

Engaging Nigerian Older Persons in Neighbourhood Environment Assessment and Improvement
Recommendations for Physical Activity Promotion: A Citizen Science Project

by

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Abstract

Understanding the role continued physical activity (PA) participation plays towards achieving healthy aging, environmental health research has identified strong links between the influences of the neighbourhood environment on the level of PA participation. Spatial qualitative measures such as the Our Voice citizen science method are useful in generating context-based in-depth subjective information on the neighbourhood environment. This study was a novel adoption of the Our Voice method to assess the effect of the neighbourhood environment on PA in an urban environment in Nigeria, a region less studied in the neighbourhood environmental health field, particularly among older adults. A small sample (N = 13) of adults aged 60 or older were engaged as citizen scientists to assess how different aspects of the neighbourhood environment act as supports and/or barriers to their participation in PA and empowered to become advocates for change. They were enabled using a tablet-based application called the Stanford Healthy Neighbourhood Discovery Tool (DT) to record a total of 156 geocoded photos and 151 commentaries of neighbourhood environment features that facilitates or hinder physical activity for in and around their neighbourhood community.

In a facilitated process, the following occurred: collaborative discussions of findings with other citizen scientists to determine common themes, setting of priority targets for change, brainstorming solutions and strategies, and identifying stakeholders to advocate for change. These priority changes focused on: social connectivity, pedestrian and traffic facilities, and green and beautiful environments. Citizen scientists identified their local government mayor, executives of environmental agencies of the local government council, executives of the resident association, executives of the community development committee, and executives of prominent non-governmental organizations for older adults as essential for advocacy for a PA-friendly

environment. Older adults as community members can be empowered to gather purposeful data using technology and collaborate to identify locally relevant and sustainable solutions for promoting PA-friendly environments.

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Dedication

This thesis is dedicated to all Nigerian older adults.

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Chapter 1: INTRODUCTION

1.1 Introduction

Physical activity (PA) has been shown to be a strong determinant of the healthy-active aging domains of physical, psychological, and social functioning (Bauman et al., 2016). Evidence shows that PA is an effective intervention to enhance overall health, quality of life, reduce the risk of falls, and reduce risks associated with chronic conditions, depression, and cognitive decline among older persons (Canadian Institute for Health Information (CIHI), 2011; Michel et al., 2016). Strong evidence also reveals that individuals can benefit from the positive influence exerted by optimal PA engagement at any point along the life course (Bauman et al., 2016; Garatachea et al., 2015, 2017; Landi et al., 2017; Pahor et al., 2014).

The neighbourhood environment is multidimensional, comprising of the perceived and objective physical and social elements of where individuals spend their time and perform their daily activities of living (Brownson et al., 2009; Menec et al., 2011; Sallis et al., 2006; Thornton et al., 2017). It reflects the multi-level approach that addresses the complex interrelationships at the micro, meso and macro levels affecting PA involvement (Brennan Ramirez et al., 2006; N. Fitzgerald & Spaccarotella, 2009; King, Winter, et al., 2016; Sallis et al., 2006; Schmidt et al., 2016). There is compelling evidence on the role of the healthy neighbourhood physical and social environment in preserving and promoting healthy aging (health across the life course). Creating, improving, and sustaining healthy neighbourhood environments can impact positively on our healthy aging.

In light of global population aging, aging demography trends and improving life expectancy, increasing research evidence shows that population and individual-level PA can be mediated by features of the neighbourhood environment. However, the research evidence

abounds in the context of high-income countries with only sparse empirical evidence to inform intervention and policy changes that can impact environment mediated PA promotion in developing countries like Nigeria (Bauman et al., 2012, 2016; Hallal et al., 2012; A. Oyeyemi, Kasoma, et al., 2016). Statistics also show that the adoption and implementation of many physical activities remain at low levels among persons over 60 years of age (Adams et al., 2014; Annear et al., 2014; Barnett et al., 2017; Bauman et al., 2016; Cerin, Nathan, et al., 2017; de Donder et al., 2013; Hawkesworth et al., 2018; Jansen et al., 2018; M. Levasseur et al., 2015; Lockett et al., 2005; McPhee et al., 2016; Milton et al., 2015; A. Oyeyemi, Kasoma, et al., 2016; Smith et al., 2017; Thompson et al., 2010; Winter et al., 2014). Consequently, a variety of multilevel health promotion, interventional programs, policies and research are being instituted and/or adopted to address this in developed countries. However, low- and middle-income countries which are estimated to bear about 80% of the global chronic disease burden (World Health Organization, 2008, 2010b, 2014) still have a sparsity of context adaptable data to help inform intervention and policy changes for PA promotion (Bauman et al., 2012, 2016; Hallal et al., 2012; A. Oyeyemi, Kasoma, et al., 2016). It is essential to study health promotion issues in older adults in the context of low- and middle-income countries like Nigeria.

The dearth of data regarding the participation of the Nigerian older adult population in PA is of concern. This study will seek to engage resident Nigerian older adults as citizen scientists in a qualitative participatory research project to identify the barriers and facilitators of PA in their neighbourhood environment. This research will aim to explore the range of multifaceted environmental attributes that hypothetically influence Nigerian older persons' PA in their neighbourhoods. These findings can be taken up by relevant organizations such as the

collaborating non-governmental organization (NGO) for this study for advocacy, policy development and implementation.

1.2 Objectives

This study will be based on the integrated *Global Strategy and Action Plan on Aging and Health* (GSAP) and *Sustainable Development Goals* (SDGs); policy frameworks for coordinated global action on population healthy-active aging by the World Health Organization (World Health Organization, 2015b). The purpose of the study will be to use a citizen science methodology to: (1) explore what community-dwelling Nigerian older persons perceive as barriers and/or facilitators to maintaining PA engagement in their neighbourhoods, and (2) to document recommendations community-dwelling older adults identify as needful for PA engagement.

1.3 Research Question

Nigerian older persons will consider the physical and social aspects of their neighbourhood environment that influence their PA levels. Older Nigerian citizen scientists will explore environmental features that positively influence their PA levels and identify multifaceted approaches to overcome identifiable barriers. In this process, the research participants identify and define the problems, they also formulate possible contextually relevant solutions that are readily understood by both the residents themselves as well as local decision-makers and stakeholders.

1.4 Rationale

Although identifying older adults' PA enhancing attributes of the neighbourhood environment is considered to be especially relevant to inform interventions supporting healthy-active aging, research reveals these attributes are modified by variables across contexts,

preferences and diverse need levels across various geographical locations (Barnett et al., 2017; Forsyth et al., 2009; Jansen et al., 2018; McGinn et al., 2007; M. Moran et al., 2014; Sallis et al., 2006). There have been a number of studies investigating the environment-PA relationships in the older adult population as well as a few studies exploring in-depth perspectives of older adults about their neighbourhood environment (Annear et al., 2014; Hawkesworth et al., 2018; M. Moran et al., 2014; Rhodes & Nasuti, 2011). Furthermore, with many of these studies largely conducted in diverse contexts (geographical, sociopolitical, economical, methodological...), findings are not directly translatable into a different context. The dearth of environment data concerning the influence of the neighbourhood environment is a gap to be filled in the context of healthy aging promotion for the Nigerian older population in urban settings.

Population-level health and PA promotion and interventions/strategies are one of the ways identified to address the challenges of the burden of chronic diseases for the aging population. In a similar definition to the life expectancy at birth, life expectancy at age 65 is the average number of years that a person at this age is expected to live assuming the age-specific mortality levels remain constant for a given period (United Nations, 2015b). The average life expectancy for the Nigerian older person at birth ranges between 54 to 56 years (World Life Expectancy 2017), while at age 65, the range is between 11 to 12 years (World Life Expectancy 2017). This life expectancy at adulthood is a better estimate of survival within the adult life course than life expectancy at birth, particularly for developing countries (Caleiro, 2021). Life expectancy at birth is hugely influenced by the high levels of infant mortality experienced by the country and therefore provides insufficient information about adults' survival (United Nations, 2015b; United Nations Department of Economic and Social Affairs Population Division., 2013). This statistic is attributable more to the high incidence of chronic disease amidst other factors

(World Health Organization, 2014). According to 2017 estimates, older persons aged 55 and above constitute 7% of the Nigerian population and are estimated at about 13 million (United Nations Department of Economic and Social Affairs Population Division, 2017b, 2017a). With this current population of older persons and projected population growth, the population remains a considerable size in the entire African region. This will present a concern for the health and economic/social system in the face of inadequate data for planning. Furthermore, to combat the currently high burden of chronic disease (economic, psychosocial, and physiologic) which is estimated to be at 80% of the world global burden of chronic disease, Nigerians need to adopt empirical evidence that can be utilized to ensure a healthy population aging (Hallal et al., 2012; A. Oyeyemi, Kasoma, et al., 2016; World Health Organization, 2010b, 2014, 2015d). Chronic diseases are the most prevalent, costly and preventable of all health problems, affecting quality of life and well-being especially in our aging population (Balogun & Salako, 2011; Ekeh et al., 2015; Hallal et al., 2012; Oguoma et al., 2017; A. Oyeyemi, Kasoma, et al., 2016; World Health Organization, 2010b, 2014, 2015d). Chronic diseases are responsible for significant economic, social and healthcare costs (World Health Organization, 2014). These costs include early death, productivity losses and foregone income (Ding et al., 2016; Kankeu et al., 2013). This number will increase as the proportion of our aging population grows if appropriate measures are not put in place as mitigation. Healthy-active aging strategies can prevent, delay or minimize the severity of chronic disease (Bousquet, Kuh, et al., 2015; McPhee et al., 2016; Michel et al., 2016; Pareja-Galeano et al., 2015; Rogers et al., 2017; World Health Organization, 2015b, 2015d).

By engaging Nigerian older adults in a citizen science participatory research project, perspectives of Nigerian older persons which have previously not been adequately explored can become available to enhance the contextual, conceptual, and empirical understanding of the

influence of their neighbourhood environment on PA, and to develop evidence and policy tools for increasing the PA and well-being of older persons in Nigerian communities. Participatory research is a social and educational process in which study participants will undertake their research as social practice (Munhall, 2012). This study will be significant in that it will inform service providers, institutions, and policymakers as well as older adults about feasible and effective strategies to promote PA in low-and-middle-income countries with a focus on Nigerian urban areas and invariably promote residents' healthy aging.

Chapter 2: LITERATURE REVIEW

2.1 Literature Review

This chapter provides a review of the literature that forms the basis for this study. A review of the current literature on healthy-active aging, the neighbourhood environment, multi-level, multi-sectoral population and individual level interventions and policy change is provided. This review of existing literature is important to identify gaps regarding the PA participation of older Nigerians.

2.1.1 Healthy/Active Aging

The terms “healthy” and “active” aging are closely related terms, which may sometimes be used interchangeably. Their concepts have been shaped over time by many policy documents (Bousquet, Kuh, et al., 2015; Bousquet, Malva, et al., 2015; Michel & Sadana, 2017). “Healthy aging” is defined as “a lifelong process of optimizing opportunities for improving and preserving health and physical, social and mental wellness, independence, quality of life and enhancing successful life-course transitions” (Canadian Institute for Health Information (CIHI), 2011; Health Canada, 2002). “Healthy aging” is also defined as the “process of developing and maintaining the functional ability that enables wellbeing in older age” (World Health Organization, 2015d). Similarly, “active aging” is defined as “the process of optimizing opportunities for health, participation and security in order to enhance the quality of life as people age.” The term “active aging” was adopted by the WHO in the late 1990s (World Health Organization, 2002a, 2002b). It was intended to convey a more comprehensive message than the “healthy aging” concept, putting into consideration all other determinants and dimensions of health for individuals and the population (World Health Organization, 2002a, 2002b). However, according to the WHO (2018), “healthy aging” replaced the World Health Organization’s previous *Active aging: a policy*

framework (World Health Organization, 2015a, 2016). “Healthy aging”, like “active aging”, emphasizes the need for action across multiple sectors and enabling older people to remain a resource to their families, communities and economies (Bousquet, Kuh, et al., 2015; Bousquet, Malva, et al., 2015; World Health Organization, 2015d, 2015a, 2016, 2018).

The conceptualization of “healthy aging” is based on the understanding of two key factors - functional ability and intrinsic capacity. The functionality of an individual is defined as “the physical, psychological, cognitive and social ability to perform basic and instrumental activities of life and/or things they value” (World Health Organization, 2015d). On the other hand, the intrinsic capacity refers to “the composite of all the physical, mental and psychosocial capacities that an individual possesses at any instance” (World Health Organization, 2015d). However, functional ability is not only determined by an individual’s intrinsic capacity but also by different dimensions of their environment, and the interaction between the two (Menec et al., 2011; World Health Organization, 2015d). Both functional ability and intrinsic capacity are influenced by a plethora of factors, one of which has been identified to be the level of PA of the individual (Lara et al., 2013).

Healthy aging is a process that spans the entire life course that is considered relevant to everyone, regardless of their current health status (Bousquet, Kuh, et al., 2015; Michel et al., 2016; World Health Organization, 2015d). From their conceptualization, the emphasis on environmental factors was identified as being fundamental to healthy aging. These factors include the features and characteristics of the physical environment; such as land use, transportation, buildings and other infrastructure, and public facilities and areas. It further takes into consideration other domains of the environment – the social environment and various mediating factors. These mediating factors may include environmental pollutants, weather,

climate, noise, crime, traffic safety, hazards, natural disasters, policies, systems, and services related to transport, housing, social protection, social facilities, and health and long-term care; politics; products and technologies; relationships with friends, family, and caregivers; and cultural and social attitudes and values (Menec et al., 2011; Public Health Agency of Canada, 2018; World Health Organization, 2015d). The interaction individuals have with the diverse dimensions of their environment present a dynamic range of enablers or barriers to determinants of what will decide what such individuals with certain levels of intrinsic capacity can do with regards to things that they value.

Furthermore, while the concerns about the global burden of disease remain valid, international health organizations such as the WHO are considering a shift from the overt focus on disease to a focus on healthy aging from the perspective of morbidity compression, enhancing functional ability, disease prevention, health promotion and promoting age-friendly environments for all persons (Beard et al., 2016; World Health Organization, 2015d).

2.1.2 The International Legal and Policy Frameworks - The Historical Course for Healthy Aging

Few major international population conferences organized by the United Nations placed issues related to population aging and older persons as foremost on their agenda (United Nations, 2020). The first concerted international effort on aging could be traced back to 1982 when the *Vienna International Plan of Action on Aging* was endorsed by the United Nations. By providing several recommendations for action on broad sectoral areas, the resolution was aimed to strengthen the capacities of governments and civil society to deal effectively with population aging and to address the developmental potential and dependency needs of older persons (Doron & Mewhinney, 2007). Years later, the United Nations General Assembly also adopted the *UN*

Principles for Older Persons (Doron & Mewhinney, 2007; United Nations, 1991). Though not binding, these principles have provided the earliest framework on which to base population-level aging strategies.

In 2002, the adoption of the *Madrid International Plan of Action on Aging* and the Political Declaration was another concerted global coalition towards addressing the key challenge of developing an enabling society for all ages. During this period, the *Active Aging Policy Framework* was developed with the intention to inform discussion and formulate action plans that promote healthy and active aging (World Health Organization, 2002a). In 2010, as a follow-up to the 2002 Second World Assembly on Aging, Member States were called upon "to develop their national capacity for monitoring and enforcing the rights of older persons, in consultation with all sectors of society, including organizations of older persons through, inter alia, national institutions for the promotion and protection of human rights where applicable" (United Nations, 2020, p. 6). During these times, although the plans and principles were not binding, some member nations and organizations adopted and attempted to see to their implementation (United Nations, 2020).

2.1.3 Global Strategy & Action Plan on Aging & Health, (GSAP) and Sustainable Development Goals (SDG)

In 2015, the World Health Organization drew upon a consensus of international experts following a wide-ranging consultation and research program to develop the *Global Strategy and Action Plan on Ageing and Health* (GSAP) (United Nations, 2015a; World Health Organization, 2015d, 2015b, 2015a). The GSAP, building upon WHO's new approach to healthy aging as outlined in the *World Report on Aging and Health* (World Health Organisation, 2017; World Health Organization, 2015d) considered five broad areas which included the *Age-friendly*

Community Initiatives (AFCI) (World Health Organisation, 2017; World Health Organization, 2015d). The GSAP and AFCI considered features that provide an enabling environment for healthy aging through community development, policy change and advocacy. In subsequent years, there have been reviews that considered indicators to measure the progress of the healthy aging agenda towards benefiting every person (Beard et al., 2016; World Health Organization, 2016). Although still very much relevant as a standalone policy tool, these strategies and action plans have been revised and are being incorporated into a bigger global agenda called the *Sustainable Development Goals* (SDGs) (Beard et al., 2017).

In 2014, UN Member States proposed a set of *Sustainable Development Goals* (SDGs), which replaced the *Millennium Development Goals* (MDGs). The SDG has provided an opportunity to explore synergies between policy instruments – including the *Madrid International Plan of Action on Aging* 2002, the WHO *Global Strategy and Action Plan on Ageing and Health* 2016-2030, and *Agenda 2030*. With the current SDG, the UN/WHO considers an integrated 2030 Agenda for Sustainable Development with a universal plan of action to achieve sustainable development in a balanced manner and seeks to realize the human rights of all people inclusive of healthy aging (Beard et al., 2016, 2017; United Nations, 2015a; World Health Organization, 2015b). The GSAP provided a policy framework to ensure that the 2030 agenda is inclusive of older people. The GSAP also outlines a framework for action that can be taken by all relevant stakeholders, inclusive of the target older population, across the 15-year period of the SDGs to contribute to achieving the vision that all people can live long and healthy lives (Beard et al., 2017; United Nations, 2015a; World Health Organisation, 2017; World Health Organization, 2015b, 2015d). It also outlines concrete actions that can be taken within this framework during the five-year period of 2016–2020, in five strategic objectives:

- “commitment to action on *Healthy Ageing* in every country,”
- “developing age-friendly environments,”
- “aligning health systems to the needs of older populations,”
- “developing sustainable and equitable systems for providing long-term care (home, communities, institutions),” and
- “improving measurement, monitoring and research on *Healthy Ageing*.” (World Health Organization 2015; World Health Organization 2015a; Beard et al. 2017; World Health Organisation 2017)

These strategic objectives are aimed at ensuring years of evidence-based action to maximize functional ability that reaches every person and to see that evidence-informed concerted actions are taken towards the sustainable achievement of a *Decade of Healthy Ageing* by the year 2030 (World Health Organization 2015; World Health Organization 2015a; Beard et al. 2017; World Health Organisation 2017).

2.1.4 Age-Friendly Community Concept

The WHO *Active Ageing Framework* (World Health Organization 2002) was an important policy tool from which the age-friendly concept was developed and has been revised over the years (Kano et al., 2017; World Health Organization, 2015c). Built upon the premise that the environment strongly influences healthy aging outcomes, the AF concept strongly advocated active aging (World Health Organization 2002; World Health Organization 2007; Menec et al. 2011). It had the main objectives of identifying environmental determinants/features that promote or support healthy-active aging (World Health Organization, 2002a). The AF concept was expected to help increase awareness of local needs, gaps and good ideas for

improvement, to establish services, settings and structures and to facilitate the advocacy, community development and policy change that support healthy-active aging (Menec et al., 2011; World Health Organization, 2002a, 2007b). Originally based on focus group participation in 33 cities around the world, the WHO study examined age-friendliness across eight core domains: outdoor spaces and buildings; transportation; housing; social participation; respect and social inclusion; civic participation and employment; communication and information; and community support and health services (World Health Organization, 2007b).

The physical and social environments are considered as major dimensions of the age-friendliness of communities (Kano et al., 2017; Menec et al., 2011). Three core domains (outdoor spaces and buildings, transportation, housing) are explicitly related to the physical environment, while the other domains are linked with the social domains of the environment.

2.1.5 The Neighbourhood Physical and Social Environment

2.1.5.1 The Physical Environment

The physical environment – a term commonly used interchangeably with the built environment has been identified as a strong determinant of healthy-active aging (Beard et al., 2017; Chaudhury et al., 2016; Glanz et al., 2016; Glanz & Kegler, 2009; Hawkesworth et al., 2018; Kent et al., 2011; Milton et al., 2015; M. Moran et al., 2014; A. Oyeyemi, Kasoma, et al., 2016; World Health Organization, 2015d)g. There is compelling evidence on the role of the physical environment in preserving and promoting human health across the life course. The physical environment refers to the objective and perceived characteristics of the physical elements of communities in which people inhabit, perform their activities of daily living, and generally spend their time (Glanz et al., 2016; Glanz & Kegler, 2009). These characteristics may also include land-use patterns; large- and small scale built and natural features (e.g., architectural details, quality of landscaping); and the

transportation system (the facilities and services that link various destinations or locations); and also including crime, safety and weather conditions (Barnett et al., 2017; Brennan Ramirez et al., 2006; Brownson et al., 2009; Buman et al., 2013; Cerin, Nathan, et al., 2017; Davison & Lawson, 2006; Glanz et al., 2016; Glanz & Kegler, 2009; Kent et al., 2011; M. Moran et al., 2014; Smith et al., 2017). These physical environmental elements and certain of their characteristics have been recognized to promoting PA among residents of all ages (Cerin, Nathan, et al., 2017; Davison & Lawson, 2006; Glanz et al., 2016; Smith et al., 2017). Many physical environmental features appear to resonate across diverse settings and geographical locations. There are, however, some identifiable differential features peculiar to various locations, which could be as a result of variation in weather, climate, noise, crime, traffic safety, hazards and natural disasters peculiar to the different physical environments (Public Health Agency of Canada, 2018; Smith et al., 2017).

