

UNIVERSITY OF CAPE COAST



URBAN INFRASTRUCTURAL DESIGN AND TRAVEL SAFETY  
AMONG SCHOOL CHILDREN IN KUMASI METROPOLIS

BERT NII ODOI MANIESON

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AMONG SCHOOL CHILDREN IN KUMASI METROPOLIS

BY

BERT NII ODOI MANIESON

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## DECLARATION

### Candidate's Declaration

I hereby declare that this thesis is the result of my own original research and that no part of it has been presented for another degree in this university or elsewhere.

Candidate's Signature ..... Date: .....

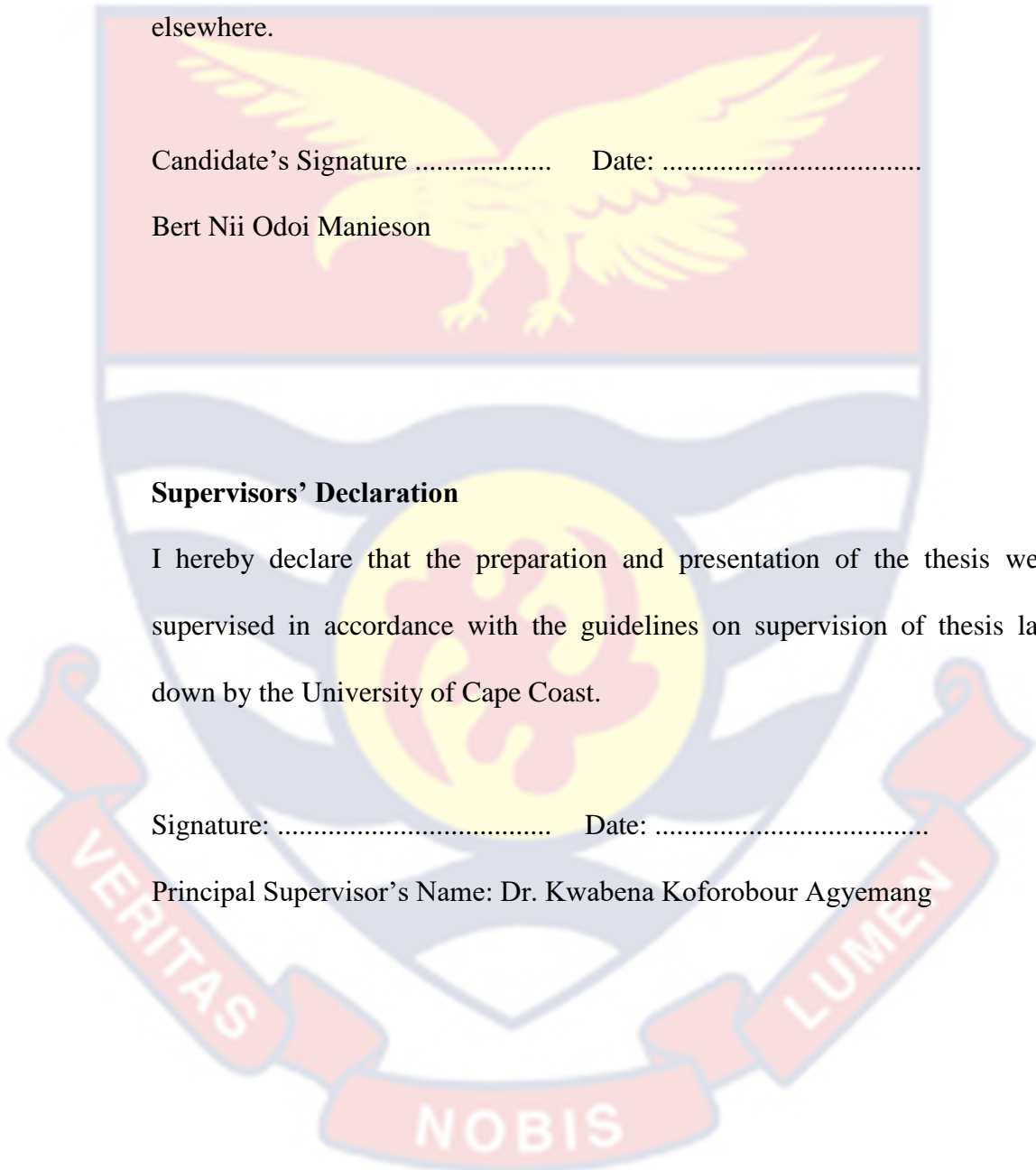
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### Supervisors' Declaration

I hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on supervision of thesis laid down by the University of Cape Coast.

Signature: ..... Date: .....

Principal Supervisor's Name: Dr. Kwabena Koforobour Agyemang



## ABSTRACT

Little attention has been given to the walking and cycling environment about research and policy, especially concerning children's school travel in built environments. Thus, this research seeks to contribute to literature by examining the factors that influence active school travel among children and the related challenges. The study employed both qualitative and quantitative methods of data collection. Pupils and parents were conveniently sampled and interviewed using structured questionnaires and interview guides on factors that influence mode choice as well as their associated risks to traffic accidents while on school journeys. Also, key informants were purposively sampled and interviewed. A pedestrian environmental data scan was used to assess the pedestrian environment and land use pattern along school neighbourhoods. The study revealed that distance to school and parental influence are major factors that influence walking and cycling. Street infrastructure that supports walking and cycling are determinants that also influence mode choice. The environmental assessment shows the absence of essential infrastructure which supports walking and cycling. Evidence from crash data suggests that more boys are likely to be hit as compared to girls while crossing the road. Analysis of the policy/strategies indicates that there are no specific national policies that promote walking and cycling although they are captured in snippets in some key policies and strategic plans. The study recommends the need for sustainable school neighborhood designs that protect children and encourage walking and cycling.

**KEY WORDS**

Active travel

Walkability

School

Children

Walking

Cycling

School

Non-motorised transport



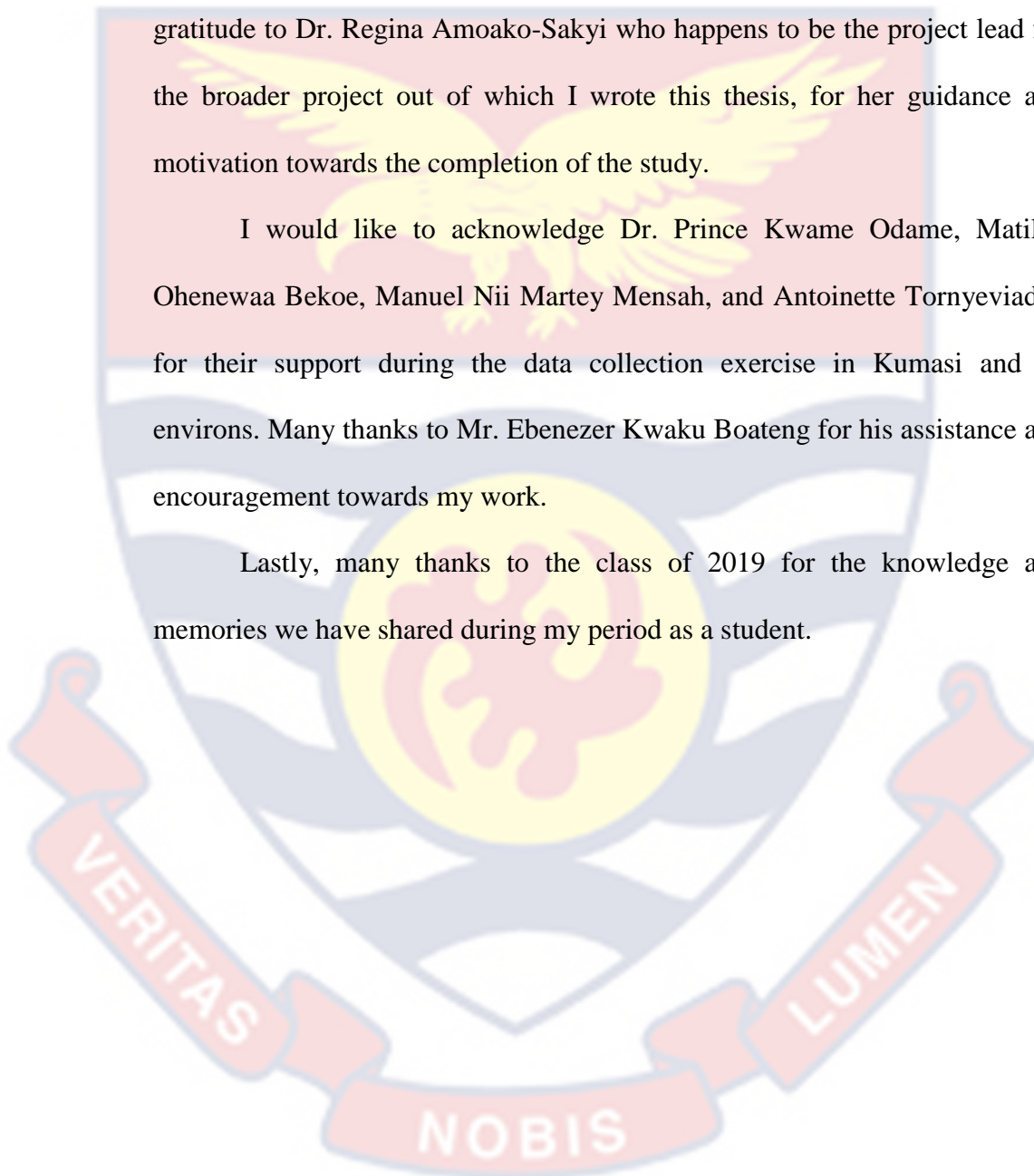


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Lastly, many thanks to the class of 2019 for the knowledge and memories we have shared during my period as a student.



**DEDICATION**

To my mother, Victoria Quashie





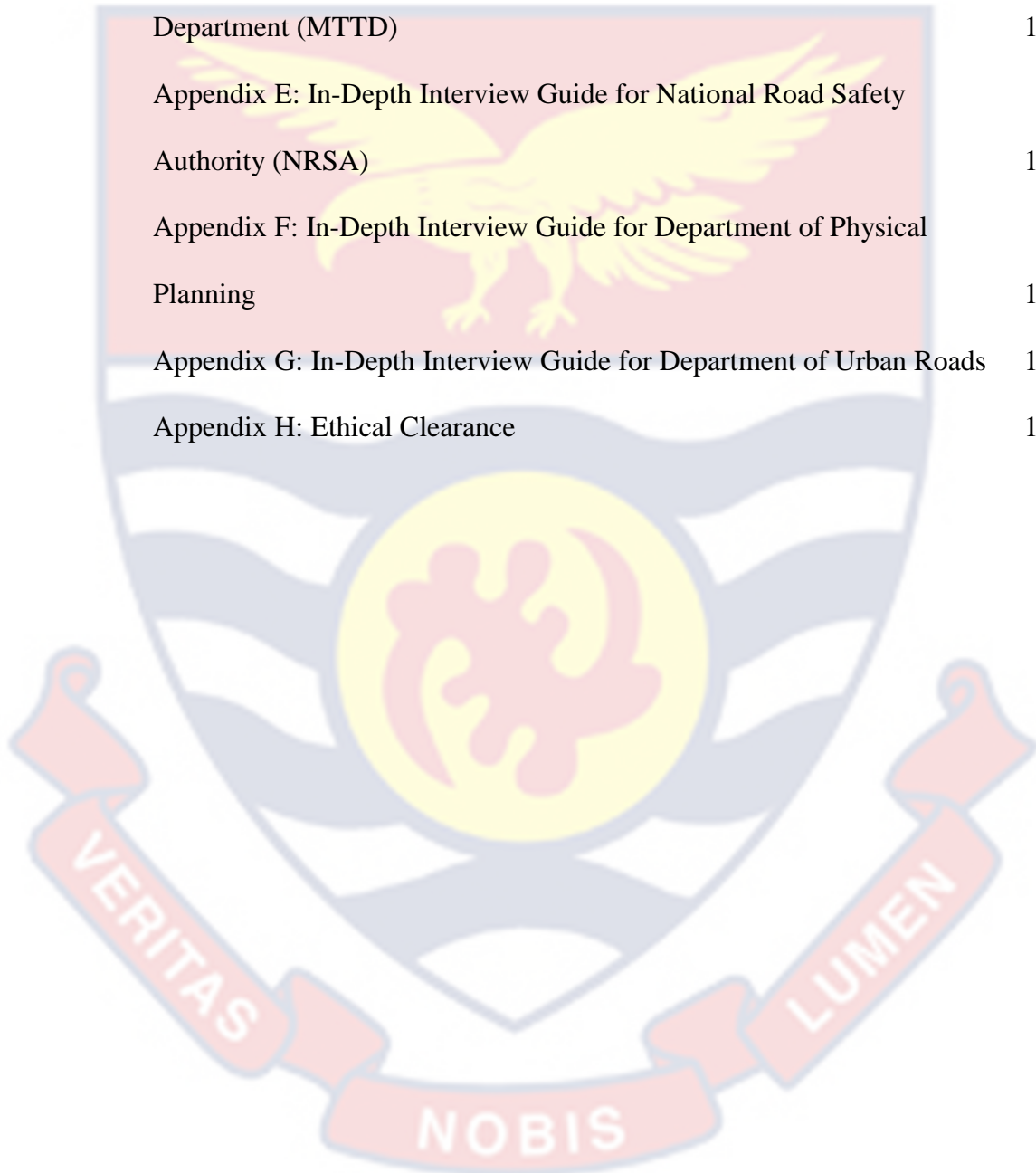
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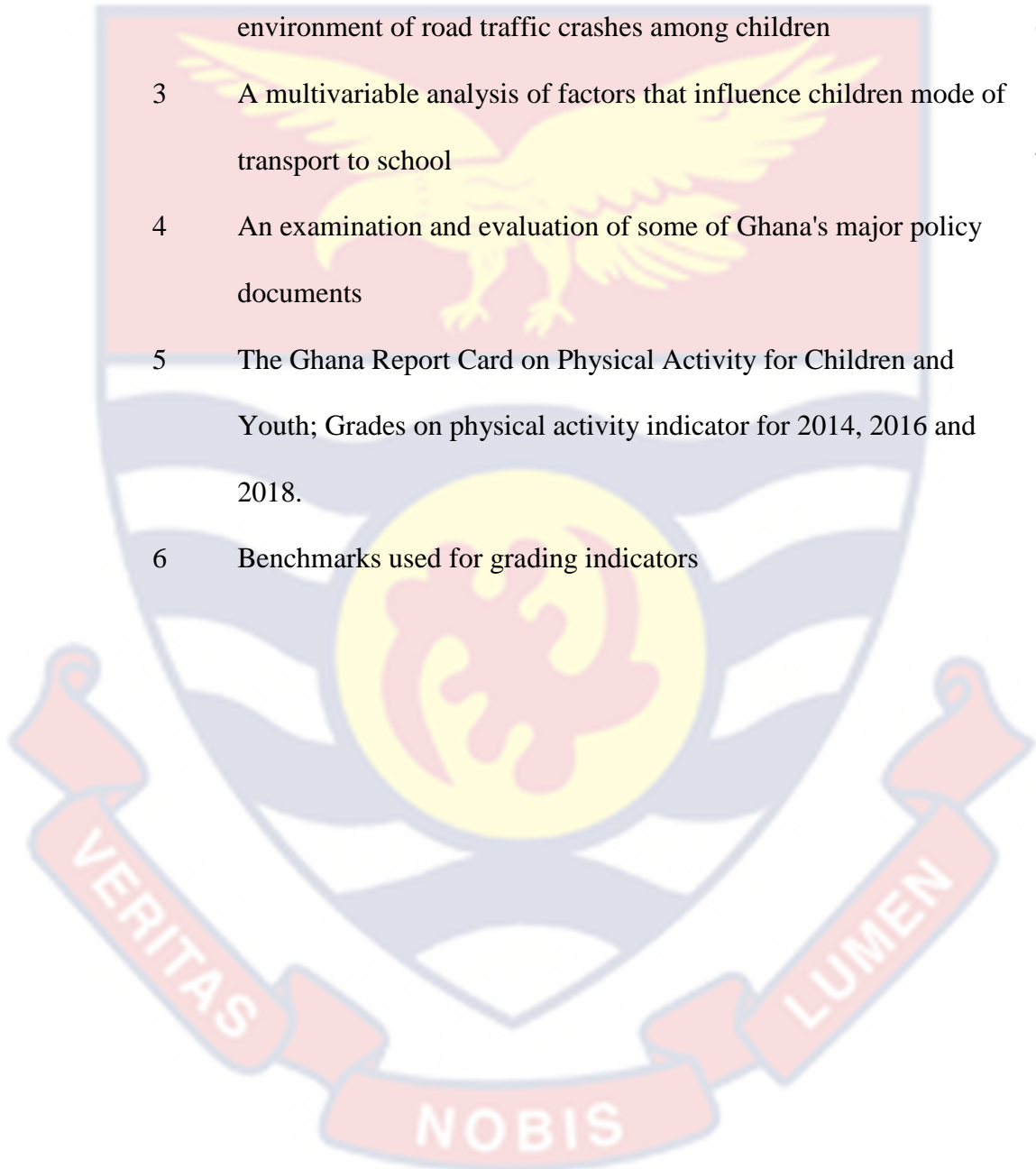
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**LIST OF ACRONYMS**

CBD	Central Business District
FGD	Focus Group Discussion
GNUPFA	Ghana National Urban Policy Framework and Action
GPS	Global Positioning System
ITDP	Institute for Transport and Development Policy
JHS	Junior High School
KMA	Kumasi Municipal Assembly
LUSPA	Land Use and Spatial Planning Authority
MTEF	Medium term expenditure framework
MTTD	Motor and Traffic and Transport Directorate
NCCE	National Commission for Civic Education
NMT	Non-Motorised Transport
NTP	National Transport Policy
NUP	National Urban Policy
NYP	National Youth Policy
OTMA	Old Tafo Municipal
PED	Pedestrian Environmental Data Scan
RTA	Road Traffic Accidents
SDGs	Sustainable Development Goals
SSA	Sub-Saharan Africa
TPB	Theory of Planned Behaviour
UDHR	Universal Declaration of Human Rights
UNEP	United Nations Environment Programme
UNICEF	United Nations Children's Fund
WHO	World Health Organization

## CHAPTER ONE

### INTRODUCTION

#### Background of the Study

As the world becomes increasingly urbanised with more than half of its population living in urban areas, the United Nations estimates that 70 percent of the world's children will live in urban environments by 2050 (Aerts, 2018; UNICEF, 2018). This has reignited interest in children's lives in cities among social scientists, geographers, planners, and designers on how cities can meet the needs of children as well as the mobility demands of children living in cities (Freeman & Tranter, 2012; Krishnamurthy, 2019). This means that towns and cities will shape the contours of millions of children's daily lives and experiences (Bowles, Kotkin & Giles, 2009).

