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Seeing Green and Feeling Blue: The Effect of Natural Environment Exposure on Mental Health*

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The Effect of Natural Environment Exposure on Mental Health***

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**Seeing Green and Feeling Blue:
The Effect of Natural Environment Exposure on Mental Health**

ABSTRACT

Does exposure to natural environments improve mental health? Past research shows benefits from spending time in green spaces, including improved well-being, as well as better mental and physical health (van den Berg et al. 2010; Atuoye et al. 2019; Bingley 2013). However, these studies focus on spending time in parks, gardens, or other natural environments and build their cases around the advantageous effects resulting from actual time spent in such places (Fan, Das, and Chen 2011; Litt et al. 2015; van den Berg et al. 2010). This study focuses instead on whether exposure to, regardless of time spent in green spaces, has similar effects. Using attention restoration theory and the theory of therapeutic landscapes, I hypothesize that the more one agrees that they have access to or views of natural environments, the fewer days of poor mental health they will have. This study uses data from the 2018 General Social Survey, with a restricted sample of only those who are employed or temporarily not working ($N = 649$). After controlling for race, family income, full-time employment status, size of place, and dwelling type, results show no significant relationship between access to or views of natural environments and days of poor mental health. However, multivariate results show that controlling for all other factors, white individuals had more days of poor mental health, and those who work full-time, live in single-family detached homes, or have higher family incomes had fewer days of poor mental health. While the results do not support the proposed hypotheses, the bivariate correlations begin to indicate which populations have access to green spaces, as well as which may be more likely to experience poor mental health based on demographic characteristics.

Walking down a busy city street in an up-and-coming neighborhood bustling with activity, a pair of friends brings their take-out lunch to a popular new pocket park. The area had been renovated from an old unused courtyard to a patio with trees, garden beds, fountains, and benches and tables for people to sit and socialize. This image may sound familiar, as pocket parks have recently become trendy and desirable destinations. Similarly, rooftop gardens, nature walkways, and other green spaces are increasing in popularity in urban places. While these areas are clearly nice to look at and create an intriguing ambiance, the powerful draw such spaces have on the public begs the question of if these spaces somehow effect people in a more concrete way. If there is some deeper benefit, green spaces could begin to dictate residential selection, or rewire the priorities of urban planning.

Residential location is a complex matter, involving public safety, eviction, neighbors, public transportation, and residential segregation. Finding a safe and healthy place to live is a pressing issue in today's society, as cities grow ever more crowded, and rural areas become less accessible. Urban sociology aims to study complexities within urban communities and spaces, encompassing the issue of residential satisfaction. While amenities affecting physical health are often studied in this field, those affecting mental health are sometimes less apparent. However, living near or with features that can improve one's mental health is important, as a home should be somewhere to find safety, security, and a sense of happiness or well-being. This being said, determining what residential or neighborhood factors may affect resident mental health could make a large impact on housing regulations and policies in the future.

When examining residential factors affecting mental health, nature is an important subtopic, because of the disparities in local nature between different sizes of places. Mainly, compact urban areas are less likely to have copious amounts of nature, whereas rural or suburban

areas have more. On the other hand, upkeep of such places is also important. Where cities might have highly maintained parks or greenways, rural areas might be more prone to unkempt natural spaces that do not offer areas for socialization, exercise, or other spaces that urban areas might cultivate for human use. The differences in uses of nature by area are another study altogether, but before determining these uses, it is important to distinguish if green spaces do in fact have positive benefits for those situated nearby.

As pocket parks, rooftop gardens, and vegetated walkways increase in popularity, green spaces are becoming regular sights in cities. However, these aesthetic recreational areas are often disproportionately planned for wealthier, white-centric areas. Moreover, where green spaces are located in lower-income neighborhoods or non-white areas, they tend to be more poorly maintained, and less conducive of relaxation and recreation. Attentive planning and continuous upkeep of green spaces differs from neighborhood to neighborhood, block to block, county to county. These differences present another reason to study the effects of having available green space, as beneficial results could provide a basis for working to improve green spaces for everyone, not just the white upper-class.

By analyzing both the effects of having exposure to green spaces, as well as the disparities in distribution of such spaces, there is potential to use this information to improve the residential lives of many people, whether they live in urban or rural areas. If city planners, policy makers, and sociologists had access to information detailing a relationship between exposure to green spaces and mental health, they could accordingly plan, design, and implement procedures and spaces to benefit the mental health of those who lack exposure to green spaces. In addition to structural and natural changes being made, such a conclusion could also inform people about benefits they may gain by orienting themselves toward nature. These possibilities create

opportunities to improve residential satisfaction and mental health, as well as equalize access to green space by taking action on provided research.

While past research has shown that spending time in natural environments can improve well-being and mental health, it is still unclear whether there is an effect of presence of green space on mental health, regardless of whether or not one utilizes the space (van den Berg et al. 2010; Atuoye et al. 2019; Bingley 2013). Time is a leading factor in having the ability to partake in activities or spend free time in natural environments, and it is reasonable to assume that some may simply lack the time to devote to natural environment exploration or recreation. Therefore, it is important to distinguish whether having the access or views of these spaces will still impact mental health regardless of time spent in them. Being able to see parks or trees from home could lead to calming effects similarly to sitting in or walking through a park. Likewise, just walking by natural or green spaces may share some of the positive effects of partaking in activities in green spaces. Pockets of nature also balance out urban areas, making them slightly more reminiscent of suburban or rural spaces. Because green spaces have an association with health and growth, and spending time in such places can lead to improved well-being and quality of life, I hypothesize that the more someone agrees that they have access to natural environments, the fewer days of poor mental health they will report. Additionally, I hypothesize that the more someone agrees that they have views of nature at home, the fewer days of poor mental health they will report.

LITERATURE REVIEW

This study intends to answer the question of whether access to nature and views of nature affect mental health. This question has been discussed in an interdisciplinary array of past

research, and is not fully agreed upon. Much research argues natural environments themselves contain healing elements that boost mental health or well-being, whereas others propose a relationship mediated by time-spent in the environments, or certain activities done in these spaces. While this body of research forms an ongoing conversation, the study at hand aims to look at the most simplistic aspect: whether being exposed to natural environments alone upholds the same effect past research describes. The literature revolves around themes of aesthetical appeal, functionality, and healing aspects when describing how a natural place may affect a person's mental state or well-being. Each of these themes will be discussed below in terms of how they shape and inform the central research question.

Aesthetical Appeal

The aesthetical appeal of an area has to do with how one experiences an area, particularly through visual elements. While many factors make up the aesthetical appeal of a place, including design, color, lighting, and decorative elements, natural features have a large contribution to the overall aesthetics of a place. The presence and quality of natural aesthetics differ greatly between rural and urban areas. Therefore, the aesthetics of natural spaces may be viewed in very different ways, depending on the type of place.

Some research shows a direct effect of aesthetics on happiness, while others suggest the effect is indirect, but still exists. Hogan et al. (2016) found an increase in happiness if residents rated 'place' factors in their area such as aesthetics, presence of nature, and other visual aspects higher. Interestingly, younger people valued this measure of aesthetical places more than older people. Litt et al. (2015) argue that it is not the aesthetical appeal itself leading to happiness, but the way the community is strengthened by living in a beautiful place. Specifically, they found a

mediating relationship where the better a place looked, the more there was collective efficacy and attachment to the place, in turn leading to higher resident happiness.

While the effect of aesthetical appeal is up for debate, previous research argues that the quality, sometimes more than the quantity of such natural features is what really matters (de Vries et al. 2013; Francis et al. 2012). If quality is a stronger predictor of residential happiness than quantity of streetscape greenery, this suggests that while the presence and amount of these natural features matters, upkeep and design are just as important, if not more (de Vries et al. 2013). Similarly, quality or enhanced aesthetical appeal can lead to more place attachment, pride, and eventually happiness, whereas quantity is less likely to have such an effect (Litt et al. 2015). It is important to note as well, that some research shows that the quality of a natural space benefits mental health specifically, whether or not the individual spends time in the space (Francis et al. 2012). This is an important take on the study at hand, as much research shows effects of green spaces only as mediators or pathways for other happiness inducing activities, such as social interaction or exercise (Fan et al. 2011; Litt et al. 2015; van den Berg et al. 2010).

