Barriers to Walkability Impact the Quality of Life Among Aging Flint Residents

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DEDICATION

This paper is dedicated to my husband, Michael, for supporting me in furthering my education, to my parents for teaching me to believe in myself, to Dr. Rie Suzuki for being my mentor and guiding me throughout my Public Health Integrative Learning Experience, and to the Public Health faculty at the University of Michigan – Flint for giving me the tools to become a successful public health professional.

Abstract

Objective: Walkability is a popular term used to describe aspects of the built and social environment that have important population-level impacts on physical activity, energy balance, and health and increases positive quality of life (QOL). However, many barriers discourage older adults from walking, ranging from lack of motivation to unsafe neighborhood environments. The objective of this study is to understand if walkability is associated with QOL. Because the low socioeconomic area such as Flint indicates poor perceived walkable neighborhoods, we expected that as people age, perceived barriers to walkability negatively impacts QOL.

Methods: This is a cross-sectional survey. Participants were recruited in 2018 and 2019 at regional health clinics in Flint, MI. To be eligible, participants had to be over 65 years old and Flint residents. The independent variable is there are major barriers to walking in my neighborhood that make it hard to get from place to place (for example, freeways, railway lines, rivers, canyons, hillsides) and the dependent variable is SF-36 (physical and mental health). Descriptive statistics was utilized on SPSS.

Results: Of the 144 participants, the mean age was 69.91 (SD = 5.103). The majority were female (63.2%), African American (72.9%), divorced (37.1%), and high school graduates (36.1%). The correlation analysis revealed that barriers to walking in the neighborhood and total mean mental composite score is statistically significant. Barriers to walking in the neighborhood and total mean physical composite score is not statistically significant. Age and QOL and age and barriers to walking in the neighborhood is not statistically significant.

Discussion: The findings suggest that neighborhood walkability characteristics are associated with mental health but are not associated with physical health. There is no relationship between age and QOL and age and barriers to walking in the neighborhood.

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INTRODUCTION

Quality of life (QOL) is defined as an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns (WHO, 2022). QOL is important to everyone especially as they age (Netuveli et al., 2006). As life expectancy increases, more emphasis has been placed on the importance of better QOL (Phyo et al., 2020). By 2030, 1 in 6 people in the world will be aged 60 years or over (WHO, 2022). Successful aging is multidimensional, encompassing the avoidance of disease and disability, the maintenance of high physical and cognitive function, and sustained engagement in social and productive activities (Rowe & Kahn, 2000). Successful aging can result from positive QOL (Fredriksen-Goldsen et al., 2015) such as increased family and social support. Significant negative influences on QOL include financial situation perceived as poor, depression, limitation in physical activities such as activities of daily living and mobility, and limitations attributable to longstanding illness (Netuveli et al., 2006). Healthy People 2030 sets data-driven national objectives to improve health and well-being over the next decade and focuses on reducing health problems and improving QOL for older adults.

Walkability is a popular term used to describe aspects of the built and social environment that have important population-level impacts on physical activity, energy balance, and health (Tobin et al., 2022). Walkability is a term often used to identify and measure features of the built environment that either enhance or impede an individual’s willingness and ability to walk to local amenities (Glicksman et al., 2013), especially those amenities that are thought to encourage healthy lifestyles (Glicksman et al., 2013). Research has tied measures of walkability to QOL. Walkability increases positive QOL (Alves et al., 2020). People who walk are more likely to have increased QOL (Dehi et al., 2014). The built environment defined as all of the physical

parts of where we live and work, influences a person's level of physical activity, and is the factor most frequently found to influence walkability (EPA, 2022). Measures of the built environment include population density, different types of land uses, street connectivity, and sidewalk availability, hilly or steep streets, the aesthetics of a neighborhood, and safety (incidences of crime and those with more dangerous streets). The weather (e.g., extreme temperatures, precipitation, and high winds) discourages people from walking. Older adults are more likely to spend the majority of their day in the neighborhood in which they reside (Yen et al., 2012) therefore these barriers to walkability in the neighborhood negatively impact QOL. Also, research has found that health problems such as obesity and hypertension, lack of self-discipline, and lack of time are the most significant perceived barriers to walkability (Clark & Scott, 2016).