While the research evidence reveals strong correlates between the diverse attributes of the physical environment and the health-enhancing PA participation levels for the general population, older persons were revealed to have certain specific and contextual attributes that influenced them more (Barnett et al., 2017; Chaudhury et al., 2016; Frank et al., 2010; Hawkesworth et al., 2018; King et al., 2011; M. Moran et al., 2014). These attributes included a variety of important contextual environmental features such as neighbourhood walkability, neighbourhood aesthetic, convenience or access to destinations and services, availability of paths and sidewalks, personal safety from crime, etc. (Barnett et al., 2017; Buman et al., 2013; Cerin, Nathan, et al., 2017; Chaudhury et al., 2016; Hawkesworth et al., 2018; Kerr et al., 2012; King, Salvo, et al., 2016; M. Moran et al., 2014, 2017; Ottoni et al., 2016; van Cauwenberg et al., 2012, 2014; Yoo & Kim, 2017a). From published literature, older persons reported barriers to their PA in the form of human or vehicular traffic, poor pedestrian access to desired destinations like shopping stores,

length of route, sidewalk features such as unavailable or faulty benches, and falls hazards (i.e., linked with poor road infrastructure). These were documented as factors negatively influencing their decision to engage in PA in their local environment (Barnett et al., 2017; Cerin, Nathan, et al., 2017; Kerr et al., 2012; M. Moran et al., 2014, 2017; Ottoni et al., 2016; van Cauwenberg et al., 2014; Yoo & Kim, 2017a). Some of these barriers were purportedly also connected with the unique environmental needs associated with age-related functional capacity adaptation, as well as with unique perceptual preferences. Altogether, these were the common environmental subthemes and themes identified and/or studied in the previous research.

There have been various approaches to measuring these elements and characteristics of the physical environment (Aytur et al., 2015; Brownson et al., 2009; Cerin, Nathan, et al., 2017; Glanz et al., 2016; Glanz & Kegler, 2009; Hinckson et al., 2017; M. Moran et al., 2014, 2017; A. Oyeyemi, Kasoma, et al., 2016). These include perceived subjective measures, objective systematic observational measures or audits, and Geographic Information System (GIS) derived measures. These approaches have been identified to provide high quality, reliable and valid measures (Aytur et al., 2015; Brownson et al., 2009; Cerin, Nathan, et al., 2017; Glanz et al., 2016; Glanz & Kegler, 2009; Hinckson et al., 2017; M. Moran et al., 2014; M. R. Moran et al., 2017; A. Oyeyemi, Kasoma, et al., 2016). The different approaches have been identified for their strengths and limitations. For instance, while the objectively derived measures are known to have good psychometric characteristics, they have the limitation of the difficulty to assess the quality of environmental features (Aytur et al., 2015; Brownson et al., 2009; Cerin, Nathan, et al., 2017; Glanz et al., 2016; Glanz & Kegler, 2009; Hinckson et al., 2017; M. Moran et al., 2014, 2017; M. R. Moran et al., 2017; A. Oyeyemi, Kasoma, et al., 2016). Furthermore, most objective measures do not provide contextual information, which is imperative to understanding barriers and facilitators to healthy-active living. Traditional spatial qualitative methods of evaluating the influence of the environment for healthy living are in the

forms of on-site observation, photovoice methodology, and walk-along interviews (M. Moran et al., 2014). More recently the traditional spatially oriented methods have come to include citizen science methods utilizing technology devices. The development of the Discovery Tool is one such method (Buman et al., 2013; Hinckson et al., 2017; King, Winter, et al., 2016).

2.1.5.2 The Social Environment

The relevance of the social aspect of the neighbourhood environment that influences older adults' participation in PA has emerged from several studies. Although recognized to be understudied when compared to the physical aspects, findings from these studies have indicated strong influences that the social aspects have on how older adults engage within their neighbourhoods in PA (Chaudhury et al., 2016; M. M. Levasseur et al., 2017; Mahmood et al., 2012; Menec et al., 2011; Wendel-Vos et al., 2007).

The social aspect of the neighbourhood environment encompasses different components at different ecological levels (Jones et al., 2018; McNeill et al., 2006; Public Health Agency of Canada, 2018; Raphael, 2016; Sallis et al., 2006; Samuel et al., 2014; Sawyer et al., 2017). Its elements cut across the interpersonal, economic, cultural, religious, and civic domains of the environment (McNeill et al., 2006; Public Health Agency of Canada, 2018; Raphael, 2016; Sallis et al., 2006). These include interpersonal relationship and modelling, social support (e.g., places of worship, cooperatives, and community organizations), and/or peer-support, partners for social activities, social climate, clubs, teams, programs, norms, culture, social capital, advocacy by individuals and organizations, area-level income, income inequality, crime rate, safety, social disorder, and social cohesion (McNeill et al., 2006; Raphael, 2016; Saito et al., 2013; Sallis et al., 2006; Sawyer et al., 2017; Wendel-Vos et al., 2007). Some of these do overlap and are strongly inter-related. The social aspect may further include broader aspects of opportunities for

participation factors (Menec et al., 2011; World Health Organization, 2015c); such as opportunities for social participation, and for civic participation (e.g., volunteering, voting, and being involved in public affairs) and employment. These may be regarded as mediating features of the neighbourhood social environment as reflected in the WHO age-friendliness factors (Menec et al., 2011; World Health Organization, 2015c).

Furthermore, closely linked with the social environment are other mediating features of communication, information and transportation (M. Levasseur et al., 2015; Sallis et al., 2006; World Health Organization, 2015c). These present a strong mediating platform for older adults to engage and interact in their environment invariably impacting their PA participation levels (Chaudhury et al., 2016; M. Levasseur et al., 2015; Public Health Agency of Canada, 2018; Sallis et al., 2006; van Holle et al., 2016; World Health Organization, 2015c). Communication and information reflect aspects of daily opportunities or engagement in PA promoting information that helps reinforce individual motivation to participate in PA. These features crosscut several aspects of the environment.

Studies reveal that the social aspects and mediating features have a significant impact on the PA levels of older adults (Belon et al., 2014; Chaudhury et al., 2012, 2016; Kamphuis et al., 2009; Mahmood et al., 2012; Prins et al., 2016; Saito et al., 2013; van Cauwenberg et al., 2012, 2014; van Holle et al., 2015, 2016). They provide opportunities for individuals to interact and engage, thus promoting the most ubiquitous form of PA – walking (recreational or utilitarian). Other social features may be reflected in group or community activities that older adults may engage such as dance programs, pottery activities and games reflecting the levels of social cohesion (McNeill et al., 2006; Yip et al., 2016). Similarly, accessibility to free or low-cost recreational or social facilities may impact older adults' engagement with these facilities.

2.1.6 Environmental Health Research and the Neighbourhood Environment

The neighbourhood physical and social environment features and mediating factors are relevant for older adults, who might be more likely to be dependent on their immediate living environment as they age. Research evaluating the influence these features and mediating factors have on the PA of older adults is emerging but not sufficient when compared with those involving other groups of the population (McNeill et al., 2006; Peters et al., 2020; Sawyer et al., 2017).

Furthermore, there is a need for complementary approaches to measurements. The literature provides good correlations found between the perceived measures and objective measures of environmental features; however, it was also reported that the associations between perceived and objective measures can likewise be diverse and modified by individual socio-demographic and psychosocial factors (Jáuregui et al., 2016, 2017; Kerr et al., 2012; Ottoni et al., 2016).

Although the research evidence abounds, findings revealed variability in terms of context – age, culture, geography, and diversity of communities regarding what aspect of the environment may matter most. There are also limitations to be addressed in terms of measures and methods used to assess the environment for PA promotion (Hinckson et al., 2017; King, Winter, et al., 2016; M. R. Moran et al., 2017). Diverse methods have been adopted in the assessment of the environmental influence on residents' healthy-active living, with several falling short in capturing in-depth descriptions of residents' experiences and did not incorporate the unique environmental perspectives of the target older population, thereby necessitating the need to include these groups of individuals in healthy environment research (Brennan Ramirez et al., 2006; Brownson et al., 2009; Hinckson et al., 2017; King, Winter, et al., 2016; Lockett et al.,

2005; M. R. Moran et al., 2017; Oyesiku, 2016; A. Oyeyemi, Kasoma, et al., 2016; Peters et al., 2020; Winter et al., 2014).

Overall, there exists a dearth of multi-sectoral, multilevel, cross-generational approaches that can extend the impact of positive health behaviours, promote its sustainability; and that can be translated into population-level health promotion across the varying cultural, geographic, social, and economic contexts globally and particularly for older persons (Ding et al., 2016; Hallal et al., 2012; Hinckson et al., 2017; Kent et al., 2011; King, Winter, et al., 2016; Plouffe et al., 2016; Reis et al., 2016; Sallis et al., 2006; Thornton et al., 2017).

2.1.7 Physical Activity

PA is all leisure and non-leisure body movements resulting in increased energy output from the resting conditions (Paterson & Warburton, 2010). For older persons, it includes recreational or leisure-time PA, transportation (e.g. walking and cycling), occupational PA, domestic chores (e.g., gardening and yard work), play, games, sports or planned exercise, in the context of daily, family, and community activities (Barnett et al., 2017; Hallal et al., 2012; King, Salvo, et al., 2016; King, Winter, et al., 2016; McPhee et al., 2016; Pahor et al., 2014; Sallis et al., 2006; Thornton et al., 2017; World Health Organization, 2010a). PA interventions exert positive influences on physiologic systems including health-related and performance-related functioning, disease risk factors, chronic illness states, and psychological functioning (Binder et al., 2002, 2005; Garatachea et al., 2015, 2017; Lekan, 2009). The protective and restorative effects of PA on physiologic processes (inflammation, metabolism, bioenergetics) may delay or prevent sarcopenia, functional decline and disability and slow biologic aging (Bernabei et al., 2017; Garatachea et al., 2015, 2017; Pareja-Galeano et al., 2015). Research has also found that

PA is also connected with overall well-being and improving mental health (Garatachea et al., 2017; McPhee et al., 2016).

Current PA guidelines drawn from conclusive evidence indicate moderate to high-intensity physical activities for optimal health benefits (Bauman et al., 2016; McPhee et al., 2016; World Health Organization, 2010a). The guidelines also indicate a dose-response relationship between PA and health benefits, such that more activity translates into better health outcomes, but indicate also that moderate intensity exercise such as brisk walking can be impactful (Bauman et al., 2016; McPhee et al., 2016; World Health Organization, 2010a). There is evidence that a minimum of thirty minutes of moderate intensity activity on most days of the week has been associated with numerous health and performance related benefits (Paterson & Warburton, 2010; World Health Organization, 2010a). Current WHO guidelines state that all adults over 65 years should participate in at least 150 minutes of moderate aerobic exercise per week or 75 minutes of vigorous PA per week in addition to strength and training (World Health Organization, 2010a). Furthermore, older adults should participate in a range of PA incorporating diverse environments and contexts (e.g., leisure, transportation, occupation, household) all year round (Canadian Society for Exercise Physiology, 2021). Currently, it has been established that regular participation in PA and also reduced sedentary behaviours are lifestyles which people could adopt to enhance their health (Canadian Society for Exercise Physiology, 2021; World Health Organization, 2010a). Furthermore, older adults with chronic conditions who cannot meet this recommendation are encouraged to do as much as they are able to, as evidence shows that the small bouts of activities all count (Canadian Society for Exercise Physiology, 2021; World Health Organization, 2010a). These evidence-based recommendations have important implications for older adults because it is recognized that even inactive frail older

adults could benefit from partaking in a PA regime (Canadian Society for Exercise Physiology, 2021; World Health Organization, 2010a).

Walking remains the most common type of PA in which older individuals engage, this includes active travel or transportation walking, and leisure walking (Aspvik et al., 2016; Cerin, Nathan, et al., 2017; Kerr et al., 2012). Other activities include biking, hiking, gardening, dance, swimming, and other recreational activities. These activities can be influenced by the availability, proximity, and accessibility to such destinations, open spaces or built amenities for such activities. There have been a number of studies that documented the health benefits of walking, an exercise that is commonly preferred by older adults and can be designed into everyday lifestyle at a population level by appropriate neighbourhood advocacy, planning and implementation (Cerin, Nathan, et al., 2017; Hinckson et al., 2017; King, Winter, et al., 2016; M. Moran et al., 2017; Ottoni et al., 2016).

As stated earlier, there is also strong evidence to show that the PA participation levels of individuals, particularly the older age groups, are largely influenced by dynamic environmental factors (Barnett et al., 2017; K. G. Fitzgerald & Caro, 2014; Hawkesworth et al., 2018; Milton et al., 2015; World Health Organization, 2015d). PA promotion is thus given multilevel, multidimensional considerations (Brennan Ramirez et al., 2006; N. Fitzgerald & Spaccarotella, 2009; King, Winter, et al., 2016; Sallis et al., 2006; Schmidt et al., 2016). There are barriers and facilitators to PA participation found on both the individual and environmental levels. The evidence is found in light of recent research evidence which highlights the importance of environmental factors and the necessity for multifaceted approaches to overcome the identifiable barriers (N. Fitzgerald & Spaccarotella, 2009; Sallis et al., 2006; Thornton et al., 2017).

2.1.8 Contextual Factors influencing Older Adults Physical Activity Participation Levels.

Conventional forms of physical activity have been aerobics, running or gym work, however international guidelines have incorporated more varied and culturally relevant types of physical activity such as traditional dancing, social dancing, gardening, household chores and creative activities such as sculpturing or wood carving or painting. Some of which were not traditionally considered as physical activity (Allender et al., 2006; Roberts et al., 2017). This has helped expand the focus of efforts to increase population activity levels (World Health Organization, 2011). In adults aged 65 years and above, physical activity includes different forms of utilitarian (activity to get somewhere or do something), recreational (activity during leisure time) physical activity or both, in the context of the home, neighbourhood or work environment (World Health Organization, 2011).

Certain studies have shown that the level of participation of older persons in these activities can be socially patterned by gender, socio-economic status, social roles, geographical location, social class, ethnicity and demographic factors (Collins & Kay, 2014; Kwarteng et al., 2014; McPherson, 1994; Ribeiro et al., 2013; Tucker-Seeley et al., 2009; Yen et al., 2009). Furthermore, the effect of the neighbourhood environment on the level of participation in these activities can be strong on older persons due to changes in their functional and cognitive capacity, changes in occupational status, changes in family structure and demographic status, as well as increasingly limited spaces for activity (Kwarteng et al., 2014; Ribeiro et al., 2013; Yen et al., 2009; Kawachi and Beckman, 2003)

Studies have suggested a complex inter-relation of these contextual factors and have been investigated to explain the differing levels of physical activity among older adults (Barnett et al., 2017; McPherson, 1994; Won et al., 2016). While some studies suggest a negative association

between physical activity and demographic factors such as age (Bauman et al., 2012; Gomes et al., 2016; Hallal et al., 2012), others have reported a positive association between physical activity and household income and perceived environmental factors such as neighbourhood safety and aesthetics (Choi et al., 2017; A. Oyeyemi et al., 2015; Yen et al., 2009). Additionally, the effect of perceived neighbourhood environment features such as a safety, access to destinations and neighbourhood aesthetics on physical activity participation have been found to differ across gender-mediated demographic and socioeconomic categories (Gasevic, 2015; Prince et al., 2016; Tucker-Seeley et al., 2009).

Social structure for older adults' gender role expectations for household chores and other activities have been reported to result in differences in location preference, types and frequency of physical activity levels engaged across different gender and age category (Li et al., 2017; Stahl Sarah T & Albert, 2016; United Nations Research Institute for Social Development, 2010; Velkoff & Kowal, 2006; WHO, 2009). Sociocultural roles such as caregiving grandparents, social and spiritual support, cooking, and shopping can influence the activity levels of female older persons. Similarly, the need to continue active work in order to provide for families may be a sociocultural factor that may necessitate the need for continuous activity engagement by male older persons. These observed gender-based disparities in physical activity participation levels have been observed based on these contextual factors (Allender et al., 2006; Harley et al., 2009). Overall, older women are more likely to be generally inactive than their male counterpart (Prince et al., 2016; WHO, 2009). Furthermore, some studies have suggested that priority may be placed more on the social environment by women, whereas physical environment may predominantly be of more interest to men (Prince et al., 2016).

However, some studies have also reported no significant differences in activity levels across gender which may be attributable to the certain level of a paradigm shift that comes with human civilization and societal modernization in certain communities especially urban community with some activities being no longer strongly gender attached. Furthermore, global economic and technological developments in the areas where people have lived by traditional methods have seen individuals replaced these with motorized transportation systems, sedentary occupations, changes to traditional food and new opportunities for sedentary leisure pursuits (Bauman et al., 2012; Hallal et al., 2012; Katzmarzyk & Mason, 2009)

2.1.9 Demographic Profile of Older Persons in Nigeria

According to international statistics, Nigeria is the world's 7th most populous country; with an estimated total population of 192,908,804 comprising 96,260,905 females and 96,647,900 males (United Nations, 2015b; United Nations Department of Economic and Social Affairs Population Division., 2002; United Nations Department of Economic and Social Affairs Population Division, 2017b; US Census Bureau, 2010). With an average life expectancy at birth of 54.07 years, Nigeria is ranked 216 in the world, and 16th in Africa. Females have an average life expectancy of 57.49 years (ranking 209 in the world), while males are ranked at 224 with an average life expectancy of 50.85 years (United Nations, 2015b; United Nations Department of Economic and Social Affairs Population Division., 2002, 2013; US Census Bureau, 2010). The average life expectancy at birth in Nigeria reflects a slow but gradual increase in the rate from 44.74 years, almost four decades ago to the current estimates (United Nations, 2015b; United Nations Department of Economic and Social Affairs Population Division., 2002, 2013; US Census Bureau, 2010). In 2020, the average life expectancy in Nigeria is expected to rise to 55.23 years (ranking 214 globally and 14th in Africa), while in 2030, it will be 59.20 years

(ranking 212) and by 2050, hit 68.15 (ranking 209 globally and 9th in Africa) (United Nations, 2015b; United Nations Department of Economic and Social Affairs Population Division., 2002, 2013; United Nations Department of Economic and Social Affairs Population Division, 2017b, 2017a; US Census Bureau, 2010).

In tandem with the global aging population trends, the Nigerian population will experience a demographic emergence of an increasing population of older people (United Nations, 2015b; United Nations Department of Economic and Social Affairs Population Division, 2017b, 2017a). According to 2017 estimates, older persons from age 55 to 64 constitute about 4% of the Nigerian population; and those aged 65 and above represent about 3% of the population (United Nations, 2015b; United Nations Department of Economic and Social Affairs Population Division., 2002, 2013; United Nations Department of Economic and Social Affairs Population Division, 2017b, 2017a; US Census Bureau, 2010). This puts the total estimation of the population aged 55 and above at about 13 million persons. With this profile, Nigeria has the largest older population in sub-Saharan Africa. By the year 2030, this figure is expected to still get ranked as the largest older population in the region, with over 12 million people aged 60 and above at current but steadily increasing life expectancy rates (United Nations, 2015b; United Nations Department of Economic and Social Affairs Population Division., 2002, 2013; United Nations Department of Economic and Social Affairs Population Division, 2017b; US Census Bureau, 2010; Velkoff & Kowal, 2006, 2007).

2.1.10 Neighbourhood Environment Assessment for Physical Activity in Nigeria

Environmental health research investigating the active participation of older adults in PA in their environment has been largely restricted to developed/ high-income countries (Bauman et al., 2016; McNeill et al., 2006; Sawyer et al., 2017; Smith et al., 2017). Several data collection

methods such as georeferenced data, observation checklists (audits), and questionnaires have been reported in the literature for use in assessing the built environment for PA (Barnett et al., 2017; Brownson et al., 2009; McNeill et al., 2006). These methods have been broadly categorized into either perceived or objectives measures (Barnett et al., 2017; Brownson et al., 2009; McNeill et al., 2006). In Nigeria, perceived/observed measures have been used in their adapted form for the environmental correlates of PA (A. Oyeyemi, Adegoke, Oyeyemi, et al., 2012a; A. Oyeyemi, Adegoke, Sallis, et al., 2012; A. Oyeyemi et al., 2013, 2017; A. Oyeyemi, Kasoma, et al., 2016; A. L. Oyeyemi et al., 2013). Perceived measures are designed to survey individuals' perception of environment features. The individual's perception about their environment can have a significant impact on an individual's decision to take part in a form of PA or not (Barnett et al., 2017; Brownson et al., 2009).

The International Physical Activity and Environment Network (IPEN) Studies, a foremost global coalition on international environmental health studies, especially environmental correlates of PA across diverse countries have so far limited their research mostly to adults aged 18–66 years and adolescents (Cerin, Mitáš, et al., 2017; Christiansen et al., 2016; Kerr et al., 2016; A. Oyeyemi et al., 2017; A. Oyeyemi, Kasoma, et al., 2016; Sallis, n.d.; Sugiyama et al., 2014). The earlier Nigerian IPEN studies were part of a series of coordinated, related, multiple IPEN African studies that have largely assessed the psychometric properties of the self-report Neighbourhood Environment Walkability Scale adapted for Africa (NEWS-Africa) and used internationally for assessing perceived attributes of the neighbourhood built environment for PA (Glanz et al., 2016; Hinckson et al., 2017; A. Oyeyemi et al., 2013, 2017; A. Oyeyemi, Kasoma, et al., 2016). The strength of the studies is that they attempted to present outcomes and validated measures for understudied African regions like Nigeria, for addition to the international literature

on the worldwide relevance of the built environment for promoting PA. According to Adewale L. Oyeyemi et al., (2013), these studies were the first to report on the psychometric properties of the NEWS in the African region.

While there were age restrictions in most of the studies, the only study that broadly included older participants had 469 adults aged 18 to 85 years who were involved in another coordinated study of the adaptation and psychometric assessment of the NEWS-Africa in 6 sub-Saharan African countries including Nigeria (A. Oyeyemi et al., 2013, 2017; A. Oyeyemi, Kasoma, et al., 2016). Though the findings of the IPEN study provide the basis for correlations, a limitation of the findings was that its primary aim was to examine the psychometric properties of the NEWS-Africa instrument among African adults using pooled data from 6 diverse sub-Saharan African countries (A. Oyeyemi et al., 2013, 2017; A. Oyeyemi, Kasoma, et al., 2016). Furthermore, the study did not report on the dynamics age had on their outcomes. Likewise, the study reported limitations in the comparability of such findings across diverse contexts. All the other related studies that utilized the adapted NEWS instrument or similar measures were conducted only with adolescents and middle-aged adults (Onywera et al., 2018; A. Oyeyemi et al., 2014).

