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Immigrant Populations in relation to Access to Greenspace and Noise Pollution

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2018

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An abstract of
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Abstract

Immigrant Populations in Relation to Access to Greenspace and Noise Pollution

By Sabrina Bogović

Immigrants exist across the globe, yet they are an understudied population in many facets. This study investigates the relationship between the environmental exposures of access to green space and noise pollution on immigrant populations. Access to greenspace, or greenness, noise pollution and immigrant populations were evaluated by systematic synthesis of environmental exposures to better understand the health implications that these exposures have on immigrant populations. By examination of select literature, three main themes were elicited, which include mental health, social cohesion, and socio-economic status as important measures in evaluation of exposures on immigrant populations. These themes highlighted the need for further research in environmental exposures. Further, it was identified that mental health issues in immigrant populations was associated with noise pollution, and negatively correlated with access to greenspace. In the theme of social cohesion, it was found that higher levels of social cohesion occur with greater access to green space, and less noise pollution. In the theme of socio-economic status, there was mixed results in exposure to greenness and environmental exposure. In essence, our analysis points to a strong correlation between general better conditions for immigrant populations in environments with low noise pollution and access to greenspaces.

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Introduction

There has been a shift in addressing the global burden of disease, moving from a system based on control of communicable diseases to a system focusing on non-communicable diseases being the primary source of mortality. This has expanded the science involved in determining risk factors to chronic conditions, falling into the non-communicable disease category (Lim et al., 2013). Environmental analysis of exposure factors has become increasingly relevant to the understanding of chronic conditions. This is due to environmental stressors becoming associated with non-communicable disease (Lim et al. 2013). However, the exploration of environmental exposure in specific vulnerable populations has been lacking within the literature. However, vulnerable populations, such as immigrants, are at increased risk of greater environmental exposure and negative health consequences (Eamranond & Hu, 2008). Greenness, or the ability to have access to green areas, is an imperative to human existence. Access to green spaces has been deemed a social determinant indicator of health (Meng et al. 2013). In linking this environmental determinant of health with negative exposures, we can understand the impact green space has with negative pollutants. More specifically, noise pollution will be studied within the context of groups that are immigrants in the United States. Observation of noise pollution and greenness availability in immigrant population will help inform indicators of health in vulnerable populations.

Access to green space has become a burgeoning topic in not only the public health field, but also in environmental justice. Greenness or access to green spaces is defined as an indicator for area in which is public parks, fields, and nature has been found to influence health behavior by promoting physical activity, social contact, decreasing stress (James et al., 2015). Expanding on this concept, contact with biodiversity and a more natural environment has been shown to

have positive effects on people's physical and mental well-being (Jackson, 2003). Further, greenness has been found to mitigate noise pollution, air pollution, and heat exposure (Markevych et al., 2017). Often explored through the lens of civic planning, access to green-space has become a criteria for successful health outcomes. This is a natural output, because greenspace has been found to support a higher quality of life (Elbakidze et al. 2017). They also serve as a prevention mechanism, due to their role on reducing disaster risk in urban and rural areas, and promoting environmental conservation (Uchiyama & Kohsaka, 2017). Therefore, not only is access to greenspace an important outlet for humans, but can be a betterment for the ecosystem in that local area, contributing to the urban and rural biodiversity (Wilkinson et al. 2013). As evident in the increased use of green areas during the COVID-19 pandemic, the "new-normal" has encouraged citizens to change habits and occupy their home spaces and avoid crowds, greenspaces have become an invaluable resource (Uchiyama & Koshaka, 2019). However, access to greenspace is slowly diminishing, due to the effects of urbanization and lack of promotion of conservational efforts (Pauleit, Ennos, & Golding, 2003).