Functionality and Amenities

A discussion of residential satisfaction would be incomplete without considering nearby resources and services, referred to in the literature as functionality and amenities. These features are also sometimes referred to as the ‘performance’ of a place, as they determine how well a place performs functionally for residential life (Hogan et al. 2016). Functionality and amenities could consist of accessible grocery stores, public transportation, good schools, or a slew of other resources and services. The presence of such amenities and their functionality has been found to increase social cohesion, as well as resident happiness or well-being (Hogan et al. 2016; Oidjarv 2018; Saporito and Casey 2015). Sometimes, nature is considered an amenity as well (Saporito

and Casey 2015). While a common thread in this field of research shows social cohesion or physical activity mediating the relationship between green spaces and well-being, another take may be that green spaces are valuable and functional amenities that promote such activities. Natural environments function in ways that bring people together, and promote leisure time or recreational activities, as well as create emotional attachments to local areas (Volker and Kistemann 2013). The presence of nearby green spaces has been found to reduce feelings of loneliness and increase feelings of social support, suggesting that natural spaces function as a social amenity (Maas et al. 2009). Therefore, both functionality and the aesthetics of natural environments are important considerations to make when analyzing green spaces.

Natural spaces may have many functions, but the social aspect brought up in research discussed previously is particularly notable, as social integration has been found to improve mental health. Social integration is important for many reasons, including providing social support, social influences, social engagement and attachment, and increased access to resources and material goods (Berkman et al. 2000). Social support has been found to increase quality of life as well, making it imaginable that if green spaces promote social integration and social support, their accessibility could lead to better well-being or quality of life (Xia, Wang, and Lin 2018). While this study focuses on access to green space as a hypothesized direct relationship, the body of research studying social integration and social support as mediating factors should not be ignored, as it contributes to the conversation as a whole.

Saporito and Casey (2015) add depth to the discussion of natural environment effects by explaining that green spaces are disproportionately present and functional across areas with different demographics. White, upper class people are the most likely to live near high quality natural environments, especially when analyzing green space distribution in metropolitan areas.

Inner-city residents and disadvantaged populations are often exposed to lower quality natural environments, and are more likely to be situated near industrial facilities or polluted areas (Downey and van Willigen 2005; Fitzpatrick and LaGory 2003). So, if exposure to natural environments does benefit mental health, this could be categorized as an urban health factor that is experienced disproportionately by white, wealthier people.

Healing Aspects

While natural environments are aesthetically pleasing and provide space for outdoor activities or socializing, some research argues that these spaces have inherent healing qualities. This trait is described in multiple different ways, including ‘restorative’ ‘healing’ and ‘therapeutic’ (Atuoye et al. 2019; Bingley 2013; van den Berg et al. 2010; Volker and Kistemann 2013). Sometimes, the healing or therapeutic feelings come as a result of nature giving the sense of ‘being away’ or escaping from everyday life and its stressors (Bingley 2013; Volker and Kistemann 2013). Of course, this effect would likely be stronger if one was ‘getting away’ from an urban setting where nature is sparser, creating a high contrast with green spaces. Another way in which nature can heal is by helping to alleviate negative effects from past trauma, especially if one spends time in these places (van den Berg et al. 2010).

Healing aspects also contribute to general residential satisfaction, as a large factor of how satisfying a residence is results from the opportunities for restoration within or around the residence (Hartig, Johansson, and Kylin 2003). Much of the potential for restoration in a home is based around sleep, but during waking hours, restoration is often found through exchanges with people or environments, as well as being engaged by aesthetical or stimulating aspects of the environment (Hartig et al. 2003). Opportunities for restoration would then be much more

frequent for those with more access to or views of natural environments near their home or in their so-called environment.

Green spaces can also act as communal therapy or restoration through the connections that people form with spaces they live in, and the community around them. Atuoye et al. (2019) found that the destruction of communal natural environments in Tanzania from large scale land acquisition led to worse health reports. The members of the studied communities believed that these spaces were therapeutic and almost sacred. By spending time in these spaces, they experienced mental health benefits, leading to continued belief in the positive effects on their health. Once commercialized building took off in the area, the community experienced a blow to residential well-being and health as a result of their natural environments being destroyed.

While most research concerning restorative properties of nature focuses on immersing oneself in the natural space, Kaplan (2001) argues that windows have potential to offer restoration from a distance. Kaplan proposed that if natural elements can be seen through a window, neighborhood satisfaction and well-being are likely to improve (Kaplan 2001). While these findings are important and vastly contribute to the overall question of natural environments' impact on mental health, the study was conducted within six low-rise apartment communities, and cannot be generalized to other types of residences or areas.

While some studies, including Kaplan's, theorize that natural environments are restorative and healing without having to enter the space, others focus on the time spent in nature as the key to improving mental health and well-being (Fan et al. 2011; Litt et al. 2015; van den Berg et al. 2010). It is left unclear whether or not the benefits of natural environments can be reaped simply from the presence and access to green spaces, or if time spent and specific activities completed are required.

In order for one to feel satisfied in their residential situation, a certain level of functioning amenities must be present in the area. Residential satisfaction and mental health can be improved even more if these amenities are aesthetically pleasing and high quality. Because natural environments have healing aspects and are aesthetically appealing, past literature suggests that green spaces become important natural amenities to have nearby a residence. Based on past research, I hypothesize that those who more strongly agree that they have access to natural environments will report fewer days of poor mental health. I also hypothesize that those who more strongly agree that they have views of natural environments will report fewer days of poor mental health.

THEORETICAL FRAMEWORK

This study is framed largely around two main theories; attention restoration theory, and the theory of therapeutic landscapes. Both of these theories focus on beneficial qualities of places, specifically soothing or relaxing qualities that lead to well-being or improved mental health. While these theories do not exclusively focus on green spaces, they attest to qualities that green spaces possess, and describe the ways in which these qualities can yield positive mental effects.

Attention restoration theory hypothesizes that sensory aspects of a place can lead to tranquility and well-being. By spending time in nature or pleasing environments, one is able to replenish their ability to focus or direct attention to everyday life (Kaplan and Kaplan 1989). The pleasure and aesthetics of the environment relax the mind and help it refresh. Additionally, attention restoration theory posits that aspects of nature contrast with aspects of everyday life in

school, work, or social life, offering a healing, or restorative experience in nature (Atuoye et al. 2019; Colléony et al. 2017; Hartig et al. 2003; Spilková 2017).

Therapeutic landscape theory similarly argues that natural places have therapeutic, healing qualities, and that the aesthetic aspects of nature can lead to increased tranquility. Wilbert Gesler originally coined the theory of therapeutic landscapes while attempting to define and discuss some of the relationships between humans and landscapes in terms of health and healing (Gesler 1992). The concept was originally used to describe places where healing features were located, whether mental, physical, or spiritual. Such places were coveted destinations and experienced influxes of travelers seeking to be healed in a range of different ways. Now, the definition of a therapeutic landscape has expanded to include natural, built, or even imagined environments that exude any type of healing effect (Rose 2012). These so-called ‘therapeutic landscapes’ have since been largely agreed upon to benefit and improve residents’ or travelers’ health and well-being (Huang and Xu 2018; Rose 2012; Volker and Kistemann 2013; Williams 2010; Zhao 2018).

Attention restoration theory and the theory of therapeutic landscapes suggest that green spaces may possess healing qualities, leading to better well-being, or in the case of this study, better mental health. While these theories focus on time actually being spent in natural environments, this study aims to find out whether simply being exposed to such places still has similar effects to those speculated in attention restoration theory and therapeutic landscape theory.