However, in a more recent follow-up study, Oyeyemi et al (2018) investigated associations between neighbourhood environmental factors and health-related moderate-to-vigorous PA (MVPA) and walking for transportation and recreation among community-dwelling Northern Nigerian older adults (age = 68.9 ± 9.13 years) (A. Oyeyemi et al., 2018). The NEWS-A which contained 54 items under 8 domains and has been adapted to Nigeria (Oyeyemi et al., 2016, 2017) was used to assess the perceived neighbourhood physical and social environment influences on the PA participation of Nigerian older adults. Six of eight perceived supportive

environmental factors on the adapted Neighbourhood Environment Walkability Scale-Abbreviated (NEWS-A) were associated with more PA among community-dwelling older Nigerian adults (A. Oyeyemi et al., 2018). These six perceived neighbourhood environmental factors were (1) land use mix–diversity (proximity to non-residential destinations), (2) land-use mix–access (ease of access to services and places), (3) infrastructure and safety for walking, (4) aesthetics, (5) traffic safety, and (6) safety from crime (A. Oyeyemi et al., 2018). Residential density and street/road connectivity were not reported to have a definite association with improving MVPA and walking for recreation and transportation among the participants.

A similar Nigerian psychometric study investigated the adaptation of the Physical Activity Neighbourhood Environment Scale (PANES) to the Nigerian context and assessed the test-retest reliability and construct validity of the Nigerian version (PANES-N) (A. L. Oyeyemi et al., 2013). The PANES measures perceived attributes of the neighbourhood environment hypothesized to be related to PA, particularly for transport and recreation (A. L. Oyeyemi et al., 2013). Neighbourhood environmental variables assessed by the adapted PANES included (1) residential density (one question), (2) access to destinations (three questions), (3) connectivity of the street network (one question), (4) infrastructures for PA and walking (three items), (4) social environment (one question), (5) aesthetics (three questions), and (6) neighbourhood safety (four questions) (A. Oyeyemi, Adegoke, Oyeyemi, et al., 2012a; A. L. Oyeyemi et al., 2013). The Nigerian PA neighbourhood environment survey done with direct relevance to PA was systematically adapted from an internationally-validated measure for relevance in the Nigerian context. Despite having inclusion criteria that made provisions only for participants aged 20–65 years old, the study reported running its test-retest reliability with 192 participants with the mean age being 36.8 ± 9.2 years (A. L. Oyeyemi et al., 2013).

A follow-up study was conducted to investigate the association between health-related PA and perception of neighbourhood safety and hygiene among adults living in low socio-economic status (SES) areas of Nigeria (A. Oyeyemi et al., 2015). This study had a representative sample, 613 adults (20–65 years; 32% female) from low-SES neighbourhoods in Northern Nigeria surveyed using the Nigerian adaptation of the International Physical Activity Questionnaire (IPAQ-SF) and Physical Activity Neighbourhood Environmental Scale (PANES). The age restriction for this study was at a cut-off of 65 years. There has been no further study reportedly done with the adapted version of the PANES-N especially inclusive for older adults beyond age 65. Nonetheless, the outcome of the study revealed that engaging in sufficient moderate to vigorous PA was positively associated with perception of the neighbourhood being free from pollutants such as garbage and odour, but negatively associated with perceptions of high crime rate during the day and with high speed of traffic and aggressive driving that make walking dangerous in the neighbourhood (A. Oyeyemi et al., 2015).

In a 2012 cross-sectional study, associations were examined between neighbourhood environment variables and overweight Northern Nigeria dwelling adults (A. Oyeyemi, Adegoke, Oyeyemi, et al., 2012a). The study utilized an adapted self-administered version of the PANES to assess participants' perception of neighbourhood environmental factors. A total of 1818 randomly selected residents of high and low SES neighbourhoods in Metropolitan Maiduguri, Nigeria were included as participants but the age cap was 65 years (A. Oyeyemi, Adegoke, Oyeyemi, et al., 2012a).

Other related Nigerian studies have been reported in the literature, but these do not directly assess the environment for PA participation. Utilizing a structured questionnaire, Southwestern Nigerian older adults aged 65 years and above were asked to provide information

about the quality of transport services including the availability of transport services, accessibility to the transport services, time taken for transport services, the extent of care by the public transport drivers, comfort in terms of the seats in vehicle and the level of cleanliness, and security while using transport services, particularly how safe it is to ride on the available mode of transport (Oyesiku, 2016). The participants were also asked to provide information regarding their mobility characteristics such as vehicle ownership, when they stopped driving, reasons for stopping, the frequency of travel, the purpose of travel and mode of trips frequency. Oyesiku (2016) described a pattern of ‘gradual alienation of the elderly’ related to observable barriers to their mobility and transportation needs. This observable alienation was reported to create a barrier to the independence and social inclusion of these older adults. Identified as insensitivity to the aging population, the study found unsafe transport mode, the high cost of alternative transport options, and poor public transport infrastructure as factors. In addition, public transport was not found accessible to older adults with functional disabilities or impairments (Oyesiku, 2016).

Within this Nigerian context, a few studies have attempted to investigate the relationship between the neighbourhood environments and PA, with sparse evidence on the relevance of environmental attributes to health-promoting PA behaviours of individuals emerging. Although many global studies have identified similarities in environmental correlates of PA for older adults and the general population in environmental health researches across the world, they have also found certain peculiarities in terms of factors that may be beneficial to promoting age-inclusive interventions for the older sub-group of the population (Tuckett, Banchoff, et al., 2018). When compared, older adults, unlike the younger general population, spend more time in their neighbourhood environments than in other locations; similarly, they hold a different

perception of what they value as important to them in their environment (Adedoyin et al., 2014; Cerin, Nathan, et al., 2017; Kent et al., 2011; Kerr et al., 2016; Smith et al., 2017; Tuckett, Banchoff, et al., 2018). These global studies reveal positive environmental correlates of PA such as social support (McNeill et al., 2006; Sawyer et al., 2017; Thornton et al., 2017), socio-economic status (Adedoyin et al., 2014), accessibility, affordability of facilities and favourable physical environment features such as presence of sidewalks (Adams et al., 2014; Adedoyin et al., 2014; Onywera et al., 2018; A. Oyeyemi, Adegoke, Oyeyemi, et al., 2012b; A. Oyeyemi, Adegoke, Sallis, et al., 2012; Smith et al., 2017), pedestrian facilities (Adams et al., 2014), mixed land use (A. Oyeyemi et al., 2018), access to public transport and proximity to destination such as local parks (Adams et al., 2014; Kerr et al., 2012; van Cauwenberg et al., 2014) resonating with findings across general population studies. Negative environmental correlates such in the form of social inequality (McNeill et al., 2006; Sawyer et al., 2017), crime rate, social disorder, traffic/pedestrian safety (A. Oyeyemi, Adegoke, Oyeyemi, et al., 2012b; A. Oyeyemi, Adegoke, Sallis, et al., 2012; A. Oyeyemi et al., 2018; Sawyer et al., 2017), were also reported in different studies across the general population and including those involving older adults.

In Nigeria, most studies have however captured the environmental influences of PA only in the younger population – adolescents and adults (Adedoyin et al., 2014; A. Oyeyemi, Adegoke, Oyeyemi, et al., 2012a; A. Oyeyemi et al., 2014; A. Oyeyemi, Ishaku, et al., 2016). Current evidence of the influence of the physical and/or social environment on PA levels of Nigerian older adults is scarce (A. Oyeyemi et al., 2018). Moreover, most research investigating the influence of the neighbourhood environment on PA in Nigerian older adults have overlooked the social aspects. Furthermore, no literature has reported the attempt to use spatial qualitative

methods to assess the effect of the neighbourhood environment on PA for this group of the population.

2.1.11 Our Voice Approach

The Our Voice approach has been used previously in diverse settings including developing countries to assess how different features of the environment impact healthy-active living, and to empower the participants for health advocacy (Chrisinger et al., 2018; English et al., 2018; Hinckson et al., 2017; King, Winter, et al., 2016; Rosas et al., 2016). The approach builds on the conventional community based participatory research method of photovoice, and citizen science with the addition of a data-driven, community knowledge translation process to generate positive health-promoting outcomes in local environments.

Community participatory research involving citizen scientists (CPR) has been favoured by a number of scholars in health research (Chrisinger et al., 2018; den Broeder et al., 2016; Dick, 2017; Dickinson et al., 2012; English et al., 2018; Hinckson et al., 2017; King, Winter, et al., 2016; Reddy Katapally et al., 2018; Rosas et al., 2016; Sallis et al., 2006). The importance of this qualitative contributory or collaborative approach to environmental health research is the engagement of members of the public in research projects, in combination with public education to address pertinent issues that affect them (Dickinson et al., 2012). Citizen scientists are participants undertaking research without formal training as scientists, and communities where members of the study area are involved from start to finish. Their involvement in environmental health research has increased in recent years. This has occurred along with the emergence of environmental monitoring technologies, geographic information system- (GIS-) enabled web applications, the accessibility and utilization of mobile devices to collect data, and the growth of

online data sharing which enables participants to collect large volumes of location-based ecological data and submit them electronically to centralized databases (Dickinson et al., 2012).

Citizen-generated data have been particularly indicated to be helpful with the monitoring of local issues, to validate demands and drive sustainable development progress (Development Initiatives, 2017). The data are also considered to be very useful for facilitating data-driven discussion amongst a diverse range of stakeholders on these opportunities and challenges (Development Initiatives, 2017). Furthermore, communities can assess and identify their own local development priorities, and aggregate timely and accurate data that feeds into local and national development decision-making and intervention plans (King, Winter, et al., 2016; Winter et al., 2014).

The Our Voice framework (Hinckson et al., 2017; King, Winter, et al., 2016; M. R. Moran et al., 2017), involves the use of technology and community-engaged methods to empower citizen scientists (i.e., community residents) to assess the barriers and facilitator of PA in their neighbourhood environment. The neighbourhood environment assessment is done using the Healthy Neighbourhood Discovery Tool (Buman et al., 2013; King, Winter, et al., 2016). The Discovery Tool is a specialized user-friendly mobile application developed to be utilizable regardless of the education level or technology literacy. It has also been culturally adapted and translated thus far into different languages and tested for accessibility in different culturally and economically diverse locations including developing countries (Buman et al., 2013; King, Winter, et al., 2016). The Discovery Tool enables community residents to document features of their environment through geocoded photographs, audio narratives, and Global Positioning System (GPS)-tracked walking routes about aspects of the environment that facilitate or hinder healthy living (particularly PA levels) (Buman et al., 2013; King, Winter, et al., 2016). The tool

also prompts participants to answer an 8-question embedded demographic and/or statement questionnaire.

The Our Voice Global Research Network which was formed in 2016 with support from the Robert Wood Johnson Foundation developed the "Our Voice Approach" which engages Citizen Scientists in collecting data, analyzing it and using their findings to shape advocacy campaigns of their own design in their local communities (King, Winter, et al., 2016; Tuckett, Banchoff, et al., 2018).

This approach, which is centered on local communities, enables and "gives voice" to those who may rather seem voiceless in the community and could have its successes replicated in neighbouring communities. The overall goal is to build healthier communities by using a four-step process; Discover, Discuss, Advocate, Change (Figure 1).

1. **Discover:** by taking a walk, they take note of aspects of their community that have impact on healthy living by taking photos and recording their thoughts and also reflecting on how their communities can be improved.

2. **Discuss:** with a group of other citizen scientists, individuals share their photos and discover common topics, prioritize target areas for change, brainstorm to come up with practical solutions and strategies to tackle problems noted, identify stakeholders, policymakers, and other potential allies and also learn to communicate their findings with such people.

3. **Advocate:** this is done with a community mindset in which citizen scientists meet with allies, stakeholders, and/or policy-makers to present and discuss findings and potential solutions and also agree on action steps.

4. **Change:** this is the end goal of this approach. individuals will live in better health enabling communities. This entails follow up on the action plan, tracking activities and results, evaluating outcomes and also celebrating and sharing successes!

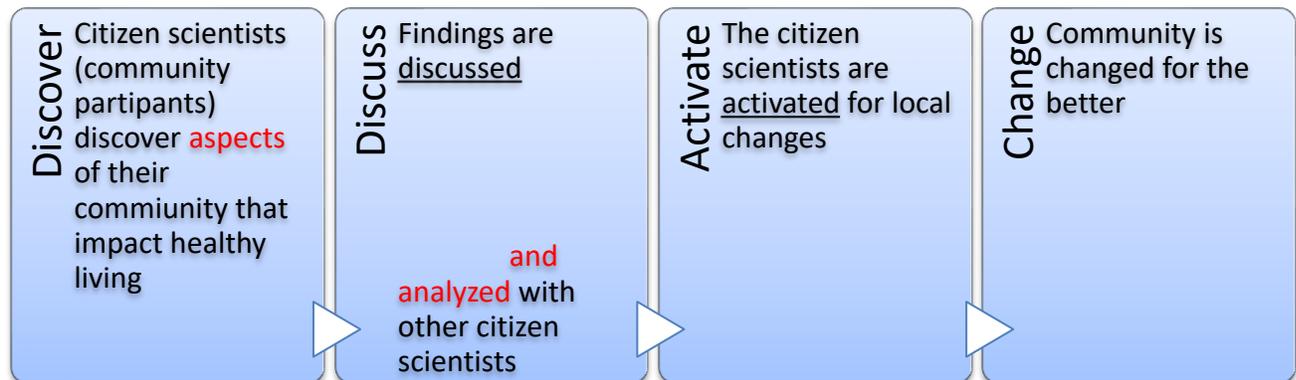


Figure 1: The Our Voice Approach

2.2 Research Gaps

The current research aims to provide evidence for population-level PA promotion towards achieving and sustaining healthy-active aging in urban Nigeria. The current research gaps exist as a result of lack of applying applicable methods in the context of low-and-middle-income countries like Nigeria. There is a need for empirical studies to provide understandings of the health issues experienced by Nigerian older persons and what solutions they suggest for change. Contextual, focused research and improved measurement are essential to better understand and act on healthy aging for the Nigerian population. Thus, there is need to involve Nigerian older adults as research collaborators, investigate wider aspects of the active aging concept and conduct an in-depth assessment of the environmental characteristics of areas, particularly in the Nigerian older person context.

Furthermore, most studies utilized objective measures which usually do not provide contextual information, which is imperative to understanding barriers and facilitators to healthy-active living. The spatial qualitative methods of evaluating the influence of the environment for healthy living, utilizing the Our Voice citizen science approach provides in-depth empirical information contextualized in the target environment and population (Hinckson et al., 2017; M. R. Moran et al., 2017). This approach utilizes the Stanford Healthy Neighbourhood Discovery Tool (DT). The use of the DT will be the first for a Nigerian environmental assessment for healthy-active aging.

2.3 Summary

Encouraging optimal and regular PA participation to promote health into older age remains a top priority (Annear et al., 2014; Hallal et al., 2012; Paterson & Warburton, 2010). This is increasingly important especially with the evidence attributed to the role of the enabling environment in promoting population-level PA for healthy aging (Annear et al., 2014; Kerr et al., 2012). An enabling environment contributes to the enhancement or sustenance of our functional ability, supporting our healthy choices, thereby helping us age healthily. For older persons, there are key neighbourhood environmental factors that have been identified as priority areas. The literature reveals an extensive study of the environment in an attempt to develop effective population-level strategies to promote healthy-active aging through knowledge translation, scalable intervention, and policy changes. However, there are still gaps related to the adopted methodology, as well as a dearth of data available for older Nigerian communities.

Qualitative research can provide in-depth information on environmental elements that influence older adults' PA (M. Moran et al., 2014). This study will seek to engage older Nigerian residents of a specific neighbourhood as citizen scientists in a community based participatory

research project to identify the barriers and facilitators of PA in their neighbourhood environment. The research will engage Nigerian older adults who will inductively explore the range of complex environmental attributes that influence their PA in their local neighbourhoods. Data collected will be utilized to enhance the conceptual and empirical understanding of the influence of the neighbourhood environment on (PA) of Nigerian older persons and can be potentially taken up by relevant organizations to develop evidence and policy tools for increasing PA and the well-being of older persons in Nigerian communities.

Chapter 3: METHODS AND METHODOLOGY

3.1 Methods

Methodology

The study utilized the “Our Voice” community-engaged “citizen science” approach, in which the community participants leveraged the potential of information and communication technologies to foster data-driven consensus-building and mobilization efforts that advance physical activity at the individual, social, built environment, and policy levels (Hinckson et al., 2017; King, Winter, et al., 2016; Rosas et al., 2016; Winter et al., 2014, 2016). The approach involved collecting data by taking photographs and recording thoughts using the DT. This method focused on individual and community strength, the collaborative development of knowledge, individual empowerment, community empowerment and development, and combines research with action. Community participants known as citizen scientists, participated in group discussion and data analysis, based on the data they collected to document their experiences. They then presented their priority recommendations to appropriate stakeholders. See Figure 2 for an overview of the framework.

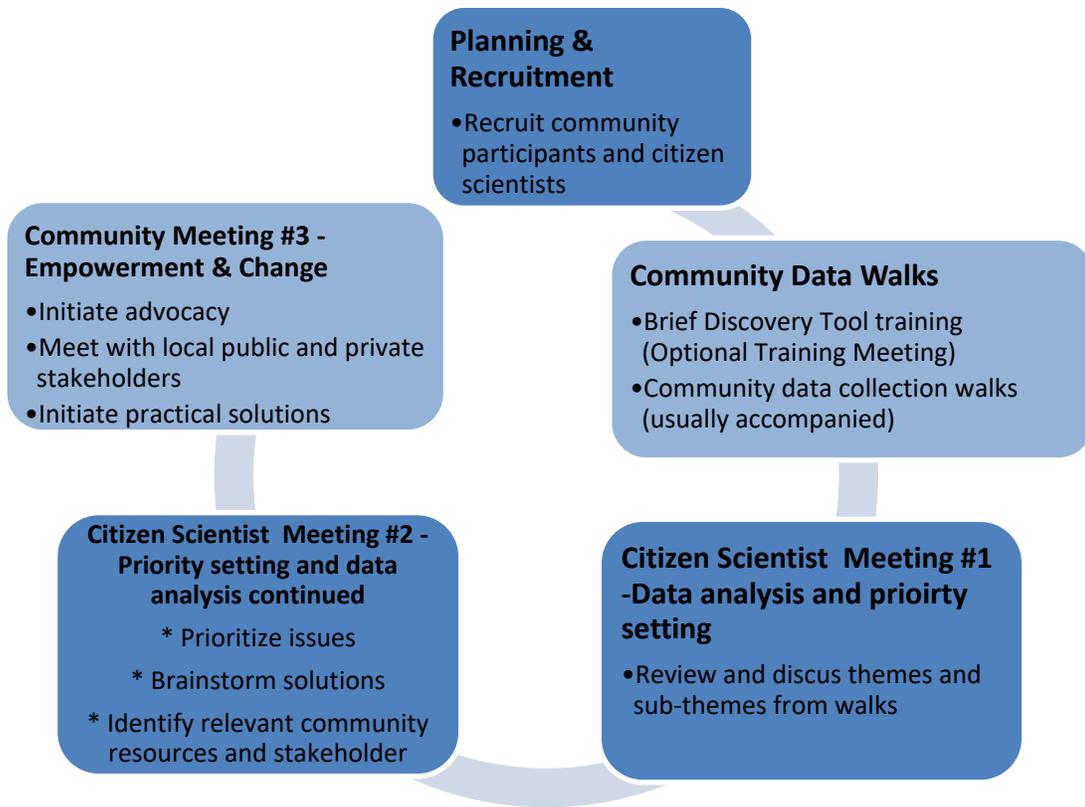


Figure 2: The Our Voice citizen scientist process as used in this project, adapted from the King et al. description of the process (2016).

3.1.1 Theoretical and Conceptual Framework – Socio-ecological Framework/Our Voice Framework

The ‘socio-ecological framework’ has been applied in the context of the ‘active aging framework’, addressing the interactivity of an individual with their environment (Menec et al., 2011; Sallis et al., 2006; Thornton et al., 2017). These frameworks recognize that PA is influenced by complex interactions between the individual, and their social and/or physical environment (Sallis et al, 2006; Menec et al, 2011). These multidimensional environmental factors can impact the health and well-being of the individual. If provided with opportunities to be active and healthy in an age-friendly environment, older adults would increase their

connectedness and participation in social activities (Menec et al., 2011). Furthermore, from the viewpoint of an ecological theory, is the identification of key interactions between an individual and the environment (Menec et al., 2011; Sallis et al., 2006).

The Our Voice Citizen Science Framework is a composite framework which integrates theories and conceptual frameworks across multiple levels of impact. The socio-ecological framework has been incorporated into the Our Voice Framework which was adopted as the primary framework for this study (Hinckson et al., 2017; King, Winter, et al., 2016).

3.1.2 Research Ethics Approval and Informed Consent

Approval by the University of Manitoba's Education/Nursing Research Ethics Board was obtained prior to commencing the study (Protocol #E2019:039(HS22856)). During recruitment, interested participants received a broad pre-identified problem to be explored using a general information leaflet (Appendix A) which included the checklist of essential features of age-friendly cities (World Health Organization, 2007a), an instruction sheet for photo taking (Appendix B), a sheet providing guidelines for walk safety (Appendix C) and the informed consent form (Appendix D) before participating in the study. This was to enable them to have sufficient time to review the study. Study participants received a study code and were assigned pseudo-names for purposes of presenting research findings.

3.1.3 Participant details and recruitment strategy

Participants were residents of the Festac Town neighbourhood area. Festac Town is a large urban community in Amuwo-Odofin local government area of Lagos State, in Southwestern Nigeria. More details are provided about this area below. Eligibility for recruitment was: (1)

being able to consent for themselves, (2) being an older person aged 60 or more, (3) being able to speak English, (4) self-identifying as living in the Festac Town community, and (5) being able to attend and participate in group meetings and interviews.