Aging is perceived to decrease QOL (Netuveli et al., 2006); however, it is important to look for predictors of QOL other than age. No single factor determines QOL in older adults and there is evidence that QOL can increase during early old age (Netuveli et al., 2006). For older adults, living longer is not a criterion; they strive for independence and well-being in their old age (Lee et al., 2022). Older adults describe QOL as being healthy, having peace, living in harmony, feeling happy, being satisfied with life, and keeping oneself busy, whether with hobbies, volunteer service or work (van Leeuwen et al., 2019). Negative factors on QOL include death of a partner, family member or close friend, major financial loss, and experience of a major personal crime or injury (Archea et al., 2007). To ensure QOL for older adults, resolving issues surrounding their health conditions, chronic diseases, and medical expenses is especially important (Choi & DiNitto, 2018). Additionally, performing meaningful activities such as gardening or reading and maintaining functional ability such as mobility and social relationships are important factors for improving QOL.

Although walking is a popular form of physical activity (Lee et al., 2013), many barriers discourage the aging population from walking (Lee et al., 2013). Popular environmental barriers to walking include bad weather, inadequate lighting, no shade, unattended dogs, disconnected sidewalks, poor walking surfaces, no interesting places to walk nearby, and no benches (Lee et al., 2013). Older adults frequently report benches, places to rest, and even and smooth walking surfaces as motivators to walking in the neighborhood while fear of injury is reported as a safety related barrier. Older adults may be exposed to increased risks of being injured while walking outside because of unsafe environments (Lee et al., 2013). They may experience health problems and functional limitations as a personal barrier making them less able to negotiate their environments that are physically challenging or induce a sense of fear (Lee et al., 2013). For safety reasons, older adults tend to walk more in the mornings and are more likely to walk with friends. Indoor venues such as treadmills at home and shopping malls are also more commonly used by older adults (Lee et al., 2013). Research has shown significant positive associations between perceived low walkability and participants' poor health status, mobility status, falls and injury history, and fear of falling (Merom et al., 2015). When older adults experience barriers to walking due to age, they are more likely to have poorer QOL compared to younger, healthy adults because adults are experiencing worst chronic or psychological conditions (Roe et al., 2020). Diseases such as high blood pressure, leg pain, and eye disease are major physical conditions that discourage older adults from walking. In addition, if older adults experience physical disabilities, they often face obstacles to walking locally (Suzuki et al., 2020) and have poorer QOL. Similarly, older adults who live in less walkable neighborhoods or experience limited mobility are at increased risk of psychological conditions such as depression and anxiety (Joshi et al., 2017).

Purpose

The purpose of this study is to understand if walkability is associated with QOL. Because the low socioeconomic area such as Flint indicates poor perceived walkable neighborhoods, we expected that as people age, perceived barriers to walkability negatively impacts QOL.

Hypothesis

H1. Barriers to walking in the neighborhood and QOL

Reducing barriers to walkability positively improves QOL.

H2. Age and QOL

Aging is associated with poor QOL when people are experiencing worst chronic or psychological conditions.

H3. Age and Barriers to walking in the neighborhood

Aging is associated with increased perceived barriers to walking in the neighborhood.

Significance of this study

There are many barriers to walkability in the city of Flint especially poor walking surfaces and high rates of crime. These barriers can affect QOL in a positive and negative way. As people age, their QOL is affected by their ability to get around the neighborhood. The city of Flint has suffered high rates of poverty due to the disinvestment in the poor maintenance of housing, streets, and buildings. Also, the residents of Flint experience poverty (Black, 2019), and older Flint residents might not take a walk in their neighborhoods because they are more likely to experience one or more functional limitations (Suzuki et al., 2021). This study would support/reveal how the barriers to walkability impact the QOL among aging Flint residents.

METHODS

Recruitment

This is a cross-sectional survey. Participants were recruited in 2018 and 2019 at regional health clinics in Flint, MI. To be eligible, participants had to be over 65 years old and Flint residents.