METHODS

Design

In order to answer my research question, I performed a secondary data analysis using survey data. The data I used comes from the 2018 General Social Survey (Smith et al. 2018). The population of this dataset is every un-institutionalized English speaking adult (18+) living in the United States who works full-time, part-time, or is temporarily not working. The original dataset sample size was 2,348 individuals, with the individual as the unit of analysis. The data were collected in 2018 mainly by 90 minute face-to-face interviews, with the exception of a small number of computer-administered interviews for those who could not schedule an interview time. The response rate for the 2018 GSS was 59.5 percent.

The sample size of my study was restricted to 649 individuals, as the nature module from which my independent variables come only appeared on Ballots B and C. In addition, the mental health variable used as the study's dependent variable is part of the Quality of Working Life module, which is asked only to working people. Specifically, only those who answered 'full-time,' 'part-time,' or 'temporarily not working,' therefore restricting the population available for use in my sample. To learn more about the data, visit <http://www.gss.norc.org/getthedata/Pages/Home.aspx>.

Variables

To assess the effect of exposure to green spaces on mental health, I use two different independent variables to fully encompass this concept. I study both access to green spaces and views of green spaces in order to get a better sense of general exposure, rather than one specific type of encounter with nature. I operationalize the concept of access to green spaces by using a question from the 2018 GSS, which asks "I have easy access to natural environments, such as

public parks, gardens or trails.” This is an ordinal variable, measured by strength of agreement with the statement given. The possible answers and their respective values are as follows: 1, “Strongly agree”, 2, “Somewhat agree,” 3, “Somewhat disagree,” and 4, “Strongly disagree.” I removed any missing data, including “Don’t know,” “No answer,” and “Not applicable.” Then, I reverse coded the responses to this question, so that higher values would represent more agreement.

My other independent variable measures views of green spaces. I operationalize this concept by using a question that states “I have views of nature (trees, lawns, gardens, water, etc.) when I am home.” The respondent then has the option to answer based on how strongly they agree with the statement. The options and their values are: 1, “Strongly agree”, 2, “Somewhat agree,” 3, “Somewhat disagree,” and 4, “Strongly disagree.” Again, I removed any missing data. I also reverse coded this variable, so that 4 indicated the highest level of agreement, and 1 represents the lowest level. This is also an ordinal variable, and I will look at my independent variables’ effects on the dependent variable separately, as two different possible indicators of mental-health.

The dependent variable aims to measure the respondent’s mental health. I operationalize this concept by using a question which asks “Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?” The respondent has the option to answer between zero and 30 days, with the values coded to align with the number of days. I removed all missing data, including “Not applicable” (-1), “Don’t know” (98), and “No answer” (99). This is a ratio measure, assessing self-reported frequency of poor mental health. The question asks about poor mental health, so zero indicates the best mental health, and 30 indicates the worst mental health.

I also control for several other factors that could potentially affect mental health, or determine the presence of green space. First, I control for the size of place the respondent lives in. This was operationalized by using a question which instructs the interviewer to determine “Size of Place in thousands-A 4-digit number which provides actual size of place of interview.” This is a ratio-level measure, as each possible answer has a coded value of the number of thousands it represents. The cases in this sample range from 0-8175, in thousands. This control is used because of the differences in presence and amount of green space in more densely settled areas compared to more sparsely settled areas.

Another control variable I include is income. I measured this variable by using the most recent family income variable, which reads “In which of these groups did your total family income, from all sources, fall last year -- 2015 -- before taxes, that is. Just tell me the letter. Total income includes interest or dividends, rent, Social Security, other pensions, alimony or child support, unemployment compensation, public aid (welfare), armed forces or veteran's allotment.” This variable’s possible responses are broken into 26 groups, ranging from under \$1,000 to \$170,000 or more. I recoded this variable to instead represent a midpoint for each category, making the recoded income variable a ratio measure, instead of an interval measure. For example, the category \$3,000 to \$3,999 became \$3,500; \$40,000 to \$49,999 became \$45,000, and so on.

Next, I controlled for race. In order to measure the race of the respondent, I use a question that asks the interviewer to “Code without asking only if there is no doubt in your mind. What race do you consider yourself? Record verbatim and code.” The possible answers and their associated values are, 1, “White,” 2, “Black,” or 3, “Other.” I removed any missing data, and then recoded to make a dummy race variable, because the original race variable was nominal.

Running Head = GREEN SPACE EXPOSURE

The dummy variable is coded as 1, “White,” and 0, “Not white.” This new dichotomous variable assesses whether or not the respondent is white.

Labor force status was also controlled for, as this concept could have an effect on the amount of time a respondent has to actually utilize green space rather than just being exposed to it. Labor force status could also have an effect on the respondent’s mental health. To operationalize this concept, I use a variable that asks “Last week were you working full time, part time, going to school, keeping house, or what?” The possible responses and their associated values are as follows: 1, “Working full time,” 2, “Working part time,” 3, “Temp not working,” 4, “Unempl, laid off,” 5, “Retired,” 6, “School,” 7, “Keeping house,” and 8, “Other.” Because my dependent variable, days of poor mental health in the past 30 days is a part of the Quality of Working Life module, my subset includes only the first three response options. This is a nominal measure, so I deleted all the missing data, and then recoded labor force status into a dummy variable assessing whether the respondent works full time or not. The dummy variable is coded as 1, “Working full time” and 0, “Not working full time.”

Lastly, I control for the type of dwelling the respondent lives in. This is an important control because some dwelling types, such as houses, are much more likely to have views of green spaces, because they often have adjacent yards or gardens. To operationalize this concept, I use a question that assesses the respondent’s “Dwelling type.” The possible responses and their values are: 1, “Trailer,” 2, “Detached 1-fam house,” 3, “2 units side by side,” 4, “2 units-one above,” 5, “3-4 fam house,” 6, “Row house,” 7, “Apartment house,” 8, “Apartment-4 stories,” 9, “Apartment-commercial,” and 10, “Other.” This is an ordinal variable, so I had to recode into a dummy variable, after deleting any missing data. I decided to simplify this measure to determine whether the respondent lived in a detached, single family house or not, as that is the dwelling

type that would most typically come alongside natural views or elements. My dichotomous recoded variable is coded as 1, “Detached 1-fam house” and 0, “Not detached, 1-fam house.”

FINDINGS

Univariate

Table 1 shows a mean of around four for access to natural environments, meaning that the average response was strong agreement that the respondent has access to natural environments. As seen in Figure 1, most respondents agree or strongly agree that they have access to natural environments. This is not a normal distribution, and is concentrated heavily at the agreement side. The median is four as well, showing that at least half of the respondents said that they strongly agreed they had access to natural environments. The standard deviation of 1 shows that two thirds of the population fell between agree and strongly agree.

Insert Table 1 about here

Insert Figure 1 about here

Figure 2 shows that there was slightly more variation in having views of natural environments than access to natural environment, although the distribution is still highly irregular. Table 1 shows a mean of four and a median of four, so strong agreement was still the average response for views of natural environments, even though there is more variability than the distribution of access to natural environments. The standard deviation is also one, meaning that two thirds of the population fell between three and four, or agree and strongly agree.

Insert Figure 2 about here

Figure 3 shows an abnormal distribution for the dependent variable, days of poor mental health in the past 30 days. The responses cluster around zero, and show spikes at multiples of

ten, likely as a result of respondent estimation. As seen in Table 1, the mean is four days of poor mental health in the past 30 days, and the median is zero. This indicates a right skew, as a few high outliers make the mean larger than the median. The standard deviation of seven tells us that two thirds of the population fell between zero and eleven days of poor mental health in the past 30 days.