A convenience snowball approach was used to recruit participants through community organizations in the Festac Town neighbourhood area. Participants were recruited in various ways, including (1) oral presentation of the study to seniors at NGO centres and at health-related group activities of older persons in the community (e.g., walking groups, exercise classes), (2) flyers posted and distributed in the community, and (3) word of mouth within the community. Community-based NGOs for older persons such as the Charity Organization for the Welfare of Aged People Foundation (COWAP-Foundation) were involved. The research team established rapport with managers/directors in the organizations to facilitate recruitment.

A total of 13 study participants were recruited. This was slightly more than the typical convenience sample similar studies utilizing the Our Voice approach (Discovery Tool application), which have been found to be capable of reaching thematic saturation in healthy neighbourhood assessments (Chrisinger et al., 2018; Chrisinger & King, 2018; King, Winter, et al., 2016). Most volunteers got involved in the study through an oral presentation of the study to older adults at NGO centres and at health-related group activities of older persons in the community.

3.1.3 Study Settings

This study was conducted in Festac Town. Festac Town is a large urban community in Amuwo-Odofin local government area of Lagos State, in Southwestern Nigeria (Ade, 2013; Fasona & Omojola, 2004). Lagos is the commercial capital and most populated state in Nigeria.

Like every other part of Lagos, Festac Town has a high-density population, with an estimated population of 900,000, representing 4% of the state population (Ibiyemi & Adenuga, 2013).

The community consists of individuals from diverse ethnocultural backgrounds from different parts of Nigeria, with a small immigrant community mostly from neighbouring West African countries (Ade, 2013). It also holds a rich cultural history and has been the residential estate designed to house the participants of the Second World Festival of Black Arts and Culture of 1977 (Festac77) from where it derives its name (Ade, 2013; Fasona & Omojola, 2004).

Older persons in this community are most likely to be retired from civil service or veterans, self-employed or privately employed in non-public sectors. They represent a large and growing population within the community, with individuals having a wide variety of skills, needs, and lived experiences. There are no long-term care facilities or seniors' residences in this area; older persons in this community generally live in their own houses or the residence of children or relations (Amuwo-Odofin Local Government, 2018; *Festac Town - Google Maps*, 2019; Ibiyemi & Adenuga, 2013). Despite the multicultural nature of the community, older adults are known to engage in common traditional and social practices such as grandchild caregiving, domestic chores, as well as social and religious gatherings (Amuwo-Odofin Local Government, 2018). Although, there are no studies investigating the gender disparity seen in these activities in the community, it is likely that strong gender-mediated preferences may be associated with varying activities engaged by older adults in this community.

English is the predominant language, however many individuals are capable of speaking their native language as a second language of communication (Amuwo-Odofin Local Government, 2018). Due to the high population density, the community presents a mix of

individuals in low-socioeconomic status (SES) neighbourhoods and those in high-SES neighbourhoods (Ibiyemi & Adenuga, 2013). Just as in many parts of the country and other LMICs, social welfare for older persons is inadequate and may present socio-economic issues for this population group (Ibiyemi & Adenuga, 2013; Oladeji, 2011).

The community was designed to have a broad range of social and physical infrastructure available, characteristic of many urban settings, except that some are now in deplorable conditions (Ibiyemi & Adenuga, 2013). The residents have access to basic amenities and infrastructure such as housing, health centres and clinics, schools including adult education centres, police and fire services, post office, markets, places of worship, open spaces and playgrounds, banking services, shopping centres, petrol filling stations, waste and sewage collection/disposal facilities, hospital, library and entertainment facilities (Amuwo-Odofin Local Government, 2018; *Festac Town - Google Maps*, 2019; Ibiyemi & Adenuga, 2013). Some of the above are also privately owned and may present affordability issues (Ibiyemi & Adenuga, 2013; Oladeji, 2011)

3.1.4 Festac Community-Based Non-Governmental Organization of Older Persons

There were several community-based NGO of older persons, most were largely sub-organizations of religious institutions in the community. However, there was a prominent NGO in the Festac community that cut across sociodemographic levels and brought diverse groups under one platform. This was the Charity Organization for the Welfare of Aged People Foundation (COWAP-Foundation).

3.1.4.1 The Charity Organization for the Welfare of Aged People Foundation (COWAP-Foundation).

COWAP-Foundation is a non-governmental organization whose mission is to "establish a concrete structure which will guarantee the overall health and welfare of all aged persons in the society and better address aging and its attendant cause and effect in the populace". The membership is open to persons aged 60 years and above (Adelana Mould, 2017; Esan Olusola, 2018). Membership is free for older persons and has impacted over a thousand in Amuwo-Odofin Local Government Area, Lagos state, where it began operations (Adelana Mould, 2017; Esan Olusola, 2018). Its inception was in 2006 and was formally incorporated with the Corporate Affairs Commission in 2010. The NGO works in partnership with various private and government institutions at local, state, and federal levels. In achieving its mission, COWAP-Foundation has been involved in organizing seminars and workshops; advocacy for justice, equity and fairness for older persons in the society; collation of statistical data and records on aging issues and providing such to both government and non-governmental organizations (Adelana Mould, 2017; Esan Olusola, 2018). The organization mobilizes the older persons in the society to come together as groups with the aim of better addressing their challenges (Adelana Mould, 2017; Esan Olusola, 2018).

The NGO believes that community-based partnership and research is essential to their organization. The organization invites experts from academia and professional fields to facilitate their activities because they believe that evidence-based knowledge should inform their programs and services as well as public policies. This provided the basis for collaboration between the NGO and the researcher for this study. Such collaborations present opportunities for knowledge translation in health promotion as well as potential for establishing effective and sustainable outcomes. For this study, the NGO provided logistical support in the areas of participant recruitment and facilities for meetings. They also aided in the understanding and

integrating of local values in the research process, to enhance acceptance and receptivity from the community. Most importantly, for the latter part of this study, the NGO was relied upon to provide an existing platform and structure for advocacy and stakeholders' intervention.

3.1.5 Data collection process

During the recruitment process, potential participants were pre-informed that they would make one data collection walk lasting up to 60 minutes. They had also been required to be familiar with the general information leaflet on community age friendliness and physical activity (Appendix A). The citizen scientists were then instructed to reach out to the study investigator to schedule their data collection walk when they were ready, after they had gone through the pre-walk documents. They had separate data collection walk days scheduled according to their availability. They had also pre-selected preferred walk days from a span of a five-week schedule to avoid any clash of walk days with other citizen scientists. Scheduled walk days were made flexible with availability for five days of the week. Citizen scientists were asked to take scheduled walks in pairs or be accompanied by the study investigator (or be asked to go with a walk/technology partner), through Festac community. They also had to start their walk at a pre-determined location (walks were encouraged to take place during daytime likely between 9:00 am-4:00 pm at a GPS location that is not their home in order to better protect their identity).

Prior to beginning their walk on their individual data collection walk days, each citizen scientist was taken through a review of the research documents they had received at the time of recruitment. The review involved the consent form and the general information leaflet on community age friendliness and physical activity (Appendix A). The citizen scientists were also trained on the functions of the DT running on a study provided tablet.

Citizen scientists were reminded to photograph and document their thoughts via audio recordings or typed commentaries about “aspects of the neighbourhood that they feel are supports or barriers to them participating in PA.” The citizen scientists had the opportunity to take rest breaks during the walk. Provisions were made for two citizen scientists who were not able to complete 60 minutes of walk at a one stretch. They took the walk in intervals of 20 to 30 minutes up to the cumulative 60 minutes mark. One citizen scientist spent about 30 minutes because she felt she was saturated regarding her data collection when she realized she was only left repeating most of her findings. Citizen scientists also had the privilege to reschedule their pre-selection according to their conveniences – two citizen scientists had their walks rescheduled due to personal reasons. To limit the principal investigator’s influence over the subject matter for citizen scientists' photographs, the photography task instructions (Appendices B and C) were kept very general. Citizen scientists were left free to take photos of any object/place but not of any identifiable person that referred to physical activity enablers or barriers.

Although the DT has been designed to be a specialized user-friendly mobile application developed to be utilizable regardless of education level or technology literacy, most of the older citizen scientists decided to have the study investigator accompany and assist with its functionality during the walk. They also made this request because some of them had envisaged this was needed for their safety in some parts of the neighbourhood. Training reminders were made available in the form of small laminated cards fitted on to the tablet lanyard. This outlined basic troubleshooting measures for the tablet and DT.

When citizen scientists had finished their walks, the study investigator requested to know if they would also attempt an 8-question interview on demographic and community information (Appendix E). This took place at an identified nearby indoor location and where they were

comfortable answering these questions in confidence. These included basic demographic information, age, gender, and education, and self-health status rating. Citizen scientists were also asked to respond to 4 statements, using a five-point scale, related to: self-perceived support within one's community, influence to affect decision-making within one's community, one's ability to work with others to influence decision-making within one's community, and knowledge concerning who to talk to within one's community to effect change. Answering any or all of these demographics and/or statement questions was entirely voluntary within the DT and this study.

Citizen science data (i.e., photos, audio commentaries, barrier/facilitator ratings, demographic information, and statement responses) were uploaded to a secure server at Stanford University by the study investigator once data walks had been completed. The University of Manitoba (U of M) research team using a secure online, password-protected researcher's portal immediately had access to this data.

3.1.6 Data Analysis

Citizen science data were collected in the form of geocoded digital photos, audio commentaries, typed commentaries, barrier/facilitator ratings, demographic information, and statement responses for each citizen scientist. Audio commentaries were downloaded from the DT and transcribed. Whilst demographic information was withheld for researchers only, the rest of the data was made available to citizen scientists for analysis in the form of one sheet per photo (see Appendix F, for an example sheet).

Once all the raw data were prepared as data sheets as described above, citizen scientists were once again reminded about the two group meetings (citizen science meetings) which would

last about two to three hours each with all at a designated centre. Citizen scientists then scheduled dates based on a poll for the first meeting.

Prior to the first meeting, a flexible pre-sorting of the data sheet was done by the study investigator. This was done primarily by putting photos of similar features in the same category and a superficial content analysis of the narratives with the pre-existing literature as guide. However, no codes or themes were made known to the citizen scientists as they were to perform the in-depth analysis for emergent, contextually relevant codes, subthemes and themes.

During the first meeting which took place on August 15, 2019, the pre-sorted data sheets were provided to all the citizen scientists for discussion and analysis. Before the data were analysed though, the citizen scientists documented the types of physical activities commonly undertaken by older persons in Festac Town (Appendix G). They also underwent a basic training on qualitative research analysis specific to the research. Furthermore, the citizen scientists utilizing the worksheets (Appendixes H, I, J) conducted a qualitative content analysis to identify themes/subthemes. The key themes emerged from the coding process which involved the results of the content analysis that were created by grouping together similar subthemes. The term “subthemes” referred to the specific environmental elements that were captioned by the citizen scientists during data collection. As the key themes emerged, the study investigator was able to centralize discussion on topics that were particularly important to the research for further explanation. The focus of the discussion in the first meeting was to encourage the citizen scientist group to identify supports/facilitators to PA which were documented in the photos and commentaries. During this time, the study investigator compiled discussion notes.

Following the first citizen science meeting, a second meeting was scheduled for approximately three weeks later. Citizen scientists met once again to review a summary report

of findings from the first meeting. They then went on to review the selected trainings on qualitative research analysis. Thereafter, utilizing the worksheets (Appendixes H, I, J), they proceeded with the qualitative content analysis to identify themes and sub-themes of barriers to PA which were documented in the pre-sorted data-sheets. The citizen scientists also brainstormed on the solutions and recommendations for change appropriate for the identified barriers.

For the prioritization process, findings were summarized on a chart paper, reviewed and decided upon by citizen scientists guided by a prioritizing worksheet (Appendix K). This provided an equal opportunity for citizen scientists to provide further ideas and experiences as it moved the focus group discussion to a deeper level taking a detailed look at identifying overarching themes as well as identifying specific Festac neighbourhood environment issues that have major impacts on the level of PA participation for older adults.

Proceeding with the prioritizing worksheets (Appendix K), the citizen scientist agreed to utilize a secret ballot voting system to rank and order the priorities of the key themes to avoid bias. There were citizen scientists who also preferred the voting system to ensure their continued engagement in the process. These were citizen scientists who were likely to be shy, nervous or just based on personal preferences.

At the conclusion of the second meeting, the citizen scientists had decided on issues that could be brought forward to relevant community resources and stakeholders at a third meeting. They also nominated two willing citizen scientists to represent the group.

The third meeting – community meeting – was held approximately three weeks later October 29, 2019 (See figure 2). In conjunction with the COWAP-Foundation NGO whose

function also includes advocacy, the findings and recommendations of the citizen scientists were communicated to the identified stakeholders and policymakers to initiate the process towards continued advocacy and effecting the data-driven changes.

Chapter 4: RESULTS

In this chapter, a detailed demographic description of the study participants and findings will be provided.

4.1 Participants

Seven men and six women participated in this study as citizen scientists (Table 1). They were all Festac Town residents who were able to walk independently. All but two of the citizen scientists were recruited via the oral presentation of the study to older persons at the NGO meetings and at health-related group activities of older persons in the community. The other two got recruited through information passed across via word of mouth in the community by attendees at the NGO meeting and by the flyers shared at the meetings.

The ages of the participants ranged from 65 to 86 years. The average age reported was 78 years for the men and 71 years for the women. Table 1 provides additional demographic characteristics of the citizen scientists. Participants had relatively high levels of education; two participants had finished secondary school, six participants had graduated with post-secondary diploma, five participants had a university degree. All participants were asked how they perceived their health status, and they rated their health as good to excellent.

Table 1. Demographic Characteristics of Participants (N = 13)

Characteristics	Count	Percentage %
Highest Level of Education Completed		
Primary	0	0
Secondary	2	15
Post-secondary diploma	6	46
University degree	5	39
Health rating		
Excellent	3	23
Very Good	7	54
Good	3	23
Fair	-	0
Poor	-	0

4.2 Data Collected

Over the course of three weeks between July and August 2019, the citizen scientists completed the data collection walks. The citizen scientists took a total of 156 photographs and had 151 audio or textual commentaries documented.

4.2.1 Community Information

Citizen scientists were asked to provide their perception of how supportive the community was to actualizing positive changes and development. The results revealed that a large proportion of the participants agreed on the supportiveness of the Festac community (Table 2).

Table 2: Statement responses on community information (N=13)

Statement Responses	SD	SWD	N	SWA	SA	Total
This is a community where people support each other.	1	0	1	6	5	13
I can influence decisions that affect my community.	0	0	1	5	7	13
By working together with others in this community, we can influence decisions that affect this community.	0	0	0	4	9	13
People in my community know who to talk to in order to make changes happen in our community.	1	0	1	6	5	13

SD: Strongly disagree, SWD: Somewhat disagree, N: Neutral, SA: Strongly agree, SWA:

Somewhat agree.

4.2.2. Types of Physical Activity Participation

Citizen scientists were asked to provide a general overview of the PA commonly engaged in by older adults in their neighbourhood. This was to provide contextual knowledge and/or

understanding of the types of PA older adults engage in and for which appropriate promotion and intervention might be tailored. There was a broad range of activities that were identified under various categories of PA. All thirteen citizen scientists had primarily indicated that there was no safe form of PA they would not perform except if it were restricted by their health or functional status. They indicated common activities of walking as a form of active or leisure transport. The citizen scientists also identified various forms of sporting activities or exercises older adults within the community commonly participated in, however these were delimited to the specific kinds of sport or exercises commonly available in their communities (Table 3). These included: tennis playing, aerobic classes, light sport or recreation, muscle strength and endurance work. They also indicated that they performed domestic chores as well as various forms of occupational/work activities. PA engagement across all subcategories documented by the citizen scientists is outlined in Table 3.

Table 3. Types of physical activities mentioned by the citizen scientists.

Active Transport and Leisure Walking
Walking leisurely, walking to work, walking to use public transport, walking to specific destinations such as places of worship/markets/banks/parks/, etc., cycling/biking.
Exercise
Stretching, fast walking, aerobics class, strength training, jogging, running, using a stair machine or climbing stairs, swimming.
Sport
Playing tennis, racquetball, badminton, pool-table or snooker game.
Household Chores
Light vacuuming, light yard work, gardening.
Cultural or Social Activities
Dance activities, music activities such as drumming, creative activities such as sculpturing or wood carving or painting, singing practices
Occupational/Work Activities
Trading, hospitality consulting, light electrical and electronics works

4.3 Core Themes and Subthemes of Neighbourhood Facilitators and Barriers to Older Adults' Participation in Physical Activities

Using the methods for data analysis described in the previous chapter, eight overarching themes emerged for both the facilitators and barriers to PA in the investigated neighbourhood. The citizen scientists further brainstormed on the promotion required for the facilitators as well as identified solutions to the barriers. Three of these themes were further prioritized for advocacy.

In Tables 4 and 5 are the themes and subthemes identified by the citizen scientists related to the features of the Festac neighbourhood environment that support or hinder PA participation of older adults. It also includes further description of findings in terms of specific features that had been identified about the subthemes and relevant suggestions or ideas for change, expansion, or sustainability.

All participants enthusiastically discussed their feelings and perceptions of the impact of the neighbourhood features for PA promotion of older adults in the Festac community. The facilitators were pedestrian and traffic facilities, green and beautiful environment, multigenerational community features (e.g., recreation and relaxation parks), social connectivity and safety (see Table 4). Barriers included pedestrian and traffic facilities, dirty environment, infrastructure, sport, and recreation parks/facilities (e.g., for intergenerational activities), stigmatization based on age (ageism), public toilets, and security (see Table 5).

The eight overarching themes were analyzed in greater detail and subthemes were added. Excerpts of commentaries have been used to support the reasoning behind each core theme and sub-theme.

Table 4. Core Themes and Subthemes of Neighbourhood Facilitators and Barriers to Older Adults’ Participation in Physical Activities.

Themes	
1. Pedestrian and Traffic Facilities*	
Physical Activity Supports/Facilitators	Physical Activity Barriers
<p>a. Roads</p> <ul style="list-style-type: none"> ▪ Availability and rehabilitation ▪ Traffic lights 	<p>a. Bad Roads</p> <ul style="list-style-type: none"> ▪ Traffic lights not available at (i) intersections / junctions, (ii) Agboju market intersection ▪ Street lights not available ▪ Zebra crossings or pedestrian crossings not available ▪ Arbitrary road use by commercial vehicle operators
<p>b. Walkways</p> <ul style="list-style-type: none"> ▪ Availability and accessibility of sidewalks/walkways ▪ Neatness of walkways ▪ Safe neighbourhood pedestrian walkways 	<p>b. Walkways</p> <ul style="list-style-type: none"> ▪ Damaged and neglected ▪ Parking on walkways ▪ Trading on the walkways/street trading

- Senior friendly

- Abuse of the walkways

Table 4 (continued).

2. Green and Beautiful Environment*

a. Lots of green areas

a. Hideouts for criminal activities, pests and dangerous animals

b. Recreation parks and gardens

b. Hazardous environment

c. Big trees

c. Noise pollution from uncontrolled social/religious activities

d. Environmental hygiene

d. Dumping of refuse/wastes on the roads, gutters and drainage holes

3. Multigenerational Community Features (e.g., Recreation and Relaxation Parks) *

a. Interaction with pupils during community walks
and related activities

a. Unavailable sports and recreation parks/facilities

- Turned to banks, mechanic workshops

- Tennis court not available

- Sold to private owners (e.g., 2nd Avenue swimming pool)

- b. Educational factors (health talks on the benefit of PA and exercises by special groups)
- c. Sports and Recreation parks (e.g., Victory Park 206, FHA Sport centre)
- d. 'COWAP' Fitness Walk /Walk for Life program

Table 4 (continued).

4. Social Connectivity*

- a. Local neighbourhood association participation
- b. Non-Government Organizations and Associations of the Aged such as COWAP
- c. Faith based organization and activities
- d. Places of worship
- e. Health talks by groups

5. Safety/Security

- | | |
|--|---|
| <ul style="list-style-type: none"> a. Safe location of desirable service centres and destinations | <ul style="list-style-type: none"> a. Vandalism b. Kidnapping |
|--|---|

b. Destinations situated in open and accessible places (e.g., automated teller machines (ATM))

c. No streetlight at night

d. Potholes on the road and walkway

e. Shanties and criminal hideouts

f. Buffer zone sold and abused

Table 4 (continued).

6. Infrastructure

a. No clean safe drinking water

b. Central sewage system bad; blocked; erection of structure on the sewage pipelines

7. Public Toilet

a. Not available at popular public destinations (e.g., at the parks)

8. Stigmatization based on Age (Ageism)

*Note: this community aspect was well documented by most of the citizen scientists

4.3.1 Pedestrian and Traffic Facilities

Facilitators. The quality of pedestrian and traffic facilities was a prominent theme. Participants discussed the safety, availability and friendliness of the facilities as features that determine whether it is supportive or experienced as a barrier to PA participation. There were factors of well-maintained walkways, presence of pedestrian crossings, separation from traffic, and regulation of street trading discussed as subthemes. Commentaries regarding what has facilitated older adults' PA participation in Festac neighbourhood in this area included:

“The walkways are there for elderly people to walk freely without having any encumbrance, nobody will disturb them, they can walk freely round Festac without being disturbed, just cross the road to another walkway, be walking and then in between the walkway and the road there is a bicycle way.” (Pa George).



Figure 3: Pedestrian walk path captured by one of the participants.

“This walk path (Figure 3) is free. It is good. It will allow old people and younger ones to walk on and not to have contact with the road (in as much) as to cause accidents. It is a free place. This is what we want, and it is beautiful. Thank you.” (Pa Ayodeji).

“Now, I am on a pathway (pedestrian walkway), and I am very happy I am walking on a pathway, no motorcyclist, no motor vehicle disturbing me. Unlike when we get to some areas where there are no pathways for pedestrians. Then you will be discouraged because your life might be in danger even from vehicles too, as you have seen them driving back and forth because they do not know exactly how to drive, many of them are not well-trained as drivers, they just move recklessly. So, I am happy for this pathway for pedestrians and if ready encourages this type of exercise walk.” (Lady Susan).

“Road fixing and rehabilitation encourages easy and safe movements” (Pa.Timothy).

“Designated and well-maintained walkways like this one (see Figure 4) leading up to the local government secretariat and beyond are admirable and desirable to encourage outdoor engagement in physical and social activities.” Ms. Janet



Figure 4: Feature Commonly Captured by the Participants.