Variables

Barriers to walking in my neighborhood. The participant was asked if there are major barriers to walking in my neighborhood that make it hard to get from place to place (for example, freeways, railway lines, rivers, canyons, hillsides). The participant had to select a response from strongly disagree (1), somewhat disagree (2), somewhat agree (3), and strongly agree (4). The independent variable in this study sought to find out information about the way the participant perceives or thinks about their neighborhood.

QOL. The Short Form 36 (SF-36) health survey questionnaire was used. It is a widely used measure of QOL (Lins & Carvalho, 2016). SF-36 consists of eight domains yielding two summary measures: physical and mental health. The physical health measure includes physical functioning, physical role limitations, bodily pain, and general health. The mental health measure includes vitality, social functioning, emotional role limitations, and mental health.

Age. Participants were asked their age in years. Participants had to be at least 65 years old to be eligible to participate in the study.

Statistical analysis

On SPSS (Kaliyadan & Kulkarni, 2019), descriptive statistics for characteristics of the sample was utilized. Spearman's rank correlation coefficient [rho (ρ)] was also utilized to determine the correlation analysis of barriers to walking in the neighborhood and QOL, age and QOL, and age and barriers to walking in the neighborhood. Hypothesis 1 treated barriers to

walking in the neighborhood as the independent variable and QOL as the dependent variable. Hypothesis 2 treated age as the independent variable and QOL as the dependent variable. Hypothesis 3 treated barriers to walking in the neighborhood as the independent variable and age as the dependent variable.

RESULTS

Participant Characteristics

The information in table 1 indicated that the majority of participants were female (63.2%), African American (72.9%), divorced (37.1%), and high school graduates (36.1%). Almost a majority of the participants collected from Social Security Disability Insurance (57.4%). The mean age was 69.91 years (standard deviation (SD) = 5.103). (See table 1).

H1. Barriers to Walking in the Neighborhood and QOL

In table 3, the correlation analysis revealed that barriers to walking in the neighborhood and total mean mental composite score was statistically significant (rho = 0.018, p = -0.197). The barriers to walking in the neighborhood and total mean physical composite score was not statistically significant (rho = 0.108, p = -0.135). (See table 3).

H2. Age and QOL

In table 4, the correlation analysis revealed that age and QOL was not statistically significant. The correlation coefficient for total mean physical composite score and age was rho = -0.057 and p = 0.498. The correlation coefficient for the physical health domains and age were physical functioning (rho = -0.115, p = 0.172), physical role limitations (rho = -0.097, p = 0.252), bodily pain (rho = 0.022, p = 0.790), and general health (rho = -0.085, p = 0.310). The correlation coefficient for total mean mental composite score and age was rho = -0.073 and p = 0.387). The correlation coefficient for the mental health domains and age were vitality (rho = -

0.105, $p = 0.211$), social functioning (rho = -0.034, $p = 0.683$), emotional role limitations (rho = -0.080, $p = 0.343$), and mental health (rho = -0.007, $p = 0.938$). (See table 4).

H3. Age and Barriers to Walking in the Neighborhood

In table 5, the correlation analysis revealed that age and barriers to walking in the neighborhood was not statistically significant (rho = -0.112, $p = 0.180$). (See table 5).

DISCUSSION

The purpose of this study was to understand if walkability was associated with QOL. Because the low socioeconomic area such as Flint indicates poor perceived walkable neighborhoods, we expected that as people age, perceived barriers to walkability negatively impacts QOL. This study found that there was no relationship between age and QOL and age and barriers to walking in the neighborhood. This study did however find a relationship between neighborhood walkability characteristics and mental health.

The first hypothesis was barriers to walking in the neighborhood negatively impacts QOL for physical and mental health. The results indicated that this hypothesis met the expectation for mental health but did not meet the expectation for physical health. The results revealed that barriers to walking in the neighborhood and total mean mental composite score was statistically significant while barriers to walking in the neighborhood and total mean physical composite score was not statistically significant. We found that the results supported the hypothesis for mental health but did not support the hypothesis for physical health because this neighborhood feature was not a significant experience for participants residing in a low socioeconomic area such as Flint. This may occur because participants are less likely to take a walk in their neighborhood (Twardzik et al., 2021). Participants living in low-income communities might not

take a walk in their neighborhood because they are more dependent on public transportation or motorized vehicles to commute to the nearby destinations (McAslan, 2017). Also, the sidewalks in the city of Flint are not well maintained (Thornton et al., 2016) therefore most participants might walk on the streets to commute to nearby destinations.