Noise pollution is defined as one of the most common environmental exposures within the United States. Being one of the four major pollutants of the world, over 170 million people are exposed to noise levels between 55 and 65 decibels. Further, chronic noise has been found to cause harmful effects on human health (Hammer et al., 2014). This can include sleep disturbance, noise induced hearing loss, cardiovascular disease (including ischemic heart disease and hypertension), endocrine effects, annoyance, increased incidence of diabetes, and decreased school performance (Passchier-Vermeer and Passchier, 2000). However, many communities do not consider this a major risk to health, which is reflected in the lack of policy changes to noise pollution in current day environmental law in the past thirty years (Hammer et al., 2014). Not

only impacting humans, noise pollution impacts the health and wellbeing of wildlife-impacting on animal's ability to find food, attract mates, and avoid predators (National Geographic, 2019). Within the context of cities, research has found that the effect of noise pollutants have primarily been affecting populations of lower socioeconomic class and minority communities (Houston, Krudysz, & Winer, 2008). However, there is little literature attempting to understand this pollutant's affect within the intersection of exposure to greenness and vulnerable populations like immigrants.

In past literature, immigrant and low socioeconomic status populations have been found to be more greatly impacted by environmental exposure than other populations (Houston, Krudysz, & Winer, 2008). This is attributed to a multitude of systemic inequalities present in the United States institutions. This is more specifically highlighted in the reluctance that the United States provides health services to immigrant populations, and general xenophobia within the country. This is represented in the lack of legal action to help this population, which manifests in environmental injustices (Eamranond and Hu, 2008). Immigrant populations overlap with low-socioeconomic status individuals in the United States, as immigrants are a particularly vulnerable group. This is due to the adversities and uncertainties they experience before and after migration, which can result in financial hardships (Bauer, Brand, Zeeb 2020). Within the literature, environmental exposures are more prevalent in the immigrant community and the populations under the poverty line. However, this has not been well studied relating to specific exposures, such as noise (Casey et al. 2017). Further, individuals who are immigrants and the exposure of greenness access have been found to be negatively associated with each other (Wen et al., 2013).

Based on prior research, one can surmise that the immigrant population of the United States have been significantly exposed to noise pollution, but there are clear gaps within the

analysis in this specific population. General absence of environmental assessment on particularly vulnerable populations can indicate a possible bias among researchers and study design, and therefore must be clarified. Further, access to greenness in the context of immigrant populations falls short, possibly having similar indications. This becomes an environmental justice issue, which is defined as "the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies (Environmental Protection Agency [EPA], 2020). Therefore, in analysis of the current literature on noise pollution, access to greenspace, and immigrant populations, we can better inform future research and lawmakers to promote equitable access to greenspace, and gain to justice for vulnerable populations in highly noise polluted environments.

Existing studies on greenness tend to analyze the impact of access to green areas on individuals, but do not seek to understand its absence, or interaction with other environmental exposures, including noise pollution on a population basis. Further, noise pollution studies typically involve analyses of exposure in urban environments, on specific population groups, excluding immigrants. The influence of access to greenness and noise pollution on a specific subset of a population is relatively unexplored, and therefore the following sections will highlight key patterns in the literature and identify gaps in the literature, and offer recommendations toward improving the health equity in all sub populations.

Methods

As stated, this review is to evaluate the gaps in the literature regarding environmental exposure to access to greenness and its intersection with noise pollution on immigrant populations. To accomplish this goal, articles reviewed included both unpublished and published

literature. Unpublished literature was included in the search, to include documents from organizations and to-be-published articles. This was done to collect all relevant documents in the search. Inclusion and exclusion criteria were developed to fit the specific goals of the review and were applied to a literature search in the PubMed, Web of Science, and Scopus databases. Articles that were defined to fit the criteria were included in analysis, and main themes were extracted. No meta-analysis was conducted. Table 1 details the search terms utilized in each database.

The searches were then exported to the citation software Zotero. Titles and abstracts were then reviewed, utilizing specified exclusion and inclusion criteria. Duplicates were deleted at this stage. Inclusion criteria is as follows:

- Available in English;
- Available in full text form;
- Evaluating the impact of greenness and noise pollution in tandem study design
- Discusses exposure of access to greenness and noise pollution impacts immigrant health.

Exclusion criteria is as follows:

- Published in language other than English;
- Full text was not available through Emory library system;
- Did not evaluate exposures of greenness and noise pollution;
- Does not discuss the exposure’s impact on immigrant health.

After careful review, the articles were analyzed and excluded if they did not meet the inclusion criteria. After review, themes emerged from the text, including social cohesion, socio-economic status, and mental health. These themes are further analyzed in the results section.