There was a consensus regarding the availability and benefits of traffic control measures in some parts of the Festac neighbourhood. During the focus group discussion, citizen scientists cited different examples of locations where they knew these were even though they could not physically be at those locations to take photos since they did not fall along their data collection walk routes. However, these examples reinforced the perspectives of the group concerning the relevance of traffic control measures or facilities to PA promotion for older persons in the Festac neighbourhood.

Barriers. On the other hand, the citizen scientists identified and discussed certain negative aspects of this feature in Festac Town that hinders them from participating in PA. Commentaries and photos included:

“There is supposed to be a zebra crossing over here (Figure 5) but there is none. This is part of the things that can hinder easy participation in outdoor physical activity. This is bad.” (Mr. Adetunji).

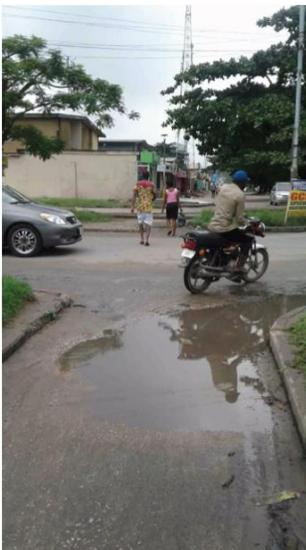


Figure 5: Picture indicating absence of pedestrian crossing facilities.



Figure 6: Picture showing example of missing pedestrian crosswalk.

“No pedestrian crosswalk even at the front of the local government secretariat (Figure 6).

Similar features are found at various major intersections in Festac town.” (Ms. Janet).



Figure 7: Picture showing example of difficult intersections and the menace of commercial motorcycles, tricycles and buses commonly encountered in the Festac Neighbourhood.

“At any “T” junction (e.g., Figure 7), there is supposed to be zebra crossing/pedestrian crossing enable people to cross the road without being knocked down by a moving vehicle.” (Ms. Oluchi).

“There are no crosswalks in Festac. Most pedestrians, older persons inclusive, find it highly risky trying to cross the busy roads.” (Ms. Christianah).

“Pedestrian crosswalk absent. No speed bumps or other traffic control measures to manage the intersections” (Ms. Sandra).

“...At the end of this road (Road 32) is a junction (an intersection) where vehicles meet, and when they get to the junction, they must be very careful to avoid accidents because

there are no traffic lights controlling the traffic; showing when people should stop, yield or move, in order to avoid accidents; the road users use the intersection disorderly.

Traffic light is highly essential for the junction.” (Pa. Oladipo).



Figure 8: Photo showing a ditch and refuse dump along a pedestrian walkway.

“This (Figure 8) has been made into a refuse dumpsite which is not supposed to be. This is a pedestrian walkway. You can also find a ditch there which makes it unsafe for pedestrians to walk and hence not good.” (Mr. Adetunji).

The citizen scientists identified various concerns about the poor state of the pedestrian or traffic facilities in places where they were present and about the total absence of such facilities in other areas of the neighbourhood. In addition, a few of the citizen scientists had personally experienced hazards presented by some of the negative features highlighted, while many knew of older persons (directly or indirectly) that had had similar negative experiences while utilizing these facilities. Further photos and commentaries were indicative of these as documented below:



Figure 9: Picture showing an unsafe pedestrian walkway.

“This is bad (Figure 9). With this on the road, you can get people injured. This is a road passed by “thousands” of persons in a day. This is not safe enough. The council ought to have done what is needful of this to remove it.” (Mr. Adetunji).



Figure 10: Participant indicating a tripping hazard along the pedestrian walkway.

“Tripping hazards on the walkways (Figure 10). After the major fall I had about two years ago, during a neighbourhood walk I was on and which resulted in me getting hospitalized for days. I have stayed away from walking major walkways due to the fall hazards they present with. I would love to walk around again but I feel safer walking in familiar vicinities where I am aware of the likely hazards” (Florence).

4.3.2 Environment Aesthetics (Green and Beautiful or Dirty)

Facilitators. Many of the participants reported that the aesthetic qualities of their neighbourhood environment were features that enhanced older adults' participation in PA. The qualities of the landscape - artificial or natural, the cleanliness of the layouts, and the maintenance of the aesthetic features that appealed to them were highlighted by these comments:



Figure 11: Picture depicting green and beautiful aspect of the neighbourhood.



Figure 12: Picture captured by Pa. George identifying the presence of trees and other green as an enabling feature of the environment for PA.

“People do not know the value of why there should be green beds and trees (Figure 11 and 12) around them. The purpose is to give you oxygen. When you breathe out carbon dioxide, the greens around you give you oxygen. We always like to destroy green beds and trees around us because we feel like that oh, it is creating a big block for us or why we believe if the leaves fall and I have to sweep every day, yet it is good for us to sweep every day, and it is good the tree is there so that it is part of the life. If you get to my house, I have an orange tree. In fact, there were two before, because one of them was destroying my wall so I removed it and left one there. You will see so many weeds like these and other things, but they are good things which I am using to make sure the life there is breezy, whether there is fan or no fan, when I come out in the sun I sit under that tree, so those are things why trees and greens are necessary around us.” (Pa. George).

“This is a very big tree shade where an older person can have a break or relax after taking a walk or exercise. They can relax under it.” (Mr. Adetunji).



Figure 13: Picture showing a neat aspect of the Festac neighbourhood.

“If everywhere can be as neat as this (Figure 13), and well cared for, it will be a very healthy living place (environment) for everyone.” (Lady Susan).



Figure 14: Picture showing green and beautiful environment.

“One of the advantages is sightseeing. When you are walking around, you can see nice places like gardens, flowers with nice fragrances and you can even move around the place and enjoy yourself. So, I think this is one of those places - as you can see these flowers here now, not only at this place but at so many places around the neighbourhood where you will see some garden which you will like” (Pa Timothy) (Figure 14).



Figure 15: Picture showing green and beautiful environment.

“Psychological and mental benefit of leisure and exercise walking around beautiful and green environments (Figure 15). When you move round you will see nice things like flower garden where one can walk around there and relax and you will feel the smelling, the fragrance nice fragrance of the flower, it is another thing that is good for one health.” (Pa. Timothy).

On the other hand, negative qualities of this feature were described and emergent as subthemes of barriers of PA participation in the neighbourhood. Commentaries reflecting these included:

“This is a bus stop and litters ought not to be there. It should not be a dumping area. It is meant for humans to be at their bus. It is not fine; something has to be done to improve the living.” (Pa. Ayodeji).



Figure 16: Picture identifying dilapidated built environment taken by Lady Susan.

“This is another road (Figure 16). When it was initially built, it had distinct pedestrian way and motorist way but today, the road has been overtaken by weeds, all sorts of garbage and trash, and flood, smelling (stink), full of mosquitoes and flies. It is very closer to people’s houses (residence) such that even when you sleep the mosquitoes will

not let you sleep well. This affects one's motivation (for you) to get up in the morning and be healthy and to take one's walk. One feels very weak because whenever you do not sleep well, you cannot get up healthy for activities, which is another challenge. Big one indeed." (Lady Susan).



Figure 17: Pictures of pedestrian walkways overtaken by bushes and garbage captured by Mr. Adetunji and Mr. Festus.

“This is a pedestrian walkway being bushy (Figure 17). It ought to have been cleared, inclusive of the garbage around, but this was abandoned. It is not good enough.” (Mr. Adetunji).



Figure 18: Roadside containers for commercial purposes or illegal residence.

"We cleared 1681 containers in Festac. in fact, there are some people if they see me, they will almost stone me, because of the containers we caused the federal government to remove; we had set up a task force and all those containers were removed. So, when they were removing it, some people removed it themselves, but some waited for the task force to remove them and then we disposed them to a plant that cuts iron at Epe. So if we had not removed 1681 then by now we cannot have any place to pass in Festac, all these places were occupied with containers, this is a new one (Figure 18) that was made recently and somebody brought it there, but I am sure if the new president of FTTRA has been proactive, he shouldn't take all these, because there is an old man who came to me

after the exercise, he said “Ah, I thank you, he said because the ‘boys’ who stayed in a container behind his block of flats will smoke Indian hemp and blow the smoke into his room and he is almost dying, the man was about 89 at that time, I don’t know whether he is still alive now, he took his walking cane and came to me to thank me. "Thank you for what you have done, you did a very big exercise" he said. All these dirty things at that time would not have been there when [] the chairman of the local government was there. All this green you see planted around was planted by []. The degraded state that you are just seeing, [] does not allow it to get to the level of such bad state. All these are what he planted green trees but unfortunately those who took over did not do it." (Pa George).

“These are junks which are not supposed to be on the walkway because once they are there, they don’t allow people free walking. People are to walk freely on the walkway, when it was created, it was not for trading but now, we have turned it for trading.

Automatically, we are creating a hazard for people and if somebody who is supposed to use the walkway avoids the traders and walk on the motor way and get knocked down, they might lose a limb or their life.” (Pa George).

4.3.3 Multigenerational Community Features (e.g., Recreation and Relaxation Parks)

Participants identified the presence of certain community features such as sports and recreation parks as a key determinant of their willingness to go engage in outdoor activities that would involve PA. They discussed that many of these features provide them beneficial opportunities to interact with others, and engage in intergenerational activities. Furthermore, there were also avenues to host and or attend physical and health education programmes.



Figure 19: Multigenerational community feature commonly captured by the participants.

Commentaries reporting these were narrated as:

“I usually come for jogging here (Figure 19) and walking so when I come like this, I use to walk round the field like at times (4) four times and I used to do it (8) eight times at times it depends on how I feel in doing it, but I don’t need to run, I just need to walk.” (Mr. Timothy).

“The sport ground here (Figure 19) provided by the Federal Housing Authority for people to relax, exercise and do various practices. You can see they sell sportswear somewhere over there. If we had come earlier on you would see those jogging, running around and so on. Various activities take place here, this is where we relax, and it is very useful. It is very valuable to the community. We would love to see some improvements; to have it better organized. By and large, it is better than nothing.” (Ms. Sandra).



Figure 20: Picture showing the Victory Park on Road 206, the only currently commonly available recreation park in Festac neighbourhood.

“The route leads to 206. This is Church Avenue that leads to 206 Park where we usually have our group exercises.” (Mr. Adetunji).

On the other hand, participants identified the rapid decline in recent years of these community features. This phenomenon had caused individuals to lose access to these community facilities and features.

Some of the commentaries as the citizen scientists recorded:

“There is a place a quite far away from here where we were stopped visiting. The place is along 202 road, off 2nd Avenue. We used to have a recreation and relaxation centre there where we engage in varieties of activities. We go there since 1978, but in the year 2002, we were told not to come there again. Because the area had been acquired by two commercial banks. These commercial banks are the one occupying. It used to be a recreation and relaxation centre, where people would go and leave there at times 9 pm, 10 pm to return home. At a stage, we were asked not to come there again after the banks acquired and built there. I used to walk down to the place back then but that is no longer the case.” (Mr. Johnson).

“Most designated public recreation places have been acquired for private use. There should be laws preventing this. There are hardly any recreation facilities left behind in the community. Perhaps, non-functional facilities or new areas can be made available.” (Ms. Janet).

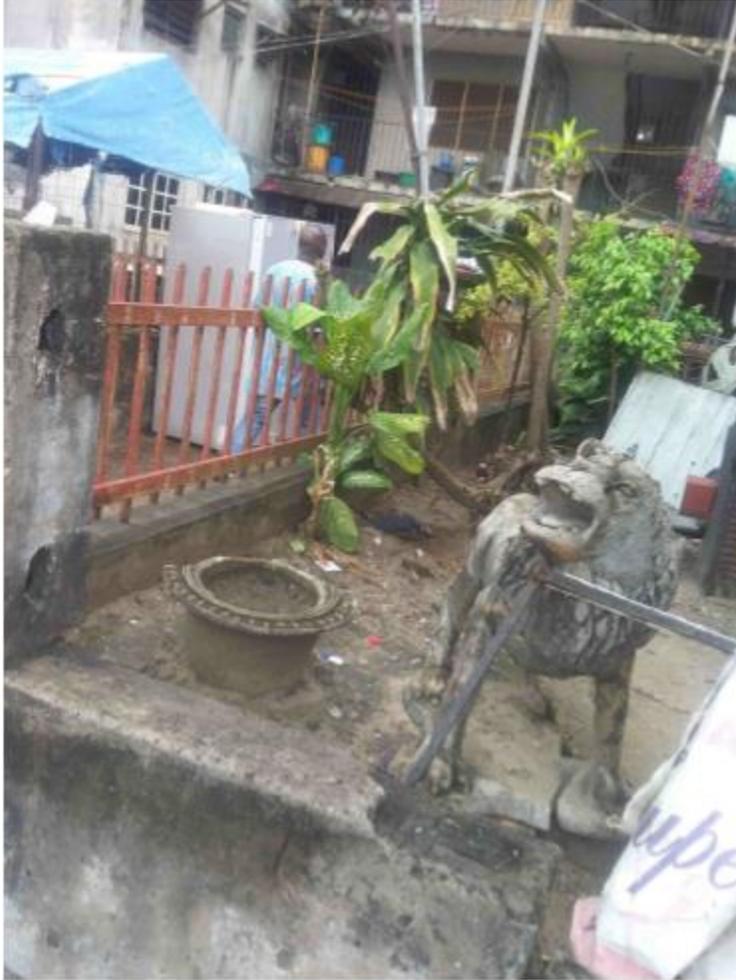


Figure 21: Photo of open public space in misuse.

“Open space initially designed for relaxation converted into a junk dumping site (Figure 21)” (Ms. Oluchi).

“Along this 321 Road (Figure 22), we used to have a place where we go to play table tennis and a particular game I am trying to recall. At times also, we stay there together, to meet each other (our brothers and sisters) to play football (soccer). There is a field there, we would go there almost every day, though quite far. However, at a point in time, we were told that someone had bought the land, and the land was used to have a building for private residential purpose.” (Mr. Johnson).



Figure 22: Road leading to a pre-existing destination of interest.

4.3.4 Social Connectivity

Platforms and activities that bring about social connectedness in the community were identified as supporting determinants to increasing levels of participation in related PA. The citizen scientists identified certain community features that encourage their capacity to socialize and invariably encourages their need to get outdoor to interact with each other. Community engagement activities, non-governmental organizational involvement, faith-based activities provide a social focus and enhance residents' perceptions of their neighbourhood environment for PA participation. Some of the commentaries included:

“The Festac Town Resident Association (FTRA) is a strong body. They do their best to call attention to the laxities in the management of the community in terms of security, environmental degradation/deterioration. They hold monthly meetings. There are about 10 or more communities. They hold meetings at each community level and at the general level. They are able to curb environmental abuse especially if they receive a report/complaint from the residents. However, if there is no report, they would not take any action, but once they receive a report, they take it up” (Mr. Festus).

“Look! What do you find over there? You can see how lovely the garden (Figure 23) is and how protected this is. This must have been the effort of the residents living in this immediate community.” (Mr. Festus).



Figure 23: Photo showing reflecting the influence of community efforts.

“I took this photograph [Figure 24] to identify some of the places where I go for daily activities. I am a member of different groups in my church. I also visit the church regularly for prayer activities. I usually walk down from my house to the church which is a few kilometres away.” (Ms. Christianah).



Figure 24: Abstract picture reflecting places of social and religious gatherings.

During the discussion, the citizen scientists had a consensus regarding the various community organizations such as the Boy Scouts, and the Festac Town Resident Associations,

Rotary Clubs, indicating that older adults continually get engaged either as active participants or active alumni of these organization making valuable contributions to the society. These organizations also provide the platform for them to get engaged in various PA through their participation. Similarly, group exercise was identified as creating important opportunities for social connection and interaction among older adults. Disease prevention, meeting new people, creating new friendships, creating networks for work or business opportunities, and sharing of relevant information were benefits that were identified from being engaged in group exercises. Further commentaries identifying the presence of these social platforms are highlighted below:

“I still live there now and we were enjoying the recreation things (recreation centre) then, because if at all you have a visitor, you can go and sit down and enjoy your discussion with your visitor and then go back home but things like that are not available again.

Elders (older persons) hardly find places where they can play game, relax, because these are the things that can be keeping elders living well but thank God for COWAP, we have an organization in FESTAC town that is referred to as COWAP where elders gather themselves on their own i.e., it is a voluntary arrangement. So, for these elders, they go around occasionally to do exercises, maybe monthly or bi-monthly. They give time for themselves and they do some exercises, they walk from a particular place to another place and at the end they assemble in an open place to do little exercises and exchange their ideas about what they feel about the trek, what they feel about moving together and if they are encouraged, they say it and we thank God that such is getting more recognized because members are coming to join such a group which I think is of good benefit to the elders in my environment and I belong to that group and I am happy that I belong to that group...” (Ms. Christianah)

“...Around Festac town, we have a recreational garden on Road 206 where we go occasionally, about once or twice a month, we gather and sit there to talk, drink and merry. Both men and women, we gather there to socialize. We return home at around 7 pm after getting there in the earlier hours of the evening. It is a place where we go to relax. You can access the place at any time and day of the week, but you cannot enjoy the place if you do not have anyone to accompany you, but we have specific days when we all meet, that is Saturdays and Wednesdays in the evening. I would say we are making efforts to ensure this place sustainable and not acquired for private and commercial use. We have put in place structures such as chairs, tables and even have someone there permanently to provide services whenever people come there” (Mr. Adetunji)

“Fitness walk has its own advantages. Some of the advantages are (1) it promote good health for the young and the old alike. When one performs exercises, the health would improve its even cure some ailments, some sicknesses that may occur to somebody can be averted by doing exercises. (2) You can do exercises and you meet with new friends. When we meet with people there are so many advantages, if you meet with new friends you will get new ideas maybe there is any important thing you can introduce which can be of advantage to you.” (Pa. Timothy)

4.3.5 Safety/Security

Safety and security concerns were raised as factors determining whether older adults get to participate in PA in the Festac neighbourhood. The safe location of desirable service centres and destinations were considered as a facilitator to moving outdoors to access and utilize them.

Similarly, participants identified that having certain sensitive service destinations such as ATM situated in open and accessible places was an encouragement to move out to use such.

“This is an ATM conveniently situated by the side of the road. It is easy for an older person to easily access and use to make transactions. This is very good.” (Mr. Adetunji)

“Minor roads and streets are usually safer due to less traffic and better speed control measures and offer avenue for better outdoor engagement in physical activities.” (Ms. Janet)

On the other hand, personal experiences and reported cases of unsafe situations, vandalism, possible criminal hideouts were a deterrent to increasing PA participation in certain parts of the neighbourhood.

“Fear of bandits. That day at 6 am, I decided I should take a walk because I had a wedding for 9 am I wanted to have a quick walk before preparing for the wedding outing. As I was walking at that time (6 am), they nearly attacked me, because I was carrying my bag, perhaps they thought I had money and other valuables in it. Suddenly, another man who lived in the neighbourhood appeared, and I began to hear the guys salute him “twale, twale” (twale means respect). Eventually, I had to give each of them about 100 Naira before I could move on. So, that fear of uncertainty about safety usually gets to me. That is the reason why I really like the new initiative to move in a group, at least we have company, and you feel safe because that day, I was alone in the dark. 6 am could be a dark period of the day. (Lady Susan)

“...Another thing in that area, was that ‘gangsters’ and ‘unruly’ commercial motorcyclist would congregate there at a particular hotel there, where they create social disorder

eating, dancing, shouting and doing all manner of stuffs, and at a point in time, the police had to come to arrest them, and I was coincidentally at the scene on that day, but fortunately because the policeman knew my identify and background, they did not arrest me but cautioned me to leave the area and avoid the place. They however arrested those other fellows gathered there and took them to police station. At a stage, the next day, I had to go there to plead on behalf of these persons and they were released. Therefore, since that time, I have not been bothering myself or interested to go out and relax (recreate) somewhere in the evening, I will stay at home to rest, but I have some neighbours who are almost of the same age, we will sit down together to rest and recreate.” (Mr. Johnson)



Figure 25: Photo showing an unsafe portion of the neighbourhood.

“This (Figure 25) is a big road, having even the pedestrian path over-flooded and filled with trash, and all sorts of garbage you can think of on earth. Thus, cutting off the area for a comfortable walk for older persons. Even youths or adults can never use this area. And that is why when one attempts to use the alternative access, that is, the other side of the road, you are exposed to the touts attacking you at any time especially at the early hours of the morning or late evenings when you are trying to do your walk and/or get back home. At times (if you may need

to take evening walks e.g., by 7:30 pm for a walk to return back by 8:30 pm, to relax and to takes one’s bath before going to bed but one gets deterred (as a result) due to the large numbers of the touts on the alternative route taking advantage of the restricted access on the bad road” (Lady Susan)



Figure 26: Photo of area described by participants as a concern for security and safety.

“A recreational spot (Figure 26) but which is highly prone to the occurrence of violence and crime.” (Ms. Oluchi)

Another participant also expressed concerns for safety by choosing to remain only in familiar vicinities.

“I feel safer walking in familiar vicinities such as my neighbourhood close and around the local car park where there are controlled traffic measures and where I

am aware of the likely hazards. One of the likely hazards is uneven surfaces of the walkway.” (Florence)

4.3.6 Infrastructure

Some participants opined that coping with the menace and stress of the infrastructural decline or abuse of the city’s infrastructure had contributed to them losing interest in other important endeavours such as having the time or motivation to engage in PA. Some of these (Figure 25, 27, 28), they reckoned were contributory factors to hazardous and unsafe environment earlier reported.



Figure 27: Photo of a degraded road and underlying drainage.

“Firstly, this is a health hazard, secondly, it is disturbing to anyone going for a walk. It is also an eye sore. Such creates obstruction on the roads. That is why I go about with a walking stick. Otherwise, I may find it difficult to navigate that environment. I ordinarily do not need a walking stick but as I have come to realized, the roads are uneven, there are ups and downs all along the route. In fact, the walking stick came into use after I had a flat fall. So, I have decided to go outdoor with it, but I do not ordinarily need it around or inside my house.” (Mr. Festus)



Figure 28: Picture of walkway cut off by a large ditch and a huge concrete object.

