021.101659.
Kan, Zihan, Mei-Po Kwan, Mee Kam Ng, and Hendrik Tieben. 2022. "The Impacts of Housing Characteristics and Built-Environment Features on Mental Health." *International Journal of Environmental Research and Public Health* 19 (9): 5143. https://doi.org/10.3390/ijerph19095143.
Kingston, B., P. Wridt, L. Chawla, W. van Vliet, and L. Brink. 2007. "Creating Child Friendly Cities: The Case of Denver, USA." *Proceedings of the Institution of Civil Engineers - Municipal Engineer* 160 (2): 97–102. https://doi.org/10.1680/muen.2007.160.2.97.
Koohsari, Javad, Tomoki Nakaya, Gavin Mccormack, Ai Shibata, Kaori Ishii, Akitomo Yasunaga, and Koichiro Oka. 2019. "Cognitive Function of Elderly Persons in Japanese Neighborhoods: The Role of Street Layout." *American Journal of Alzheimer s Disease and Other Dementias*, March. https://doi.org/10.1177/1533317519844046.
Krefis, Anne Caroline, Matthias Augustin, Katharina Heinke Schlünzen, Jürgen Oßenbrügge, and Jobst Augustin. 2018. "How Does the Urban Environment Affect Health and Well-Being? A Systematic Review." *Urban Science* 2 (1): 21. https://doi.org/10.3390/urbansci2010021.
Krishnamurthy, Sukanya. 2019. "Reclaiming Spaces: Child Inclusive Urban Design." *Cities & Health* 3 (1–2): 86–98. https://doi.org/10.1080/23748834.2019.1586327.
Lansdown, Gerison, and Vanessa Sedletzki. 2022. "Effective, Representative, and Inclusive Child Participation at the Local Level: A Study on Child and Youth Councils in UNICEF National Committee Countries." United Nations Children's Fund (UNICEF). https://childfriendlycities.org/latest-news/.

Liddicoat, Stephanie. 2019. “Enhancing Emergency Care Environments: Supporting Suicidal Distress and Self-Harm Presentations through Environmental Safeguards and the Built Environment.” *Patient Experience Journal* 6 (3): 91–104. https://doi.org/10.35680/2372-0247.1361.

Ludwig, Jens, Greg J. Duncan, Lisa A. Gennetian, Lawrence F. Katz, Ronald C. Kessler, Jeffrey R. Kling, and Lisa Sanbonmatsu. 2012. “Neighborhood Effects on the Long-Term Well-Being of Low-Income Adults.” *Science (New York, N.Y.)* 337 (6101): 1505–10. https://doi.org/10.1126/science.1224648.

Marzukhi, Marlyana Azyyati, Nur Masyitah Ghazali, Oliver Ling Hoon Leh, and Hamizah Yakob. 2020. “A Bidirectional Associations between Urban Physical Environment and Mental Health: A Theoretical Framework.” *Environment-Behaviour Proceedings Journal* 5 (13): 167. https://doi.org/10.21834/e-bpj.v5i13.2048.

Moore, T.H.M., J.M. Kesten, J.A. López-López, S. Ijaz, A. McAleenan, A. Richards, S. Gray, J. Savović, and S. Audrey. 2018. “The Effects of Changes to the Built Environment on the Mental Health and Well-Being of Adults: Systematic Review.” *Health & Place* 53 (September): 237–57. https://doi.org/10.1016/j.healthplace.2018.07.012.

Ni, Michael Y, Xiaoxin I Yao, Felix Cheung, Joseph T Wu, C Mary Schooling, Herbert Pang, and Gabriel M Leung. 2020. “Determinants of Physical, Mental and Social Well-Being: A Longitudinal Environment-Wide Association Study.” *International Journal of Epidemiology* 49 (2): 380–89. https://doi.org/10.1093/ije/dyz238.

Nock, Matthew K., Guilherme Borges, Evelyn J. Bromet, Christine B. Cha, Ronald C. Kessler, and Sing Lee. 2008. “Suicide and Suicidal Behavior.” *Epidemiologic Reviews* 30 (1): 133–54. https://doi.org/10.1093/epirev/mxn002.

Patel, Vikram, Shekhar Saxena, Crick Lund, Graham Thornicroft, Florence Baingana, Paul Bolton, Dan Chisholm, et al. 2018. “The Lancet Commission on Global Mental Health and Sustainable Development.” *Lancet (London, England)* 392 (10157): 1553–98. https://doi.org/10.1016/S0140-6736(18)31612-X.

Pollock, Nathaniel J. 2019. “Place, the Built Environment, and Means Restriction in Suicide Prevention.” *International Journal of Environmental Research and Public Health* 16 (22): 4389. https://doi.org/10.3390/ijerph16224389.