Utilizing the process described, the search was conducted in the databases of Pubmed, Web of Science, and Scopus. Citations were then downloaded to the citation manager Zotero. The search yielded a total of 14 articles. No duplicates were found. Five articles were excluded first due to the full article was unavailable from the Emory Library system. One article was removed due to language difference. The remaining eight articles were then analyzed for inclusion by reading of full text. Of the eight, five were excluded due to missing exposures in either greenness or noise pollution. This process is detailed in Figure 1. In total, three articles were identified for the review of literature.

Results

Three articles were included in this review, based on the inclusion criteria of evaluating environmental exposures based on immigrant populations. Major overlapping themes extracted from these articles were the impact of these environmental exposures had on mental health of immigrants, impact of socio-economic status had in association with exposures on immigrant populations, the importance of social cohesion in association with positive outcomes of health related to immigrant populations. These four studies focused on different immigrant populations, where three focused on populations within the United States and one study focused on immigrant populations in the Netherlands. The articles span from the earliest in 2000 and the most recent in 2018.

Social Cohesion Analysis

Of the three articles assessed, three highlighted social cohesion as a factor related to access to greenspace and noise pollution. Two studies, both done in differing communities in the United States, utilized methodology of conducting surveys and interviews with immigrant populations.

In the study Ou. et al. 2018, 354 interviewees from Chelsea, Massachusetts defined social cohesion as "feelings of trust and inclusion in social settings." In understanding noise and access to greenspace, interviewees outcome's were related on differing scales. Perceived health was rated on a scale of very good, good, fair, and poor. Environmental exposures were assessed by percipient's perception of noise and neighborhood conditions, including greenspace. Social cohesion was assessed by use of the Sampson's Collective efficacy scale, understanding the participant's perceptions of cooperation and participation in their communities, and generalized social cohesion. The environmental exposure of noise pollution was reported by 50% of the population, experiencing at least one regular noise disturbance per week. Further, within the variable defined as neighborhood conditions (encompassing access to greenspace), worsening neighborhood conditions had a positive association with poor self-rated health, and an inverse relationship with social cohesion. Noise disturbances had positive associations with poor self rated health, and poor social cohesion.

Further, in the study Brugge, Leong, Averbach, and Cheung, 2000, Asian and Pacific Islander immigrants were interviewed in Chinatown, Boston, with a sample size of 42 participants. By use of survey, participants were asked several questions regarding their environmental exposures, including perception of available greenspace and perceived noise. It was found that access to green areas or "open/green space" was needed. Further, positive associations with lack of greenspace and poor health were found. Lack of greenness was

correlated to the absence of community groups, and social cohesion. This, therefore, correlates with the finding in Ou et al. 2018.

In Generaal et al. 2018 based in the Netherlands, neighborhoods were assessed by impact of traffic noise, availability of greenspace and water space, and social cohesion on immigrant populations and diagnosis of anxiety or depression. By conducting a cross-sectional study with the Netherlands Study of Depression and Anxiety, participants were found at primary care offices, specialized mental health care, and recruited in the community, from both urban and rural neighborhoods. Controls were defined in the same neighborhoods but did not have current diagnoses of depression or anxiety. Noise was categorized by the Netherlands Environmental Assessment, and greenspace was calculated by using Calculate Geometry-option in ArcGIS. It was found that both depression and anxiety were correlated with high traffic noise and lower social cohesion. Anxiety also had a positive correlation with less available greenspace.

Socio-Economic Status Analysis

Three articles found that socio-economic status was related to access to greenspace and presence of noise pollution. In Generaal et al. 2018, it was found that socioeconomic status was associated with health status of immigrant populations. Socioeconomic status was assessed by obtaining information from the Netherlands Institute of Social Research, which bases socio-economic status of neighborhoods on education, income, and position in the labor market. Anxiety, along with high levels of noise and lower greenspace availability, was associated with low socioeconomic score. Depression was significantly associated with low socio-economic status neighborhoods, along with traffic noise (Generaal et al. 2018).

In Ou et al. 2018, socioeconomic status was assessed in tandem with greenspace availability and noise pollution. Socioeconomic status was found to be a confounder, and was then later assessed by breakdown of income and education, and these factors were not found to be statistically significant in relation to the outcomes (Ou et al. 2018).