Insert Figure 3 about here

In Figure 4, we see that family income has a relatively normal distribution, with a seemingly high amount of respondents with a family income of 170,000 or higher. This is likely because the subset is limited to full-time, part-time, or temporarily not working people. Table 1 shows a mean of \$75,926, and a median of \$67,500. It is notable that this distribution is right skewed because of the outlying higher values, which is clear from the mean exceeding the median. The standard deviation of \$49,495 indicates that two thirds of the population fell between total family incomes of \$26,431 and \$125,421.

Insert Figure 4 about here

Figure 5 shows that most respondents in this subset are full-time workers. The mean for full-time employment in Table 1 shows that 80 percent of the sample works full-time, and the median of one confirms that most respondents work full time. The standard deviation of 0.4 shows that at least two-thirds of the population works full-time.

Insert Figure 5 about here

In Figure 6, it is clear that most respondents are white. Table 1 shows a median of one and a mean of 0.72, telling us that 72 percent of the population is white. The standard deviation of 0.5 indicates that at least two-thirds of the population is white.

Insert Figure 6 about here

Figure 7 shows a concentration of respondents who live in places under one million people. This is not a normal distribution, and we can see outliers near eight million people, which likely explains the right skew exemplified by the mean of 346 thousand people being so much larger than the median of 37 thousand people. The standard deviation of around one million tells us that two-thirds of the population lives in areas between zero and 1.3 million people.

Insert Figure 7 about here

As seen in Figure 8, most respondents live in a detached, single family house. Table 1 shows that 66 percent of the sample lives in a detached, single family house, and the median of one tells us there is no skew. The standard deviation of 0.5 shows that at least two-thirds of the population lives in a detached, single-family house.

Insert Figure 8 about here

Bivariate

As seen in Table 2, there are no significant correlations between access to or views of natural environments and mental health. However, detached single family house has a significant weak negative correlation with days of poor mental health, meaning that those who live in detached single family houses are more likely to have fewer days of poor mental health. Race had a significant, weak, positive correlation with poor mental health meaning that white people are more likely to report more days of poor mental health. Family income and employment status both had significant, weak negative correlations with poor mental health, respectively meaning that the higher one's family income, the better their mental health, and full-time workers are more likely to have better mental health. Access to natural environments and views of natural environments had the strongest correlation, with a correlation coefficient of .432. This is a

moderate, positive, statistically significant relationship. While we would expect these two variables to be correlated, it is notable that the relationship is not stronger. The moderate correlation suggests that while it is common to have both views of and access to natural environments, some may live in places where natural environments are accessible, but not visible out of their windows, or areas where they can see natural environments, but cannot access them.

Insert Table 2 around here

The correlation matrix also indicates which demographics might be more likely to have access to or views of natural environments. As seen in Table 2, both access to and views of natural environments have a weak positive statistically significant relationship with race. This means that white people are slightly more likely to be exposed to natural environments. Additionally, both nature exposure variables are weakly but positively correlated with family income. Here, the correlations suggest that the higher one's family income, the more likely they are to be situated around visible, accessible natural environments. Detached single-family house is also significantly and positively correlated with both exposure variables, meaning that those who live in detached single family homes are more likely to have access to and views of natural environments. Lastly, size of place is negatively correlated with exposure to natural environments, meaning that the larger the place one lives in, the less likely they are to have access to or views of natural environments.

Multivariate

Table 3 reveals a significant regression equation with an F value of 4.458 ($p < .05$). The R^2 value is .046, meaning that 4.6 percent of variation in days of poor mental health can be explained by access to natural environments, views of natural environments, dwelling type, size of place, race, employment status, and family income. Table 3 shows that the two independent

variables, access to and views of natural environments, are not statistically significant. However, detached single family house, race, full-time employment, and family income are statistically significant predictors of days of poor mental health ($p < .05$). Race is the strongest predictor of poor mental health ($\beta = .130$). Because white is a dummy variable, the unstandardized coefficient ($b = 2.052$) tells us that on average, white people reported 2.052 more days of poor mental health than non-white people. The other three significant variables have negative effects, meaning that they decrease poor mental health, or increase good mental health. The second strongest predictor, detached single family house ($\beta = -.101$) has an unstandardized coefficient of -1.513, meaning that those who live in detached single family houses reported 1.5 days fewer of poor mental health than those who live in any other type of dwelling. The third strongest predictor ($\beta = -.092$) is family income. The unstandardized coefficient ($b = -.00001316$) tells us that for every extra dollar of family income, respondents reported -.00001316 days fewer of poor mental health. More simply, for every extra 10,000 dollars in family income, respondents reported 0.1316 days fewer of poor mental health. Lastly, full-time employment ($\beta = -.088$) tells us that with an unstandardized coefficient of -1.529, those who work full-time reported 1.529 days fewer of poor mental health than those who work part-time or are temporarily not working. While this regression equation is significant, the insignificant independent variables show that the hypotheses must be rejected, as access to and views of natural environments do not affect mental health.

Insert Table 3 about here

DISCUSSION

The multivariate findings show no significant relationship between views of and access to natural environments and poor mental health. Therefore, both hypotheses are disproven. The

findings challenge attention restoration theory and the theory of therapeutic landscapes, although both theories assume the individual spends time in the given natural setting. However, the control variables uncover important relationships that hint at what may be affecting mental health instead. For example, the relationship between living in a detached single family home and mental health shows better mental health for those in single family detached homes. From the correlation matrix alone, we would expect the detached, single family house effect to disappear when controlling for income or size of place, as the table also shows that wealthier individuals living in smaller places are more likely to live in houses. Additionally, poor mental health is less common among those with higher incomes, which would suggest the relationship between single family, detached house and mental health would disappear in the regression, after controlling for those factors. However, the regression produces an interesting result showing that living in a detached house, regardless of income, size of place, or any of the other control variables, improves mental health. Attention restoration theory could be loosely applied to this finding, as it can apply to settings that are relaxing or calming, as well as natural settings (which usually are associated with relaxation). Therefore, single-family, detached homes could possess certain qualities—possibly including more space, agency over the building, and less noise—that relax and restore the mind, following attention restoration theory's framework (Kaplan and Kaplan 1989). Additionally, the security of owning a home rather than renting or leasing could forge deeper connections with the space, reinforcing the potential relaxation and restoration of the home.

Another consideration to take away from the bivariate results is the relationship between race and mental health. Being white is positively correlated with both access to and views of natural environments, and these correlations are relatively strong compared to the other

coefficients in the matrix. However, when transitioning to the regression results, white is the strongest predictor of poor mental health, where being white leads to two more days of poor mental health. Because the bivariate findings showed that white people are more likely to have natural environment exposure, and are also more likely to have poor mental health, the insignificant effect of natural environment exposure on mental health in the multivariate findings becomes interestingly layered. Considering why white people report worse mental health is crucial to untangling these findings. Past research shows that functionality and quality of amenities lead to better well-being or mental health, and that these features are more likely to be located in largely white areas (Downey and van Willigen 2005; Fitzpatrick and LaGory 2003; Saporito and Casey 2015). Therefore, it is unlikely that residential features could explain the racial difference in mental health found in the multivariate regression. Additionally, white people experience less stress and trauma related to discrimination. One possible answer to this curious result is that discussing mental health is more accepted in white settings, and that people of color are not taken seriously when disclosing poor mental health, which could possibly lead to suppressing or downplaying experiences with poor mental health, especially in a survey setting.

Another area that stands out within this study is which characteristics increase the likelihood of having access to or views of natural environments. Whether or not exposure to natural environments has an effect on mental health, there is still significant evidence from previous studies showing that spending time in, or doing activities in natural environments can boost well-being or social cohesion (de Vries et al. 2013; Francis et al. 2012; Hogan et al. 2016; Kaplan 2001; Litt et al. 2015; Maas et al. 2009; Saporito and Casey 2015; van den Berg et al. 2010). Considering the general agreement that spending time in natural environments has some form of beneficial mental result, it is important to note the positive correlations between access

to and views of natural environments with being white and having a higher family income. These findings suggest that wealthier, white people have access to resources that may be found within natural environments, while people of color or people with lower family incomes are less likely to have access to these spaces and experience the social cohesion or increased well-being that past studies have suggested can be gained from spending time in natural environments.