Cities are engines of economic growth and present many opportunities, but they may also be sources of inequity. Inequity has spatial dimensions that may make children vulnerable, which is often disregarded (Aerts, 2018). Globally, 500 children are killed each day on our roads, four children are permanently disabled for every child that dies, and ten more are severely injured (WHO, 2015). Many of these children are killed while on their journeys to and from school. Child pedestrians are more likely to be injured or killed in road traffic crashes, according to global data, and children between 5 to 14 years are the most vulnerable (Soori, 2016; World Health Organisation, 2018). This is because children within these ages are less able to make safe decisions on the road (Amoako-Sakyi, 2017; Peden, et al., 2004).

The situation is even worse in low- and middle-income countries which account for more than 90 percent of the world's road traffic crashes

with the majority of these being pedestrians (WHO, 2019; WHO, 2015). The issue is of great concern because in sub-Saharan Africa, walking is still the dominant mode of transport for school journeys and parents/guardians seldom accompany their children to school (Amoako-Sakyi, 2017; Porter et al., 2011; Ipingbemi & Aiworo, 2013)

Studies in sub-Saharan Africa on road traffic crashes have identified poor child supervision, poor land use and streetscape planning, lack of child-friendly transport infrastructures such as sidewalks, zebra crossing, playgrounds, bicycle lanes and excessive speed in areas where speed limits are not posted as the root causes of road traffic crashes among child pedestrian (Amoako, Cobbinah, & Niminga-Beka, 2014; Peden et al., 2014; Poku-Boansi, 2019; Tatari, Khorasani, Yadollahi & Rahimi, 2013).

In Ghana, walking is still a dominant mode for school travel despite many risks and hazards school pupils are exposed to (Adom-Asamoah, Asare-Okyere & Senayah, 2015; Amoako-Sakyi, 2017; Poku-Boansi et al., 2019). Children who walk to school accounts for 74.4 percent making it the highest mode for school travel. Yet, for those who walk, a majority of them travel to school unaccompanied exposing them to greater risks. This is largely attributed to fact that most children live 1 to 1.6 kilometres from their school. How farther away the school is from the home is a critical factor in determining the mode choice for school travel (Amoako-Sakyi, 2017; Poku-Boansi et al., 2019; Ghana Statistical Service, 2012).

Evidence from Ghana indicates that pedestrians (36.7%) continue to be the road user group with the highest fatalities with children constituting about 40 percent of all road traffic fatalities. The country also witnessed an increase

in pedestrian fatalities by 11.7 percent in 2019 compared with 2018 (Ministry of Transport, 2021). Of the total number of deaths, teenagers recorded 33.33 percent whilst children below the age of 12 accounted for 66.67 percent. A significant number of these crashes occurred while children were crossing the road, walking along road edges or playing on the road (Ministry of Transport, 2016).

For these reasons, efforts targeting road safety have been included in Goals 3 and 11 of the Sustainable Development Goals (SDGs). SDG 3 seeks to reduce traffic accidents by half by 2030 while also promoting good health and well-being. Despite the fact that this target is far from being achieved some improvements were made (WHO, 2015). SDG 11 aims to create equitably safe, resilient, and sustainable cities and human settlements. Target 11.2 is focused on ensuring sustainable transportation networks that are affordable, accessible, and safe for everyone, especially vulnerable populations including women, children, the elderly, and persons with disabilities. Target seven of Goal 16 also seeks to ensure inclusive participation at all levels and to ensure representation in decision-making at all levels. Children must be involved in the decision-making processes in cities since they are also affected by the decisions that are often made by adults.

To specifically target the needs of children in cities, UNICEF introduced the Child-Friendly Cities Initiative. This project emphasizes the significance of protecting and realizing children's rights in the development of cities and communities. The initiative describes a framework for promoting child-friendly governance. Part of the goals of the framework is for children to



be valued and respected, have access to quality essential services such as education and healthcare, provide a safe and secure clean environment for children as well as give hearing to the needs and priorities of children in the formulation of policies, budgets, and decisions that affect them (UNICEF, 2018).

### **Problem Statement**

Kumasi is Ghana's second largest city and serves as a nodal town with road networks that provides access and connectivity for people to several parts of the country. It is also an industrial enclave and which inhabits millions of families with their children. Despite the prominence of the city as one of the fastest growing cities in Ghana at a rate of 5.4 percent, the city is also plagued with issues of road traffic safety accounting for the second highest pedestrian fatalities and injuries in Ghana (Cobbinnah, & Amoako, 2012; GSS, 2012; Ministry of Transport, 2019). Vulnerability of pedestrians could be attributed to the absence of essential pedestrian infrastructure such as sidewalks and pedestrian crossings, as well as street calming measures such as speed ramps. In cases where they are available, they are poorly maintained (Amoako, 2014; Poku-Boansi, 2019). According to Amoako (2014), the original plan of the Central Business District (CBD) did not take into consideration sidewalks for pedestrians.

Also, available literature on school journeys in Ghana has focused on factors influencing mode choice looking at varied modes for school travel without paying specific attention to active (walking and cycling) school travel as well as their shared use of the shared urban spaces despite the increasing pedestrian crashes among children in Ghana leaving a gap in literature about

children use of public spaces in Ghanaian cities (McMillan, 2005; Poku-Boansi et al., 2019).

Also, in Ghana, interventions to reduce pedestrian crashes have always focused on education of the general public paying little attention to the design of public spaces. However, educational initiatives often place on children the responsibility of protecting themselves from being crashed by motorists (Adanu et al., 2023). It is on this premises that this study sought to explore the contours of the everyday life of children engaged in active travel to and from school within the urban realm and to understand the implications of the available or otherwise of streetscape infrastructure impacts on their safety while on school journeys. For these reasons the study sought to provide answers to these research questions;

1. How does the available streetscape ensure the safety of school children in Kumasi Metropolis?
2. To what extent are school children involved in RTCs in the Kumasi Metropolis?
3. What factors determine the mode of travel among active school children in the Kumasi Metropolis?
4. How do existing policies/strategies/infrastructure support active school travel in urban Ghana?

### **Research Objectives**

Examine the linkage between the design of public spaces and travel safety among active school children during school journey to and from school.

The specific objectives of the study are to:

1. Conduct a streetscape audit using the Pedestrian Environmental Data Scan.
2. Examine incidences of pedestrian RTCs involving children in the Kumasi Metropolis
3. Examine the factors that influence active school travel among children in Kumasi Metropolis
4. Examine how existing policies/strategies/infrastructure support active school travel in urban Ghana.

### **Significance of the Study**

This thesis contributes to academic knowledge on the need for creating safe and inclusive cities for all people especially children, women and vulnerable populations. The study highlights the difficulties that schoolchildren experience on their way to and from school in built environments. The author hopes city planners, local authorities and decision-makers in charge of cities will make use of the findings in this study to improve city planning, design and provision of pedestrian infrastructures, especially along school neighbourhoods. The results of this thesis will add to the existing discussion regarding the connection between active travel among schoolchildren in Ghana and sub-Saharan Africa and the built environment.

### **Delimitation of the Study**

The study was limited to basic school pupils in both lower primary and upper primary and Junior High schools (JHS). Data on road traffic crashes obtained from the Building and Road Research Institute did not have GPS coordinate making a visual representation of crash data on the map impossible.



Government restrictions due to the coronavirus pandemic during the period data was collected resulted in fewer school contact hours between teachers and pupils. This made data collection very challenging since teachers only made available free classes for interviews making it difficult to use simple random sampling to randomly select children from each class. Social distance regulations by the government meant that pupils could not be followed to get data on the distances to travel to school and also the poor housing address system made it difficult to collect such data from child respondents.

### **Study Organisation**

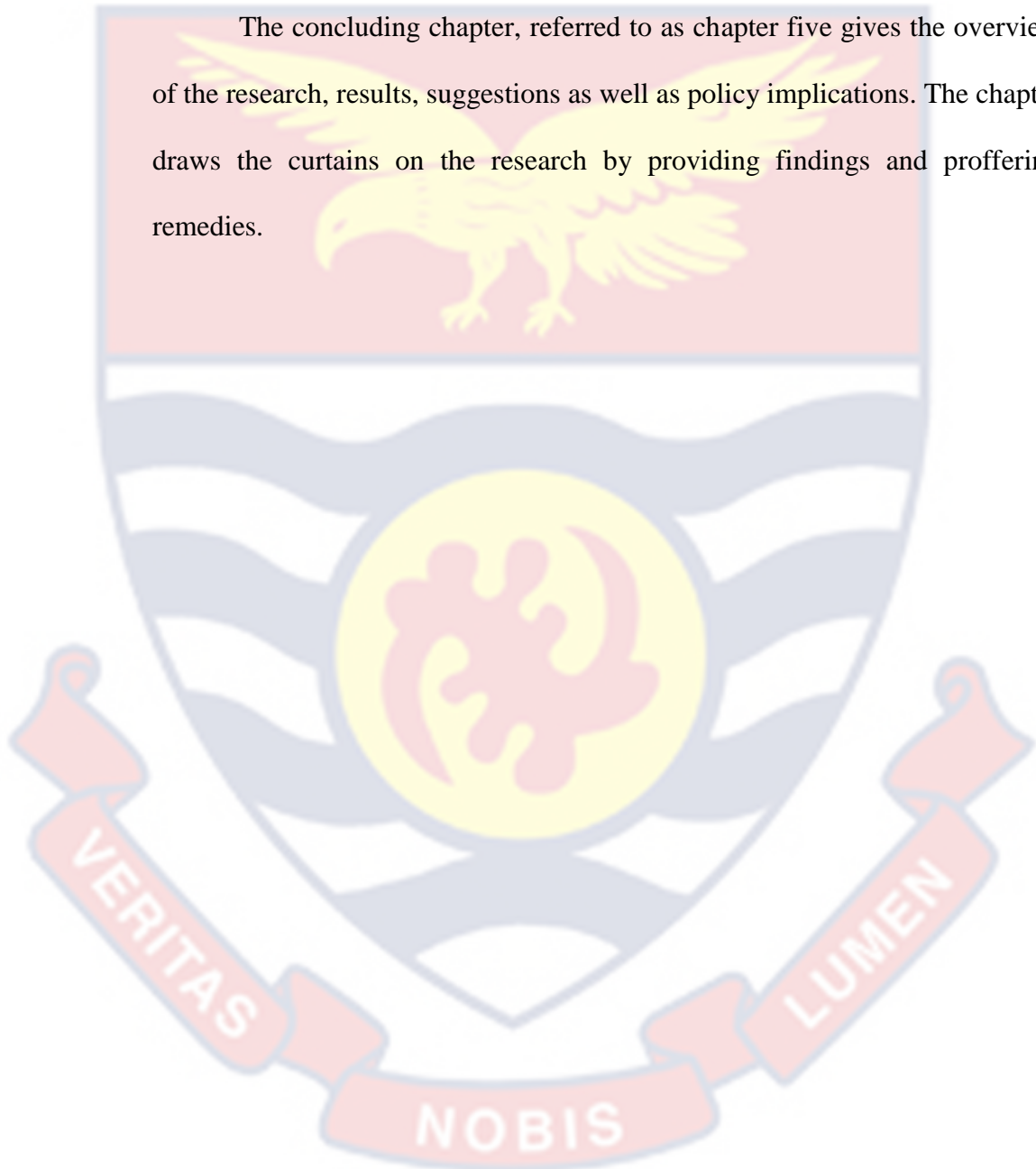
This study is broken into five (5) chapters, the first of which contains the study background, problem statement, research questions, study goals, and the significance of the study. The second chapter, commonly referred to as the literature review, focuses on a review of relevant literature.

Chapter two covers into theoretical and conceptual reviews separately. The chapter, thus, analyses the research about children active travel to school, concerns on pedestrian collisions, road infrastructure provision, school neighbourhood design in relation with the built environment.

The third chapter focuses on the research concept that guides the investigation and specifies the methodologies used. The chapter also discusses sample procedures, data sources, data collection methods, data analysis, and a description of the research region.

Chapter four of the research demonstrates the analysis and interpretation of the data. The chapter further examines the results offered in accordance with the literature studied. The conversations are thus arranged to meet the different aims of the research.

The concluding chapter, referred to as chapter five gives the overview of the research, results, suggestions as well as policy implications. The chapter draws the curtains on the research by providing findings and proffering remedies.



## CHAPTER TWO

### LITERATURE REVIEW

#### Introduction

This chapter examines the literature on children's school trips, infrastructure provisions for non-motorized transport (NMT) in Ghana, children's mode choice decisions, and children's access to road safety education. The chapter also reviews the literature on theories and concepts underpinning the study. The review looks at two theories: The Theory of Planned Behaviour (TPB) and the road accident causation model.

#### Children's Active Travel to School in Ghana

Many children in Africa face mobility challenges including safe access to school, health, and leisure (Porter et al., 2010). At present, walking is still the dominant mode of transport in Sub-Saharan Africa since it constitutes out of the door and shorter trips in urban areas as well as most community-based trips in rural areas (Ghana Statistical Service, 2012). Children from poorer homes without vehicle availability are more likely to walk to and from school (Poku-Boansi et al., 2019). Unlike their counterparts in the developed countries, where there has been a significant fall in the number of children who walk to school, however, in many Sub-Saharan countries like Ghana, walking is still a dominant mode of commuting to school despite many child pedestrian face on daily basis while on their journey to school (Amoako-Sakyi, 2017; Amoako-Sakyi & Owusu, 2011). For instance, Ghana's last National Household Transport Survey conducted in 2010 showed that 74.4 percent of children walk to school making it the highest mode for travel to school (Amoako-Sakyi, 2017; Accra Metropolitan Assembly, 2017; Amoako-

Sakyi & Owusu, 2011; Poku-Boansi et al., 2019; Ghana Statistical Service, 2012; Porter et al., 2010).

Distance walked by children is critical and measures the level of exposure to risk while on the journey to school. From the National Household Transport Survey Report, the majority (60.1%) of Ghanaians travel less than 1 km to access education. This is confirmed by studies conducted by Amoako-Sakyi (2017) and Poku-Boansi et al., (2019) who revealed that a significant percentage of school children walk to school and this is attributed to the fact that most of these pupils live within 1 to 1.6 km of their school. A distance which according to Amoako-Sakyi (2017) can be described as an "acceptable" walking distance to school. Long distances travelled to school have major consequences for school-age, early drop-out, and absenteeism. The problem has been attributed to poor land use planning and spatially dislocated settlements (Amoako-Sakyi, 2017; Amoako-Sakyi and Owusu, 2011; Ministry of Transport, 2008; Porter et al., 201; Poku-Boansi et al., 2019)

In cities such as Kumasi and Cape Coast, most school pupils are unaccompanied by adults and are therefore expected to take critical road traffic decisions to avoid collisions leading to injury and in some cases fatalities (Poku-Boansi et al., 2019). Investing in low-cost non-motorised transport in developing countries tends to improve access to economic activities and social amenities and educational opportunities in both rural and urban settings (Amoako-Sakyi et al., 2021; Poku-Boansi et al., 2019). In Ghana, cycling is the most common Non-Motorised Transport (NMT) for travel and accounts for the second-highest used transport mode for school (7.1%). As compared with developed countries, bicycles are underutilised in

travel to school in some parts of sub-Saharan Africa (SSA) including Ghana. In Ghana, bicycle usage is dominant in three northern regions while reports show the emergence of use among people in the southern parts of Ghana. A study on bicycle uses among Ghanaian children revealed that only 1 percent ride to access education services whilst majority of them ride for leisure. According to the study, there is generally, a negative attitude among drivers towards bicycle riding by children due to a perceived notion that child-cyclists are dangerous hence the incidence of drivers' unwillingness to share the roads with them. Drivers, therefore, tend to see child cyclists as a nuisance (Amoako-Sakyi, & Owusu, 2011; GSS, 2012; Heyen-Perschon, 2005).

#### **Non-Motorised Transport (NMT) for Travel to School in Ghana**

Generally, the National Transport Policy (NTP) acknowledges the lack of appropriate legislation for Non-Motorised Transport operations but emphasises the Transport sector's desire for increased provision and rehabilitation of infrastructures linked to Non-Motorised Transport (NMT). This is further emphasised in the National Urban Transport Policy (NUTP) which devises strategies such as raising awareness on the benefits of NMT use, especially including, but not limited to, walking and cycling. It is interesting to note that, both the NUTP and the NTP contemplate the schools and educational institutions as the starting point for raising awareness.

