

Riverdale Country School

## Case Study of the Effects of Urbanization and Exposure to Green Space on Mental Health

Claire Kho  
11th Grade  
8 Engle St Cresskill, NJ, 07626  
[claireskho@gmail.com](mailto:claireskho@gmail.com)  
201-983-1742

## Abstract

*10.7% of people globally have suffered from mental illness, anxiety being the most prevalent. Shockingly, rates of depression have rapidly increased over the years, with a shocking 63% jump between 2009 and 2017 in young adults. What if this rapid increase in mental illness correlates with a seemingly unrelated topic, urbanization? With the growth in urbanization in most countries around the globe, there has been a substantial loss of green space, and with that, the worsening of our environment. Recent studies have shown that there might even be another consequence: the lowering of one's mental health. The connection between these two seemingly unrelated concepts might actually reveal the damages done by urbanization that cannot be seen with our eyes. In this paper, I analyze the relevant scientific literature examining the relationship between mental health and the environment in over 12 studies. I look at four factors in the literature; (1) the definition of mental health used in research papers, (2) the methods, (3) the results, and (4) the studies' limitations in order to draw connections and attain the most accurate interpretation of the broader literature. Through the thorough analysis of the works, I find that there is indeed a correlation between the growing loss of exposure to green space and the worsening of one's mental health and overall wellbeing. This paper focuses on the different ways researchers have approached a common mystery and reveals how the relationship between mental health and urbanization is more complicated than what meets the eye.*

Keywords: Urban agriculture, Urban farming, Mental health, Green space, Urbanization

## 1. Introduction

Urbanization, the process whereby more and more people come to live in a concentrated area which leads to a city, has been present all throughout our history and is taking place even today. What began in ancient Mesopotamia at approximately 7500 BCE has evolved drastically. Due to modernization, there has been great technological advancement that drives the development of buildings, apartments, factories, and streets, all of which need land. In Ghana's capital city, Accra, the urban built environment has expanded from a shocking 55.1% to 83.79% at the expense of green spaces, which have declined from 41% to 15% over the last 27 years (Pulampu and Bofo, 1). This decline in the natural environment because of urbanization prompted global issues such as deforestation, endangerment of species, and unclean air quality. Moreover, scientists have found that urbanization may also have an impact on a person's mental health.

Mental health is a very complex subject and a very layered word in itself. What was once understood as having a mental disease, mental health is now defined as “a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity”(Manderscheid, 2). Because of the variety of definitions of mental health throughout time, it is important to note that research papers may assess different forms of mental wellness. However, this vast array of the interpretations of mental health could actually increase the accuracy of the common thread of the collection of papers by seeing how urbanization impacts all aspects of mental health. There is extensive empirical literature on the association between exposure to nature and mental health, so in this narrative review, I will discuss the methods I used to assess the strength of the evidence from recent experimental studies, the concreteness of its results, as well as the limitations of the studies.

## 2. Methods

In order to corroborate a conclusion from recent studies, I needed to collect an extensive amount of experimental research papers. In total, I reviewed and analyzed the methods and results of over 12 scientific studies. Two vital pieces of information I paid close attention to were the ways scientists approached the assessment of mental health and the methods in which they attained their results. The way scientists in the experimental studies define mental health is critical because this variation in the way scientists approach the topic of mental health may convince readers to cast doubt on the findings; however, this difference may actually reinforce the results of the studies because it shines light on all aspects of mental health no matter which definition is used. If the results in the variation of papers show a significant correlation between the exposure to nature and the definition of mental health they choose to use, there is a very high chance that the results of the papers are linked together under the large category of mental health. Secondly, the methods in which the scientific papers obtain their data is vital because there could be limitations that are reinforced based on how scientists choose participants for their surveys or how exposure to green space is assessed.