The bivariate results also show a negative correlation between access to and views of natural environments and size of place. Substantively, this means that the larger the place one lives in, the less exposure to natural environments they will have. This is not surprising, given rural and suburban areas often allow for yards and gardens, whereas urban areas are less likely to have the same opportunities for natural features. However, if past research shows benefits in being able to see natural environments out of a window, there may be an underlying benefit to living in rural or suburban areas, compared to urban areas in this sense (Kaplan 2001).

The findings of this study show that mental health benefits from living in detached, single-family houses, and that lower-class, non-white people are more likely to lack access to and views of natural environments. These results yield two very different deductions, which should be clearly distinguished. First, one might interpret this study's findings to mean that the production of more detached, single-family houses would be a tactical way to improve mental health on a large scale. However, this mindset is counter-productive to housing markets, the environment, and residential satisfaction in urban areas. While this study shows an inherent benefit of living in a detached, single family house, this benefit could be a result of people feeling as though they have achieved the 'American Dream,' or a so-called 'successful' lifestyle by owning a home. If this is the basis for detached-single family homes showing a mental-health reward, we must attempt to deconstruct the ideal of a large, single family house being part of the

‘American Dream.’ These dwellings take up valuable land and resources, which could be conserved by building more urban-based shared resource housing, focused on offering more green-space access. The take-away to emphasize here is not one that supports an increase in building detached, single-family homes, but instead one that attempts to dismantle the disentanglement of single-family homes with success, and promotes wide-spread green space access and views for the community at large.

CONCLUSION

This study examines the effect of access to and views of natural environments on mental health. Using attention restoration theory and the theory of therapeutic landscapes as a framework, I hypothesized that the more strongly someone agrees that they have access to and views of natural environments, the fewer days of poor mental health they will report. By using 2018 GSS data with a sample of 649 full-time and part time workers, as well as temporarily not working people, regression results show that when controlling for other demographic characteristics, access to and views of natural environments have no significant effect on mental health. However, holding all else constant, white people are more likely to report more days of poor mental health, and those with higher family incomes who work full time and live in single-family, detached homes are more likely to have better mental health.

Attention restoration theory and the theory of therapeutic landscapes posit a beneficial relationship between spending time in natural environments and well-being, focus, or happiness. The results of this study challenge attention restoration theory and the theory of therapeutic landscapes, leading to the possibility that the key factor in these relationships may be the actual time spent in natural environments. While having parks or nature trails nearby might be nice, it is

possible that the real benefits of such places may only have an effect if the person physically spends time in these places, allowing for psychological relaxation and restoration to occur, rather than simply being aware of and in close proximity to green spaces.

Limitations and Future Research

Past research largely argues that exposure to natural environments does improve mental health and well-being, making possible limitations especially important to examine, as this study finds no significant relationship (Atuoye et al. 2019; Bingley 2013; Francis et al 2012; Gesler 1992; Kaplan 2001; Saporito and Casey 2015; Volker and Kistemann 2013). The first area to consider is how this study is different than past studies. Past research has often focused on individuals who make time to immerse themselves in natural environments whether through gardening, exercising in the outdoors, or spending time with others in parks (Fan, et al. 2011; Litt et al. 2015; van den Berg et al. 2010). This study, however, aimed to diagnose whether access to and views of natural environments still impacted mental health, regardless of time actually spent in such places. The limitation here is that time spent in green spaces is not controlled for. Because this study finds no significant relationship between natural environment exposure and mental health, it is probable that the existence of these spaces is not the key element leading to increased mental health as past studies have argued. Instead, the key element may be time spent or activities done in the natural environments. Therefore, future research should aim to control for either time spent in or activities done in natural environments, in order to distinguish what the key factor is in improving mental health.

Another limitation lies within the confounds of the sample. Because the dependent variable was part of the 'Quality of Working Life' module of the 2018 GSS, the sample was constricted to only those who are full-time workers, part-time workers, or temporarily not

working. Therefore, anyone who is searching for a job, is a stay at home parent, retired, or any other form of unemployed is not included in this study. This becomes an especially important limitation to consider because of the relationship between employment and mental health. As seen in both the bivariate and multivariate findings, working full-time is negatively related to days of poor mental health, meaning that those who work full-time are more likely to have better mental health than those working part-time or temporarily not working. Likewise, it is reasonable to conclude that those who work even less than part-time people, or are searching for jobs, may have even worse mental health. Including these populations in future studies could result in much more variation in the dependent variable. The sample also consists mainly of people who agree that they have access to and views of natural environments, and who reported few days of poor mental health. While these are uplifting findings, a sample with more variation in both the independent and dependent variables could show more exaggerated results.

Lastly, the format of the dependent variable poses some caution around interpreting results. The question asks the respondent to answer how many days in the past thirty days they experienced poor mental health. This is a subjective statement, and each respondent might come into the survey with a different standard of what is considered 'poor' mental health. The subjectivity of this question could very well have led white people to over-report days of poor mental health, or people of color to underreport, due to stigma surrounding discussions of mental health. Additionally, it is generally difficult for respondents to remember how they may have been feeling over a week or two prior to the time of interview, so they are likely to end up estimating. While estimation often can still yield telling results, the exact number of days reported from each respondent may not be exactly accurate. Therefore, a subjective measure that may be hard to remember should be taken cautiously as the dependent variable, and processed

more as an estimate rather than an exact number. In future research, a more objective measure of mental health could help balance out factors that could skew this variable's distribution, including stigma, estimation, and relativity.

This study aims to identify a possible relationship between exposure to green spaces and mental health. While there is no significant relationship found between access to or views of natural environments and mental health, other relationships in the bivariate and multivariate results have important connotations for future research and urban planning. By determining that white, wealthier people are more likely to have access to and views of natural environments, it is clear that lower-income people and people of color are generally situated farther away from gardens, parks, or trails. While the findings of this study do not show a mental health benefit from access to or views of natural environments, past research shows benefits resulting from spending time in natural environments. Therefore people of color and low income people would have a harder time reaping these reported benefits (Atuoye et al. 2019; Bingley 2013; Francis et al 2012; Gesler 1992; Huang and Xu 2018; Kaplan 2001; Rose 2012; Saporito and Casey 2015; Volker and Kistemann 2013). This finding could inform urban planning policies in an attempt to create and upkeep more green spaces in low-income neighborhoods or areas with high proportions of people of color.

In this study, those who live in detached, single-family houses are found to have better mental health than those residing in other types of dwellings, regardless of their income. This finding is intrinsically important in terms of housing research, residential decisions, and residential satisfaction disparities between urban and rural or suburban areas. Future research should look into why single-family detached houses contain inherent benefits for mental health, and if this effect is related to ideals of success or the 'American Dream.'

While the results of this study disproved the hypotheses and challenge its theoretical framework, the findings yield new directions for housing research and urban planning, as well as the potential to improve green space development to be more equitable for all.

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Table 1. Means, Medians, and Standard Deviations for Variables ($N = 649$)

Variable	Mean	Median	SD
Access to natural environments	3.74	4.00	0.518
Views of natural environments	3.53	4.00	0.726
Days of poor mental health in past 30 days	3.66	0.00	7.106
Family income in dollars	75,925.65	67,500.00	49,494.633
Size of place in 1000s	345.50	37.00	1,117.638
White	0.72	1.00	0.450
Works Full-time	0.79	1.00	0.407
Lives in a 1-fam detached house	0.66	1.00	0.475

Table 2. Correlations (r) between Days of Poor Mental Health and Seven Variables (listwise deletion, two-tailed test, $N = 649$.)