The NTP proposes as one of its strategies, to conduct surveys to help understand road user needs/perceptions to pave the way for the inclusion of NMT infrastructure into the whole development planning process as a step towards achieving its objective. The policy also seeks to bring awareness of the management of schools and Universities to provide infrastructure to



support the use of NMTs in their facilities, acknowledging that infrastructure for NMT use in urban centres and schools is inadequate. The NTP even goes further to propose a strategy aimed at increasing NMT use to about 10 percent, with the setting up of credit schemes to enable students to purchase and maintain bicycles at affordable prices. It is unfortunate that 12 years after enacting the policy, Ghanaian students are yet to see this happen (Non-Motorised Transport Strategy, 2019-2028)

Apart from students, other population subgroups such as women, children, the aged and the physically challenged persons are also to be considered while making available the needed transport infrastructure. The strategy is to create an enabling environment where all commuters can access basic transport infrastructure to allow for easy commuting. In furtherance of the objective to improve upon the transport infrastructure that supports non-motorised transport in Ghana, the Institute for Transport and Development Policy (ITDP) was appointed by the UN Environment Programme (UNEP) for the preparation of the Government of Ghana's Non-Motorised Transport Strategy (2019-2028). The strategy was developed on the principles of universal access since areas with footpaths in Ghana reveal varying degrees of barriers ranging from sloping pavement to the presence of open drains. These identified barriers obstruct the movement of NMT users including pedestrians who are estimated to make up about 67 percent of travel in Accra. Additionally, the report laments the absence of trees along various sidewalks since these expose pedestrians and cyclist to harsh weather conditions such as heat from the sun (National Transport Policy, 2008).

### **Infrastructure Provision for Non-Motorised Transport**

Improving mobility is considered crucial to improving the standard of living among the urban poor, majority of the urban poor live in peripheries of cities and have to travel longer distances at a huge cost to school, work and accessing essential services like health therefore become dependent on walking, cycling (NMT) and public transport for their travel needs (Beukes, Vanderschuren, Zuidgeest & Brussel, 2011)

Available transport infrastructure, as well as the quality of service, have a great impact on children's ability to conveniently and safely travel to and from school. Studies on available infrastructure on children's route to school reveal that school children had difficulties with the lack, insufficient and dilapidated state of transport infrastructure and amenities, among these studies is one conducted in Kumasi by Adom-Asamoah et al., (2015). The study also showed how the absence of sidewalks along several streets to school coupled with the absence of essential road facilities such as zebra crossing, and road signs increase children's exposure to the risk of injury and crashes. Additionally, the bad nature of some of the roads with potholes induces commercial vehicles to compete with school kids for use of the sidewalks or paths along the streets (Siiba, 2020). Street hawkers also compete with pedestrians on the few available sidewalks making it inconvenient for pedestrians to use (Siiba, 2020). It is important to note that the provision of pedestrian infrastructure in itself is not the solution but usability and convenience to pedestrians is critical. In most Ghanaian communities, little attention has been given to pedestrian infrastructures when



planning and designing road infrastructure (Amoako-Sakyi, 2017; Poku-Boansi et al., 2019).

### **Under-Representation in Decisions with Regard to Children's Mobility**

The UN convention of the Universal Declaration on Human Rights seeks to protect children, provide an enabling environment that meets their basic needs and also encourage children's participation in the choices and decisions making process about their living environment (Lundy, 2007). Children have specific needs and these needs must be protected and provided for due to their vulnerability and requirement for healthy development (Elshater, 2018). A friendly urban environment is that one that children of different peer groups go out to play, learn and thrive with or without their parents (Brown et al., 2019). It is also one in which children's perceptions and opinions are taken into consideration as well as given the opportunity to influence the decision-making process (Elshater, 2018).

Adom-Asamoah et al., (2015) revealed that parents have significant control when it comes to decision making on children's mode choice to school and in most cases, parents dictate the mode choice to pupils. The study also revealed that parents' influence over mode choice was felt more by children in private schools than their counterparts in public schools. This may be as a result of the fact that most of the private schools were farther away which usually requires public/private transport as compared with public schools that were within the immediate environment or a walking distance from the home (McMillan, 2005). Even the decision as to which basic school to attend is largely decided by the parent (Amoako-Sakyi, 2017; McMillan, 2005). The opportunity for children to express their thoughts and needs during

participatory planning for the design and building of transportation facilities is minimal to non-existent (Porter et al., 2010; Porter, Hampshire, & Abane, 2010).

### **Access to Information on Transport Safety**

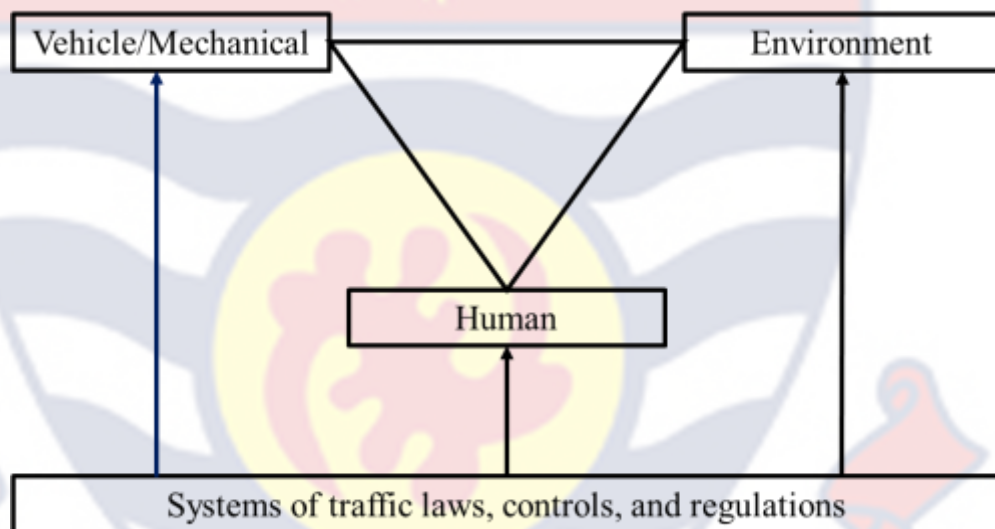
In Ghana children usually, gain access to information on transport through schools. At some basic schools, children are taught basic road safety drills on using the zebra crossing and how to interpret the traffic light. Some parents also educate their children on basic road safety drills especially for children who walk to school and children who use public transport. The Government of Ghana through the National Commission for Civic Education (NCCE) once a while educates the public and children on pedestrian safety. Aside these government institutions, other private organisations and NGOs have also taken the lead in spearheading road safety awareness and education. For instance, in 2017 AMEND-Ghana, the Federation Internationale de L'Automobile (FIA) Foundation and Puma Energy Foundation launched a three years project to educate school children in selected schools in Accra. Also, other corporate institutions like Vivo Energy Ghana launched the Junior Road Care Project that was intended to educate school children on road safety in 2019. Not much in terms of policy has been instituted to ensure that children have access to information on road safety awareness.

### **Developing the Conceptual Framework**

#### ***Jorgensen and Abane (1999) Road Traffic Accident (RTA) causation model***

The Road Traffic Accidents (RTAs) causation model by Jorgensen and Abane (1999) was developed from the human ecological model of disease causation by Mead, Florin and Gesler (1988). RTAs are caused by three

primary interacting components, according to the model: vehicle/mechanical, human/behavioral, and environmental. It does, however, include a fourth component, traffic laws, limits, and regulations, which directly affects or influences the other three components in the model to determine risk (see Figure 1). This is so that road users can function within the framework that these rules and regulations, to a significant part, provide to guide and govern human behavior. As a result, the severity of current traffic rules and regulations, as well as how they are ultimately enforced, might affect the likelihood of Road Traffic Crashes (RTC) in particular areas.



*Figure 1: Road Traffic Causation Model*

Source: Jorgensen and Abane (1999)

The mechanical or vehicular causes are mostly related to the condition of the vehicle in use, which might range from driving an older car to a part malfunctioning, such as a brake failure or a tire rupture. Inadequate vehicle maintenance practices and the use of out-of-date and inappropriate replacement parts during repairs are further contributing factors to this problem.

The human/behavioral element's human/behavioral component includes the behavior, attitudes, risk perception, beliefs, and value systems of road users, including drivers, cyclists, passengers and pedestrians, which puts them at risk for accidents. This includes demographic data on the road user, such as age and gender. Driving while intoxicated, driving too fast, driving while fatigued, driving while inattentive, and disrespecting the rules and laws that govern the driving environment are some of the behavioral characteristics linked to road traffic accidents among vehicle drivers (Amoako-Sakyi, 2017). For the pedestrian, factors such as age, gender, crossing at authorised pedestrian crossing places, and choosing sidewalks rather than the hard shoulders of the road, among others, can significantly impact their likelihood of being involved in pedestrian crashes.

The environment is the next issue to consider, and it is directly related to the study that intended to examine the current pedestrian environment of routes to school in order to assess how walkable they are and the relationship with pedestrian collisions inside the city. The environment includes both physical and social components that may operate as significant risk factors in road traffic accidents, including collisions involving pedestrians. This is according to Jorgensen and Abane (1999). The environment may have factors that affect the likelihood of a pedestrian accident, such as the presence of pedestrian facilities including sidewalks, traffic islands, crossing aids and others. The component, in addition to the pedestrian environment, also covers issues with the general driving environment, such as weather and other road conditions like the presence of potholes.



Since the model analyzes risk based on three variables, including environmental factors, which serve as the foundation for walkability evaluation, it is good and may be extensively incorporated in this study. Therefore, it is necessary to evaluate several ideas and models that underpin the other elements of active travel.

***Theory of Planned Behaviour (Ajzen, 1991)***

A development of the idea of reasoned behavior, the theory of planned behavior (TPB) was proposed by Ajzen and Fishbein in 1980. The purpose of the individual to carry out a specific behavior is the main focus of the theory of planned behavior. In other words, it is a theory that links belief of individuals to behaviour. The theory is made of three components which are perceived behavioral control, subjective norms and personal attitudes, all of which shape individuals' intentions. The idea takes into account all of our information, attitudes, and biases (both positive and negative) when defining personal attitudes. The perceived behavioural control theory examines how much we feel we have control over our conduct whereas the subjective norms theory examines how we view other people's viewpoints on a certain activity. This depends on how we see both internal qualities like our own skill and drive and external qualities like the tools and assistance that are at our disposal.

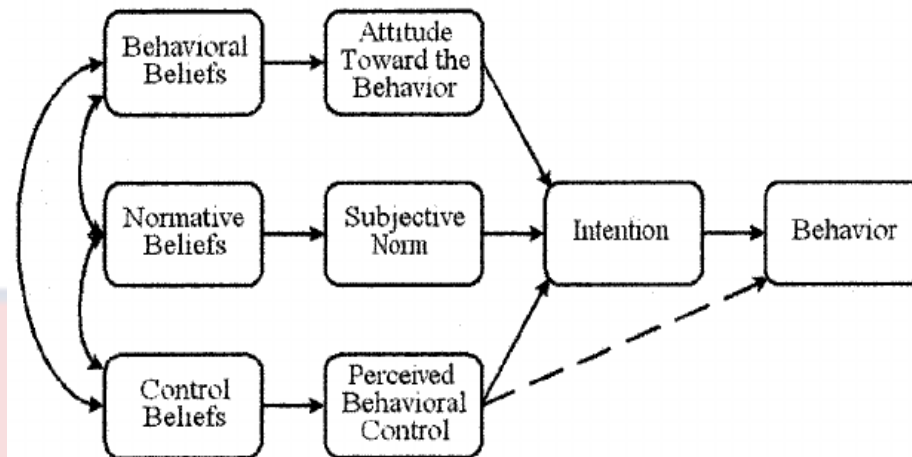


Figure 2: Theory of Planned Behaviour

Source: Ajzen (1999).

The TPB maintains that the closest predictor of human social behavior is behavioral intention. The theory of planned behavior emphasizes the importance of psychological or proximal aspects in a particular activity (such as attitude, subjective norm, and perceived behavioral control). Based on the Theory of Planned Behavior, this study hypothesized that users' intentions to engage in active school travel could be analyzed to predict their choice of commuting mode (walking or cycling). Generally speaking, a person is more likely to carry out a behavior the more strongly they wish to do it.

### Conceptual Framework

The framework for environmental determinants of active travel is a cutting-edge theoretical paradigm that examines how to include the environment into broader decision-making processes around travel choices for children. The conceptual framework on the connection between urban form and children's travel behavior was derived from McMillan (2005). Additionally, it examines mediating and moderating factors that affect how children go to and from school, as well as how parents choose a child's mode of transportation.

The conceptual framework in figure 3, demonstrate how the built environment, urban design, and infrastructure affect students' active commute to and from school. The framework examines the elements of urban environments, personal perceptions of actual and perceived safety, and the impact of outside variables like institutional and national policies.

The concept is predicated on the idea that, up until a certain age, the choice to send a child to school is often made by parents or other adult household caregivers rather than the child themselves. Therefore, rather than merely the child's schedule, constraints, or thoughts, that decision is mostly influenced by the preferences of the parents or caretakers.

Specifically, it is a factor on the proposed causation pathway between urban form and a child's commute to school (Bauman et al. 2002). In this regard, parental choices might be viewed as a mediating or intervening causal variable in relation to a child's travel behavior.

Other influencing circumstances, on the other hand, may have an influence on parental decision-making in and of themselves. According to Baumann et al. (2002), a child's school travel habits and urban form are "a series of cascading mediators that intervene and are causally related in sequence." These mediators include safety and/or traffic perceptions, socioeconomic variables, and block length. These characteristics may, in turn, impact parental decisions regarding how a kid should get to school. These components draw attention to the nature and outlines of the relationship between urban form and a child's school commute.



The conceptual framework purports that, given particular components of urban form, a parent develops views about the physical environment's potential to accommodate alternate means of transportation for their child's trip to school, and these beliefs control how the child gets to school. The framework, for instance, contends that a street's design may not directly affect a parent's choice regarding a child's travel, but rather may have an effect on traffic, crime, or household transportation options that affects the parent's choice regarding the school trip. Therefore, unless it addresses parents' underlying worries about their children's school commute, a sidewalk may not be the answer to low walking rates.

With regard to the urban form or infrastructure several studies have examined walkability and urban form in neighborhoods and found a correlation between the presence of sidewalks and walking (Holman et al, 1996; Moudon et al. 1997). For instance, site design and route directness were shown to have a considerable impact on the number of pedestrian trips to business districts by Hess et al. (1999) and Moudon et al. (1997), in a study of twelve neighborhood sites in the Puget Sound region. The decision to walk is also influenced by the condition of the surrounding pedestrian environment (McMillan, 2005).

Walking trips for shopping have been found to be impacted by factors including congested roadways and the overall safety of the walking environment between residential zones and commercial districts (Handy and Clifton, 2001; Handy, Clifton, and Fisher, 1998). Stead et al., (2001). also found sidewalks to be positively correlated with the amount of non-motorised journeys in five San Francisco Bay Area areas.

### **Neighbourhood Safety (Perceived or real)**

Elements of urban design contribute to parents' dread of criminal threat, which limits their child's travel and play bounds. Routes that seem run-down and have poor monitoring may give a pedestrian a perception of danger (McMillan, 2005). Children's safety concerns may not always transfer into adult safety concerns: The findings of various research on the association between safety fear and adult walking activity are equivocal (Booth et al., 2000). While the topic of neighborhood safety is frequently highlighted, studies seldom go further to identify specific neighborhood features associated with anxiety in children or to determine whether variables outside of the local environment have a bigger impact on behavior.

### **Traffic Safety (Perceived/Real)**

Streets with heavy traffic and fast-moving vehicles put young pedestrians in risk and deter them from walking. This may be especially true on streets near schools, where parents who drive their children to school add to the danger for people walking or riding their bikes (Bradshaw, 1995). However, a child's decision to drive to school is not necessarily predicated on a realistic risk assessment or a parent's anxiety about traffic. Adult walking behavior is also influenced by perceptions of excessive traffic, with some studies indicating perceptions of heavy traffic as a primary barrier to walking (McMillan, 2005; McMillan, 2007). The impact of perceived and actual traffic safety on parental decision making may change depending on the parents' perception of control over their child's behavior (McMillan, 2005).

### **Household Transportation Options**

Accessibility, or proximity to destinations, creates an enabling environment in which walking might be a feasible means of transportation in some circumstances. Studies have shown that environments that encourage walking as a mode of transportation, such as reducing the distances to commercial areas, transit stops, and services, are linked to an increase in the number of walking trips or the percentage of nonmotorized trips that adults make to these locations (McMillan, 2005; Mitra, 2013). Other research has found that access effects parents' decisions about their children's school transportation. The physical distance between home and school limited a household's transportation options and was a major factor in a parent's decision on how to get their children to school (Clark et al., 2014; Lucas et al, 2016). School placement decisions inside a neighborhood may limit a household's mobility options by placing children beyond walking or bicycling distance of a school or outside of the boundaries of a means of transportation (McMillan, 2005; Mitra, 2013).

### **Parental and Children's Attitudes**

Parents' general views and ideas may affect decision regarding a child's mode of transportation to school. In one-of-a-kind research by Stead et al., (2001) which looked at the relationship between land use, transportation, and attitudes, it was discovered that an individual's attitude was a major predictor of travel behavior, maybe even greater than land use features. Other studies suggest that parents' attitudes can impact not just their own travel decisions, but also those of their children (McMillan, 2005, Lucas et al, 2016). Other studies have shown that many work and nonwork automobile travels are

driven by the demands of the home and children, whether for school, leisure activities, or medical reasons. The results of these research show that both mothers and fathers take children on a sizable number of excursions, with mothers taking most of these trips for kids under the age of 17 (McMillan, 2005; Panter et al., 2008).

Those who have access to a car, on the other hand, may regard the surroundings as inappropriate due to a lack of understanding. Similarly, a parent who has previously good sentiments regarding active travel will be more inclined to pick an active transport mode for their children (Panter et al., 2008).