The results revealed that barriers to walking in the neighborhood does not negatively impact QOL for physical health. One possible reason is that the participants who did not use assistive devices could be those without physical disabilities. Assistive devices intend to help with mobility function using wheelchairs, walkers, crutches, and canes (Sehgal et al., 2021). Of the participants in this study, 65.7% did not use assistive devices therefore physical functioning, physical role limitations, bodily pain, and general health would not affect the total mean physical composite score. Further, those without assistive devices might not have physical barriers to walking in the neighborhood since they do not identify themselves as one with a physical disability (Rosenberg et al., 2013).

The second hypothesis was aging was associated with poor QOL when people experienced worst chronic or psychological conditions. The results revealed that there was no relationship between age and QOL and that aging was not perceived to decrease QOL. It is important to look for predictors of QOL other than age because age itself does not decrease QOL, but rather the factors that affect QOL in the aging population. For example, significant events during this stage of the life span include loss of income because of exit from the labor force and the increasing probability of illness (Netuveli et al., 2006). Contextual factors like social capital, social networks, and social participation also can contribute to the QOL in older adults. A study by Netuveli et al. (2006) found that no single factor determines QOL in older ages. Furthermore, the aging population is more likely to experience depression, functional

limitation attributable to longstanding illness, and limitations in everyday activities which can affect QOL negatively. Hence, QOL in older adults can be improved by affluence, residing in an appreciated neighborhood, and having trusting relationships with children, family, and friends (Netuveli et al., 2006).

The third hypothesis was that aging was associated with increased perceived barriers to walking in the neighborhood. The results revealed that there was no relationship between age and barriers to walking in the neighborhood. Many barriers discourage people from walking in the neighborhood ranging from lack of motivation to unsafe neighborhood environments (Lee et al., 2013). Additionally, research studies have found that there was a greater association between psychological and environmental motivators and barriers to walking in the neighborhood than age (Lee et al., 2013). Residents of low-walkable neighborhoods such as in the city of Flint, were more likely to spend more time doing activities indoors such as cleaning up or doing other small household chores (Van Holle et al., 2014).

Another possibility for no association between age and increased perceived barriers to walking in the neighborhood is the contribution of the socio-ecological factors. The characteristics of participants in the study were mean age of 69.91 (SD = 5.103), majority were female, African American, divorced, high school graduates, and low socioeconomic status. In the city of Flint, older adults might not take a walk in their neighborhoods because they are more likely to experience one or more functional limitations. Additionally, few destinations are available in the community to walk to such as grocery stores (Wang & Yang, 2019).

CONCLUSIONS

Our data demonstrated that neighborhood walkability characteristics was associated with mental health but was not associated with physical health. There is no relationship between age and QOL and there is no relationship between age and barriers to walking in the neighborhood. An improved understanding of the positive neighborhood features that support older adults and can increase the precision in targeting intervention opportunities; for example, development of well-maintained sidewalks, appropriately designed street crossing, and presence of parks can improve QOL among older adults. Additionally, these findings indicate that improvements in an individual's social cohesion and sense of community could be positively associated with improved mental and physical health and contribute to increased walkability in the city of Flint.

Lastly, in the city of Flint, there is very little pedestrian traffic and residents are dependent on motorized vehicles and public transportation to commute to the nearby destinations. Both the city of Flint and its residents need to work together to develop creative investment approaches to neighborhood walkability, such as fear of crime and lack of timely and consistent maintenance of sidewalks and parks. Future effort should focus on assessing micro-scale features of neighborhood walkability using Google Street View-based audits (Steinmetz-Wood et al., 2019) between home/store and home/public transportation stop to further understand relationships between neighborhood, age, and QOL in older adults residing in Flint, MI.