In Brugge, Leong, Averbach, and Cheung, 2000, socioeconomic status was relevant in the understanding of environmental exposures in relation to immigrant population. Socioeconomic status was accounted for by use of survey methodology, in assessing education level and neighborhood area. It was not found to be statistically significant in relation to greenness and noise pollution.

Mental Health Analysis

Two studies focused on mental health in relation to the immigrant population, in tandem with greenness and noise pollution, where one evaluated mental health as an aggregate term and the other evaluating depression and anxiety in this context. In Ou et al. 2018, mental health was assessed by participant-reported diagnoses, where they evaluated participants based the dichotomous variable of on one or more mental health conditions. In the population assessed, 37% participants reported at least one mental health condition. Worsening neighborhood conditions (greenness variable) was found to have an association with presence of mental health conditions, but was not significant. Noise pollution was associated with the variable of mental health conditions.

In Generaal et al. 2018, this study was specifically assessing depression and anxiety. The participants were chosen based on a mental health condition of either depression and anxiety, and controls did not. The study population was n = 2,966, where 1,784 participants had a

diagnosed disorder, and controls of 1,197. It was found that individuals with higher levels of traffic noise was correlated with depression/anxiety. Depression was found to have higher association with noise, while anxiety had an association with less green space and noise.

Discussion

Social Cohesion Conclusions

In examining the results of the three studies that analyzed the impact of social cohesion while studying noise and access to green space exposures, it was found to have a general positive association with access to greenspace, and general negative association with noise pollution. We can infer that social cohesion can be understood as a moderating effect on negative environmental exposures, including noise pollution, and positive associations with access to greenspace (Ou. et al. 2018). This is in line with other studies examining the impact of social cohesion and mental well being, positing that individuals that feel more connected to their community can have higher levels of emotional wellbeing (Elliot et al. 2014). This is particularly true for immigrant populations, in which being more emotionally connected to your community and neighborhood has been found to have positive associations in generalized health (Alegria, Sribney, and Mulvaney-Day, 2007). To foster these connections, external environment availability is key for gathering in communities and therefore influencing social support and emotional support. It has been found that ethnic minorities living in more homogenous neighborhoods are more likely to use health care services than immigrants living in heterogenous communities (Haas et al., 2004). However, this can be difficult to achieve, where immigrants may face loneliness during the periods of the settlement process and can isolate themselves. Families were analysed and understood that urban parks provided a unique family-bonding opportunity and can meet other families in parks (Hordyk, Hanley, and Richard 2015).

Noise and social cohesion was shown to be inversely related to another in the immigrant populations studied in the literature. This follows research in other populations, where noise has been found to negatively impact the ability for social cohesion to occur, but no firm conclusions have been drawn (Dzhambov, Tilov, Markevych, & Dimitrova, 2017). There are some hypotheses on why this is, and many point to undue "urban stress," that noise pollution creates (Hordyk, Hanley, and Richard 2015). Further, some studies identify that larger streets resulting in higher traffic volume can have a result of decreasing interpersonal interaction, and therefore resulting in lower social cohesion (Dzhambov, Tilov, Markevych, & Dimitrova, 2017). These results identify that immigrants fall under similar circumstances that many populations due when exposed to great noise pollution, however, they are impacted on a larger scale due to environmental inequity (Eamranond & Hu, 2008).

Socioeconomic Status Conclusions

Socio-economic status has been well studied in connection to immigrant health, where it has been found to be a major determinant to health in minority populations (Lindström, Sungquist, & Östergren, 2001). However, this conclusion is not without contrast, in which some studies have found that socioeconomic status in ethnic minorities is not an important factor in examining health in immigrant populations (Lorant, Van Oyen, & Thomas, 2008). Therefore, the conclusion of the theme found in the three studies, two of which reported not-significance in socio-economic status with exposure to greenspace and noise, is in line with the literature.