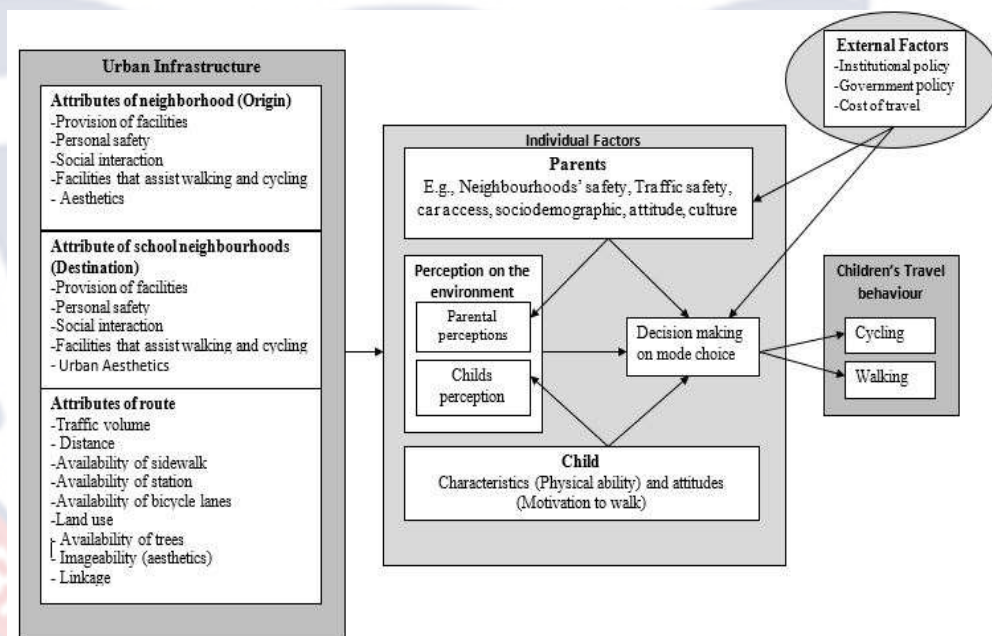


Figure 3: Conceptual framework for environmental influence on children's active travel.

Source: Adapted from Panter et al., (2008).



## CHAPTER THREE

### RESEARCH METHODOLOGY

#### Introduction

This section of the thesis discusses the methods and approaches used in achieving the objectives of the study. The study focuses on exploring the relationship between the urban streetscape and active school journeys and identifying the mobility needs and barriers associated with active school travel within the built environment in Kumasi. Issues raised in this chapter cover the research design, study approach, target population, sample size and procedure, research instrument, data collection and analysis as well as the challenges from the field.

#### Research Design

For the purpose of this study a mixed method approach was employed. The mixed method design is a systematic blending of qualitative and quantitative research or assessment methodologies is known as mixed methods research which has gained more attention in recent years among scholars (Creswell, 1999). Mixed approaches, according to proponents, can overcome the shortcomings of a single approach (Greene & Caracelli, 1997; Johnson, & Onwuegbuzie, 2004). To be more specific, the study employed the use of the concurrent triangulation mixed method. According to Greene and Caracelli (1997), triangulation require combining qualitative and quantitative approaches to investigate the same issue can increase validity and achieve convergence.



Triangulation is a technique for cross-checking or validating a research study's conclusions by combining information from several sources or data gathering methods. You can use triangulation to discover biases, gaps, or inconsistencies and to make your results more reliable, complete, and consistent (Creswel, 2014). This paradigm often gives equal weight to quantitative and qualitative data, prioritizes their analysis, collects both types of data concurrently or simultaneously, and takes both into account during the findings, interpretation, or conclusion phase. (Creswel et al., 2004).

### **Study Area**

The study was conducted in two local government authorities within the Kumasi Metropolis, the Kumasi Metropolitan Assembly and Old Tafo Municipal Assembly in the Ashanti Region. The Ashanti Region is situated in central Ghana, roughly between latitudes 5.50 N and 7.46 S and longitudes 0.15 E and 2.25 W. The region's borders were shared with the Western Region and the Ahafo Region in the west, the Bono East Region to the north, the Central Region to the south, and the Eastern Region to the east. The Kumasi Metropolitan Assembly is a highly urbanised region with a population of about 443,981 with females making up 51.9 percent and males making up 48.1 percent of the population. It has an area of 68 km<sup>2</sup> with a population density of about 6,542.6-person km<sup>2</sup>. It is also regarded as one of the largest and fastest growing cities in Ghana (Ghana Statistical Service, 2012).

One of the 38 District Assemblies that were established in 2018 was the Old Tafo Municipal Assembly, which was separated from the Kumasi Metropolitan Assembly. On March 15, 2018, the Municipal Assembly was formally established by Legislative Instrument (LI 2293). The Old Tafo

Municipal Assembly has its capital as Old Tafo. With a size of around 5 km<sup>2</sup> and a population density of 20,880.2 people per km<sup>2</sup>, it is a highly urbanized region.

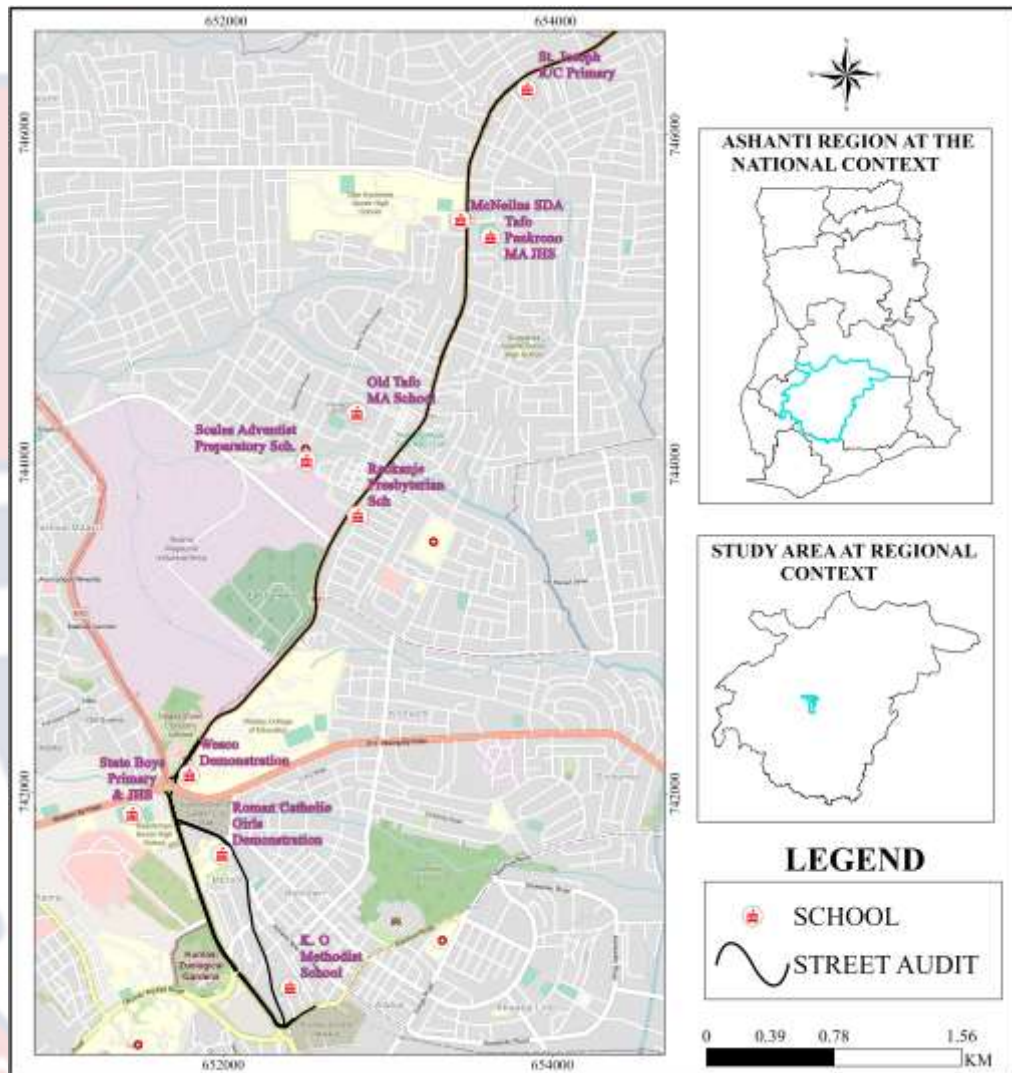


Figure 4: Study area map showing selected schools in the Kumasi Metropolis  
Source: GIS and Cartographic Unit. Department of Geography and Regional Planning, University of Cape Coast.

### Study Population

The target population for the study were mainly school pupils living in urban environments in the Kumasi Metropolis specifically Kumasi Metropolitan Assembly (KMA) and Old Tafo Municipal Assembly (OTMA) who travel to and from school either by walking or cycling. The study

focused on school pupils in upper and lower primary as well as those in Junior High School since they fall within the age bracket of children that are greatly affected by road traffic crashes mostly while crossing the street (UNICEF, 2018).

The focus of the study was children's safety in the urban environment as active walkers and paratransit users for school journeys. An array of actors contributes to children safety including parents and guardians who decide on children's mobility options, availability of different transport modes and service provision elements that influence access; infrastructure development and policy guidelines that influence safety; and socio-cultural and economic factors that influence the choices made by individual households.

The study thus targeted different audiences, among them were children, the subject matter of the study; their parents, schools, community leaders, policymakers, public transport providers including paratransit and motorcyclists, civil society organisations, and other relevant organisations. Specifically, the study targeted basic school children from upper primary to Junior High School children who travel to school using paratransit. The study focused on both private and public basic schools within Old Tafo Municipal Assembly and the Kumasi Metropolitan Area (KMA), covering a stretch of about 9.2km. The study targeted various stakeholders such as the Department of Urban Roads, National Road Safety Authority, Motor Transport and Traffic Directorate (MTTD) of the Ghana Police Service and headteachers.

### **Sampling Procedure**

For the study, a multi-stage sampling method was employed. Multi-stage sampling entails moving from a large to a small sample using a step-by-

step procedure (Taherdoost, 2016). It can also refer to the practice of breaking up big populations into smaller clusters in order to increase the effectiveness and efficiency of collecting primary data. This technique is employed to overcome the challenge of sampling large populations. In essence, this process reduces the size of the population by dividing it into smaller groups that may then be randomly selected (Rahman et al., 2022).

For this study, in the first stage of sampling, a purposive sampling technique was used to identify a street that had many schools located along its streetscape. As a result, the IRA 4 (Tafo-Pankrono) road was selected for the streetscape audit based on consultation with local authorities and the local education district heads in both the Kumasi Metropolitan Assembly (KMA) and the Old Tafo Municipal Assembly (OTMA).

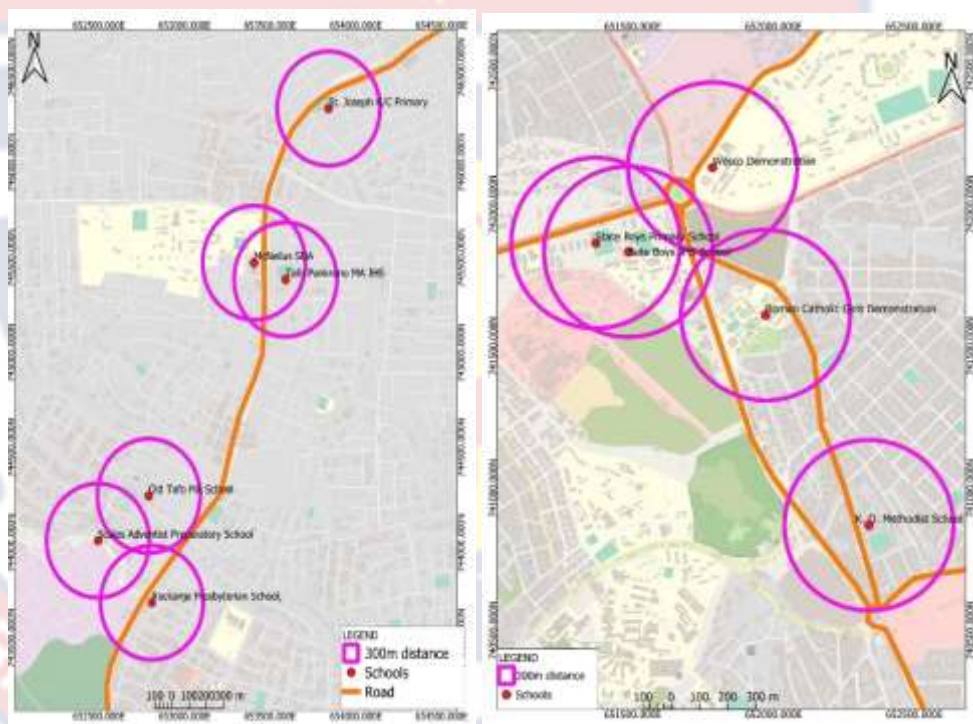
After selecting the road for the street audit, the convenient sampling technique as employed to selected schools there within 300 meters buffer of the road network. As a result, 10 school were selected for the study as seen in the Figure 5 below.

With the assistance of school instructors, a random sample procedure was utilized in the third step to choose school children with the assistance of school instructors, a random sample procedure was utilized in the third step to choose school children. To participate in the study, a pupil had to be below 18 years and live within the neighbourhoods for which the study was conducted. The study focused on children engaged in active school travel (either walking or cycling) to and from school. pupils who passed the selection criteria were then randomly sampled with the help of class teachers. As per the sampling population required by the project under which this study was conducted, two



hundred (200) active school pupils were randomly selected for the students. As a result of data cleaning a sample size of 175 pupils were randomly selected for the semi-structured interviews using the questionnaire.

Focus group discussions were also conducted for both Primary School and Junior High School (JHS) pupils. Each focus group was made up of at least ten pupils who were randomly selected by their respective class teachers. Male and female participants were grouped separately. Participants were also grouped to have pupils from the same class in a group to ensure that students were comfortable with each other.



*Figure 5: A study area map showing schools within 300 meters buffer of school neighbourhood.*

Source: GIS and Cartographic Unit. Department of Geography and Regional Planning, University of Cape Coast.



### Data Collection Instruments

The study used three main research instruments for data collection. These are;

- i. User perception survey instrument for interview schedule
- ii. In-depth interview guide for subjective assessment of children engaged in active travel to and from school.
- iii. In-depth interview for stakeholders
- iv. Street Audit (Pedestrian Environmental Data Scan)

The user perception interview schedule was used to solicit data on children use of the urban spaces, how they navigate their way to and from school, factors that influence walking and cycling as well as issues of safety, security convenience and attractiveness of the urban space. It also looked at the challenges that school children face while on their journeys to and from school as well as their socio-economic backgrounds.

In-depth interview guide at the qualitative aspect of the issues raised in the interview schedules. It allowed for children to express themselves and give interpretations to the issues relevant to their safety needs in the urban spaces while on their journeys to and from school.

In-depth interviews were conducted for stakeholders within the Old Tafo Municipal Assembly (OTMA) and Kumasi Metropolitan Assembly (KMA) concerned with the management of the cities such as the head for land use and spatial planning, director of urban roads, head teachers of selected schools and the National Road Safety Authority representative.

The Pedestrian Environmental Data Scan (PEDs) was used to conduct a streetscape audit of street infrastructure around school neighbourhoods on the selected street. It examined issues such as safety, security, convenience

and attractiveness of the pedestrian environment. Specifically, the Pedestrian Environmental Data Scan examined four key variables, that is the environment, pedestrian safety, road attributes and walking environment. These variables measured quantitatively the street infrastructures in terms of safety, convenience, security, and attractiveness as well as the land use patterns of the streetscape.

### **Data Collection Procedure**

Based on the standards and institutional research ethics of the University of Cape Coast, an introductory letter was sent to the municipal directors of education in the KMA and OTMA asking for permission to engage schools within their jurisdiction. After the letters were approved, an introductory letter was attached to the approved letter from the directors of education and was sent to the selected basic schools. Introductory letters were also sent to the various stakeholder institutions such as the Department of Urban Roads, the Spatial Planning Department of the Kumasi Metropolitan Assembly, National Road Safety Authority and others indicating the time for interview with these institutions.

In addition to the letters, the researcher also added copies of the research instruments in order to get the responding institutions to understand what would be required from them during the interviews. The educational institutions also approved of the research instruments to buttress the approval already given by the Institutional Review Board of the University of Cape Coast.

To assess the pedestrian infrastructure, an auditing tool known as the Pedestrian Environmental Data Scan was used to assess the street

infrastructure. To do this Six Research Assistants (RAs) were employed and trained on how to conduct the audit. The auditing was for every 100 meters of the selected road network. This was to allow the RA's fully see the environment and assess it. The measurement of the 100-meters mark was done using the 'my-track software'. For every 100-meters the street environment was audited using the Pedestrian Environmental Data Scan and Mytrack applications.

The audit looked at walkability indicators such as availability of pedestrian walkways, traffic lights, pedestrian crossings, street calming measures such as posted speed limits and speed ramps along the segment of the route. As discussed earlier the Pedestrian Environmental Data Scan measured main variables such as general environment, pedestrian facility, road attributes and walking and cycling infrastructure. The researcher also observed key activities along the road segment such as driver behaviour towards school pupils and pedestrians as well as on-street parking and other environmental obstructions and destructions.

Due to the Covid 19 protocols and its resulting restrictions, pupils had little contact class hours therefore pupils were only available during their break.

This was to avoid interrupting the lesson hours of the pupils. Pupils that were available to participate were grouped into two: participants for focus group discussion and participants for interview schedules. For the focus groups, pupils were grouped by sex. The study further grouped focus group participants into lower primary and upper primary. The interviews from the discussions with the permission of participants, recorded with a recorder and

protected with a password. Each focus group consisted of not less than ten participants. All covid-19 protocols were fully observed.

Secondary data were obtained from the NRSA and the Building and Road Research Institute (BRRRI) after an introductory letter from the Department of Geography and Regional Planning was sent to the various institutions requesting for accident data involving children within road networks selected by the project.

### **Processing and Analysis**

Streetscape audit from the pedestrian environmental data scan was analysed using the Statistical Product and Service Solution (SPSS) V.23. The tool helped in analysing the audit by generating frequencies and percentages with the available street infrastructure and their conditions. Percentage, charts, cross tabulations and basic statistics were used to analyse the street infrastructure.