### 2.1 Assessment of Mental Health Findings

Generally speaking, mental health is split into two spheres: mental illness and mental wellness. Mental illness refers to conditions that affect cognition, emotion, and behavior (eg. schizophrenia, depression, autism) (Manderscheid, 3). On the other hand, mental wellness focuses on overall mental happiness and life satisfaction. Based on which dimension the authors of these scientific papers focused on, the scales used to assess mental health will be different. For instance, in the scientific paper, *The Impact of Urbanization on Nature Dose and the Implications for Human Health* (Cox, Daniel T.C., et al., 2018), the scientists chose to approach mental health as more diagnosis-based, thus choosing mental illness. The specific

tool they used to assess this was the “Depression, Anxiety, and Stress Scale” or the DASS 21. This scale was measured by a 4 point system where respondents “rated the extent to which seven statements applied to them over the previous week”(Cox, Daniel T.C., et al., 2018). The total scores would stretch from 0-4, mild cases of depression, to 14+, extremely severe cases of depression. The key to this scale is the use of the word depression and anxiety, which serves to diagnose the respondent after they answer the list of questions. Similarly, the scientists behind *The Effect of Air Pollution and Rural-Urban Difference on Mental Health of the Elderly in China* (Tian, Tao, et al., 2015) chose to focus on mental illness but by using a different scale: the Center for Epidemiological Studies Depression Scale (CES-D). The scale measured the depression degrees of respondents based on their answers to 10 questions based on the China Health and Retirement Longitudinal Survey (CHARLS). If the CES-D score was higher, it meant that the respondent would be more depressed. Thus, the purpose of the scale is to diagnose each of the respondents.

Unlike the previous two papers, the study described in *“Happiness in the Air: How Does a Dirty Sky Affect Mental Health and Subjective Wellbeing?”* (Zhang, Xin, et al., 2017) focused on the mental wellbeing aspect of mental health. They further classify wellbeing into two subgroups: hedonic happiness and evaluative happiness. Hedonic happiness refers to “moment-to-moment experienced utility and directly links to immediate emotions and affection, while evaluative happiness, such as life satisfaction, reflects an overall assessment of the entire life and therefore is less likely subject to short-term changes in external environment”(Zhang, Xin, et al., 2017). To measure both of these, the study uses the China Family Panel Studies (CFPS), a national representative survey of Chinese communities. The respondents must answer questions given by the CFPS that measure Subjective Well-Being (SWB) such as, “Overall, how satisfied are you with your life?” The respondents must answer on a scale of 1(not satisfied) to 5(very satisfied), and then these answers reflect “the

extent to which people’s own experiences match their long-term aspirations and expectations about their lives as a whole”(Zhang, Xin, et al., 2017) instead of diagnosing the respondent.

## 2.2 Assessment of Methods Findings

Factoring in such different scales used to measure mental health, all 12 studies I have evaluated assessed their respondents with a common tool: surveys. Although some researchers such as those who conducted the study in *The Effect of Urban Nature Exposure on Mental Health-A Case Study of Guangzhou* (Liu et al. 2021) proceeded with face-to-face interviews, others such as scientists behind *Living in Grey Areas: Industrial Activity and Psychological Health* (Marques and Lima, 2011) conducted online surveys. It can be assumed that the most efficient way to measure one’s mental health is through surveys and questionnaires. The sample size of the respondents in a total of 12 evaluated scientific papers, including the previous listed studies, ranged from 1,546 to 387,195 people. Each of the 12 research papers were hyper focused and conducted in specific parts of the world such as Guangzhou, China, the Netherlands, and more, which could affect how many participants the scientists could include in their data collection. Similarly, the age groups of the participants varied, as some researchers such as the ones in *The Effect of Air Pollution and Rural-Urban Difference on Mental Health of the Elderly in China* (Tian et al. 2015) wanted to focus on specific age groups such as the elderly. Another essential component of the study was to calculate what classified as an urban environment or rural environment, and how scientists could pick participants based on which type of society they lived in.

In the study *Associations of Combined Exposure to Surrounding Green, Air Pollution, and Traffic Noise on Mental Health*(A.H.Janssen, et al., 2019), the researchers used 2 different metrics to assess surrounding green space: Normalized Difference Vegetation Index (NDVI) and the National Land-Use Database of the Netherlands of 2010 (TOP10NL). The TOP10NL categorized sections of the Netherlands into different classes of land-use such as

water, terrain, etc. Based on these two tools, this study categorized the extent to how urbanized the land that the participants live on was. In contrast to how this study assesses green space, *The Impact of Urbanization on Nature Dose and the Implications for Human Health* (Cox, Daniel T.C., et al., 2018) used another form of survey in which they trust the participants to accurately describe their surroundings. The survey participants in this paper completed the Nature Relatedness Scale, which required them to answer their individual differences in connections to nature. These questions assessed affective, cognitive, and experiential relationships individuals have with the natural world.