Socioeconomic status has been defined generally as factors of education, mean income, and area deprivation (Lorant, Van Oyen, & Thomas, 2008). As argued in literature, socioeconomic status in vulnerable populations such as immigrants can lead to a chain of events resulting in poor outcomes (Lorant, Van Oyen, & Thomas, 2008). In Eamranond & Hu, 2008,

this is shown where in xenophobic environments can create lower socioeconomic statuses, leading to environmental and occupational exposures, creating a sick immigrant. This then results in lack of access to health care and culturally inadequate health care can lead to poor outcomes in immigrants.

In evaluation of greenness and socio-economic status among immigrant populations, it is found that there is some correlation between lack of greenspace and lower socio-economic status (Lorant, Van Oyen, & Thomas, 2008). These factors have been found to be connected in populations that are not immigrants. As studied in The Netherlands, when comparing access to greenspace and socio-economic status, it is found that lower socio-economic status populations have less greenness than wealthier populations. This was found in rural populations, but not always found in urban populations (Vries, Buijs, & Snep, 2020). According to PEW Research, 64% if immigrants in the United States are located in 20 major metropolitan cities (Budiman, 2020). Therefore, differences in socioeconomic status and greenness availability in cities is a topic that should be further studied.

Noise and socioeconomic status in the immigrant population have been found to be related. This exposure is regarded in prior research as a debated topic, and has been less studied in immigrants (Lorant, Van Oyen, & Thomas, 2008). Socio-economic status in general populations has been found to be an indicator of noise pollution in several circumstances (Tonne et al. 2018). As stated, due to the vulnerability of immigrant populations and the inequity existing in communities, one can surmise associations.

Mental Health Conclusions

Mental health in immigrant populations has been a particularly well-researched part of immigrant health, in a generally difficult population to research. Therefore, the correlations found between immigrant populations and mental health issues in the above articles has been found to generally correspond with previous research. Immigrant populations and mental health conditions have been hypothesized to be influenced by various factors, including added stressors experience of the process of immigration, living in unfamiliar country with different cultural and ethnic identities, and lack of community are to name a select few (Pumariega et al., 2005). However, mental health in the immigrant population in relation to access to greenspace and noise pollution is not particularly well studied.

Noise pollution and mental health have been associated in various populations, not only immigrants. Chronic stress that noise pollutants has been studied to cause interference with task performance, modifies social behavior, and increases annoyance. Over long periods of time, these can manifest into mental health symptoms (Stansfeld, & Matheson 2003). It has been shown as a dose -response association in some studies, in which higher levels to aircraft noise was related to increase in depressiveness and nervousness (Hiramatsu, Yamamoto, Taira, Ito, & Nakasone, 1997). Therefore, the studies in the immigrant populations are following the research, but more studies should be done about long-term impacts in this population.

Associations with access to green areas and mental health issues is a well-documented relationship. Studies have shown that greater neighborhood greenness has been associated with reduced risk of stress, psychiatric morbidity, psychological distress, depression and anxiety. Some studies conclude that this relationship is possibly due to encouragement of physical activity, participation in social settings, and psychological benefits of nature (James, Banay, Hart, & Laden, 2015). In the immigrant populations studied in the articles above, one studied

perceived greenness. Even then, perception of greater access to green areas showed associations with less mental health diagnoses (Ou et al. 2018).

Limitations

The largest limitation for this study was that only four articles were identified as meeting the inclusion criteria. This is in part due to a limited number of full-text articles being present in the Emory library system. More importantly, research in immigrant health and environmental exposures is a relatively small, and growing, field of research. Due to challenges in documentation in immigration process, and general hesitancy due to the political climate in regards to immigrants, many of these individuals may feel at risk to participate in a study (Wray-Lake et al., 2018). Xenophobia has resulted in general fear form the immigrant community, and therefore curb research participation. However, due to the general xenophobic reaction of the 2016 presidency and the increasing amounts of anti-immigrant and refugee rhetoric, this should only encourage research into this population. The trend toward nationalistic ideation and immigrant-hate should prompt institutions of research to regard this community as particularly vulnerable. Therefore, more studies should be encouraged in this field of recording environmental exposure of the immigrant population.