Responses from the interview schedules were also analysed using SPSS V. 23. Basic frequencies and percentages, were generated. Descriptive analysis of study participants to investigate socio-economic background characteristics of respondents. A multivariate analysis was used to analyse factors that influence children mode choice.

Secondary data from the BRRRI and NRSA were also analysed using the SPSS software. Basic analysis such as percentages and frequencies were generated whilst a chi-square analysis was used to determine accident severity among several bio and environmental variables.

Interviews from focus group discussions were recorded using a recorder and field notes. Recording was transcribed verbatim. Transcribed data was analysed using Dedoose since the software gives the flexibility to type and listen to recording at the same time. The software also allows for team works with other assistants who were helping in the transcription of the data. It also keeps data secured and protected. Data were analysed based on thematic areas of interest to the study. Analysis sampled summary views of responses that matched the various themes under investigation.





## CHAPTER FOUR

### RESULTS AND DISCUSSION

#### Introduction

This section discusses the study's principal findings and presents them within the theoretical and conceptual framework. The chapter is put into four parts: The first part discusses the street audit and its effect on children's mobility, the second part looks at factors that influence active travel among school children, the third part examines incidences of pedestrian crashes and the final part looks at options for promoting safe mobility among school children in urban spaces. The streetscape audit, incidences of crashes among children, and interviews with children were the main sources of information for the study.

#### Socio-Demographic Characteristics of Participants

The study drew participants from various socio-demographic backgrounds. However, all participants selected for the study were engaged in active travel (walking or cycling). For participants who journeyed to school by walking, that was the only mode of transport to school for them. Participants using bicycle to school indicated that in situations where the bicycle was faulty or unavailable, they resorted to the use of public transport. Given that the study employed a mixed method approach, Table 1 is a summary of the socio-demographic background of pupils who responded to the questionnaires.

Socio-demographic characteristics such as age and sex are key variables in understanding issues regarding school journeys and their perceptions of safety and security. Ages of respondents ranged from 8 to 16

years with a mean age of 12 years. Respondents between the ages of 11 and 13 years recorded the highest (46.3%) number of respondents. Pupils between the ages of 8 and 10 years recorded the second highest (29.7%) with those between the ages of 14 to 16 recoding the least respondent of 24 percent. With regard to gender differences, males recorded the highest with 52 percent in spite of evidence from Ghana Education Service (2013) suggesting there are more females than males in basic schools with the number of girls reducing as they climbed the academic calendar. The result is also consistent with a study by Amoako-Sakyi (2017) in Cape Coast which indicated that females (53.4%) outnumbered males (46.6%) slightly.

**Table 1: Socio-Economic Profile of Child Respondents**

Variable	N(175)	Percentage
Age (years)		
8-10		29.7
11-13		46.3
14-16		24.0
Sex		
Male		52
Female		48
Stage		
JHS (1-3)		62.3
Upper Primary (4-6)		37.7
School type		
Public school		86.9
Private school		13.1
Municipal		
Old Tafo Municipal Assembly (OTMA)		86.3
Kumasi Metropolitan Assembly (KMA)		13.7
Disability		
Children with no disability		98.9
Children with disability		1.1
Child's living arrangement		
Parent		92
Guardian		8
Mothers' occupation		
Other		6.9
Managers		4.6
Professionals		0.6
Technicians and Associate Professionals		0.6

Table 1: Cont.

Services and Sales Workers	80.6
Skilled Agric, Forestry and Fishery Workers	1.7
Craft and Related Trade Workers	3.4
Plant and Machine Operators and Assemblies	1.7
Fathers' occupation	
Other	6.9
Managers	4.0
Professionals	2.3
Technicians and Associate Professionals	0.6
Services and Sales Workers	52.0
Skilled Agric, Forestry and Fishery Workers	5.7
Craft and Related Trade Workers	12.6
Plant and Machine Operators and Assemblies	16.0
Accompanied or unaccompanied travel	
Parents	5.7
Siblings	34.9
Friends	8.0
Unaccompanied	51.4
Walk or Use bicycle	
Walk	95.4
Use bicycle	4.6
Time taken to get to school	
1 - 15	33.1
16 – 30	46.3
31 – 45	6.9
46 – 60	11.4
1 hour or more	2.3
Number of Siblings in school	
None	22.9
1-3	62.3
3-6	14.9
Household vehicle availability	
None	82.3
Bicycle	4.5
Motorcycle	1.1
Private Vehicle	8.5
Commercial Vehicle	2.8
Other	0.5

Source: Fieldwork, Manieson (2021)

Table 1 also shows 86.9 percent of the respondents were from public schools with 13 percent from private schools. Respondents in Junior High School (JHS 1-3) recorded 62.3 percent whilst those in lower primary (4-6) recorded 37.7 percent. Majority (92%) of the pupils lived with their parents with 8 percent living with their guardians. A significant proportion (51.4%) of

the children reported that they journeyed to school unaccompanied. This according to Congiu et al., (2008), is a key factor in the high incidence of pedestrian crashes among children in developing countries. According to Congiu et al (2008), children have been given too much independence to use the roads by their parents/guardians in spite of their poor judgement and ability to navigate their way on roads. A study by Harrador-Colmenero et al., (2017), revealed that Children between the ages of 10 and 12 were found to be more likely to travel actively and to have a higher feeling of safety than younger children.

Children who are accompanied by their siblings accounted for 34.9 percent. This could be as a result of majority (62.3%) of school pupils having 1-3 of siblings in their schools and therefore the younger ones accompanied by their elderly siblings to school. School pupils with 3-6 siblings in school accounted to 14.9 percent and those with no siblings accounted for 22.9 percent of respondents. Only 8 percent of the children were accompanied friends to school. Children who were accompanied by their parents were the least accounting for 5.7 percent of respondents.

Pupils who walked to/from school (95.4%) formed the majority of respondents whilst children who rode bicycles to school accounted for 4.6 percent of respondents. This could be attributed to the fact that most (82.3%) of the children had no household vehicle. Only 4 percent of the pupils had bicycles available in their household. The rest of the pupils had motorcycles (1.1%) private vehicles (8.5%) and commercial vehicle (2.8) in the household.



Another socio-demographic characteristic of respondents that was of interest was the occupation of both parents; mother and father. The occupation was measured according to the International Standard Classification of Occupation (ISCO). As shown in Table 1, with regard to mothers' occupation, the majority (80.6%) of respondent mothers were services and sales workers. Most of these people worked in the informal sector as petty traders who sold their wears as market women or along the streets as food vendors. Managers accounted for 4.6 percent whilst Plant and Machine Operators and Assemblies (1.7%), Craft and Related Trade Workers (3.4%), Skilled Agric, Forestry and Fishery Workers (5.7%), Technicians and Associate Professionals (0.6%) and others (6.9%). For fathers' occupation Services and Sales Workers accounted for 52 percent followed by Plant and Machine Operators and Assemblies (16%), Craft and Related Trade Workers (12.6%), Skilled Agric, Forestry and Fishery Workers (5.7%), Managers (4%), Professional (2.3%), Technicians and Associate Professionals (0.6%) and others (6.9%).

With regard to the socio-demographic characteristics of children engaged in focus group discussions, respondents were chosen from selected schools in the KMA and OTMA. Within the KMA, pupils were selected from K.O Methodist and State Boys Basic Schools. Ten boys were selected from State Boys MA JHS. Ten girls were also selected from K.O. Methodist School. In the OTMA district 40 participants (20 each for both boys and girls) were selected for the focus group discussion from 4 schools namely Rokanje Presbyterian School, Old Tafo MA School, St. Joseph R/C Primary and the Tafo Pankrono MA JHS. 10 participants of the same gender were selected from each school.



All the participants were in JHS and had commuted to and from school for not less than a period of 8 months and therefore had a fair idea of the streetscape within the neighborhood. The ages of the pupils ranged from 14 years to 17 years. Participants recorded an average of 4 siblings in school. Participants with siblings in a school accompanied them to and from school. Participants with siblings in different schools had to accompany their younger siblings to school before they made their trip to their school. Majority of the participants selected walked less than a kilometer with a few participants journeying for over a kilometer to school. All participants selected for the focus group discussions walked to school since pupils who ride to school were not available.

### **Streetscape Audit of Routes along School Neighbourhoods**

#### ***General Environment of Streetscape Segment.***

This section of the study discusses the results from the streetscape audit using the Pedestrian Environmental Data Scan (PEDs). The purpose of the PEDs helps in the systematic assessment of streetscape pattern and the quality of the sidewalk as well as pedestrian facilities that support walking and cycling (Brown, et al., 2019). The street audit is divided into five main indices; environment, pedestrian facility, road attributes and walking and cycling environment (Clifton et al., 2007). Discussion on the street audit would be done based on the indices mentioned above. Under environment, the audit looked at some essential streetscape attributes such as segment use, slope, and segment intersections.

The total length of route audited was about 6,834 meters (6.83 kilometers). This is a segment with many schools located along it. Majority (84.8%) of the segment was a high-volume road and the rest being low-volume (15.2%) roads. According to Ghana's road categorization, a high-volume road includes regional and national roads with an average daily traffic volume of 500 vehicles, while a low-volume road includes local roads with an average daily traffic of less than 400 cars (IFRTD, 2013).

### *Land Use Type and Eyes on the Street*

In most urban areas, the fear of crime is a major stressor which may involve a perceived threat to a person's wellbeing and existence (Adu-Mireku, 2002; Bannister and Fyfe, 2001; Nasar and Jones, 1997; Nayak, 2003; Warr, 1990). Fear is generated by empty streets and deserted public areas, which provide opportunities for criminal activities to go unnoticed (Bannister and Fyfe, 2001; Loukaitou-Sideris and Ehrenfeucht, 2011). This study examined the presence of other commuters while traveling to school and the likelihood of being seen by persons in their houses, workplaces, or stores whilst walking to school, as it examines Jacobs' (1961) eyes on the street theory.

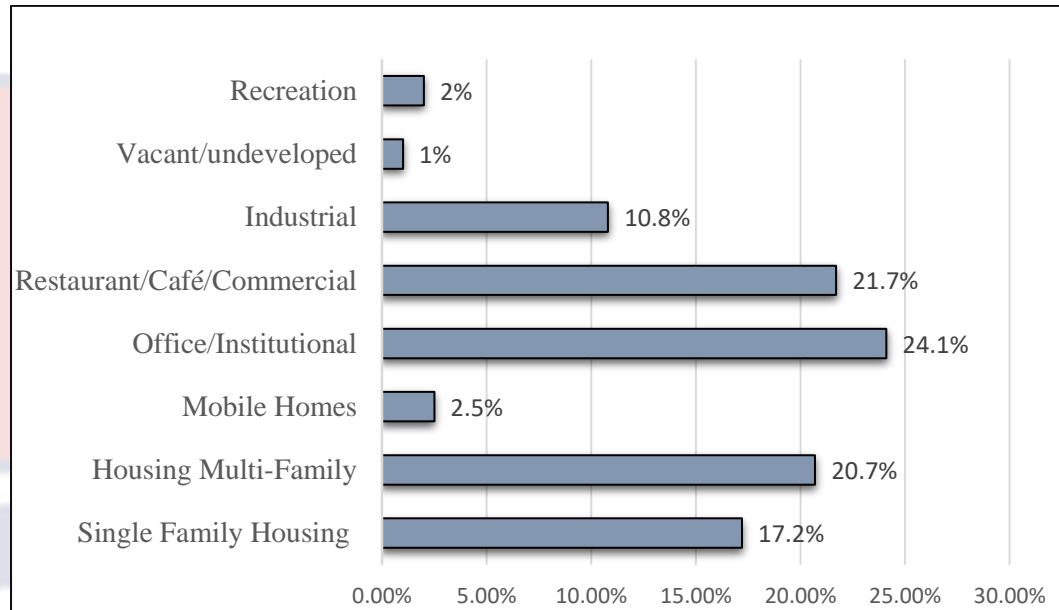
To examine the security on the streets to school, land use was the main factor that was used to examine security within and around school neighbourhoods. Some studies have shown that land uses such as commercial, as well as residential and office land use, have been regarded favorable to walking (Zhu and Lee, 2008). Given the concept of eyes on the street, the study assumes that the more commercial activities developed around the school neighbourhoods, the safer the school. The school neighbourhoods may

be assumed to be safe from crime barring other negative challenges that may undermine the safety of school children.

Analysis of the street segment audit (see Figure 6) showed that only a percentage of the street segment along the school neighbourhoods were vacant, this was due to the fact that areas under study were highly urbanized with pressure on land for commercial use as sited by Koranteng (2017) and Cobbinah and Amoako, (2012). The street audit (see Figure 6) indicated that majority (24.1%) of the segment had offices and institutional facilities such as Banks, office spaces for both private and public institutions.

However, assessment of the street segment in terms of housing which could be of help in increasing the level of security on the path to school or increase the level of eyes on the street indicated a 17.2 percent and 20.7 percent for both single housing and multi-housing units respectively along the segment. What this may imply is that, all other things being equal, child pedestrian will be visible to other persons whilst on their commute to or from school. Also, because of the fact that school hours coincide with working hours, they may also meet people who may also be commuting to work or making a short trip to the station to board a vehicle. Nevertheless, the way and manner in which some of these houses are built especially for single housing unit may make it impossible for children to be seen given their high fence walls unlike multiple housing units (compound houses) which are common in Kumasi (Andreasen and Andersen, 2006; Afrane and Asamoah, 2016). According to Sinai (2001), over 70 percent of residents who live in Kumasi live in single or multi-story housing. Mobile-homes (2.5%) or otherwise referred to as kiosk were present along the segment with some

sections of the route dedicated to industrial use (10.8%) and few areas marked for recreational (2%) purposes, predominantly sports fields around school neighbourhoods.



*Figure 6: Street audit of segment type along selected route*

Source: Fieldwork, Manieson (2021)

Examination of land use patterns (see Figure 7 and Figure 8) around school neighborhood within a buffer of four hundred meters indicated that most of the schools within the Kumasi Metropolitan Area could be found within mixed land use zones. With the Exception of the Wesco-Demonstration school which had greenery surrounding the school, most of the schools were caught up in commercial, mixed-use (commercial and residential) and industrial areas.



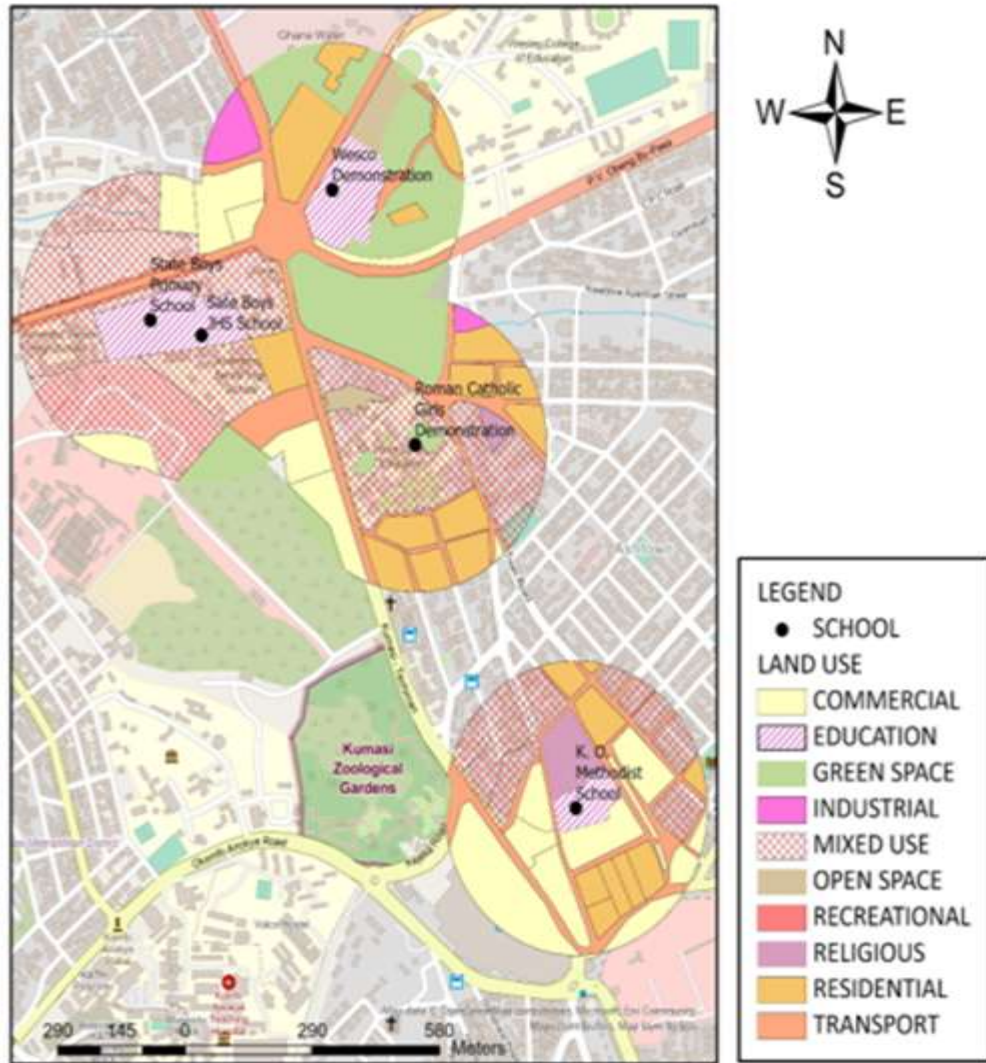


Figure 7: Land use map for school neighborhoods within the KMA

Source: Fieldwork, (Manieson, 2021)