“This walkway leading up to Road 23 has been completely cut off. There is no covering for the huge ditch cutting across it. It is a high risk or major hazard to pedestrians and cyclists utilizing the pathway, older persons inclusive.” (Mr. Festus)

“When I ride my bicycle, I cut through this path. I also take the main road, but I began to cut through this shortcut when the road became bad. This is what I mentioned about the walkway getting blocked. This is the market zone.” (Mr. Festus)

4.3.7 Public Toilet

Whilst the participants had considered in general the infrastructural decline as a deterring factor to their participation in PA; they singled out the fact that there was no public toilet facilities at any public destination in the city either for the residents or for visitors to the community. This they reckoned was a factor they considered whenever they needed to plan or engage in outdoor activities. Some of the participants reported that they either limit the duration to spend outdoors or avoid eating or drinking for sustained periods.

As two citizen scientists put it:

“Most individual residing here have their private toilets, some may even have like two to three and the houses are so close to each other but not withstanding I think that there should be a provision of public toilet (washrooms) facilities especially for those who do not reside here, those on tours or visits, even for residents who might find themselves far away from home, to have access to toilet facilities. This is to avoid the messing up of the place and these persons can find places to relieve themselves. However, I do not know if any of such facility is available here.” (Ms. Christianah)

“If there is need for me to empty my bladder of any point along the course of my walk, I am unable to do so because there is no facility. So, I avoid taking water before my walk and so far, I have been able to do the whole 45 mins walk without having to use the toilet. I don’t carry water around either, I only get to do my water therapy when I return home.” (Mr. Festus)

4.3.8 Stigmatization based on Age (Ageism)

Some of the citizen scientists opined during the focus group discussion that certain traditional beliefs and negative stereotypes of aging such as permeated by the media industry especially the movie and advertising has been contributory to the stigmatization of older persons. This age-related stigma undermines the continued valuable contributions by older persons to the community and may limit the participation levels of older persons. They reiterated that they were active participants and active alumni of various community organizations such as the Boy Scouts, Festac Town Resident Associations, and Rotary Clubs. They spoke of their various engagement in making valuable contributions to the society and invariably getting physically active through these participations (see Table 5). One of the citizen scientists documented on the worksheet:

“Stigmatization of older persons as witches or witchcraft practitioners should be discouraged. Older persons should be recognized for their valuable contributions to the community.” (Lady Susan)

4.4 Ideas for Continuation/Expansion of Facilitators.

As part of the ‘Discuss’ phase, the citizen scientists expanded on the relevance of the facilitators and brainstormed ideas for their continuation or expansion. Table 5 below highlights the ideas and their relevance. These focused on the prioritized facilitators i.e., social connectivity, pedestrian and traffic facilities, and green and beautiful environments.

Table 5. Physical Activity Facilitators and Ideas for Continuation/Expansion

Facilitator	What is important about this for Physical Activity?	How can it be expanded/used in other areas?
<p>Pedestrian and Traffic Facilities (Available, Neat, Safe, and Senior Friendly) (Note: this community aspect was well documented by most of the citizen scientists)</p>		
<ul style="list-style-type: none"> • Walkways 	<ul style="list-style-type: none"> • Encourages smooth walks for young and old • Encourages bicycle riding • Demarcate other traffic • Routes to parks and other desirable destinations 	<ul style="list-style-type: none"> • Promote the maintenance and repairs of the sidewalks • Keep sidewalks and walkways free of obstructions or hazards • Creation of more pathways • Fixing of potholes on the ways • Walkways should not be overtaken by street trading,

<ul style="list-style-type: none"> • Can use the sidewalks to access desirable destinations of daily activities and interests • Desirability of use • Psychological effect • Prevents injuries or accidents from happening 	<ul style="list-style-type: none"> • Fixing of bad roads • Abolish trading and wares on the walkways • Keep walkways clean • Ensure cleaner walkways
<p>Considers joint use by older persons and individuals of other age groups in the community</p>	<ul style="list-style-type: none"> • Keep Festac Clean community initiatives • Provision of public bins • Keep sidewalks and walkways free of obstructions or hazards • Prompt removal of hazardous materials • Prompt repairs

- **Roads**

- Demarcate other traffic
- Encourage other road users (motorists and motor cyclists) not to encroach on pedestrian ways
- Road safety
- Provides route and access to desirable destinations – markets, stores, places of worship, recreation centres, etc.

- Same as above, where applicable.

- **Traffic Lights**

- Ensure road user safety
- Helps prevent road accidents/deaths

- Installing traffic lights will improve road usage to promote road and pedestrian safety

Green and Beautiful

Environment (Note: this community aspect was well documented by most of the citizen scientists)

-
- | | |
|---|--|
| <ul style="list-style-type: none">• Enable location to be active;• Makes location desirable• Provides serene and mood enhancing atmospheres• Gives off pleasant fragrances enjoyable during outdoor activities | <ul style="list-style-type: none">• Recreation and relaxation parks and garden beautification -Victory Park 206.• Need more access for people to use it so that it is not lost• Need to advocate for and mediate with local community owner – residential association of Road 206 to allow further provision of trees at the park• Encourage more planting and garden restoration |
|---|--|
-

-
- Engage community corporate or business organization in more community beautification as a recognized endeavor of corporate social responsibility

-
- Beautifies area
 - Provides shade from hot sun
 - Provides shade for short relaxation during outdoor walks
 - Fresh air
 - Serve as windbreakers
 - Provides bird watching activities
- Community resident association replant dead tree areas
 - Local government to plant trees in available locations
 - Regulate cutting of trees

-
- More beautiful to walk around neighbourhood
- Encourage proper waste management practices
 - Provide public bins
 - Public enlightenment and community initiative on keeping the environment clean

-
- Opportunities to provide education to young ones
-

-
- Opportunities to interact with younger ones

-
- | | |
|--|--|
| <ul style="list-style-type: none">• Health effect of exercises | <ul style="list-style-type: none">• Provide more support; |
| <ul style="list-style-type: none">• Aging gracefully | <ul style="list-style-type: none">• Encourage more health talks/education programmes |
| <ul style="list-style-type: none">• Posture maintenance | <ul style="list-style-type: none">• Encourage more older persons to participate |
-

-
- Recreation locations
 - Group fitness activities and aerobics
 - Desirable place of destination for recreation, relaxation and group activities
 - Bimonthly aerobics – Community Walk of older person’s
 - Used by persons of all ages, encourages the inter-relation between young and older persons
 - Serve as safe destinations for kids play (children, grandchildren, etc.)
 - Need to mediate with local community owner – residential association of Road 206 to allow further provision of recreational facilities such as outdoor exercise equipment and games facilities (e.g., table tennis, draft, at the park)
 - More recovery of park lands and development
 - Should be improved
 - Maintained to enable older persons makes of it for light exercises and relaxations
 - Chanties and wastes therein cleared off
 - Engage park owners in park development
-

-
- Bimonthly aerobics – Community Walk of older persons
 - Social inclusion of older persons
 - Social interaction
 - Breaks social restriction and motivates older people to being active
 - Health promotion
 - Continuous support and recognition of the walk by relevant stakeholders – Red Cross, Legion, Neighbourhood security agencies, private organizations, local government authorities.
 - Encourage more member participation
 - Walk route should be cleared and recognized

Social Connectivity

- Keeping people active, helps to encourage older adults' outdoor activities
 - Gives focus to older person's issues
 - Promotes social wellbeing
 - Joint or community exercise
 - Provide more support and recognition to such groups
 - More community associations to be formed and provided
 - Organize more activities, sport and games programs for older adults
-

-
- Enables opportunities for social network and companionship
 - Promotes joint activities (e.g., aerobics, dance events, group leisure walks)
 - Physical health education
 - Provides opportunities for group religious activities

Safety

-
- | | |
|------------------------------|--------------------------------------|
| • Open location | • More safe community destinations |
| • Deter robbery | and service centre locations choices |
| • Provides sense of security | for everyone |
-

4.5 Ideas for Change to Barriers

Furthermore, the citizen scientists reviewed the identified barriers, brainstormed on ideas needed for changes to them while also identifying the relevance of the change. These priority changes focused on the theme of pedestrian and traffic facilities, dirty environment, infrastructure, sport and recreation parks/facilities, stigmatization based on age (ageism), public toilet and security. These are highlighted in Table 6 below.

Table 6. Physical Activity Barriers and Ideas for Change

Barrier	What is the change that needs to be made to address this barrier?	Why is it important for the community to make this change (i.e., what difference will it make?)
Pedestrian and Traffic		
<p>Facilities (Note: this community aspect was well documented by most of the citizen scientists)</p>	<ul style="list-style-type: none"> • Provision of traffic lights and streetlights • Restoration of faulty traffic and streetlight facilities • Provision of pedestrian crossings and speed bumps at major road junctions (intersections) • Enforce traffic laws 	<ul style="list-style-type: none"> • Can safely use the roads and walkways/sidewalks to access desirable destination of daily activities and interests • Prevents road users' accidents/deaths

-
- Discourage indiscriminate road use by commercial vehicle operators, they should use only designated bus stops
 - Discourage street trading, indiscriminate parking of vehicles and refuse
 - Traffic warden availability
 - Roads need to be repaired with quality materials
- Installing traffic lights will improve road usage to promote road and pedestrian safety

-
- Relocation of illegal users to proper sites/locations
 - Repairs of walkways
- Encourages safe and comfortable walks and related physical activities
 - Promotes healthy living
 - Confers positive psychological effect

Dirty Environment (Note:
this community aspect was
well documented by most of
the citizen scientists)

-
- Replacement of vandalized properties (e.g., drainage holes)
 - Good maintenance culture
 - Security guards
 - Mobilize joint community cleanliness initiatives (e.g., Keep Festac Clean Initiatives by the community resident association)
 - Removal of shanties and dangerous hideouts
 - Encourage proper waste management practices
 - Provide public bins
 - Public enlightenment and community initiative on keeping the environment clean
 - Need to advocate for and mediate with relevant government environmental agencies
- Cleaner and more beautiful to walk around neighbourhood
 - Confers positive psychological effect
-

-
- Engage community corporate or business organization in more community beautification as a recognized endeavour of corporate social responsibility
-

Infrastructure

- Rehabilitation/repairs of existing facilities
 - Encourage good maintenance culture
-

Sport and Recreation

Parks/Facilities (e.g., for intergenerational activities)

- Need to mediate with local community owner – residential association of Road 206 to allow further provision of recreational facilities such as outdoor exercise equipment and games facilities (e.g., table tennis, draughts) at the park
 - Provides encouragement for senior to exercise
 - Provides opportunities to engage in sporting and recreational activities, group fitness activities and aerobics
-

-
- Legislative laws and community efforts to protect and preserve existing ones and avoid extinction of the remaining few
 - Provision of public parks and recreation grounds – if possible
 - Provides opportunities to provide education to young ones
 - Provides opportunities to interact with younger ones
 - Health effect of exercises
 - Promotes aging gracefully
 - Enhances social connectivity and interaction of older persons

Stigmatization based on Age

(Ageism)

-
- Stigmatization of older persons as witches or witchcraft practitioners should be discouraged
 - Older persons should be recognized for their valuable contributions to the community
 - Older persons would be recognized for their valuable contributions to the community
 - Will promote social participation of older persons and more positive
-

contributions by older persons to
the community

Public Toilet

- Provision of mobile public toilet
 - Provide environmental sanitation for public health
-

Security

- Replacement of vandalized properties (e.g., drainage holes)
 - Good maintenance culture
 - Security guards
 - Regular community meetings
 - Removal of shanties and criminal hideouts
 - Promote group/community exercise activities organized by community organization such as Community Organization for the Welfare of Aged Persons (COWAP)
 - Safer and good community/neighbourhood
 - Security restored
 - Freer walks
 - Peaceful environment
-

4.6. Priorities for Change, Advocacy and Knowledge Translation

During the discussion phase, the three issues prioritized by the citizen scientists to advocate for were: social connectivity, pedestrian, and traffic facilities, green and beautiful or environment. The citizen scientist group further identified stakeholders and community resources relevant to the advocacy of these priorities. There were additional suggestions made by the group on the supplementary forms the community meeting or findings dissemination should take. These included radio media coverage and broadcasting of the findings, a feature story in local news publication, or a bulletin interview. All these were considered in the light of the logistical challenges required to host a community meeting with all identified stakeholders present.

The identified stakeholders included the Mayor (Chairman) of the Amuwo-Odofin Local Government Area, executives of relevant environmental agencies of the local government council, executives of the Festac Town resident Association, executives of the community development committee, and executives of the COWAP (Festac and National executives). Some of the stakeholders were met by members of the group on one-on-one basis, while others attended the public presentation organized by the group.

The citizen scientists nominated two participants to present their priority findings to the stakeholders at the community meeting and to lead the advocacy for change process. The citizen scientists had a power-point presentation (Appendix L) highlighting the research overview and priority areas in their findings. The community meeting, which was held on October 29, 2019, was hosted at the city hall provided by the generosity of the Mayor. There were about 50 persons in attendance, the group also had a bulletin (Appendix M) of the priorities published and distributed to those in attendance as well as to the identified relevant stakeholders in the community.

In addition to the community stakeholder meeting, delegates from the citizen scientists' group in collaboration with the community NGO for older persons had private consultations with the Mayor of the local government area and had plans to meet with additional specific agencies such as the environmental task force of the Amuwo-Odofin local government area. This set the precedence for a continuous engagement between citizen scientists, community advocacy groups and other identified stakeholders in disseminating the findings. This will foster collaborative dialogue and build on existing advocacy process that will lead to the implementation of relevant solutions for the promotion of PA for older persons in the community. This latter aspect of community engagement for change implementation was not specifically studied, and so is beyond the scope of this project.

Chapter 5: DISCUSSION

This study established the feasibility of adopting the “Our Voice” community-engaged “citizen science” approach (King et al., 2020; King, Winter, et al., 2016) in a Nigerian community. An inclusive and enabling neighbourhood environment is pertinent to how older adults engage with their environment in ways that are influential on their level of participation in PA, and which are vital to their healthy aging. Features of the neighbourhood environment can facilitate older adults’ PA, enable them to access services, and provide opportunities or platforms to be active and engage in their neighbourhood environments regularly (Chaudhury et al., 2016; M. Moran et al., 2014; van Cauwenberg et al., 2012; Yoo & Kim, 2017b). In line with the vision outlined in the WHO *Global Strategy and Action Plan on Ageing and Health* (World Health Organisation, 2017; World Health Organization, 2015d) as well as in the *Sustainable Development Agenda* (United Nations, 2015a), creating a healthy, active community was a desirable outcome that was supported by older adults and relevant stakeholders in this study.

This study represents a novel adoption of spatial qualitative methods to assess the effect of the neighbourhood environment on PA in an urban environment in Nigeria, a region less studied in the neighbourhood environmental health field, particularly among older adults. The present study supports the feasibility of using the Our Voice Citizen Science framework and the DT for the first time in this community, revealing that citizen scientists can assess and make recommendations about their neighbourhood environment for features that facilitate or hinder their participation in PA or access to it.

This study demonstrated that it was possible to have older adults make recommendations towards changes in the neighbourhood (King et al., 2020; Tuckett, Banchoff, et al., 2018; Tuckett, Freeman, et al., 2018). The citizen scientists were encouraged to see that they could

systematically capture data about issues impacting their levels of PA engagement in their community and make evidence-based advocacy concerning them.

5.1 Physical Activity Engagement

Citizen scientists who participated in this study were already actively engaged in PA or had the propensity to being engaged in PA. This was revealed by the broad array of contextually relevant activities identified by the research group. There were also self-reported activity levels revealing that many of the participants endeavour to meet recommended levels of PA.

Documentation by the citizen scientists revealed older adults in the community engaged in PA by participating in active transport and leisure walks, structured exercise, sports, house chores, cultural or social activities, and in occupational or work activities. The group identified the diverse opportunities and platforms available for older adults in the community to be physically active. Furthermore, they identified an active health promotion group that has increased the awareness of the importance of PA to the community. On the other hand, they identified different barriers in the neighbourhood environment that may deter them from easily attaining desirable levels of engagement in PA despite their motivation and knowledge of the benefits of PA to them.

5.2 Demographic Characteristics and Health Ratings

The participants were recruited to ensure gender, socioeconomic, and sociocultural diversity to provide an extensive view of the research topic. The demographic pattern revealed that most of the participants were educated and there was equal participation of those who identified as men or women. It can be reasonably assumed that despite the diversity in the demographical characteristics of the citizen scientists, features of the neighbourhood environment that were identified by the citizen scientists might not necessarily differ when it

concerns PAs. On the other hand, these findings might be attributed to the relatively limited sample size in this study, and thus future research on larger samples is needed to address this issue. Similar findings were reported in a DT study conducted in Israel involving limited sample size of older adults in a multicultural setting where older adults from diverse demographical backgrounds did not differ in views concerning their PA engagement in their neighbourhood environment (Moran et al., 2017). Further study might be required to explore gender and socio-cultural diversity and PA amongst older adults in this community.

The study findings also revealed most of the participants had positive perceptions of their self-rated health levels. This suggests that there might be relations between self-reported health ratings and perception of self-efficacy and the high level of self-reported PA engagement among this population. Further study is required to explore this relationship in greater detail.

5.3 Facilitators and Barriers

Enabling features of the Festac neighbourhood environment cut across the different aspects of the built and social environment. Themes such as the impact of the green and beautiful environment and dirty environment (environmental aesthetics), multigenerational community features (e.g. recreation and relaxation parks), social connectivity, safety and security, infrastructure, sport and recreation parks/facilities (e.g., for intergenerational activities), stigmatization based on age (ageism), infrastructure and public toilet resonated with similar findings exploring the impact of the environment on PA levels of older adults (M. Levasseur et al., 2015; M. Moran et al., 2014; Salvo et al., 2018; Tuckett, Freeman, et al., 2018; van Cauwenberg et al., 2014; Yarmohammadi et al., 2019). These themes are further corroborated by similar comparable descriptions identified in other Our Voice studies in other LMICs such as in Mexico (Rosas et al., 2016), South-Africa (Odunitan-Wayas et al., 2020) as well as in other

comparable low socioeconomic resourced neighbourhoods in high-income countries such as the United States (Buman et al., 2013; Seguin et al., 2015; Winter et al., 2014) and Israel (M. Moran et al., 2017). The themes were however described in the specific context relevant to the Festac neighbourhood designs, transportation designs, as well as to the governance, social, cultural, and religious institutions of the local community.

The findings from this study not only exemplify the individual presence or absence of the neighbourhood environmental features but also their interconnectedness as indicated by the subthemes. Pedestrian and traffic facilities were related to maintaining social connectivity. Personal and traffic safety were related to environmental aesthetics and invariably to the potential to utilize available environmental spaces for continued and sustained PA engagement. Attributes of the neighbourhood appearances and aesthetics were among the determinants older adults in this community considered to promote their outdoor participation in PA. Findings regarding the availability, accessibility, safety, and desirability of the public space in a contextual understanding revealed Festac-dwelling older adults would consider these features when engaging in daily activities. These public spaces are the settings wherein they perform their active transportation or leisure walks, and serve as destinations where they go for leisure or to access services, and it is a part of the route they use to reach various destinations of interest.

5.4 The Prioritization Process

From the prioritization process, findings revealed that older adults prioritized pedestrian and traffic facilities that encourage various forms of transportation (utilitarian or leisure), accessibility to desirable locations, and enhance social interaction. They also prioritized environmental spaces and aesthetics that enhance positive perception to utilize the spaces, promote social interaction, promote intergenerational activities, and enhances personal

engagement in PA. Lastly, platforms and activities that enhance social connectivity were regarded as the third priority. Social connectivity was a theme that resonated across all three priorities; hence it received the highest rating of importance. This inter-relatedness of PA and the social aspect of the neighbourhood environment is corroborated by findings from the studies across the globe (Cao et al., 2019; Kepper et al., 2019; M. Levasseur et al., 2015; M. Moran et al., 2014; Salvo et al., 2018; van Cauwenberg et al., 2012; Yarmohammadi et al., 2019). It also further establishes the need to improve our understanding of the impact of contextually relevant determinants or constructs of the neighbourhood social environment on PA as reported in a systematic scoping review of studies investigating the association of the neighbourhood social environment on PA (Kepper et al., 2019). Kepper et al (2019) identified that the measures and construct of the importance of the neighbourhood social environment in relation to physical activity were diverse and often interconnected.

5.4.1 Social Connectivity

Outcomes of this study suggest that the frequency of social interaction and connectivity including certain levels of civic participation mediated by local community groups and organizations may be motivating factors for sustained engagement in PA outside of work-based activities for older adults. As documented by previous studies (Gao et al., 2015; Salvo et al., 2018), older adults in this study reported that their social connectivity was linked with their involvement in local organizations or clubs that engaged them in recreational, spiritual, and cultural activities which invariably included different levels of PA. Furthermore, their increased level of social interaction may increase their access to health promotional resources about PA for healthy aging. The study findings suggest that there is a broad spectrum of psychosocial correlates that could significantly influence levels of PA participation among older adults in this

community. From our findings, it is suggested that the correlates which cut across self-perception of healthy aging, perceived social interaction and participation, spiritual or religious engagement, civic participation, and perceived neighbourhood safety were leading factors that determined older adults sustained engagement in the Festac community.

5.4.2 Pedestrian and Traffic Facilities

On the importance of pedestrian and traffic facilities, participants described the findings in terms of mode and safety of transportation specific to their environment. This includes the use of bicycles, motorbikes, tricycles, and buses as means of public and/or private transportation as well as the shared spaces with these features. The design and characteristics of the traffic and pedestrian facilities were described to address how these contextually relevant modes of transportation can be incorporated into improved community design that enables PA participation by community members. This importance of pedestrian and traffic facilities was found in only a couple of previous studies (M. Moran et al., 2014; Tuckett, Freeman, et al., 2018).