Variable	Access to Natural Environments	Views of Natural Environments	Detached, single-family house	Size of Place	White	Working Full-time	Family Income
Days of Poor Mental Health	-.048	-.029	-.104**	-.039	.077*	-.106**	-.121**
Access to Natural Environments		.432**	-.153**	.123**	.207**	.031	.094*
Views of Natural Environments			.153**	-.167**	.166**	-.013	.093*
Detached, Single-family House				-.190**	.224**	.066	.332**
Size of Place					-.077	-.076	.029
White						.014	.220**
Working Full-time							.184**

* $p < .05$

Table 3. Regression of Days of Poor Mental Health in the Past 30 Days on All Variables

Variable	<i>b</i>	β
Access to Natural Environments	-.744	-.054
Views of Natural Environments	-.138	-.014
Detached, Single-Family House	-1.513	-.101*
Size of Place (in 1000s)	.000	-.062
White	2.052	.130*
Full-Time	-1.529	-.088*
Family Income	-1.316E ⁻⁵	-.092*
Constant	8.799	

$R^2 = .046$; $F(7, 641) = 4.458$; $p < .05$

* $p < .05$

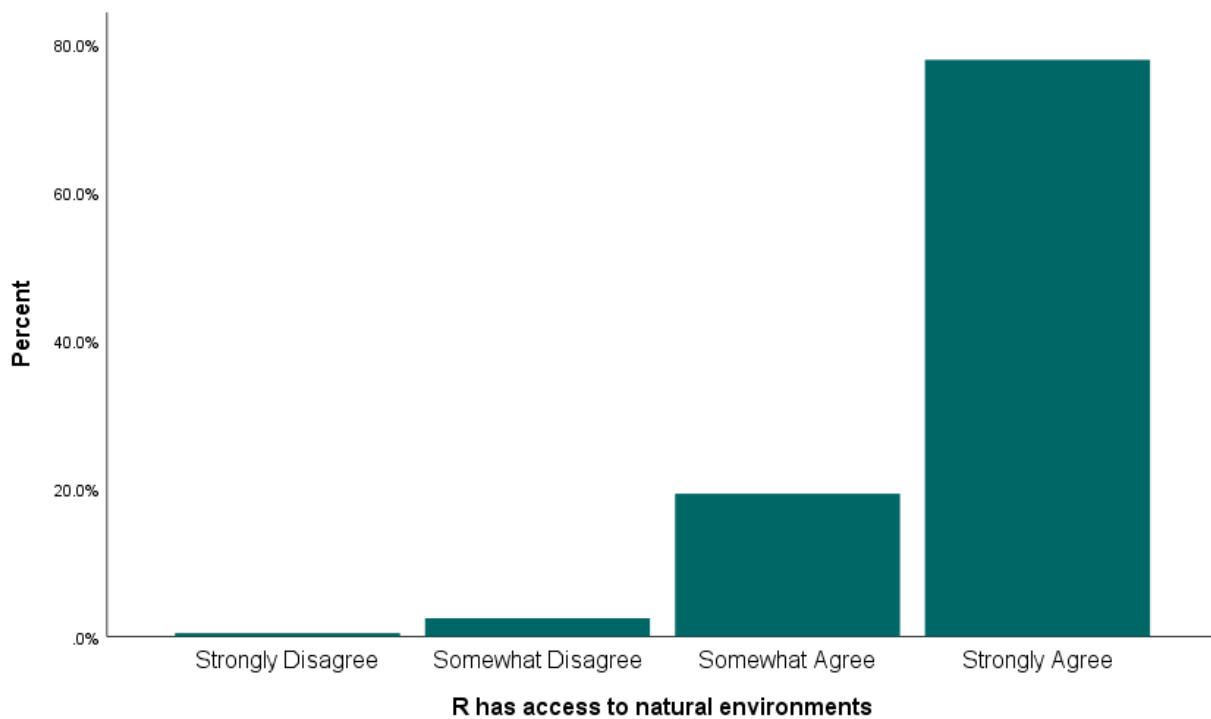


Figure 1. Bar Graph of Access to Natural Environments

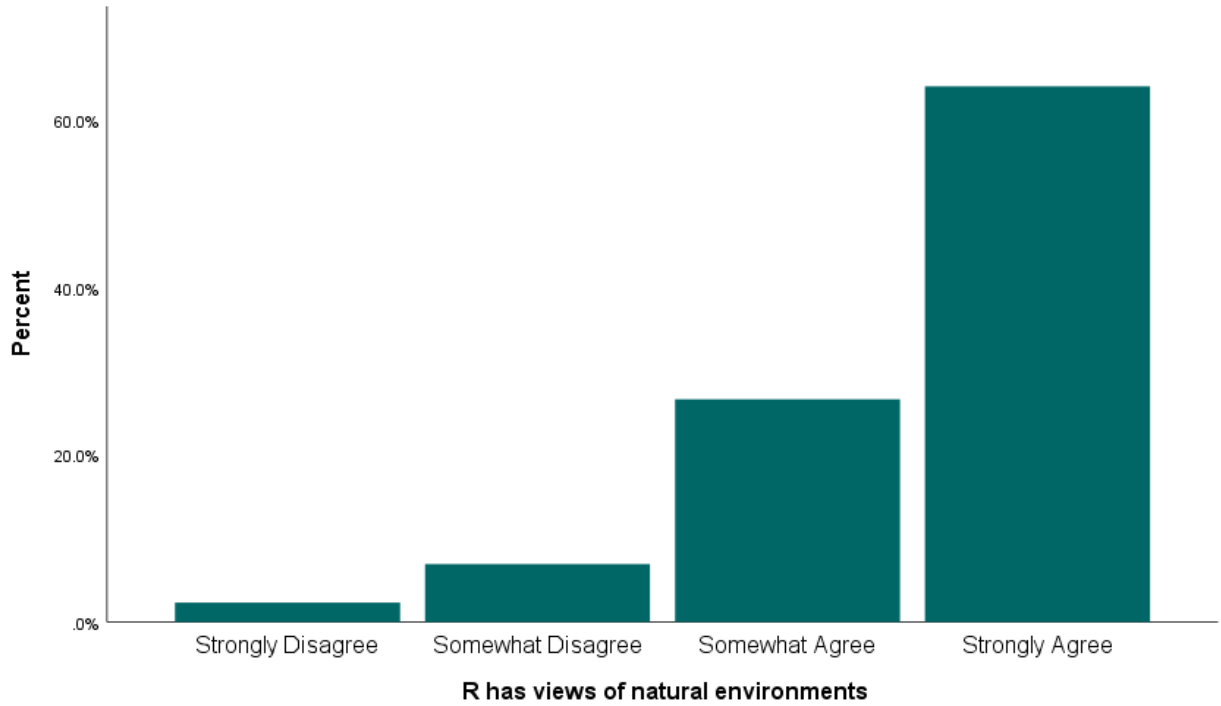


Figure 2. Bar Graph of Views of Natural Environments

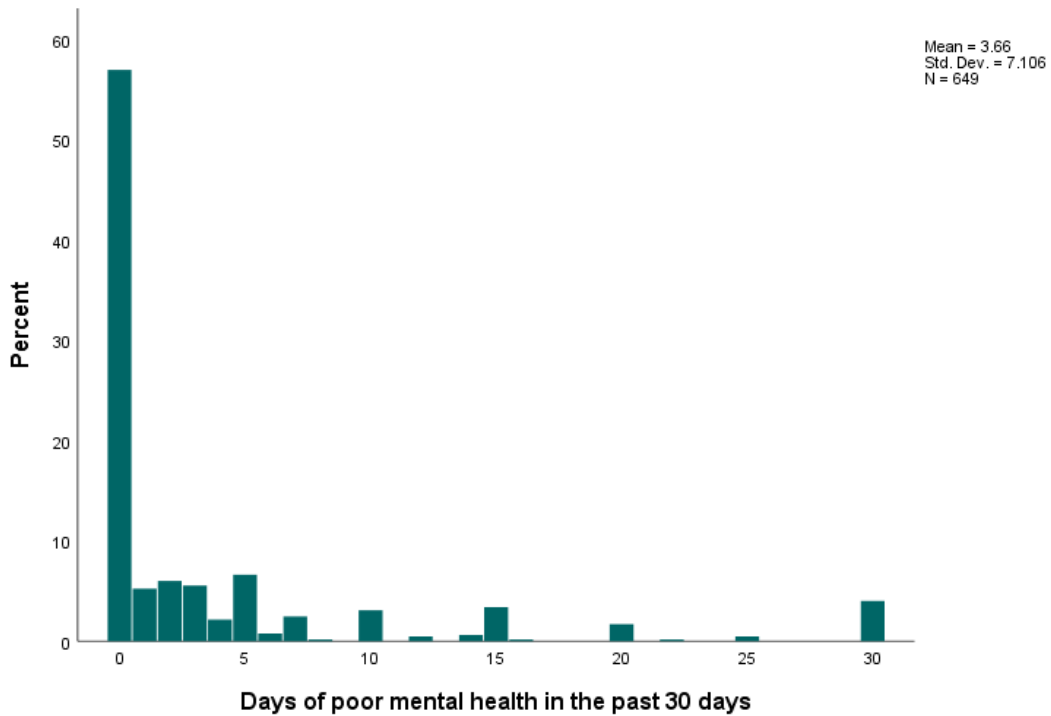