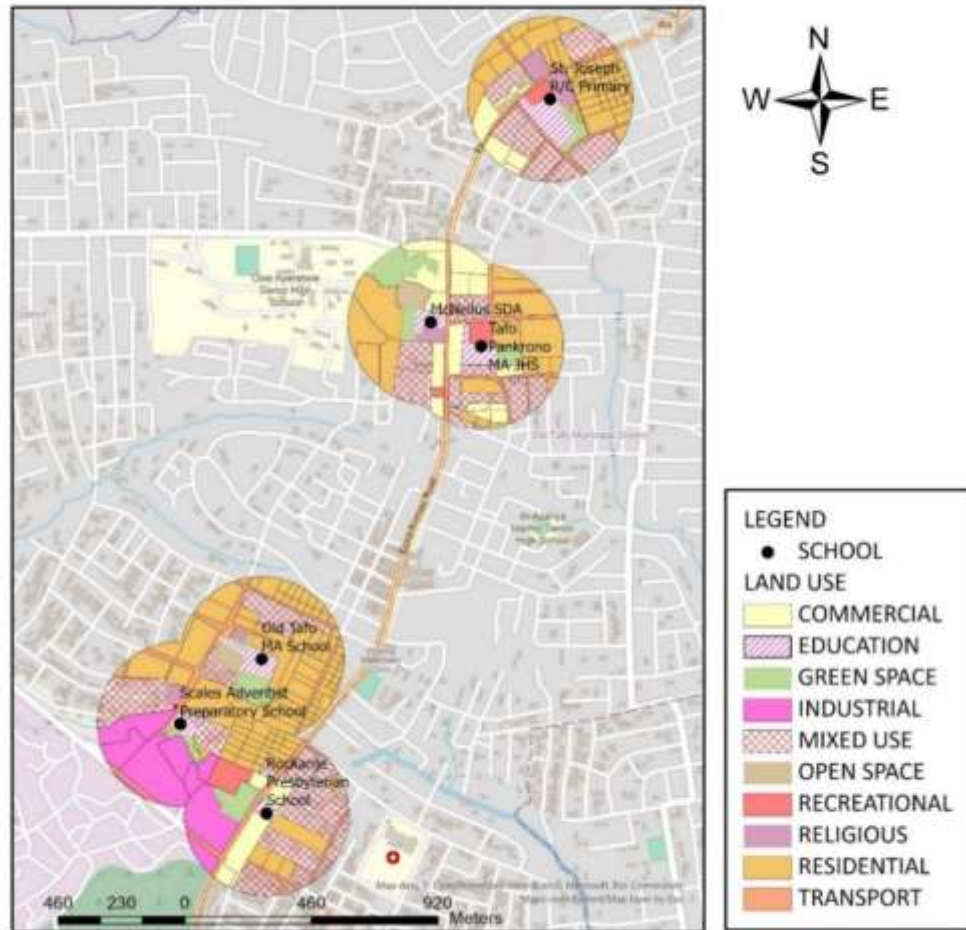


Figure 8: Land use map of school neighbourhoods in the Old Tafo Municipal Assembly (OTMA)

Source: Fieldwork, Manieson (2021).

According to the spatial planning unit in KMA the city is allowed to grow organically. A staff of the land use and spatial planning unit in KMA had this to say:

*For Kumasi, Adum for instance was organically created, there wasn't any plan. Because when you get to Adum you don't see the parcels of the plot being in shape or in size. You know, so, it was organically created. As and when somebody needed it then they would go and demarcate for the person depending on what size the person wanted.*

The organic approach without proper planning and enforcement of land use regulations in the city may have allowed commercial activities to expand beyond their borders. While most of the schools were in a mixed land use area, others like the K.O Methodist school are caught up in heavy commercial areas (see figure 9) around the Adum market in Kumasi. For these children commuting to and from school, they have to compete with vehicular traffic amidst the emission of toxic gases from exhaust fumes of vehicles which studies have proven that they may have adverse effect on the health of the children (Ruzaik, 2020; Friedrich, 2017).



*Figure 9: Heavy commercial activities around K.O Methodist school neighborhood in KMA*

Source: Fieldwork, Manieson (2020)

Some of the school children complained about the heavy vehicular traffic that they had to navigate through while on their way to and from school and the fear of being hit by a vehicle. A 12 years girl recounts her experience:

*When you are coming to school in the morning, the cars are plenty on the road. There is no place for you to pass because people are selling their things there. If you are not careful a*

*vehicle would hit you. The drivers too will be blowing the horns at you. I get scared sometimes.*

### ***Path Type and Material***

The study examines the road type and materials that were used in the construction of the road network under study. Generally, majority of the route examined were made up of paved trails (47%) followed by sidewalk making up 38 percent of the segments examined. A few of the segments had worn-out or dirty footpaths (12%) with pedestrian streets consisting of only 3 percent of the segment. Generally, materials used for the construction of the segments were asphalt (82.4%), this is evident because majority of the segments is being used by vehicles. The road asphalts were being stretched to the edges of the road therefore creating a confusion between pedestrians and motorists. Parts of roads were made up of concrete (5.4%) which were usually places where the shop owners had created as an extension to enable them to sell the wares or cover up the sandy portions of the entrance to their shops or offices. Some of these facilities included banks, fuel stations and other private and public office institutions. Some segments of the roads had paving breaks (1.4%) which were usually materials for sidewalks and frontage for some office complexes. Other parts were also made of gravels (4.1) and these were usually spaces for selling vehicles. A few of the segments were made of sand. These were usually areas where sidewalks have not been constructed leaving the land bare or segments of the roads that had been destroyed or worn-out awaiting repairs.



### *Sidewalk Availability and Road Markings*

The availability and quality of sidewalks have been demonstrated to be a major predictor of perceived safety in the broader pedestrian environment (Landis, et al., 2001). The presence of sidewalks has been found to create a significantly safer walking environment for children because it helps separate school children from faster moving vehicles (Boarnet, et al., 2005). In this study, sidewalk accounted for 38 per cent of the street segments audited. This was far better than studies by Amoako-Sakyi (2017) on walkability in Cape Coast which recorded 6.2 percent. Most of the school neighbourhoods in this study did not have sidewalks. In places around school neighbourhoods where the sidewalks were available, they were being occupied by street vendors to sell their goods. This often puts children in uncomfortable situations in their daily walk to and from school. The practice where street spaces such as sidewalks were illegally occupied by street vendors is a common one in many areas within or close to market areas. In other cases, some of these sidewalks were blocked by parked vehicles and also garbage waiting to be emptied by the sanitation vehicles (see Figure 10). The obstruction leaves child pedestrians with little room than to compete with moving vehicles which rendered them at risk of road traffic crashes.



Figure 10: Sidewalk obstructions along school neighbourhoods

Source: Fieldwork, Manieson (2020)

Generally, in most of the school environments, pedestrian walkways were largely absent especially with regard to schools in the Old Tafo Municipal Assembly. Due to the absence of sidewalks a head teacher had this to say concerning the safety of children:

*Due to the lack of pedestrian walkways, school children and even all pedestrian are left with no other choice than to compete with moving vehicles. This is very risky for children because they are often hit by the Okada (auto rickshaw) vehicles while walking by the shoulders of the street. The Okada (auto rickshaw) drivers are always trying to outsmart the other vehicles and end up driving on the shoulders of the road putting pedestrians at risk.*

The situation is evident in Figure 8, where Okada motorists have occupied a sidewalk in one of the school neighbourhoods making it difficult for pedestrians to navigate their way through the sidewalk. A 12 years old girl



in class six narrates her experience of having to deal with walking at places without sidewalks:

*“Because there are no sidewalks, I have to walk at the side of the road. But the trotro and Okada people will be blowing their horns at you. Some of them will be insulting you too and its bad”*



Figure 11: Plate showing Okada motorists parked on a sidewalk

Source: Fieldwork, Manieson (2020)

According to Amoako-Sakyi (2017), a child’s pedestrian safety may not be guaranteed by the mere presence of a sidewalk along their path because other elements like its breadth and quality may also provide concerns. Other studies have demonstrated that two people moving side by side or in opposing directions with adequate space on either side require around 4.7 feet/1.4 meters of space. However, some transportation organizations and the Federal Highway Authority of the US advise that it be about 6 feet/1.4 meters tall because they think that will be more suitable for two pedestrians who are either walking in the opposite direction from one another or walking together and pushing back at one another, leaving one to veer off to the road. As a

result, the purpose for which the sidewalks are provided to ensure that pedestrians are protected from vehicular traffic are being defeated rendering the sidewalk unsafe for pedestrian use (FHWA, 2006). In the case of the Kumasi Metropolis, sidewalks provided are usually narrow with no or little effort to protect pedestrians by providing barriers that protects pedestrians from moving vehicles.

For all the schools selected for the study, only three had sidewalks available within their school neighbourhoods. In cases where the sidewalk had been provided, there were no physical barriers such as street buffers that protected pedestrians from harm in case a vehicle veered off its path in the direction of the sidewalk. Although some of the sidewalks were raised above the height of the main road, in most parts where there were sidewalks, they remained at the same height as the road giving drivers the leeway to easily park on the them thereby serving as obstruction for pedestrian and sometimes leaving pedestrians walking on the road.

### ***Road Intersections***

Road segment intersection refers to the number of roads that intersect or join each other. The road may join to form a three-way (Y-interconnection or T-interconnection) interconnection or a four-way (cross interconnection or roundabout) interconnection (U.S Department of Transportation, 2014). Due to their daily usage and complexity, these intersections usually pose risks to pedestrians due to mode conflicts that occur in intersections (LA, 2011). The road segment was shown to have many intersections at every 100 meters that were measured by the audit. Analysis of the intersection indicated that 57

percent of the road segment had three interconnections with 6.1 percent of the segment having four intersections.

### *On-street Parking Along Streetscape*

Due to the unavailability of parking lots, inadequate bus stops and the high commercial activities, many commercial vehicles like the taxis and trotro (mini-bus) tend to park along the streets for onboarding passengers or to alight passengers. Also, due to the high presence of commercial buildings like hotels, banks, offices and shops there were places where parking lots were not available. This posed a lot of risk to school children since they had to manoeuvre their way through vehicles and in many cases. They had to step onto the road to be able to have access. The street audit showed on-street parking to be very prevalent (74.2%) along the road segment. In some cases, abandoned vehicles and faulty vehicles were left on the streets which is in congruence with Abane (1993) and Agyapong and Ojo (2018). Other reports suggest that children attempting to cross roads behind parked vehicles are usually at risk due to the fact that they have difficulty detecting traffic because their field of vision is one-third of that of adults making on-street parking a threat to children commuting to school especially in school neighbourhoods (Jacobsen, 2015).



*Figure 12: Plate showing on-street parking in and around school neighbourhoods*

Source: Fieldwork, Manieson (2020).

### ***Presence of Crossing Aids and Warden***

Studies have shown that as compared to adults, children, especially those below age ten, have poor skills when it comes to crossing the road unaccompanied (Nakitto et al., 2008; MacGrego et al., 1999; Simons et al., 2018; Congiu et al., 2008). Analysis of the street audit showed that crossing aids along the streets were largely unavailable (89.4%). Even along school neighbourhoods there were no crossing aids to aid children safely cross the street. Crossing aids are known to be very helpful to child pedestrians due to their vulnerability. Only two schools had zebra crossings in front of their schools. To support school children, some of the schools had sought the services of crossing guards, who are stationed in front of the schools to help pupils cross the road. This is also largely due to the high traffic volumes making it safe for children to easily cross the roads.





*Figure 13: Plate showing crossing guard /lollipop man helping school children cross the road and from school.*

Source: Fieldwork, Manieson (2020).

Interview with a senior personnel at the National Road Safety Authority (NRSA) revealed the need for school neighbourhoods to have road signs indicating the presence of school children and the need to slow down in such environments. According to the National Road Safety Authority, schools situated along busy roads should provide street wardens to help school children cross the streets. A senior staff at the National Road Safety Authority had this to say:

*“We as an authority inform the school to get a sign and a traffic warden to assist children to cross roads in the school environment but beyond that, how do we make sure our kids commute to/from school safely. For now, the NRSA is going round to check on school buses of various schools and also ensure that these schools have this signage that we talk about and good parking lots. Also, school with roads in front of them must have traffic wardens that assist them to cross the road”.*



Despite all the assertions made by the authority, majority of the schools studied especially those in the KMA had no street signs either indicating the presence of a school or as a speed calming measure. In cases where some of these amenities like pedestrian crossing were available there were nearly wiped out. This can be seen in Figure 14 below.



*Figure 14: Plate showing a nearly wiped-out zebra crossing*

Source: Fieldwork, Manieson (2020)

### ***Pupils' Perception of Driver Behaviour at Crossing Points***

No matter the circumstances in which other road users may find themselves, pedestrians should always be given the right of way since they constitute a substantial portion of the population of vulnerable road users, and their vulnerability is considerably heightened when they are youngsters. When crossing roadways, pedestrians are more likely to be involved in accidents (O'Dell, 2022). When traffic controls like pelican crossings and traffic lights are not available, drivers must yield to pedestrians crossing the street, especially if the pedestrian is on the same side of the road as the driver or is in immediate danger.

The study revealed that school pupils found it a very challenging task having to cross the road while on their way to/from school. This was because

drivers would not easily stop for them to cross the road. Even in places where there were zebra crossings, the drivers tended to ignore the presence of the children at the zebra crossing. A 14 years old JHS 3 pupils shared his experience on the road when asked the question on the challenges that they face with drivers whilst navigating their way to school:

*“For some of them there are sign boards indicating speed limits and traffic lights. But the thing is that even in zebra crossings they won’t stop for us to cross the road. Sometimes you will have to stand there for a long time when the road is free then you are able to cross. Sometimes too you may get help from people who are also crossing the road.”*

Some children also shared their experiences of incidences where they have been abused by drivers while trying to cross the road

*“One time on my way to school in the morning there was traffic on the road and it was difficult to cross the road because none of the drivers were willing to stop. There was no zebra crossing there for me to cross. I managed to cross the road and I almost got hit by a taxi. The driver started insulting and threatening he will beat me because I want to bring him trouble” (Boy 12 years, JSH 1).*

On the other hand, a teacher in one of the schools had a different opinion with regard to drivers’ behaviour towards pedestrians and school children in the community. It must be noted that this is a school that had street warden to help children crossing in spite of the presence of zebra crossing. A basic school teacher accounts his experience with drivers on the road:

*“In fact, I must be very thankful to the drivers, because for all I have observed they are very, very patient on the road. I don’t know whether road safety has spoken to them. In fact, I myself have been crossing the road on several occasions and they are so patient, that when they see pedestrian crossing, they actually slow down and make sure you all cross before they move. The drivers have been helpful.”*

In an interview with the National Road Safety Authority, it became evident that there have been some forms of training programs organised for drivers within the metropolis on the need to respect, and drive in the manner that protects pedestrians from harm. These workshops were conducted in order to re-educate drivers to make them more responsible on the road. A senior staff of the National Road Safety Authority had this to say concerning the road safety education when asked about education for drivers in the metropolis:

*“Yeah! we educate all manner of road users and we also educate drivers as well as passengers at lorry terminals so every year we have a target that we try to reach and this should not be less than about 7000 drivers and a lot more passengers. Last two years in 2019, road safety educated about 4000 drivers in the Ashanti region alone and that was a formal training where we got them into the classrooms and educated them and gave them certificates. Apart from that, the informal ones cannot be counted. We do it as often as*

*possible especially with our stakeholders thus the MTTD and the DVLA”*

### **Examine Incidences of Pedestrian Crashes Among Children in the Kumasi Metropolis**

Pedestrian road traffic crashes, whilst being a primary cause of death, have gotten little attention, particularly in developing countries (WHO, 2015). In low- and medium-income nations, efforts to reduce the risks of traffic accidents did not start until the middle of the 1970s. In addition to being tardy, the measures taken in these countries to counter the threat unfairly favor vehicles over walkers (Amoako-Sakyi, 2017; Amoako-Sakyi, 2013; Downing, 1991). The slow response to the threat is seen to have played a vital role in the current level of road traffic accidents in most parts of the world today.

Ghana, over the years, has been battling with the issues of road traffic crashes given the rising incidences of road traffic crashes over the last decade. According to the recent statistics on road traffic crashes in Ghana, pedestrians continue to be the most vulnerable road user group with pedestrian fatalities of 33.7 percent (BRRI, 2018). Despite the downward trend since 2015, urban road sections have seen an annual increase of 21.3 percent in fatalities with pedestrian being the road user group with the highest fatalities of 45.8 percent (Ministry of Transport, 2016). From 2015 to 2021 Ghana lost 1,378 population below 18 years to road traffic crashes and 5,322 of those who survived ended up with injuries (Ministry of Transport, 2016).

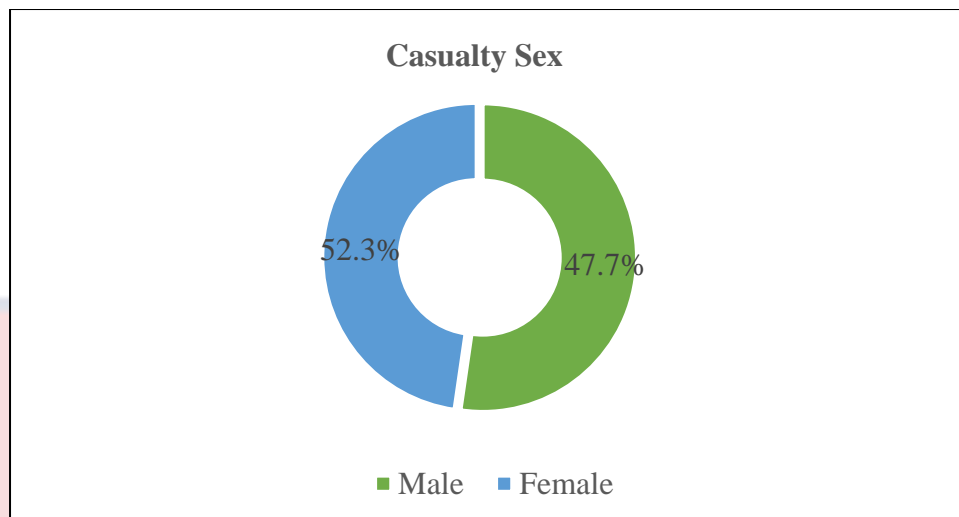
Data collection on road traffic crashes in developing countries has always been a major challenge among stakeholders largely because of the lack of proper formal system for collection of data and in places where these



systems exist, the data is usually associated with errors and inconsistencies (Amoako-Sakyi, 2017). Ghana's road traffic data is collected and maintained by Motor Traffic and Transport Department (MTTD) of the Ghana police service and National Road Safety Authority (NRSA) in collaboration with the Building and Road Research Institute (BRRI). The loss of spatial precision owing to the lack of geocoded information is a barrier when employing this dataset. It simply states the location or stretch of road where the accident happens.