5.4.3 Environmental Spaces and Aesthetics

Environmental spaces and aesthetics were other prominent features of the study findings. Citizen scientists reiterated the holistic importance of beautiful environments in terms of mental health, motivation, feelings of tranquility, desirable destinations, and the enabling influence they have on older adults' PA engagements. The availability of and accessibility to aesthetically pleasing neighbourhood environments were resonating factors with similar findings in previous literature (Lockett et al., 2005; Salvo et al., 2018). These spaces were also recognized in terms of providing a safe space for PA and creating social connections.

On the other hand, disruptive environments were strongly associated with negative impacts such as ill-health, disease transmission, accidents, unpleasant feelings, and in some cases creating direct physical barriers to accessing desirable places.

5.4.4 Neighbourhood Safety and Security

The importance of neighbourhood safety and security was captured in a multidimensional multilevel construct cutting across the physical and social aspects of the neighbourhood environment. These were expressed in terms of neighbourhood crime, traffic safety, pedestrian facilities safety, neighbourhood environment aesthetics and hygiene, public hygiene facilities, exposure to dangerous wildlife, pests, and pathogenic conditions. Citizen scientists in this study revealed that older adults will participate more in PA and related social activities when they perceive their neighbourhood as being safe and secure for such activities. This is similar to findings from other studies where a positive association exists between perceived enhanced neighbourhood security and safety and the level of PA engagement by older adults (Lee et al., 2020; Salvo et al., 2018; Tucker-Seeley et al., 2009). On the other hand, negative attributes were identified with reduced levels of PA participation (Salvo et al., 2018).

5.5. Intergenerational and Multigenerational features

One important dimension of the findings was the sense of community the older participants had in their findings. Although the participant population was delimited to older adults, findings revealed that the potential opportunities and barriers were made in consideration of intergenerational and multigenerational activities. The citizen scientists were able to identify the immediate local needs of the older adults in the community whilst considering the inclusion of other population groups in the community.

Overall, the neighbourhood environment themes identified in our study correspond to previous studies on the environment and older adults' PA, especially those utilizing spatial qualitative methods (Barnett et al., 2017; Cao et al., 2019; M. Moran et al., 2014, 2017; A. Oyeyemi et al., 2019; Salvo et al., 2018; Tuckett, Freeman, et al., 2018; Yoo & Kim, 2017b) whilst also specifically adding to the existing body knowledge in the aspect of the social neighbourhood environment. The multidimensional evidence from this study reveals that older individuals can be motivated to be active when features of the social aspects of their environment enables them opportunities to build positive social connections.

These results are consistent with previous literature investigating facilitators and barriers to PA among older adults, nevertheless, the broad consistency, some of the findings were contextually elaborated and differentiated in terms of geography, culture, and socio-religious practices.

5.6 Advocacy and Stakeholders Involvement

Although the advocacy and change phase of this study was only initiated during this study, it remained a continuous process. The documented feasibility regarding initiating such levels of community engagement underscores the empowerment and activation potential of the “Our Voice” research model in diverse settings (Hinckson et al., 2017; King et al., 2019, 2020). Citizen Scientists in this study were able to identify the immediate and contextual issues impacting PA engagement for older adults in the Festac community. They were able to achieve the aim of actively engaging local and relevant local stakeholders for continued advocacy towards developing realistic, community-relevant solutions. Further exploration of the outcomes of this advocacy were beyond the scope of this project. However, other studies from the literature have found that this approach had successfully led to extensive collaboration between

citizen scientists and relevant government, community, and industry stakeholders to enhance the translation of findings into effective, sustainable and tailored community-based initiatives (Buman et al., 2012; King et al., 2020; Odunitan-Wayas et al., 2020; Tuckett, Banchoff, et al., 2018; Tuckett, Freeman, et al., 2018; Winter et al., 2014)

5.7 Strengths of the Study

Spatial qualitative measures such as the Our Voice citizen science method are useful in generating context-based in-depth subjective information on the neighbourhood environment. This was a strength of this study. Another strength of this study was that the participants were highly motivated to advocate for change and so this made the analysis and recommendation sessions very fruitful. The community-based citizen science research approach was empowering for the citizen scientists that enabled co-learning and capacity building process. Furthermore, the citizen scientists and stakeholders were more aware of the need to systematically evaluate the needs of the immediate environment, prioritize needs and implement changes or improvements. The acquired knowledge will be useful in making available, essential insights that may guide the development of continuous assessment and review tools for future projects, as well as the design and evaluation of tailored, sustainable community-based interventions.

The study also presented opportunities for the citizen scientist to identify themes and subthemes using culturally relevant codes and/or terminologies; as well as identify context-specific and sustainable solutions to identified issues.

This study, like other spatial qualitative studies provided information-rich and comprehensive contextually-relevant outcomes (M. Moran et al., 2014; van Cauwenberg et al., 2012; Yoo & Kim, 2017b). Furthermore, while most studies have focused on the built environment

improvements for health, the study incorporated the exploration of the social aspects of the environment.

Whilst it is too early to generalize the outcome of the study to other neighbouring communities, the study presents a basis for a reproducible model that would help to contribute to the knowledge base for adoption by neighbouring communities with similar geographical or contextual factors, resulting in a comparatively similar outcomes as reported in the Israel study (King et al., 2020). The outcome of this study thus provides a knowledge base for future comparative studies across communities of similar context as well as co-sharing of ideas and initiatives.

5.8 Limitations of the Study

Despite the rich and in-depth nature of the findings of the study as well as the relatively direct follow-up on the translation of the study outcomes, this project had some limitations such as the utilization of a small purposive sample of motivated members of the community, the delimitation of the sample size to those living in an urban area, and reasonably short time frames for which the feasibility of changes to be implemented were prioritized. Thus, the outcomes of the study need to be weighed carefully against the sample size. Although, the relatively small sample generated an array of issues in the neighbourhood environment, translating the results to other immediate communities needs to be carefully approached. The citizen scientists provided a broad overview of the types of PA commonly performed by older adults in this community and in terms of the environmental barriers/facilitators (connected with social or cultural roles). These PAs were however not explored to reveal gender differences in terms of identified activities.

Furthermore, Nigeria is a large diverse population. While it was hoped that the findings of this study would be applicable in broad settings across the population, some findings were

context-specific and limit the transferability to older adults and communities with other cultural, socioeconomic backgrounds, and geographical settings. Besides, there are many languages spoken in the city of interest, so the study's citizen scientist participation was limited to individuals who were able to communicate in the primary language of English. This was a potential limitation to including every member of the target population.

This study was delimited to the southwestern region of Nigeria. The scope of the study was also primarily delimited to the three preliminary phases of the Our Voice Citizen Science Method. There are four phases of the method namely discover, discuss, advocate, and change, altogether captioning the four-step process involved (King, Winter, et al., 2016). The latter stage of the model would involve active advocacy which could be a lengthy process. The initiation of the process was, however, done in collaboration with the COWAP NGO, once other stakeholders and policymakers have been identified. The long-term change implementation was beyond the scope of this study. Thus, a definitive conclusion or evaluation of the impacts of the intervention was not conducted.

Lastly, although the DT can take objective measures of the environment, in the form of GIS geo-coded photographs and GPS-tracked walking routes (Buman et al., 2013; M. Moran et al., 2017), the analysis of such data collected was outside the scope of this study. Similarly, objective measures of the physical literacy and/or PA levels of the participants, though favoured by similar studies for correlates (Hinckson et al., 2017), were not included in the scope of this study.

5.9 Conclusion

Older adults are a heterogenous and marginalized group in many communities, yet they represent a large and increasing proportion of the human population. Responding adequately to

the needs of this group requires taking into consideration their contribution, incorporating the perspectives and experiences of the older adults as well as other citizens in our neighbourhoods towards multisectoral and intergenerational community planning.

This study contributes to the growing research and field of environmental health promotion and healthy aging by suggesting important attributes of an urban neighbourhood environment influencing the PA of older adults. The Our Voice (Hinckson et al., 2017; King et al., 2020) approach utilized in this study builds on the combination of the spatial qualitative method of photovoice and focus group enhanced by technology in a citizen science model to be able to achieve multisectoral collaboration of professional researchers, community participants, and stakeholders in local community planning and development for environmental health promotion initiatives influencing the PA of older adults. The study also highlights the reproducibility of the research model that can be adopted by other communities in similar geographical regions and/or contextual situations, and from which a database of findings for comparative purposes, co-sharing of ideas, and initiative can also be enabled.

Health promotion strategies, community-level interventions, community designs should consider the mediating role of the social dimensions of the neighbourhood environment on older adults' PA engagement. Findings show that older persons would not only consider the physical attributes of their neighbourhood environment but also their social and psychological appeals when considering opportunities for PA.

Overall, the findings reinforce the need for multisectoral, intergenerational policies and programs addressing the barriers identified by participants to help make communities sustainably healthier and more active. This is as stated also in the 2002 *Madrid International Plan of Action on Ageing* (MIPAA) which recognizes that older adults ought to participate in and benefit

equitably from the outcomes of development to advance their health and well-being and that societies should provide enabling environments for them to do so. The global initiative recognizes the environment as a key influence on the functional ability of older adults (Beard et al., 2016, 2017).

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Appendix A - General Information Leaflet on Physical Activity, and the Age-friendly checklist.

Physical Activity:

Physical activity is all leisure and non-leisure body movements resulting in an increased energy output from the resting conditions. In adults aged 65 years and above, physical activity includes the following examples:

- **play, recreational activities, and leisure time** physical activity for example: games, sports, walking or hiking, swimming gardening, dancing, tennis, swimming, golfing, pool-table games.
- **transportation** (e.g. walking or cycling/biking),
- **occupational** physical activity (walking to work or bus stations if the individual is still engaged in work),
- walking to specific destinations such as place of worship/markets/banks/parks/etc.,
- household chores
- creative activities such as sculpturing or wood carving or painting,
- planned exercise (Resistance/strength training – sandbag lifting, dumbbell lifting, resistant band exercises; aerobic exercises; balance training; flexibility exercises; water exercises),

All these can take place in the context of daily personal, family, and/or community activities.

Checklist of Essential Features of Age-Friendly Cities – obtained from

https://www.who.int/ageing/publications/Age_friendly_cities_checklist.pdf.

Appendix B - Instruction sheet for photo taking and audio recording (provided to participants before their walks)

It is up to you to choose what kind of pictures to take, but here are a few points to consider:

1. Please review the general information sheet on ‘Physical Activity, and the Age-friendly checklist’ provided to you.
2. When taking photos, please keep in mind that your photos may stand as representation of tangible or intangible aspects of your neighbourhood that you feel are supports or barriers to you participating in physical activity. You do not need to limit yourself to barriers and facilitators that are physical only but also convey other aspects.
3. While the community is a public space, we would ask that you do your best not to take photos that include individual faces. If faces are included in a photo in a way that would allow others to identify an individual, this photo may not be used in this research study.
4. You will be asked to utilize the functions of the tool during ONE data collection walk (lasting between 30 – 60 minutes).
5. We encourage you to also use the audio commentary feature in the Discovery Tool (i.e., the blue button with the microphone) to record your ideas or feelings about your neighbourhood that you feel are supports or barriers to you participating in physical activity.
6. Please refrain from mentioning the names of individuals in the community when making audio-recordings. If you need to reference someone, do so in general terms (e.g. “my neighbour”, “a member of the community board”, etc.).

7. You may review your photos and/or audio commentaries in the Discovery Tool at any time before finishing your walk using the 'Review' button on the bottom right-hand side of the tablet screen.

Appendix C - Sheet providing guideline for walk safety

When taking Photographs, you are reminded of the following prior to taking photographs:

1. Be respectful (i.e., be polite when approaching others, do not invade the private space of others)
2. Use a buddy system, especially when going to places you are not familiar with.
3. Don't do anything you wouldn't usually do (i.e., take a photograph while driving or taking a photograph in a location that puts you in danger)
4. Don't go anywhere you wouldn't usually go.
5. Be aware of your surroundings.
6. Do not take a photo of any identifying person or personal property.

Any photograph that contradicts the guidelines will be destroyed or identifiers to any known individual will be blurred out of the photographs.

Appendix D – Informed Consent Form



RESEARCH PARTICIPANT INFORMATION AND CONSENT FORM

- Title of study:** Engaging Nigerian Older Persons in
Neighbourhood Environment Assessment and
Improvement for Physical Activity Promotion: A
Proposed Citizen Science Project
- Principal Investigator:** Emmanuel A. Odeyemi, Masters Student, Faculty of
Kinesiology, University of Manitoba.
+234 [REDACTED], +1 [REDACTED],
odeyemie@myumanitoba.ca.
- Supervisor:** Dr. Michelle Porter, Professor, University of Manitoba,
+1 [REDACTED], michelle.porter@umanitoba.ca
- Sponsor:** This project is partially supported by the
University International Program and
Partnership Seed Fund at the University of
Manitoba

This consent form, a copy of which will be left with you for your records and reference, is only a part of a continuous informed consent process. It should give you an overview of the research and what your participation will involve. Please take your time to read it carefully, and feel free to ask for any further detail or clarification about something mentioned here, or any information not included.

Thank you.

Purpose of the Study:

Not all community experience the same challenges and opportunities in making their environment healthy and to promote different forms of physical activity. The objectives of this study will be to: (1) explore what Festac, Nigeria, community-dwelling older persons perceive as barriers and/or facilitators to maintaining PA engagement in their neighbourhood, (2) document suggestions community-dwelling older adults identify as needful for PA engagement, and (3) stimulate constructive dialogue between participants and community stakeholders.

This study will be adopting the Our Voice Framework. The Our Voice Framework seeks to recruit and empower community members to become citizen scientists. Citizen scientists are community participants undertaking research without formal training as

scientists. Community members shall be trained to collect data, analyze it and use their findings to shape advocacy campaigns of their own designs in their local communities.

The Our Voice framework is facilitated by utilizing a user-friendly tablet-based application (app) called the Healthy Neighbourhood Discovery Tool. The Discovery Tool was developed by the Stanford Prevention Research Centre, Stanford University, California. The app allows for citizen scientists to take photos, record audio and rate locations in their environment.

What you will be expected to do:

The entire project will involve 4 stages. When you have agreed to participate in the study, an appointment will be arranged for you (and potentially a walk partner). At this appointment you will be: 1) asked a few questions about yourself and your community (5 minutes); 2) trained to use the tablet and app, which will take about 15 minutes. Then you will go for a walk to record barriers and facilitators of physical activity for older persons in your neighbourhood of Festac Town.

This walk will last about 30 to 60 minutes depending on how far you go and how many pictures you take. You will go at your own pace and can take rests along the way. The goal for picture taking is about 10 photos. The choice of photos to take will be entirely yours, except pictures of people are not allowed. There will be no right or wrong answers, just your perspectives on your neighbourhood. While you are walking you will have instructions on how to use the app, and the study

investigator will either be close by to answer questions or be along with you for the walk.

Once all the citizen scientists have collected data, two group meetings will be arranged to identify common physical activities in which older persons participate in the community and to discuss all the data collected. Also, in these 2-hour meetings, themes and subthemes will be determined from the data collected, possible solutions will be discussed, and priorities and recommendations will be determined. The two meetings will take place approximately one week apart. Thereafter, you will be provided with the opportunity to present your findings and recommendations to community stakeholders at a meeting of about two hours.

Overall, the anticipated time commitment for participants in this study is approximately 8 hours, spread over several weeks.

If you choose to participate in this study, you will be given a study information package. This package will include (1) a general information sheet about physical activity and a

checklist by the World Health Organization on age-friendly communities, (2) an instruction sheet for taking photos, (3) a sheet providing guidelines for walk safety.

Possible Risk and Discomfort

This study is not expected to expose you to more than minimal risk of daily activities.

As we will be asking you to enter outdoor public spaces to take photographs and record audio commentaries, there is a minimal risk posed to your general safety. As a result, we will suggest that you incorporate the safety measures provided to you for your walk safety. Do not take any extra risks to get a photo (e.g. standing on roads outside pedestrian lanes). You may walk with either a walking partner or the study's principal investigator.

You will be provided with a sheet outlining other guidelines for your walk safety.

Benefits

You as the participant will be able to explore your perceptions of environmental facilitators and barriers to physical activity participation in the city. You will be involved in collaborative problem-solving that equitably includes you and other the citizen scientists, with stakeholders, and researchers to brainstorm solutions to some of the issues identified. The outcome would be geared towards enabling an interaction between stakeholders, local policymakers and the participants, with the aim of involving and considering older people's views of the community consensus-building and mobilization efforts that advance physical activity at the individual, social, built environment, and policy levels.

Cost for Participation

There will be no added cost for your participation in the study. However, to thank you for your time, a \$5 (equivalence of N1150) local grocery store voucher will be given to you for participating in the walk. In addition, you will be receiving an additional \$10 (equivalence of 2300 Naira) grocery store voucher when you participate in any of the citizen science meetings. You will also be compensated with the same \$10 grocery store voucher if you chose to withdraw after any of citizen science meetings.

Confidentiality

The Discovery Tool data you collect (i.e., photos, audio commentaries, barrier/facilitator ratings, GPS-tracked walking routes) will be shared with researchers at Stanford University in California using a secure computer server. The data will not be connected to your identity. They will be stored on a secure server and are being saved so

that researchers at the University of Manitoba (U of M) or at Stanford University can use the data for comparison of data from communities across the world. Only the University of Manitoba (U of M) research team principal-investigator (Emmanuel A. Odeyemi), supervisor (Dr Michelle Porter), and a project coordinator for the Discovery Tool at Stanford University using a secure online, password-protected researcher's portal will immediately be able to access this data you have collected. Data stored on the server will not include any information that could readily identify you.

The Discovery Tool data you collected for this project will be jointly analyzed by you and other participants. The results will be disseminated at a community meeting and published in a Masters' thesis. It may also be presented at scientific or professional meetings or published in scientific journals, however, your name and any other identifying information will not be included.

Personal information and your survey responses (i.e. demographic information, and statement responses) collected confidentially, will be safely coded and encrypted electronically. They will be saved on the UM Dataverse secured server. Informed consents and transcription will be kept safely locked away. Identifiers to individuals will be taken off the transcripts. Only the principal investigator, the co-investigator and project coordinator shall have authorized access.

Stanford University will destroy any copies of all data on their server after 10 years from the publication of the study findings. A copy of all participant data will be stored on a password-protected encrypted external hard drive in a locked safe at the

Centre on Aging(University of Manitoba) and on the password protected UM Dataverse secured server.

This data will be destroyed ten years after any research-related journal articles have beenpublished, or rendered anonymous as soon as it is no longer necessary scientifically to link data with individual participants.

You are however to be aware of the risk to confidentiality in a group situation. Measures will be taken to offset this risk. You and every other participant will be required to sign an oath of confidentiality (included with this consent form) regarding information shared by other participants within the group, and a reminder to participants to keep each other's confidentiality will be made. All of the photos and/or transcribed quotes that are shared atthese meetings will be kept anonymous, so the other participants and/or stakeholders willnot know which participant took which photos.

Certain authorized organizations may inspect and/or copy these research records forquality assurance and data analysis purposes. These organizations may include representatives of the study sponsor or funding agencies or national or international

(foreign) regulatory agencies that may have oversight responsibilities for the study. The University of Manitoba may look at the research records to see that the research is being done in a safe and proper way. If any of these documents need to be copied and provided to any such organization, all identifying information will be removed. No information revealing any personal information such as your address or telephone number will leave the institution unless required by law.

You should also be aware that backup copies of the photo and audio files that you document will save on the tablet device and could be accessible to other participants. Therefore, we suggest that you do not document anything that you would be uncomfortable discussing publicly with other participants.

Voluntary participation/withdrawal from the study

Taking part in this study is voluntary and you may withdraw from the study at any time and for any reason by contacting the investigator for the project, Emmanuel Odeyemi, by phone (+1-██████████ or +234-██████████) or email (odeyemie@myumanitoba.ca). The latest possible time to have collected data by you deleted will be one week before the first data analysis meeting. You will be notified of the date of the first meeting. Beyond this timeframe, it will not be possible for you to pull out your data from the flow of the conversation because identifying information connected with it will be removed at this period after your walk. Your decision not to participate or to withdrawal from the study will not impact you in any adverse way.

Debriefing and dissemination of results:

The results of this study will be published in various forms including in a master's thesis as well as journal articles or book chapters, and may be presented at various venues, including professional/academic conferences. This could include individual photos that you might have taken. No photos and/or transcribed quotes will include identifiable pictures of people or confidential information, nor will they include information that could identify you.

Questions

If you have any questions or concerns about the study, you may contact the principal researcher, Emmanuel Odeyemi, +1- [REDACTED] at odehyemie@myumanitoba.ca, or the Co-researcher, Dr Michelle Porter, at +1- [REDACTED] [REDACTED] or michelle.porter@umanitoba.ca. For questions about your rights as a research participant,

you may contact The University of Manitoba, Human Ethics Coordinator at (204) 474-7122 or email: humanethics@umanitoba.ca

Consent

Please check your responses to the statement below:

I agree to have my responses used for this project and for future related projects. yes no

I give permission for the principal investigator to use my photographs developed during the ‘**Engaging Nigerian Older Persons in Neighbourhood Environment Assessment and Improvement for Physical Activity Promotion: A Proposed Citizen Science Project.**’ They are free to use the photographs for project related reports, exhibits and presentations.

yes no

I declare on oath to maintain the confidentiality of the identity and discussions of other members of the group.

yes no

Your signature on this form indicates that you have understood to your satisfaction the information regarding participation in the research project and agree to participate as a subject. In no way does this waive your legal rights nor release the researchers, sponsors, or involved institutions from their legal and professional responsibilities. You are free to withdraw from the study at any time, and /or refrain from answering any questions you prefer to omit, without prejudice or

consequence. Your continued participation should be informed as your initial consent, so you should feel free to ask for clarification or new information throughout your participation.

The University of Manitoba may look at your research records to see that the research is being done in a safe and proper way.

This research has been approved by the University of Manitoba Research Ethics Board. If you have any concerns or complaints about this project you may contact any of the above-named persons or the Human Ethics Coordinator at +1 204-474-7122.

A copy of this consent form has been given to you to keep for your records and reference.