Qin, Ping, Esben Agerbo, and Preben Bo Mortensen. 2003. “Suicide Risk in Relation to Socioeconomic, Demographic, Psychiatric, and Familial Factors: A National Register–Based Study of All Suicides in Denmark, 1981–1997.” *American Journal of Psychiatry* 160 (4): 765–72. https://doi.org/10.1176/appi.ajp.160.4.765.

Richards, David A., David Ekers, Dean McMillan, Rod S. Taylor, Sarah Byford, Fiona C. Warren, Barbara Barrett, et al. 2016. “Cost and Outcome of Behavioural Activation versus Cognitive Behavioural Therapy for Depression (COBRA): A Randomised, Controlled, Non-Inferiority Trial.” *Lancet (London, England)* 388 (10047): 871–80. https://doi.org/10.1016/S0140-6736(16)31140-0.

Rishi, Parul, and Gayatri Khuntia. 2012. “Urban Environmental Stress and Behavioral Adaptation in Bhopal City of India.” In *Urban Studies Research*, 2012:1–9. https://doi.org/10.1155/2012/635061.

Roswall, Nina, Vibeke Høgh, Pernille Envold-Bidstrup, Ole Raaschou-Nielsen, Matthias Ketzel, Kim Overvad, Anja Olsen, and Mette Sørensen. 2015. “Residential Exposure to Traffic Noise and Health-Related Quality of Life—A Population-Based Study.” Edited by

Qinghua Sun. *PLOS ONE* 10 (3): e0120199. https://doi.org/10.1371/journal.pone.0120199.

Shen, Yu-Sheng, and Shih-Chun Candice Lung. 2018. "Identifying Critical Green Structure Characteristics for Reducing the Suicide Rate." *Urban Forestry & Urban Greening* 34 (August): 147–53. https://doi.org/10.1016/j.ufug.2018.06.005.

Sin, Nancy L., and Sonja Lyubomirsky. 2009. "Enhancing Well-Being and Alleviating Depressive Symptoms with Positive Psychology Interventions: A Practice-Friendly Meta-Analysis." *Journal of Clinical Psychology* 65 (5): 467–87. https://doi.org/10.1002/jclp.20593.

Srinivasan, Shobha, Liam O'Fallon, and Allen Dearry. 2003. "Creating Healthy Communities, Healthy Homes, Healthy People: Initiating a Research Agenda on the Built Environment and Public Health | AJPH | Vol. 93 Issue 9." *American Journal of Public Health*, no. 93 (April): 1446_1450.

Valladares, Arturo. 2017. "Successes and Failures of Participation-in-Design: Cases from Old Havana, Cuba." *Frontiers of Architectural Research* 6 (July). https://doi.org/10.1016/j.foar.2017.06.001.

Van der Kolk, Bessel A. 2015. *The Body Keeps the Score: Brain, Mind and Body in the Healing of Trauma*. New York, NY: Penguin Books.

Van Orden, Kimberly A., Tracy K. Witte, Kelly C. Cukrowicz, Scott R. Braithwaite, Edward A. Selby, and Thomas E. Joiner Jr. 2010. "The Interpersonal Theory of Suicide." *Psychological Review* 117: 575–600. https://doi.org/10.1037/a0018697.

Vaughan, Laurene. 2018. *Designing Cultures of Care*. London, UNITED KINGDOM: Bloomsbury Publishing USA. http://ebookcentral.proquest.com/lib/washington/detail.action?docID=5573368.

Vaz, Eric, Richard R. Shaker, and Michael D. Cusimano. 2020. "A Geographical Exploration of Environmental and Land Use Characteristics of Suicide in the Greater Toronto Area." *Psychiatry Research* 287 (May): 112790. https://doi.org/10.1016/j.psychres.2020.112790.

Vigo, Daniel, Graham Thornicroft, and Rifat Atun. 2016. "Estimating the True Global Burden of Mental Illness." *The Lancet. Psychiatry* 3 (2): 171–78. https://doi.org/10.1016/S2215-0366(15)00505-2.

Wang, Pin, William B. Goggins, Xuyi Zhang, Chao Ren, and Kevin Ka-Lun Lau. 2020. "Association of Urban Built Environment and Socioeconomic Factors with Suicide Mortality in High-Density Cities: A Case Study of Hong Kong." *Science of The Total Environment* 739 (October): 139877. https://doi.org/10.1016/j.scitotenv.2020.139877.

Weich, Scott, Martin Blanchard, Martin Prince, Elizabeth Burton, Bob Erens, and Kerry Sproston. 2002. "Mental Health and the Built Environment: Cross – Sectional Survey of Individual and Contextual Risk Factors for Depression." *British Journal of Psychiatry* 180 (5): 428–33. https://doi.org/10.1192/bjp.180.5.428.

Zainal, Nurul Zakirah, and Nafisa Hosni. 2022. "Effects of Urban Built Environment on Mental Health: A Review." *Journal of Cognitive Sciences and Human Development* 8 (1): 30–48. https://doi.org/10.33736/jcshd.4398.2022.