***Road Traffic Crashes along study routes (1R4, N6 and R106) in the Kumasi Metropolis: A Spatio-Temporal Analysis***

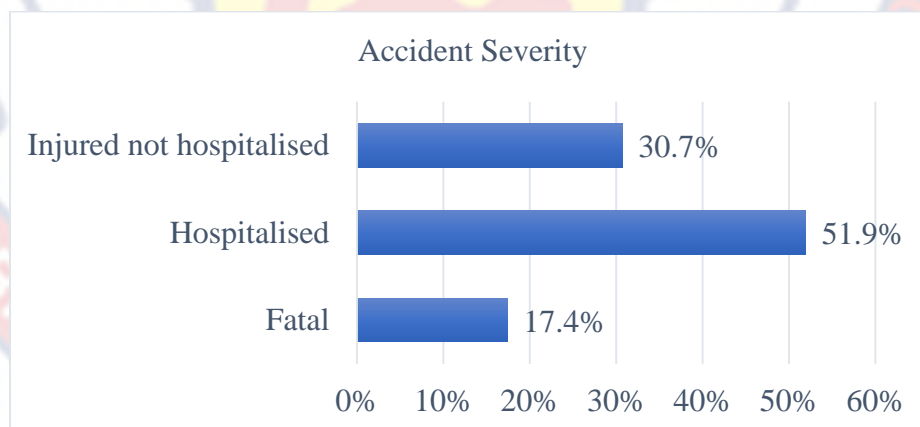
Descriptive analysis of 264 separate incidents of road traffic crashes from the Building and Road Research Institute (BRRI) involving 264 child pedestrians. For a better insight into the epidemiology of the crash victims, a demographic characteristic of the casualties involved were analysed. A disaggregation of the crash incidents with regards to casualty sex showed that, 52.3 percent of casualties were male (see figure 12). An in-depth analysis of the crash data reveals that males (53.2%) fatalities were slightly higher than female (46.8%) while the number of males (52.7%) hospitalised were also above their female (47.3%) counterparts. With regard to children injured but not hospitalised, there was not much difference between males (50.7%) and female (49.3%).



*Figure 15: Child pedestrian Road Traffic Crash Casualty Sex within the Kumasi Metropolis*

Source: BRR (2014-2018); Fieldwork, Manieson (2021)

A breakdown of the accident's severity indicates that 51.9 percent of the individuals affected ended being hospitalised while 30.7 percent were injured but not hospitalised. Fatal cases recorded 17.4 percent of the incidents recorded.

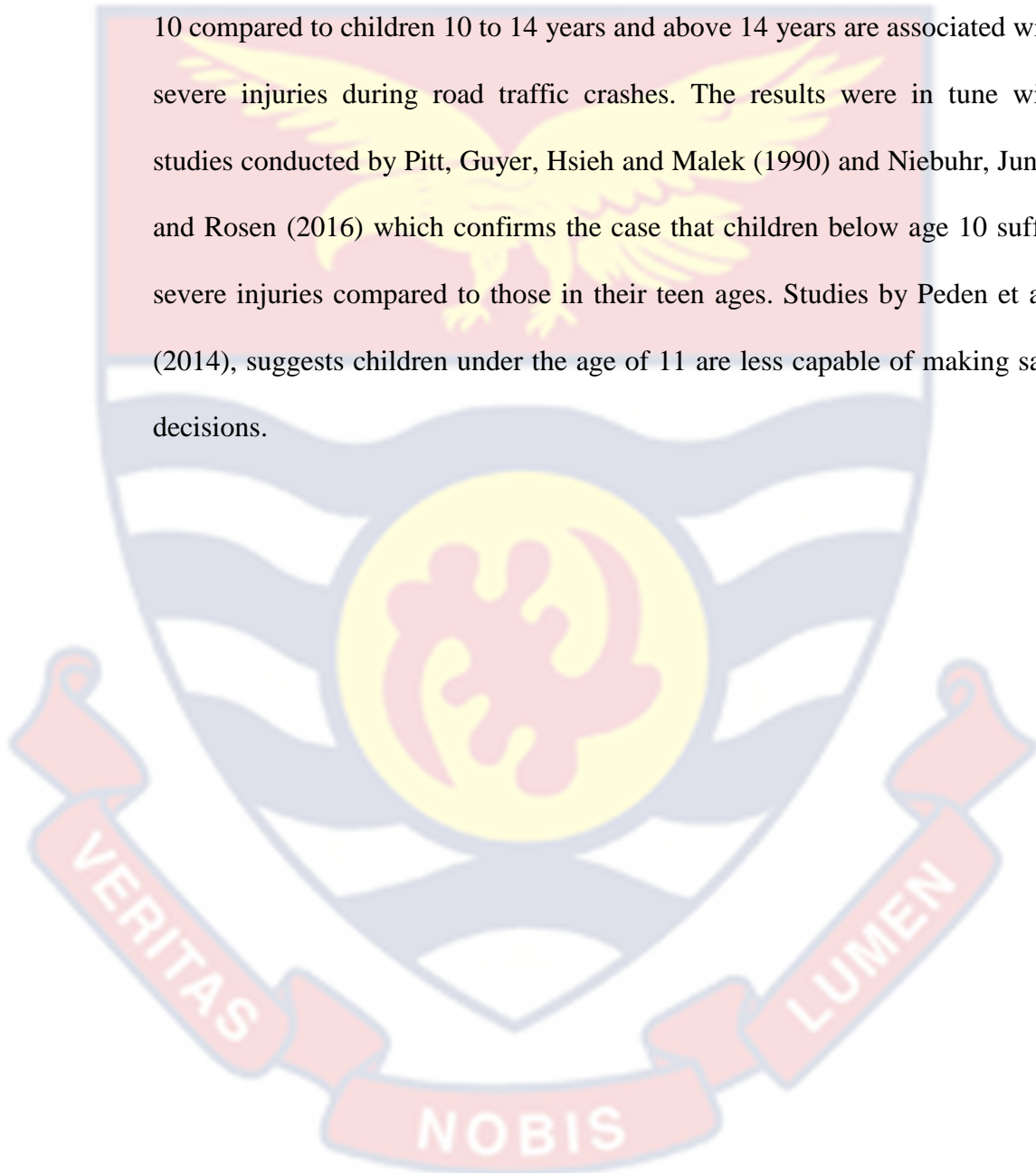


*Figure 16: Accident severity among child pedestrians within the Kumasi Metropolis*

Source: BRR (2014-2018); Fieldwork, Manieson (2021).

An in-depth analysis of the crash data shows a significant association between age and accident severity,  $\chi^2 (2, N=264) = 11.573, p < 0.05$ .

Disaggregating the data by age differences (children <10 years, 10 to 14 years and >14) child pedestrians below age 10 recorded the highest (66.1%) of severity incidences whilst children aged 10 to 14 and 14 years above recorded 25.8 percent and 8.1 percent respectively. This implies that children below age 10 compared to children 10 to 14 years and above 14 years are associated with severe injuries during road traffic crashes. The results were in tune with studies conducted by Pitt, Guyer, Hsieh and Malek (1990) and Niebuhr, Junge and Rosen (2016) which confirms the case that children below age 10 suffer severe injuries compared to those in their teen ages. Studies by Peden et al., (2014), suggests children under the age of 11 are less capable of making safe decisions.



**Table 2: Chi-square test for accident severity and nature of physical road environment of road traffic crashes among children**

Bio and Physical Environment variable	Accident severity (%)			d.f	Chi-value	P-value
	Fatal	Hospitalised	Injured not Hospitalised			
Sex				2	0.101	0.951
	Male	53.2	52.7			
	Female	46.8	47.3			
Age (years)				4	11.573	0.021*
	<10	66.1	48.9			
	10-14	25.8	29.8			
	>14	8.1	21.4			
Pedestrian action				8	9.500	0.302
	Crossing road	67.7	66.4			
	Walking along the road	16.1	18.3			
	Walking along edge	4.8	1.5			
	Playing on the road	0.0	1.5			
	Other	11.3	12.2			
Pedestrian Location				10	23.497	0.009*
	Pedestrian crossing	14.5	4.6			
	Within 50m of crossing	0.0	0.0			
	On central refuge	1.6	2.3			
	In road center	51.6	58			
	On footpath or village	12.9	16.8			
	Unknown	19.4	18.3			



Table 2:Cont.

Day of the week				12	14.961	0.244
Monday	12.9	14.5	15.5			
Tuesday	3.2	14.5	11.3			
Wednesday	14.5	8.4	12.7			
Thursday	16.1	13.0	21.1			
Friday	19.4	13.7	18.3			
Saturday	21.0	16.8	8.5			
Sunday	12.9	19.1	12.7			
Weather				4	4.595	0.331
Clear	83.9	90.8	88.7			
Fog/mist	1.6	0.0	0.0			
Other	14.5	9.2	11.3			
Light condition				6	14.529	0.024*
Day	77.4	70.2	71.8			
Night-lights	0.0	3.8	5.6			
Night-lights off	4.8	0.0	0.0			
Night-lights on	17.7	26	22.5			
Road surface				10	19.592	0.033*
Tar good	83.9	77.1	85.9			
Tar few potholes	4.8	11.5	8.5			
Tar many potholes	3.2	9.2	5.6			
Gravel	3.2	0.0	0.0			
Earth few potholes	4.8	0.8	0.0			
Erath many potholes	0.0	1.5	0.0			

Table 2: Cont.

Shoulder type					4	4.340	0.362
	Tarred	62.9	64.1	57.7			
	Untarred	3.2	3.8	0.0			
	No shoulder	33.9	32.1	42.3			
Shoulder condition					4	6.663	0.155
	Good	53.2	45	47.9			
	Poor	12.9	22.1	9.9			
	No shoulder	33.9	32.8	42.3			
Surface repair					6	11.142	0.084
	No shoulder	6.5	9.2	4.2			
	Good	80.6	71.8	85.9			
	Potholes	3.2	13.7	5.6			
	Rough	9.7	5.3	4.2			
Location type					10	9.934	0.446
	No intersection	80.6	76.3	84.5			
	4-way intersection	3.2	6.1	4.2			
	3-way intersection	8.1	13.0	9.9			
	Staggered intersection	1.6	2.3	0.0			
	Round about	1.6	1.5	1.4			
	Other	4.8	0.8	0.0			

Source: Fieldwork, Manieson (2020)

Further analysis shows statistically significant relationship between pedestrian location, ( $\chi^2(10, N=264) = 23.497, p < 0.05$ ) and accident severity. The analysis of the data shows that, with fatal cases recorded, 51.6 percent of the cases occurred at the center of the road while 14.5 percent of the incidents occurred where children were crossing the road at places where pedestrian crossings (zebra crossing) were available. The results were in tune with studies by Ackaah and Adonteng (2011) which showed that 76 percent of the children were hit while crossing the road. Poku-Boansi et al, (2019), also argued that because of the lack of pedestrian amenities, school children travelling to and from school are at risk of being hit when crossing the road. Other scholars have argued that the absence of designated pedestrian crossing amenities results in children crossing the road at inappropriate locations (Damsery-Derry et al., 2010; NACTO, 2011).

Other associations were established, providing credence to the risk compensating model in the Kumasi Metropolis. For instance, examination of other environmental variables showed road surface type ( $\chi^2 = 14.529, P < 0.05$ ) and light conditions ( $\chi^2 = 23.497, p < 0.05$ ) had positive association with accident severity. In relation to road surface type, the better the road condition the more severe the injuries among children who had fallen victim to road traffic crashes in the metropolis. As compared to good road, roads in poor conditions have lower accident severity and number of accidents. Similar findings were shown in a study by Amoako-Sakyi (2017), walkability studies on child pedestrian which indicated that good roads recorded more severe injuries among child pedestrians. Shaji (2021) placed emphasis on the fact that cities should not only think of providing better asphalt roads but must ensure

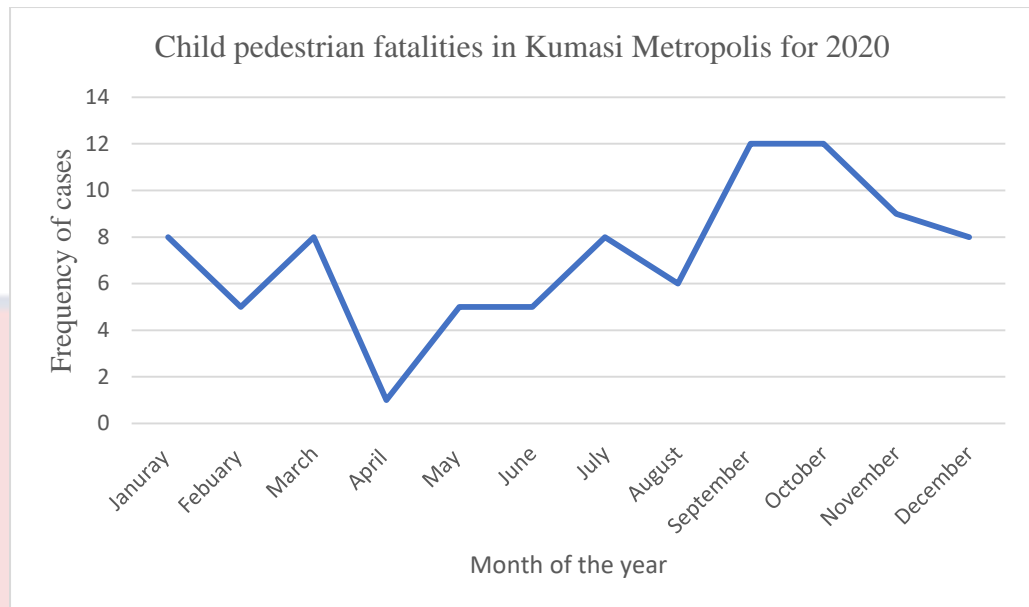
that the road infrastructure is supported with the needed speed calming measures, signage amenities as well as community sensitisation on the use of road infrastructure.

With regard to light condition, the study revealed that child pedestrian, in this case school children, more likely experience road traffic crashes during the day as compared to night hours. The results showed that most (72.3%) of the incidences occurred during the day and with few cases occurring during night hours at places with street lights on. Other studies have shown that a significant number of road traffic collisions occurred during school trip hours, with 23.5 percent and 5.9 percent of crashes occurring between 2 and 4 p.m. and 6 a.m. and 8 a.m., respectively (Amoako-Sakyi, 2017; Gopalakrishnan, 2012; Ministry of Transport, 2016; Poku-Boansi et al., 2019)

#### ***Temporal Analysis of Child Pedestrian Fatalities***

Analysis of the monthly trends show the highest number of road traffic crashes over the months of September and October. Out of the total of 600 persons killed in road traffic crashes in the Metropolis, 14.5 percent were persons below the age of 18 years in 2020. The decline in the incidents of deaths reduced drastically in the month of April. It must be noted that due to the Covid 19 pandemic a directive by the President of the Republic of Ghana, saw all schools close down in the country from the basic schools, junior high schools to tertiary institutions. The Presidents directive on March 28, 2020 placed a four weeks lockdown and a ban on schools and other public activities. The drastic reduction in the month of April may be attributed to the fact that most children were at home and therefore had less interaction with motorists.





*Figure 17: Crash distribution over the month of the year*

Source: National Road Safety Authority (2020)

A further analysis of the data in terms of gender difference in the distribution of fatalities shows that more males are killed on the road than females which is in tune with the global statistics on road traffic related deaths and injuries. More male children were killed in the months of September, November and December. The higher number of casualties recorded during the end of the year could be attributed to the period for preparation towards Christmas festivities and how drivers tend to be in a rush during the period. According to the World Health Organisation (2005), boys are nearly twice as likely to be involved in traffic accidents as girls.

A 10 years' trend analysis of fatalities in Figure 17 shows the male child is more likely to die on the roads of the Metropolis as compared to their female counterparts. The data shows an increase in deaths among males in 2013 and 2016. In 2016 whilst there was a reduction in female deaths, the number of males killed was at its highest. This has also been confirmed by several studies on child and adolescent injuries involving road traffic crashes

(Amoako-Sakyi, 2017; Clark, 2020; Soori, 2016; UNICEF, 2005; WHO, 2005). Ghana’s road traffic situation is no different from global trend (Ministry of Transport, 2016).