Participant's Name

Participant's Signature _____

Date (day/month/year): _____/_____/_____

Researcher and/or Delegate's Name

Researcher and/or Delegate's Signature: _____

Date (day/month/year): _____/_____/_____

Appendix E - Interview on Demographic and Community Information

When the participants decide to finish their walk in the Discovery Tool, they will be requested to answer four basic demographic questions. They will be instructed that they can go to an indoor location and be seated while they answer these questions.

These will include:

- **What is your sex?**

Answers options: (i.e. male, female)

- **What is your age?**

Answer options: Participants enter a number.

- **Years of School Completed?**

Answer options: Participants enter a number

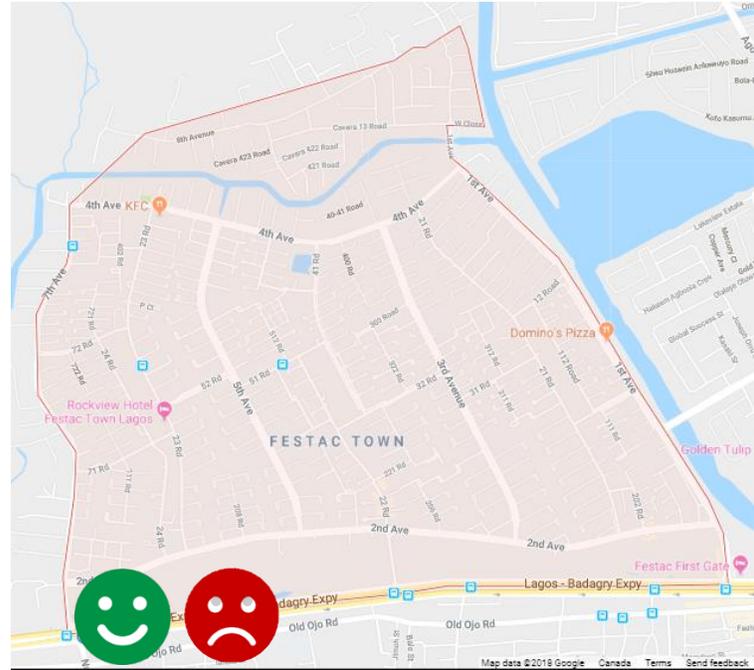
- **Compared to others your own age, how would you rate your health?**

Answer options: excellent, very good, good, fair, poor

Participants will also be asked to respond to several statements (with these possible response options: Answer options: Strongly disagree, somewhat disagree, neutral, somewhat agree, strongly agree)

1. Is this a community where people support each other?
2. I can influence decisions that affect my community.
3. By working together with others in this community, we can influence decisions that affect this community.
4. People in my community know who to talk to in order to make changes happen in our community.

Appendix F - Sample Datasheet showing geocoded photograph and rating, audio narratives transcripts, and GPS-tracked walking routes



“This a picture of a sidewalk I took to show that there are dedicated sidewalks that encourage walking in this neighbourhood”

Appendix G - Worksheet I: Types of Physical Activity Participation

1. Recall the general information on Physical Activity, which of the following physical activities do older adults in your community you engage in? Please tick all that applies.

Walking leisurely (Y/N) walking to work (Y/N), walking to use the public transport (Y/N), walking to specific destinations such as place of worship/markets/banks/parks/ etc. (Y/N), cycling/biking (Y/N),

Household chores: light vacuuming () light yard work (Y/N) gardening (Y/N),

Exercises: stretching () none () Fast walking () aerobics class () strength training () Jogging () running () using a stair machine or climbing stairs

Sport: playing tennis () racquetball () badminton () pool-table game ()

Cultural or Social activities: cultural dance activities (), other dance activities (Y/N), musical activities such as drumming (), creative activities such as sculpturing or wood carving or painting (), horticulture (), swimming (),

Occupational/work activities (Y/N)

Others: _____,

(Options for you to provide a comprehensive list of physical activities engaged in)

Appendix H – Meeting 1 and 2 Worksheet – Theme Identification

FESTAC COMMUNITY ASSESSMENT AND IMPROVEMENT FOR PHYSICAL ACTIVITY WORKSHEET:

Identifying Themes in the Data

You have been provided with a data package (i.e., photos and transcribed descriptive quotes) that have previously been identified as being linked by a common theme. Please review this data individually or as a pair and decide on the following:

1. Is there a common overarching theme that links all of the photos/quotes in the package? Examples of overarching themes could include “housing”, “transportation”. If you feel that any of the photos/quotes do not appear to belong with the others in the package, please set these aside.

Record the common overarching theme your pair has identified below:

2. Within the overarching theme, can your pair identify subthemes that may

help to explain its various elements? For example, for the theme of “housing”, possible subthemes could include 1) cost, 2) accessibility, 3) distance to community services

Record any subthemes your pair has identified below:

Appendix I – Meeting 1 or 2 Worksheet – Facilitators and Ideas for Continuation

**FESTAC COMMUNITY ASSESSMENT AND IMPROVEMENT FOR PHYSICAL ACTIVITY
WORKSHEET:
Facilitators and Ideas for Continuation/Expansion**

Use the themes and subthemes that you identified for your data package to complete the following table. Share this information with the group.

Age-Friendly Community Facilitator	<u>WHAT</u> is it about this facilitator that is beneficial for community age-friendliness?	<u>HOW</u> can this facilitator be expanded and/or applied to other aspects of the community?

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Appendix J – Meeting 1 or 2 Worksheet – Barriers and Change Ideas

<p>FESTAC COMMUNITY ASSESSMENT AND IMPROVEMENT FOR PHYSICAL ACTIVITY</p> <p>WORKSHEET:</p> <p>Barriers and Ideas for Change</p>
--

Use the themes and subthemes that you identified for your data package to complete the following table. Share this information with the group.

Age-Friendly Community Barrier	<u>WHAT</u> is the change that needs to be made to address this barrier?	<u>WHY</u> is it important for the community to make this change (i.e. what difference will it make)?

Appendix K – Determining Priorities for Change

Determining Priorities for Change

This table can help you prioritize your work and communicate your plans

		Feasibility	
		High	Low
Importance	High	HIGHER PRIORITY – Focus efforts here to accomplish these tasks	Lower Priority – Identify smallertasks that can be more easily accomplished
	Low	Lower Priority – Think about ways to make these tasks more impactful	Lowest Priority

Festac Community Assessment and Improvement for Physical Activity Areas for
Change

		Feasibility	
		High	Low
Importance	High		
	Low		

Appendix L – Bulletin Highlighting the Research Overview and Priority Area



Festac Neighbourhood Older Persons' Citizen Science Project on Physical Activity Participation

CITIZEN SCIENTISTS'
FINDINGS
ON PRIORITY AREAS



- “Harnessing everyone (residents) together for community development”
- “Encouragement to join progressive community organization by being active participants, and financial members”
- Advocacy for issues : “If we talk, stakeholders will listen”

-FESTAC TOWN OUR VOICE CITIZEN SCIENTISTS

SOCIAL CONNECTIVITY

- Local neighbourhood association participation; Activities of Non-Government Organizations and Associations of the Aged such as COWAP, Rotary associations, Alumni associations e.g. Scout
- Faith based organization and activities
- Places of worship
- Health talks by groups
- Ageism

SOCIAL CONNECTIVITY : SUPPORTS



Look! What do you find over there? You can see how lovely the garden is and how protected this is. This must have been the effort of the residents living in this immediate community.”_8122



“I took this photograph to identify some of the places where I go for daily activities. I am a member of different groups in my church. I also visit the church regularly for prayer activities. I usually walk down from my house to the church which is a few kilometres away.”_8421

“I still live there now and we were enjoying the recreation things (recreation centre) then, because if at all you have a visitor, you can go and sit down and enjoy your discussion with your visitor and then go back home but things like that are not available again. Elders (Older persons) hardly find places where they can play game, relax, because these are the things that can be keeping elders living well but thank God for COWAP, we have an organization in FESTAC town that is referred to as COWAP where elders gather themselves on their own i.e. it is a voluntary arrangement. So, for this elders, they go around occasionally to do exercises, maybe monthly or bi-monthly. They give time for themselves and they do some exercises, they walk from a particular place to another place and at the end they assemble in an open place to do little exercises and exchange their ideas about what they feel about the trek, what they feel about moving together and if they are encouraged, they say it and we thank God that such is getting more recognized because members are coming to join such a group which I think is of good benefit to the elders in my environment and I belong to that group and am happy that I belong to that group...”_8421

“As of the moment, I am at home sitting down (retired), resting, relaxing, only when I want to do something in the church, I go out, but I have been advised (health counsel) that I should be doing these exercises, and that is what I normally do twice a week. I get the advice from a medical doctor who is attached to my church, and who is also used to walking. At times, we would walk together, go out together, and return to relax.”_9148

“The Festac Town Resident Association (FTRA) is a strong body. They do their best to call attention to the laxities in the management of the community in terms of security, environmental degradation/deterioration. They hold monthly meetings. There are about 10 or more communities. They hold meetings at each community level and at the general level. They are able to curb environmental abuse especially if they receive a report/complaint from the residents. However, if there is no report, they would not take any action, but once they receive a report, they take it up.”_8122

“I am taking this photo of a mosque in the Amuwo-Odofin Local Government office at 41 Road in Festac. Because I am interested in showing appreciation to the sponsors/builders because they know the importance of religious activities”_4361

“The route leads to 206 Park. This is Church Avenue that leads to 206 Park where we usually have our group exercises.”_1757

“Some of us are active participants and active alumni of various community organizations such as the Boy Scouts, Community Development Associations, Festac Town Resident Association, Rotary Clubs, and so on. We get engaged in making valuable contributions to the society and also get engaged in various physical activities through our participation”_Focus Group Discussion Participants

SOCIAL CONNECTIVITY : **Barriers - Ageism**

Stigmatization based on Age (Ageism) – “Stigmatization of older persons as witches or witchcraft practitioners should be discouraged. Older persons should be recognized for their valuable contributions to the community” _818

What is important about this SUPPORT(S) for Physical Activity?

- Keeping people active, helps to encourage older adults' outdoor activities
- Gives focus to older person's issues
- Promotes social wellbeing
- Joint or community exercise
- Enables opportunities for social network and companionship
- Promotes joint activities e.g. aerobics, dance events, group leisure walks
- Physical health education
- Provides opportunities for group religious activities
- Older persons would be recognized for their valuable contributions to the community
- Will promote social participation of older persons and more positive contributions by older persons to the community

How can the SUPPORTS be expanded/used in other areas?

- Provide more support and recognition to such community groups
- More community associations to be formed and provided
- Organize more activities, sport and games programmes for older adults
- Charity Organization for the welfare of the Aged People (COWAP Festac) and Welfare organization for Elderly People (WOFEP)
- Festac Town Residents Association (FTRA) and Community Development Committee (CDC)
- Rotary Clubs

What is the change that needs to be made to address the BARRIER (S)?

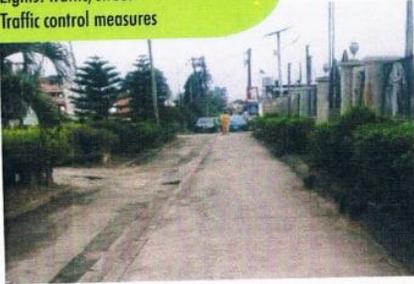
- Stigmatization of older persons as witches or witchcraft practitioners should be discouraged
- Older persons should be recognized for their valuable contributions to the community

- Walkways/Sidewalks: Availability, accessibility, Neat, Safe, and Senior friendly, damaged, parking on walkways, trading on walkways/indiscriminate street trading, abuse of the walkways
- Roads: repaired, rehabilitation, bad roads (traffic lights and street lights not available, zebra crossing not available, arbitrary road use by commercial vehicles operators)
- Lights: traffic, street
- Traffic control measures

Pedestrian and Traffic Facilities - Supports



“Some of the obstacles which we have is illegal parking of the shop owners extending their shop to the pathway which is meant for people to pass or for even small bike to ride, or for children to ride; but right now action is being taken to drive them to their shop and not into the pathway.” _8170



“The walkway is meant for people, elderly (older persons) and others to walk on instead of going by the road...it is good because there are some other areas where we have many access to the road where the elders can be helped at times so that you don't get crush down by vehicles or moving bike or whatever so we can say we are enjoying the walkway to some extent...” _8421

Pedestrian and Traffic Facilities - Supports - WALKWAYS AVAILABILITY, ACCESSIBILITY, SAFETY, NEATNESS



“I took this photograph of the walkway in front of Amumo-Odofin Local Govt office because I like the sight of it. I admire the trees along the passage and the lawns. I also like the neatness of walkway. I know everybody walking along the walkway would not need to fear accidents/collisions. Furthermore, it adds to the beauty of the area.” _4361

“You can do your walk physical exercises in your close at the early hours of the morning. The areas have less traffic, safe” _1760

“The walk ways are there for elderly people to walk freely without having any encumbrance, nobody will disturb them, they can walk freely round FESTAC without being disturbed, just cross the road to another walkway, be walking and then in between the walk way and the road there is a bicycle way.” _4403



“This walk path is free. It is good it will allow old people and younger ones to walk on and not to have contact with the road (in as much) as to cause accidents. It is a free place. This is what we want and it is beautiful. Thank you.” _8340

Pedestrian and Traffic Facilities – Supports - Zebra Crossing/Pedestrian Crossing, Traffic Control Measures

“There are speed bumps available in certain areas e.g. on road 31. There also used to be traffic lights or occasionally traffic wardens at certain junctions such as the Agboju market junction” _Focus Group Discussion Participants

Pedestrian and Traffic Facilities – Supports – Repairs and rehabilitation works



Pedestrian and Traffic Facilities - Barriers



“I feel safer walking in familiar vicinities such as my neighbourhood closes and around the local car park where there are controlled traffic measures and where I am aware of the likely hazards. One of the likely hazards is uneven surfaces of the walkway. Tripping hazards on the walkways. After the last major fall I had about two years ago, during a neighbourhood walk I was on and which resulted in me getting hospitalized for days. I have stayed away from walking major walkways due to the fall hazards they present. I would love to walk around again but I feel safer walking in familiar vicinities where I am aware of the likely hazards.”_1401

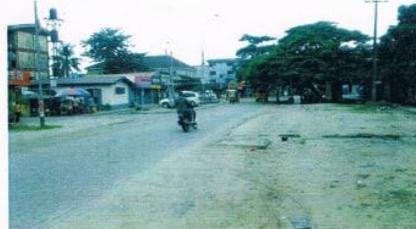
“These are junks which are not supposed to be on the walkway because once they are there, they don’t allow people free walking. People are to walk freely on the walk way, when it was created it’s not for trading but now, we have turned it for trading. Automatically, we are creating an hazard for people and if somebody who is supposed to use the walkway avoids the traders and walk on the motor way in get knocked down, they might lose a limb or their life.”_4403

PEDESTRIAN AND TRAFFIC FACILITIES

Pedestrian and Traffic Facilities - Barriers - Threats to the walkways



Pedestrian and Traffic Facilities - Barriers - Arbitrary road use by commercial vehicle operators, pedestrian crosswalks, traffic control measures



“At any “T” junction, there is supposed to be zebra crossing/pedestrian crossing enable people to cross the road without being knocked down by a moving vehicle.”
_1760

“...At the end of this road (32) is a junction (an intersection) where vehicles meets, and when they get to the junction, they have to be very careful to avoid accidents because there are no traffic lights controlling the traffic; showing when people should stop, yield or move, in order to avoid accidents; the road users use the intersection disorderly. Traffic light is highly essential for the junction.”_4361



Pedestrian and Traffic Facilities - Barriers - Bad roads and walkways

Bad road that doesn't encourage physical activities like jogging or walking.. especially for elderly people_1760

Pedestrian and Traffic Facilities - Barriers



Pedestrian and Traffic Facilities - Supports/Barriers

What is **important** about the SUPPORT(S) for Physical Activity?

- Encourages smooth walks for young and old
- Encourages bicycle riding
- Demarcate other traffic
- Routes to parks and other desirable destinations
- Can use the sidewalks to access desirable destination of daily activities and interests
- Desirability of use
- Psychological effect
- Prevents injuries or accidents from happening
- Considers joint use by older persons and individuals of other age groups in the community
- Demarcate other traffic
- Encourage other road users (motorists and motor cyclists) not to encroach on pedestrian ways
- Road safety
- Provides route and access to desirable destinations – markets, stores, places of worship, recreation centres, etc.
- Ensure road user safety
- Helps prevent road accidents/deaths

Why is it **important** for the community to make this change to the BARRIER(S) (i.e. what difference will it make?)

- People can safely use the roads and walkways/sidewalks to access desirable destination of daily activities and interests
- Prevents road users' accidents/deaths
- Installing traffic lights will improve road usage to promote road and pedestrian safety
- Encourages safe and comfortable walks and related physical activities
- Promotes healthy living
- Confers positive psychological effect

HOW CAN THE SUPPORT(S) BE EXPANDED/USED IN OTHER AREAS?

- Promote the maintenance and repairs of the sidewalks
- Keep sidewalks and walkways free of obstructions or hazards
- Creation of more pathways
- Fixing of potholes on the ways
- Walkways should not be overtaken by street trading, indiscriminate parking of vehicles and refuse
- Fixing of bad roads
- Abolish trading and wares on the walkways
- Keep walkways clean
- Ensure cleaner walkways
- Keep Festac Clean community initiatives
- Provision of public bins
- Keep sidewalks and walkways free of obstructions or hazards
- Prompt removal of hazardous materials
- Prompt repairs
- Installing traffic lights will improve road usage to promote road and pedestrian safety

Pedestrian and Traffic Facilities

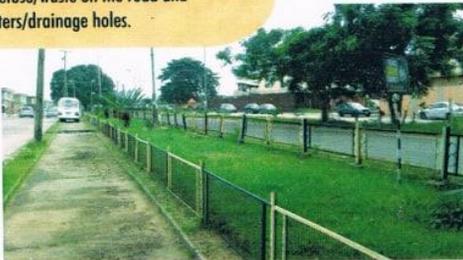
What is the change that needs to be made to address the BARRIER (S)?

- Provision of traffic lights and street lights
- Restoration of faulty traffic and street light facilities
- Provision of pedestrian crossings and speed bumps at major road junctions (intersections)
- Enforce traffic laws
- Discourage indiscriminate road use by commercial vehicle operators, they should use only designated bus stops
- Discourage street trading, indiscriminate parking of vehicles and refuse
- Traffic warden availability
- Roads need to be repaired with quality materials
- Relocation of illegal users to proper sites/locations
- Repairs of walkways

- Lots of green areas
- Recreation parks and gardens*
- Big trees
- Environmental Hygiene
- Dirty environment: hideouts for criminal activities, hazardous environment, dumping of refuse/waste on the road and gutters/drainage holes.

GREEN AND BEAUTIFUL ENVIRONMENT

Green and Beautiful Environment - SUPPORTS - GREEN AREAS



Green and Beautiful Environment – Supports – Community Sport centres Recreation Parks and Gardens



Green and Beautiful Environment – Supports – Community Sport centres Recreation Parks and Gardens



“The sport ground here provided by the Federal Housing Authority for people to relax, exercise and do various practices. You can see they sell sportwear somewhere over there. If we had come earlier on you would see those jogging, running around and so on. Various activities take place here, this is where we relax, and it is very useful. It is very valuable to the community. We would love to see some improvements; to have it better organized. By and large, it is better than nothing.”_8170

“I usually come for jogging here and walking so when I come like this I use to walk round the field like (4) four times and I used to do it (8) Eight times at times it depends on how I feel in doing it but I don’t need to run I just need to walk.”_9918

Green and Beautiful Environment – Supports – Environmental Hygiene

“You will see this road, they have done general environmental sanitation this morning, you will see how they cleaned their frontage. This is what used to be in those days when we are doing environmental sanitation...”_4403

Green and Beautiful Environment - Barriers



“This is a bus – stop and a waste bin ought not to be there. It should not be a dumping area. It is meant for humans to be at their bus. It is not fine something has to be done to improve the living.”
_8340



“You see this one, you see it has been more than 24 hours, we can see weeds growing on it, if it had been within 24 hours, do you think weeds grass, and everything will grow on it. The

beauty of this place is destroyed by this dirty thing you see, these things are not supposed to be there. Immediately they are doing it, they are supposed to be removed and dumped where it will not be a hazard to their buildings, but these are not done again. These are issues that affect elderly people. If we say elderly people, they need to be in a place where they can do things and live a happy life, but it is not so now.” _4403

Green and Beautiful Environment - Barriers



Green and Beautiful Environment – Supports/Barriers

What is important about this SUPPORT(S) for Physical Activity?

- Enables locations to be active;
- Makes location desirable
- Provides serene and mood enhancing atmospheres
- Gives off pleasant fragrances enjoyable during outdoor activities
- Beautifies area
- Provides shades from hot sun
- Provides shades for short relaxation during outdoor walks
- Makes fresh air available
- Serve as windbreakers
- Provides bird watching activities
- More beautiful to walk around neighbourhood

Why is it important for the community to make this change to the BARRIER(S) (i.e. what difference will it make?)

- Cleaner and more beautiful to walk around neighbourhood
- Confers positive psychological effect

How can the SUPPORT(S) be expanded/used in other areas?

- Recreation and relaxation parks and garden beautification -Victory Park 206.
- Need more access for people to use it so that it is not lost
- Need to advocate for and mediate with local community owner – residential association of Road 206 to allow further provision trees at the park
- Encourage more planting and garden restoration
- Engage community corporate or business organization in more community beautification as a recognized endeavor of corporate social responsibility

- Community resident association replant dead tree areas
- Local government to plant trees in available locations
- Regulate cutting of trees

- Encourage proper waste management practices
- Provide public bins
- Public enlightenment and community initiative on keeping the environment clean

What is the change that needs to be made to address the BARRIER(S)?

- Replacement of vandalized properties e.g. drainage holes ...
- Good maintenance culture
- Security guards
- Mobilize joint community cleanliness initiatives e.g. Keep Festac Clean Initiatives by the community resident association
- Removal of shanties and dangerous hideouts
- Encourage proper waste management practices
- Provide public bins
- Public enlightenment and community initiative on keeping the environment clean
- Need to advocate for and mediate with relevant government environmental agencies
- Engage community corporate or business organization in more community beautification as a recognized endeavor of corporate social responsibility



Discussion and Questions

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