REFLECTION OF COMPETENCIES

The following competencies were completed in this research project in order to fulfill the requirements of the PHS 595 Public Health Integrative Learning Experience (ILE) for the Master of Public Health (MPH) program at the University of Michigan-Flint. The mastery of public

health coursework is demonstrated through this paper and attainment of the MPH foundational and concentration specific competencies.

Foundational Competencies:

1. Analyze quantitative and qualitative data using biostatistics, informatics, computer-based programming and software, as appropriate

To meet this competency, I used the coding survey, *Health and You!*, and the quantitative data from the Fall Hamilton data set. I worked with Dr. Suzuki on understanding the variables and identifying outliers in the data set. The coursework in HED 547 Biostatistics for Health Professionals and HCR 500 Epidemiology and the statistical guidance from Dr. Suzuki helped me to analyze the quantitative data using the statistical program SPSS. Mean, standard deviation, frequencies, range, skewness, kurtosis, and correlation analysis was conducted using skills obtained from biostatistics coursework for obtaining results of the relationship between barriers to walking in the neighborhood and QOL, age and QOL, and age and barriers to walking in the neighborhood among aging Flint residents. From this competency, I learned about the importance of understanding the variables in a study and identifying outliers in a data set as the outliers can greatly affect the statistical analysis.

2. Interpret results of data analysis for public health research, policy or practice

This competency was met after completing the data analysis and creating APA format tables from the output. Dr. Suzuki and the coursework in HED 547 Biostatistics for Health Professionals and HCR 500 Epidemiology helped me interpret the results and write the literature review and discussion section of the paper. From this competency, I learned how to better interpret results of data analysis and how to create APA format tables.

3. Communicate audience-appropriate public health content, both in writing and through oral presentation

I submitted an abstract of my project for the 2022 Healthy Flint Research Coordinating Center Research Symposium. My abstract was accepted for the poster session portion of the symposium. I created a poster including information on the background, objective of the study, hypotheses, methods, results, APA format tables, conclusion, implications/conclusions, and references. The symposium was held on September 30, 2022, at the Riverfront Conference Center in Flint, MI. On the day of the event, I arrived on time to hang my poster and get checked in. During the poster sessions, I stood by my poster and engaged with other poster presenters and guests to answer any questions and share my research. From this competency, I learned how to create and submit an abstract as well as how to best communicate audience-appropriate public health content both in writing and through oral presentation.

Health Education Concentration Competency:

1. Analyze and report community assessment data collected using an appropriate existing or new instrument

To meet this competency, I used the coding survey, *Health and You!*, and the quantitative data from the Fall Hamilton data set. I worked with Dr. Suzuki to analyze the data collected in Flint, MI and run the statistical analysis on SPSS. From this competency, I learned how to analyze and report community assessment data using an existing instrument.

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APPENDIX

Table 1

The Characteristics of the Participants

Variables	Mean (SD)	Frequency (% and n)	Range
Age	69.91 (5.103)	99.3%, n = 144	27
Gender	na		0-1
Female		63.2%, n = 91	
Male		36.8%, n = 53	
Ethnicity	na		5
African American		72.9%, n = 105	
Caucasian, Non-Hispanic		21.5%, n = 31	
Hispanic, Latino		3.5%, n = 5	
Native American		2.1%, n = 3	
Marital status	na		5
Divorced		37.1%, n = 53	
Married		21.7%, n = 31	
Widowed		20.3%, n = 29	
Single, Never Married		14.0%, n = 20	
Separated		4.2%, n = 6	
Living Together		2.8%, n = 4	
Education	3.24 (1.071)		5
Never attended school or kindergarten		0.7%, n = 1	
Grades 1-8 (Elementary)		5.6%, n = 8	
Grades 9-11 (Some high school)		16.0%, n = 23	
Grade 12 or GED (High school graduate)		36.1%, n = 52	
College 1 year to 3 years (Some college or technical school)		30.6%, n = 44	
College 4 years or more (College graduate)		11.1%, n = 16	
Type of healthcare coverage	46.33 (36.953)		76
Multiple answer		59.0%, n = 85	
Medicare		25.7%, n = 37	
Medicaid		9.0%, n = 13	
Private insurance		3.5%, n = 5	
I do not have insurance		2.8%, n = 4	
Collect from Social Security Disability Insurance	0.43 (0.496)		0-1
No		57.4%, n = 81	
Yes		42.6%, n = 60	
Assistive devices	14.71 (21.595)		76
Do not use assistive devices		65.7%, n = 94	
Crutches/cane		15.4%, n = 22	
Multiple answer		10.5%, n = 15	
Walker		4.9%, n = 7	
Power wheelchair or scooter		0.7%, n = 1	
Manual wheelchair		0.7%, n = 1	
Other		2.1%, n = 3	