### 3. Results

Although each study conducted their own experiment and used their own unique methods, the relationship between mental health and urbanization are very evident in their conclusions. Generally speaking all 12 studies showed a strong correlation between a decrease in exposure to nature and a decrease in overall mental health. According to *The Impact of Urbanisation on Nature Dose and the Implications for Human Health*, which focused on mental illness, “people in more built up areas were more likely to perceive that they had better physical health, but were increasingly likely to suffer from depression compared with their rural counterparts”(Cox et al. 2018). Furthermore, they found that “people who choose to spend time in nature more often, and for longer, are healthier across multiple dimensions of health”(Cox et al. 2018). People in heavily urbanized environments with a low nature dose (exposure to greenspace) tended to have worse mental health and lower perceptions of social cohesion. Additionally, for studies that focused on mental wellbeing, access to large parks was positively associated with all aspects of well-being. For instance, in *Happiness in the Air: How Does a Dirty Sky Affect Mental Health and Subjective*

*Wellbeing?*, scientists found that a higher API (air pollution which is a by-product of urbanization) “significantly increases hedonic unhappiness”(Zhang et al. 2017).

Finally, one of the most pronounced results in all 12 studies was in the study, *Associations of Combined Exposures to Surrounding Green, Air Pollution and Traffic Noise on Mental Health*, which stated that the “prevalence of poor mental health in the most urbanized areas was twice as high as the prevalence in the least urbanized areas”(Klompaker, Jochem.,et al., 2019). Thus, based on the results of all the studies, there seems to be a strong connection between mental health and the environment.

### 3.1 Inconsistencies/Limitations in Data

Although there seems to be a notably strong correlation between the two topics, there were some inconsistencies between some of the research papers based on the demographics of their participants. For instance, in some studies that encompassed a wide range of age groups, researchers found that there was an overrepresentation of the elderly, which could have influenced their results and made it slightly different than other studies. Additionally, some studies found that women were more impacted by lack of green spaces than men, which was not touched on by other studies. Lastly, one study found that high urbanization versus extremely high urbanization does not seem to affect mental health in people, which is not stated by other studies. It is important to note that although there seems to be clear correlation between studies, that there are inconsistencies as well that must be taken into consideration.

These inconsistencies in the data can also be influenced by the limitations of the studies. Because mental health is such a complex subject and can be influenced by a variety of factors that have nothing to do with exposure to nature, there are many limitations that should be taken into account. Firstly, social demographics can influence what type of occupation a person has and how much income they have, which can then in turn affect a

person's life satisfaction. Secondly, a person's socioeconomic status and family stability can influence their mental wellbeing and their happiness. These things can all come together and influence a person's mental health on top of the level of urbanization the area they live in is. These limitations are important to keep in mind so that studies in the future can factor these in before in order to create more effective surveys or experiments. Limitations are unavoidable in the research field and it is crucial to build on top of them in order to improve accuracy.

#### **4. Discussion**

Despite these limitations, the connection between a decrease in mental health and an increase in urbanization is evident in all the research papers that were analyzed. The establishment of this relationship is very critical because before research was conducted on this correlation, urbanization was presented as dangerous to people based on external consequences such as species extinction and deforestation. However, one of the biggest threats of urbanization is actually shown to be inside the mind of people as proven by multiple studies. Mental Health is proven to be a rising global issue as the rates of young adults who have a mental health disorder are rising each year at rapid rates. This increase coupled with the growing rates in urbanization and development can only have negative outcomes. Based on this research, scientists should look into urban farming techniques such as hydroponic gardening or community gardens, to help those who live in heavily urbanized areas gain access to green spaces to combat this rising issue. If the government cannot stop the spread of urbanization and the destruction of green spaces, they can help combat it by providing their people with access to parks, gardens, and other natural spaces.

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