In considering further limitations, the definition of noise pollution and greenness exposure varied between studies, and therefore can cause issues in drawing comparisons in this review. For example, Ou et al. 2018 defined greenness in the survey questionnaire as “perception of available greenspace,” while other studies utilized ArcGIS to measure green spaces in neighborhoods. Noise pollution definitions also varied in this review. Noise pollution in Ou et al. 2018 was defined as a variable of three levels; noise disturbance level, negative response to noise, and sleep disruption to noise. In the study Generaal et al. 2018, daily mean noise of road,

rail and air traffic for several years were modeled in a separate study in the Netherlands Environmental Assessment, and those values were utilized for the current study. Therefore, these differences can possibly lead to different levels of greenspace or noise across the various immigrant populations.

Further, a limitation in studying immigrant populations generally is that groups that are immigrants can vary in many ways; from country of origin, to race and ethnicity, this brings general challenges in utilizing research for specific populations of immigrants to generalize for others. Further, race and ethnicity can play a major role in comparison between sub-populations. In a study done in the United States and Canada, there were various differences in immigrant health statuses between foreign born white immigrants and foreign born non-white immigrants. While in Canada, these racial differences in healthcare were not significant, the differences in non-white and white immigrant health were significant. These differences ranged from access to care, access to health insurance, and overall poor health, where non-white immigrants were found associated with poorer outcomes (Prus, Tfaily, & Lin, 2010). When such drastic differences are evident in only race, it is hard to compare populations of immigrants. Further, this points to the overall differences between systemic issues of racial inequalities, and can therefore manifest in health and environmental inequity, and is therefore vital to be studied further.

Recommendations

In examining the current evidence of environmental exposure to noise pollution and access to greenness, several recommendations can be made. Specific focus to the immigrant community is necessary to identify the barriers to immigrant health and help construct a system of health equity. As environment plays a massive role in individual and community health,

studies focusing on the expansion of green areas and decrease in noise pollution would assist not only immigrant populations, but all populations in both rural and urban environment.

Further, this review identified environmental racism issues within the scope of immigrant populations. Immigrants are not the only population that deal with the negative exposures of noise pollution and lack of greenspace, and therefore more research in this area should become a priority. This need is evident in the current pandemic, in which those with lower socioeconomic flexibility do not have the same access to green areas due to restrictions, which can manifest in negative mental health consequences (Thomson Reuters Foundation, 2020). Further identification on how environmental justice is necessary for vulnerable populations to succeed. Through the promotion of green areas and decrease in noise pollution, this is one step closer to being accomplished.

Further, future research should be conducted on the increase of green areas in relation to noise pollution. It has been found that increase of vegetation can reduce exposure to harmful noise, and has found to reduce cardiovascular disease risk (James, Banay, Hart, & Laden, 2015). With greenspaces slowly decreasing in urban areas, this can manifest in further environmental issues, and therefore should be prioritized (Pauleit, Ennos, & Golding, 2003). Therefore, encouraging lawmakers to create more greenspace should help mitigate the factors of pollution in the present day.

Studying social cohesion within the context of environmental exposure to noise pollution is vital to a population becoming more socially disengaged (Elliot et al. 2014). This can further foster immigrant populations and other populations in communities to participate in their environment, and encourage positive social and physical health (Alegria, Sribney, and Mulvaney-Day, 2007). Benefits of social cohesion in all populations should be prioritized, due to

the positives it elicits in communities (Dzhambov, Tilov, Markevych, & Dimitrova, 2017). Therefore, in assisting communities to come together, further equality and better health outcomes for all populations can be possible.

Conclusion

The results of this review helps define the parameters in which further research is needed in assessing environmental exposure and immigrant health. Immigrants have face mental and physical health difficulties historically after migration, which has been primarily addressed by individualized based interventions. As the impact of health and the environment is being understood more fully, we can encourage that facilitating the physical environment of surrounding communities and addressing populations on a wider scale is more beneficial (Hordyk, Hanley, and Richard 2015). Therefore, by conducting further research in a more equitable manner on vulnerable populations, we can help ensure greater health equality among all populations.

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Appendix A

Table 1

Database Search

Database	Search
Pubmed Web of Science Scopus	(((((greenness) OR (access to green space)) AND (noise)) OR (noise pollutants)) AND (immigrant))

Appendix B

Figure 1: Diagram of Identified Literature