Table 2

The Characteristics of the Variables in the Model

Variables	Mean (SD)	Frequency (% and n)	Range	Skewness	Kurtosis
Physical functioning	52.59 (31.095)	100%, n = 143	0-100	0.077	-1.254
Role limitation physical health	52.29 (42.412)	100%, n = 142	0-100	-0.074	-1.695
Bodily pain	56.15 (28.518)	100%, n = 144	0-100	-0.118	-1.023
General health	56.49 (22.571)	100%, n = 144	0-100	-0.341	-0.448
Vitality	53.88 (25.770)	100%, n = 143	0-100	-0.208	-0.623
Social functioning	71.44 (26.306)	100%, n = 144	0-100	-0.754	-0.160
Role limitations due to emotion	65.49 (41.288)	100%, n = 142	0-100	-0.611	-1.330
Mental health	76.66 (19.956)	100%, n = 143	84	-0.910	0.297
Total Mean MCS	66.82 (21.737)	100%, n = 144	92	-0.417	-0.526
Total Mean PCS	54.31 (27.616)	100%, n = 144	96	-0.044	-1.084

Note. MCS = Mental Composite Score; PCS = Physical Composite Score. Higher values indicate a better quality of life.

Table 3

Correlation Analysis Barriers to Walking in the Neighborhood and QOL (N=144)

	Barriers to Walking in the Neighborhood
Barriers to Walking in the Neighborhood	Coefficient: 1.000
Total Mean MCS	Coefficient: -0.197**
Total Mean PCS	Coefficient: -0.135
Physical functioning	Coefficient: -0.126
Role limitation physical health	Coefficient: 0.000
Bodily pain	Coefficient: -0.211
General health	Coefficient: -0.187
Vitality	Coefficient: -0.232
Social functioning	Coefficient: -0.167
Role limitations due to emotion	Coefficient: -0.063
Mental health	Coefficient: -0.118

Note. MCS = Mental Composite Score; PCS = Physical Composite Score; ** = Correlation is significant at the 0.05 level (2-tailed).

Table 4

Correlation Analysis Age and QOL (N=144)

	Age
Age	Coefficient: 1.00
Total Mean MCS	Coefficient: -0.073 Significance (2-tailed): 0.387
Total Mean PCS	Coefficient: -0.057 Significance (2-tailed): 0.498
Physical functioning	Coefficient: -0.115 Significance (2-tailed): 0.172
Role limitation physical health	Coefficient: -0.097 Significance (2-tailed): 0.252
Bodily pain	Coefficient: 0.022 Significance (2-tailed): 0.790
General health	Coefficient: -0.085 Significance (2-tailed): 0.310
Vitality	Coefficient -0.105 Significance (2-tailed): 0.211
Social functioning	Coefficient: -0.034 Significance (2-tailed): 0.683
Role limitations due to emotion	Coefficient: -0.080 Significance (2-tailed): 0.343
Mental health	Coefficient: -0.007 Significance (2-tailed): 0.938

Note. MCS = Mental Composite Score; PCS: = Physical Composite Score.

Table 5

Correlation Analysis Age and Barriers to Walking in the Neighborhood (N=144)

	Age	**Barriers to Walking in the Neighborhood**
Age	Coefficient: 1.000	Coefficient: -0.112 Significance (2-tailed): 0.180
Barriers to Walking in the Neighborhood	Coefficient: -0.112 Significance (2-tailed): 0.180	Coefficient: 1.000