Figure 3. Histogram of Days of Poor Mental Health in the Past Thirty Days

Running Head = GREEN SPACE EXPOSURE

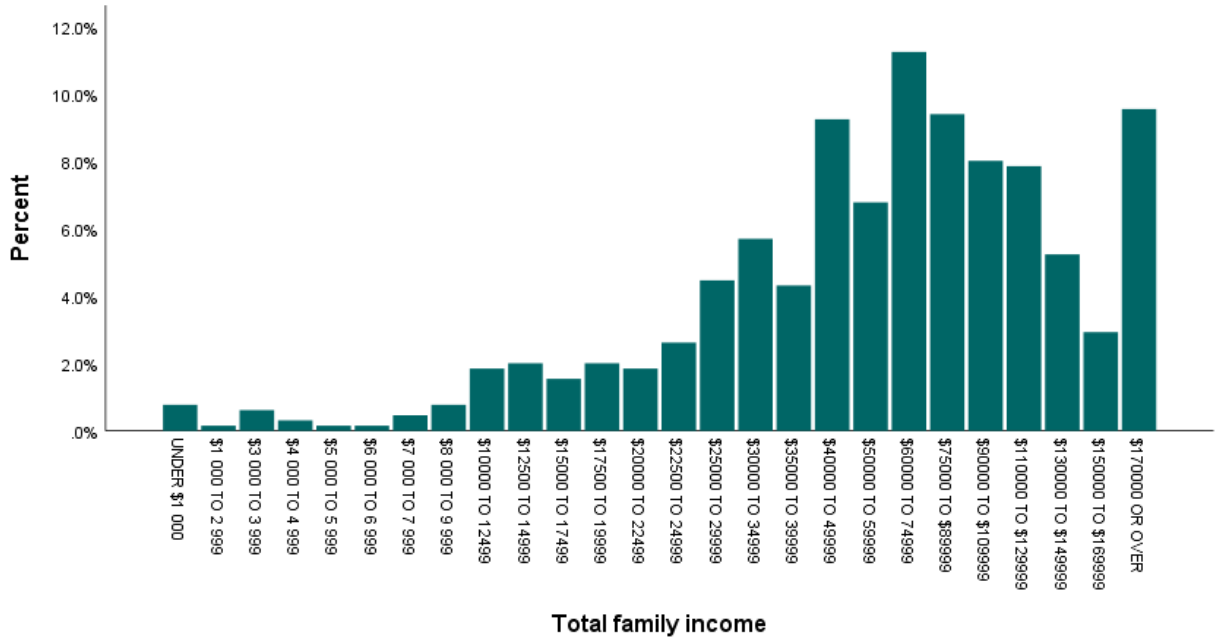


Figure 4. Bar Graph of Total Family Income

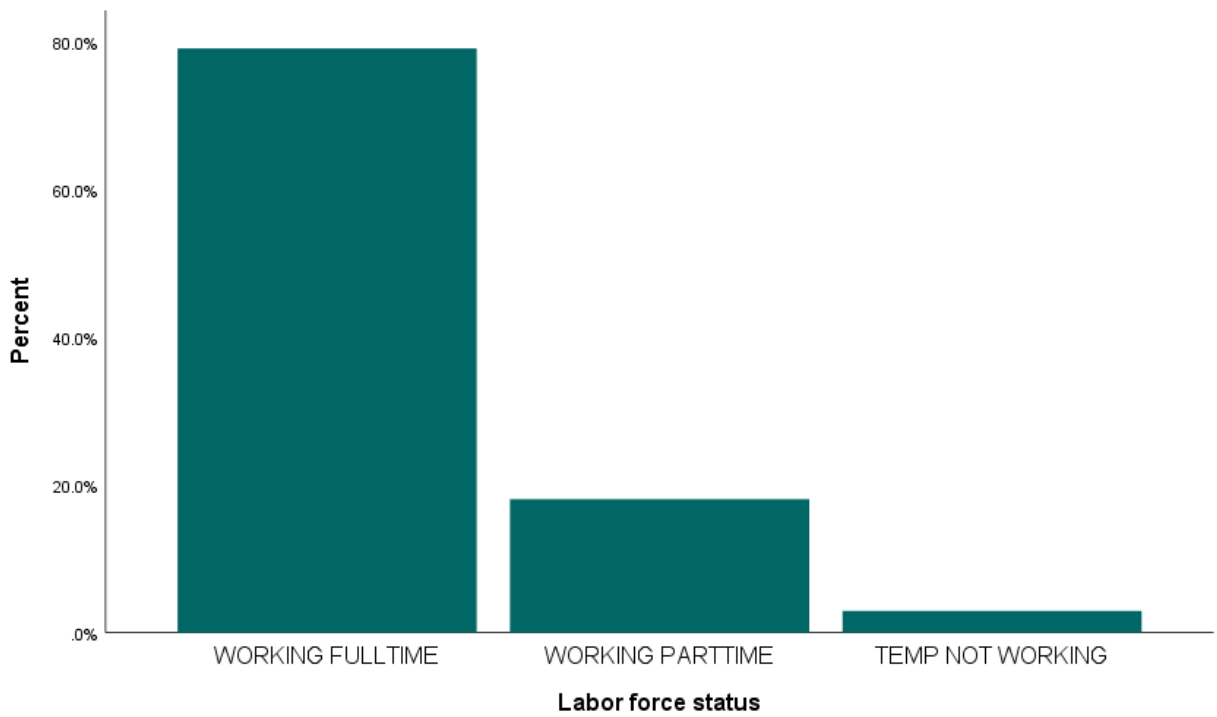


Figure 5. Bar Graph of Labor Force Status

Running Head = GREEN SPACE EXPOSURE

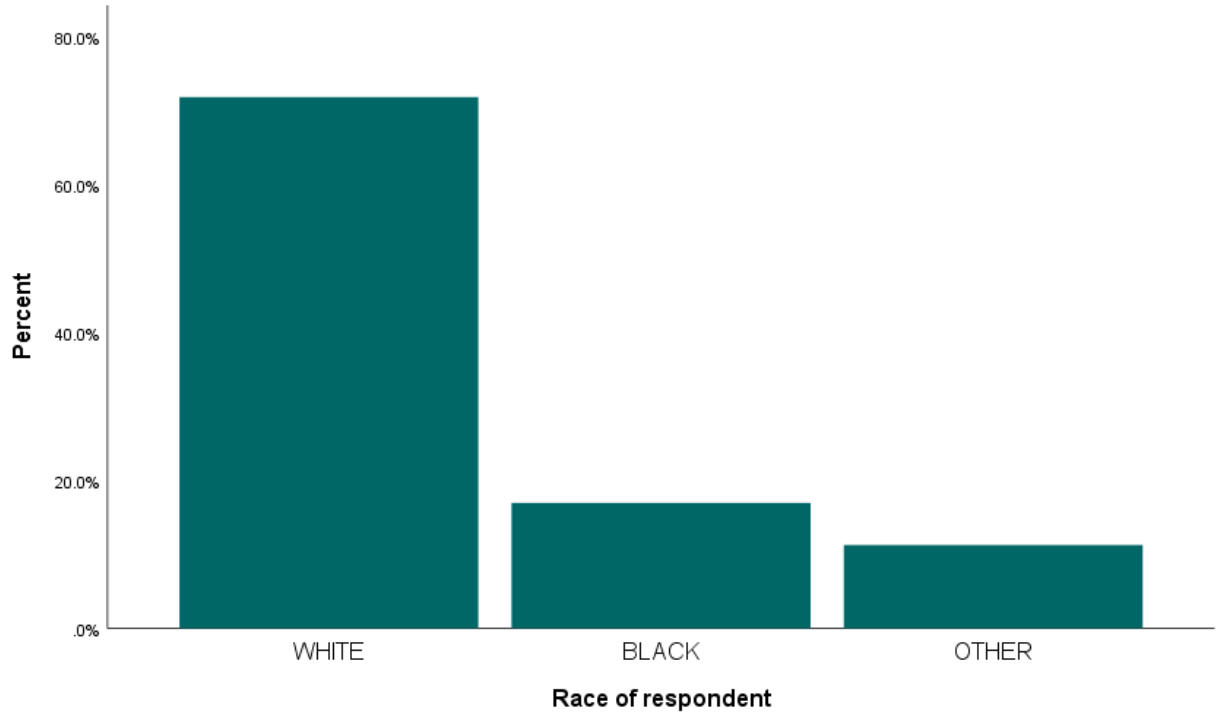


Figure 6. Bar Graph of Race of Respondent

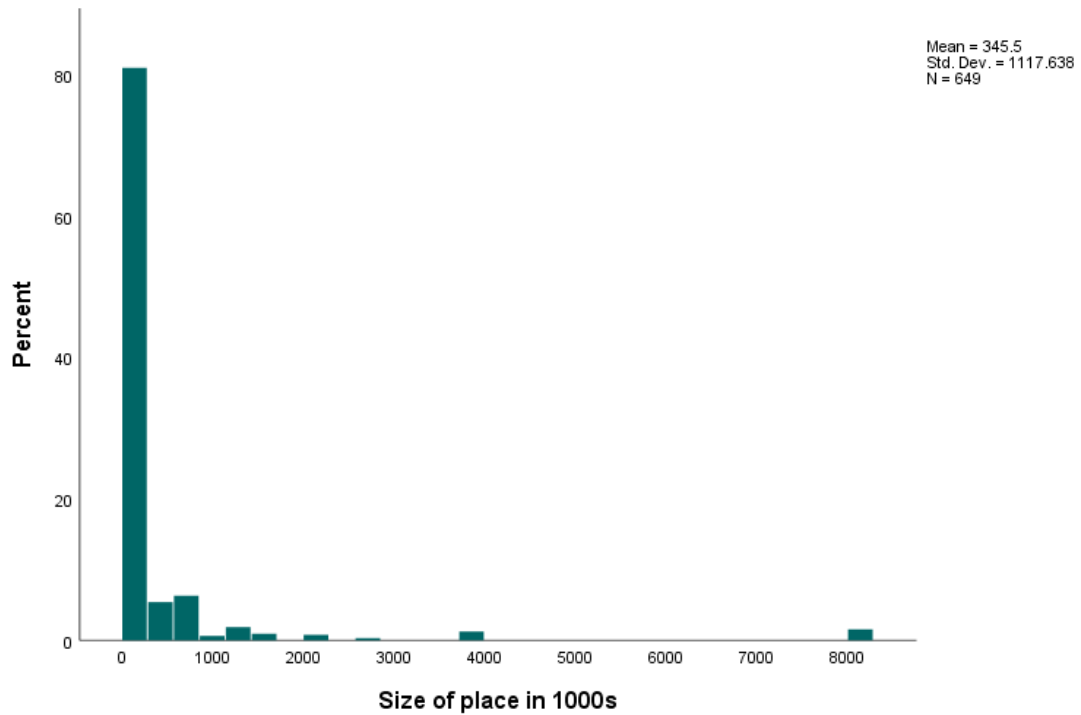


Figure 7. Histogram of Size of Place in Thousands

Running Head = GREEN SPACE EXPOSURE

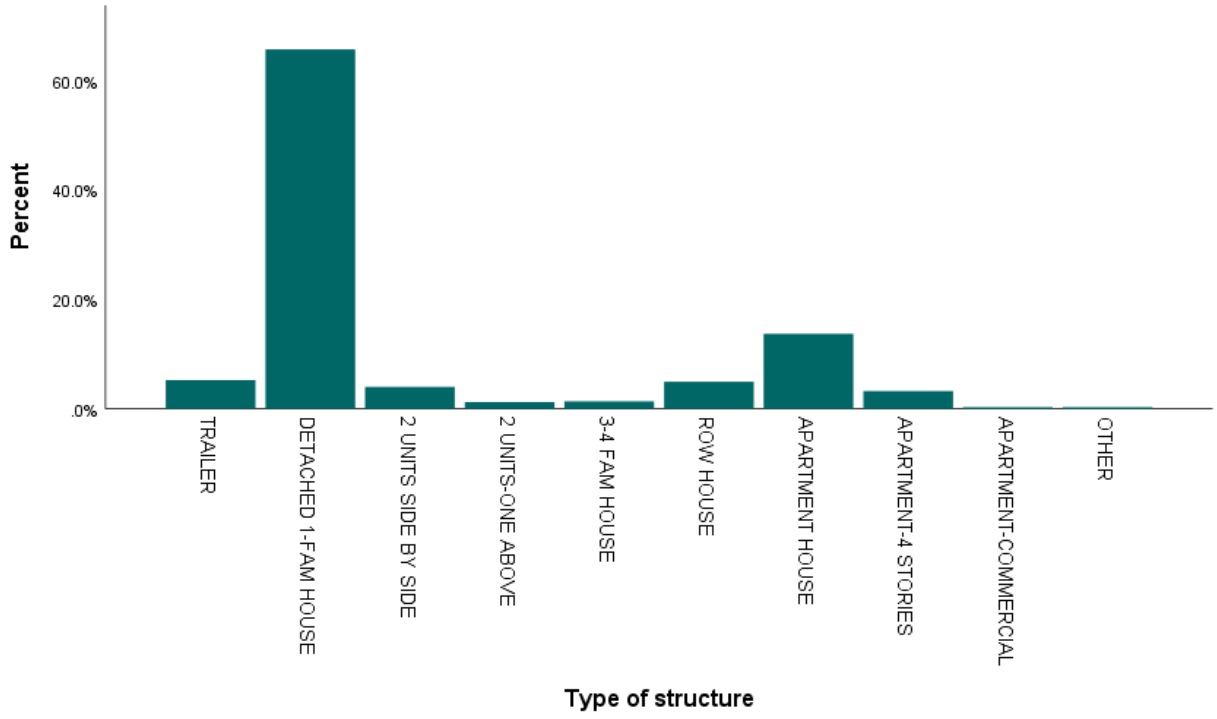


Figure 8. Bar Graph of Type of Dwelling