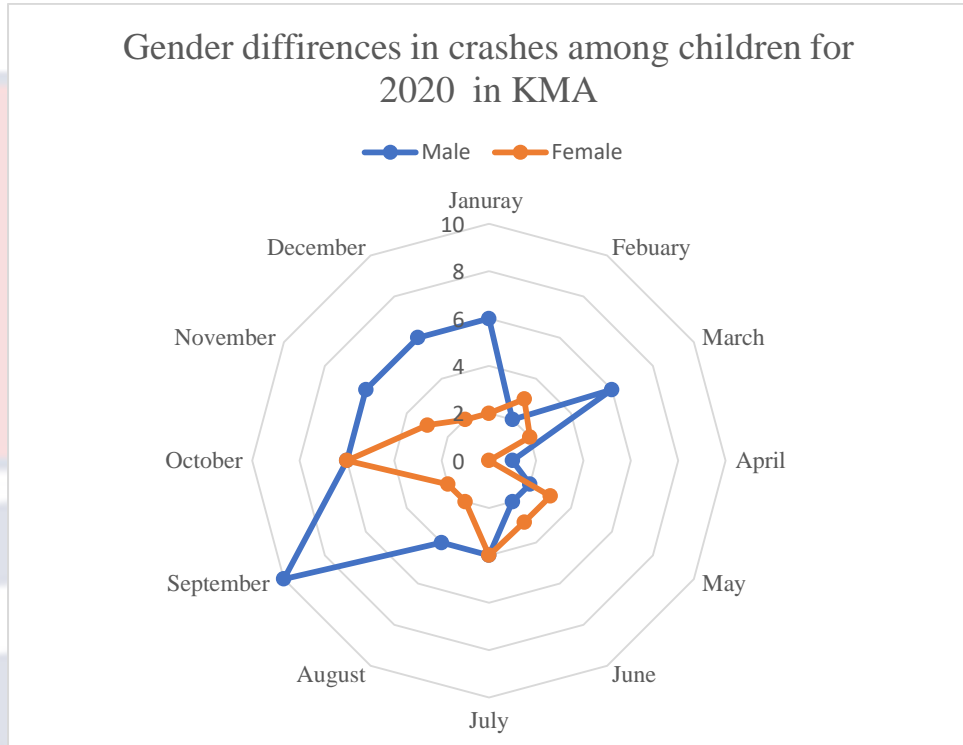


Figure 18: Crash distribution over month of the year

Source: National Road Safety Authority Data (2020); Manieson (2020)

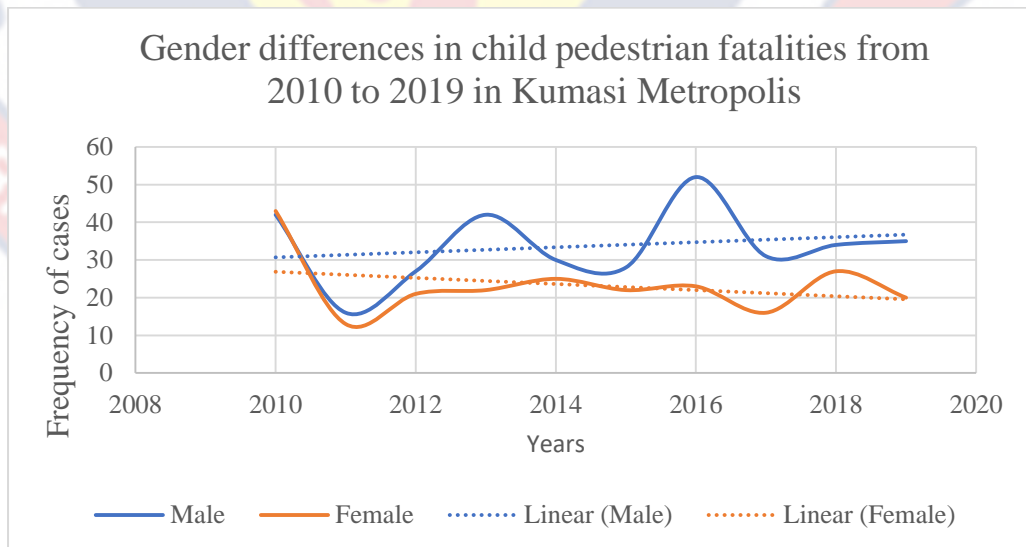


Figure 19: Gender differences in child pedestrian fatalities from 2010 to 2019 in Kumasi Metropolis

Source: Fieldwork, Manieson (2020)

### Factors Influencing Mode Choice Among School Children

This objective of the study seeks to examine factors that influence a child to either walk or cycle to or from school. The results of a multivariate logistic regression analysis on the variables influencing the mode of transportation for school children are shown in Table 3. Even though these were thoroughly examined to determine how exogenous and endogenous factors affect a child's transport mode to school, the outcome was only displayed in four (4) models. Model IV represented the adjusted model that controlled for both endogenous and exogenous factors.

Table 3 revealed that the presence of zebra crossings in Kumasi had a higher odd (AOR=2.459, CI=1.1165-5.416) in influencing children's choice of walking as compared to the use of other travel modes. The findings also show that, school children are attracted to crossing roads that have zebra crossing on them. When children were asked what they needed on the road in order to ensure their safety on the road, some children had this to say:

*“The zebra crossing helps us a lot. Because without the zebra crossing you can stand at the roadside for a long time and the vehicles will not stop for you to cross. You will have to struggle to cross the road but if the sidewalk was available, we will easily cross the road without any struggle. The government should provide more zebra crossings”* (Boy 12 years JH2)

*“I want the government to bring road safety signs on the road. That will help us cross the road easily”* (Girl, 10 years JH1)

With regard to parental control, children whose parents or caregivers' owned vehicles (AOR=0.406, CI=0.1760,0.936) and those whose parents insist on different travel modes had a lower odd (AOR=0.341, CI=0.1383,0.843) of walking to school. Consequently, findings revealed that children whose parents considered walking to be a cheaper travel option have a higher odd (AOR=3.237, CI=1.2702,8.251) of walking to school as compared to those whose parents did not. Parental/care givers influence has always been key to deciding children's mode choice and route to school due to the fact that these children are minors, therefore their decision making in this case is very limited and giving their parents the advantage. While the decision-making process lies solely in the hands of some pupils, for others it's was a shared decision between them and their parents. When asked during the focus group discussion on the decision to either walk or cycle to school, the children had this to say:

*“My parents have a say in it because the distance between the house and the school is not far at all. So, if I decide to board a car or something like that, it will be a waste of money.”* (Boy 9 years, Class 6)

*“It's my parents and I who take the decision to walk”* (Girl 11 years, JHS1)

It is also important to note that, most of the children indicated the decision to walk was solely their decision to make. But the interesting thing among such children is that their schools were very close to the home therefore walking was the most convenient option. When asked why the decision to walk or cycle to school rests on them, some responded saying:



*“It is my decision to walk because, the distance between my school and my house is not very far. It is my decision to walk”*

Regarding the convenience of travel, children who considered the distance from their home to schools to be shorter recorded a higher odd of walking (AOR=3.575, CI=1.4076,9.079) The same was also realised about children who had playgrounds or park on their trip from home to school (AOR=4.761, CI=1.2861,17.628). On the other hand, children who affirmed the existence of amenities like public toilets were less likely (AOR=0.154, CI=0.0439,0.543) to influence the decision to walk to school. This is in alignment with the street audit which showed that public toilets around school neighbourhoods were absent. Amoako-Sakyi (2017) on the other hand reiterated the need for public toilets along routes in school neighbourhoods to allow children make use of it.

In as much as some findings are counterintuitive, the result shows that children's' decision to walk to school was primarily influenced by parental control even though other factors in the physical environment and the desire for convenience influenced children's' travel mode.

**Table 3: A multivariable analysis of factors that influence children mode of transport to school**

Variable	Model I	Model II	Model III	Model IV
<b>School type</b>				
Public	0.015 OR=3.203 [1.251-8.20]	0.032 AOR=2.967 [1.0995-8.004]	0.044 AOR=2.898 [1.0291-8.163]	0.051 AOR=3.099 [0.9947-9.658]
Private	Ref	Ref	Ref	Ref
<b>Sex</b>				
Male	0.033 OR=2.035 [1.060-3.90]	0.043 AOR=2.006 [1.0219-3.937]	0.125 AOR=1.740 [0.8583-3.528]	0.269 AOR=1.554 [0.7106-3.399]
Female	Ref	Ref	Ref	Ref
<b>Household Vehicle Availability</b>				
Yes	0.155 OR=1.924 [0.781-4.74]	0.167 AOR=1.956 [0.7560-5.061]	0.217 AOR=1.903 [0.6859-5.281]	0.176 AOR=2.247 [0.6949-7.268]
No	Ref	Ref	Ref	Ref
<b>Infrastructure</b>				
Presence of Zebra Crossing				
Yes		0.033 AOR=2.078 [1.0603-4.071]	0.034 AOR=2.154 [1.0601-4.378]	0.026* AOR=2.459 [1.1165-5.416]
No		Ref	Ref	Ref

Table 3: Cont.

Presence of Traffic light			
Yes	0.877 AOR=0.899 [0.2360-3.428]	0.965 AOR=1.032 [0.2491-4.276]	0.633 AOR=0.687 [0.1470-3.209]
No	Ref	Ref	Ref
Influence of Sidewalk			
Yes	0.052 AOR=2.106 [0.9940-4.463]	0.072 AOR=2.050 [0.9370-4.483]	0.288 AOR=1.597 [0.6738-3.786]
No	Ref	Ref	Ref
<b>Parental control</b>			
Parents own a private car			
Yes		0.053 AOR=0.484 [0.2324-1.009]	0.034* AOR=0.406 [0.1760-0.936]
No		Ref	Ref
Parents say it is the cheapest			
Yes		0.012 AOR=2.951 [1.2648-6.886]	0.014* AOR=3.237 [1.2702-8.251]
No		Ref	
Parents prefer me walking to school			
Yes		0.056 AOR=0.450 [0.1987-1.020]	0.020* AOR=0.341 [0.1383-0.843]
No		Ref	Ref

Table 3:Cont.

<b>Convenience of travel</b>		
Distance to school is short		
Yes		0.007* AOR=3.575 [1.4076-9.079]
No		Ref
There are shelters along the stretch		
Yes		0.249 AOR=1.813 [0.6585-4.992]
No		Ref
It allows me to do physical distancing		
Yes		0.555 AOR=0.774 [0.3309-1.811]
No		Ref
There are public toilets on the road		
Yes		0.004* AOR=0.154 [0.0439-0.543]
No		Ref
There are benches on the way to school		
Yes		0.277 AOR=2.276 [0.5170-10.022]
No		Ref



Table 3:Cont.

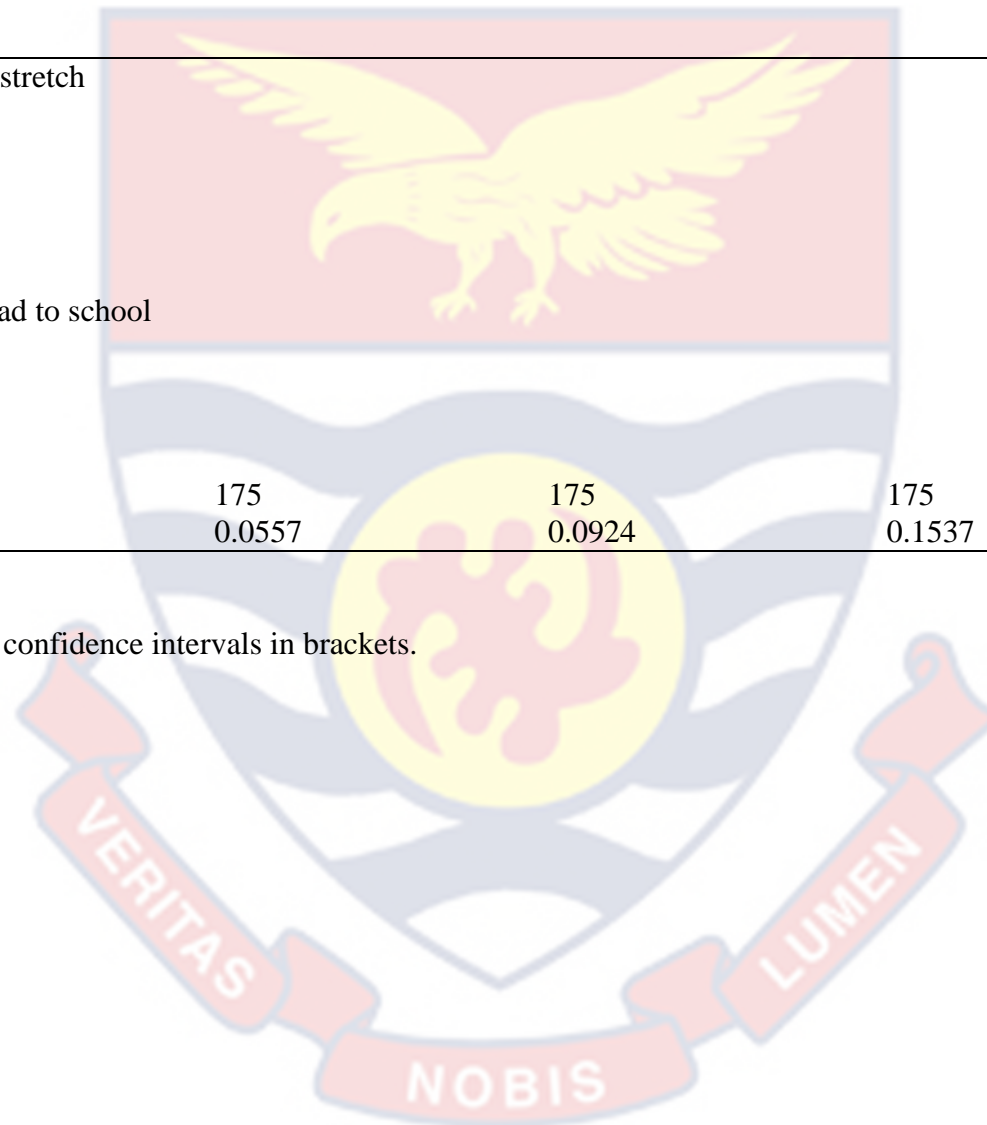
There are playgrounds along the stretch				
Yes				0.019* AOR=4.761 [1.2861-17.628]
No				Ref
There are drinking taps on the road to school				
Yes				0.058 AOR=0.265 [0.0674-1.046]
No				Ref
N	175	175	175	175
Pseudo $R^2$	0.0557	0.0924	0.1537	0.2706

$p < 0.05^*$ ,  $p < 0.01^{**}$

Exponentiated coefficients; 95% confidence intervals in brackets.

Ref = reference category.

Source: Manieson (2020)



## **Examine How Existing Policies/Strategies Support Active School Travel in Ghana**

To assess the policy environment which regard children travel and safety needs, a content analysis was conducted on selected national policies and other strategic documents for Ghana which were relevant to the study. The analysis paid attention to school children's travel safety in built environments with emphasis on children engaged in active travel (walking and cycling) feature in terms of policy goals, and strategies in selected policy documents. For purposes of this study, analysis of the documents is based on three categories which are policy on children, policy on school travel and inclusion of walking and cycling in policy documents. Ten (10) policy documents and strategies were reviewed based on their relevance to the study.

The policy documents assessed in this study seen in Table 4; are National Youth Policy (2010); Ghana National Urban Policy Framework & Action Plan (2012); An Agenda for Jobs: Creating prosperity and equal opportunity for all (first step) (2018-2021); National Spatial Development Framework (2015–2035); National Transport Policy (2015); Child and Family Welfare Policy (2015); National Road Safety Policy (2010); Ghana Building Code; Ministry of Transport's Medium term expenditure framework (2020-2022); Children's (Amended) Act (Act 937), (2016) and Ghana Report Card on Physical Activity for Children and Youth (2014, 2016 and 2018). These documents were selected because they targeted infrastructure provision in cities.

To begin with the local policy analysis, it is important to look at the perspectives of international policies and strategies of which Ghana is a member. Notable among these policies is the Sustainable Development Goals (SDGs) and the New Urban Agenda. The SDGs also known as “Agenda 2030” provides some directions towards achieving sustainable transport mobilities in both advanced and developing countries by 2030 (Pradhan et al, 2017; Brussel et al, 2019). Making cities and human settlements inclusive, secure, resilient, and sustainable is the broad focus of Goal 11. The goal's target 11.2 aims to develop an inexpensive and sustainable transportation infrastructure, paying special attention to the mobility requirements of disadvantaged groups including women and children. Target 4.3 recommends that educational facilities such as school buildings must be child friendly by providing a safe environment to children and vulnerable populations such as persons with disability. Goal 3.6 encourages efforts targeted at reducing road traffic injuries and death as a result of road traffic accidents.

The New Urban Agenda encourages investments in transportation in conjunction with integrated land use planning that enables densification and encourages biking, walking, and public transit. It encourages governments prioritisation of transit-oriented development supported by sustainable transport infrastructures for walking, cycling and public transport (Andersson, 2021; Buffel and Phillipson, 2018; Caprotti et al., 2017; Watson, 2016). Given the brief description of the international goals, it is important to narrow down on the local policies which can be seen in Table 4.

Table 4 provides a review of key policies selected which are assessed based on the three categories. The study begins with the analysis of the National Youth Policy (2010). This policy looks at empowering youth in order to impact positively on national development. The policy specifically mentions youth participation in the protection, improvement and preservation of the environment. It encourages youth participation in active living through sporting activities and encourages healthy living among young people. Despite the fact that it encourages sporting activities in schools such as inter-school games, policy directions in relation to school travel and the protection of school neighbourhoods are absent from the policy.

Ghana National Urban Policy Framework and Action Plan (2012), intends to ensure that Ghanaian cities and towns become sustainable while fostering growth and development in the cities and towns. Though the policy does not specifically mention children in relation to school travel, walking and cycling and active living, there are initiatives to ensure effective planning and management of sprawl in large urban centers by working with recommendations from relevant government institutions. Although its targeted toward achieving efficient urban infrastructure and service delivery in towns and cities, there are no direct guidelines for the protection of school neighbourhoods.

Another important policy that was looked at is the Child and Family Welfare Policy (2015). The policy takes a close look at a coordinated system for child and family welfare that fosters children's wellbeing, prevents abuse, and shields children from danger. Regarding children's mobility in built environments, there is no defined objective. Although this policy protects the



rights and freedoms of children which may include abuse by drivers including insults, there is no clear-cut goal on the protection of children engaged in active living, be it cycling or sporting events. Just like the Children and Family Welfare Policy (2015), the Children's Act (Act 937) (2016), also focuses on protecting the rights and needs of children but emphasis on school travel and active living such as walking and cycling are not captured on the policy.

The National Transport Policy (2015) and National Road Safety Policy (2010) did capture three indicators of interest for the policy review which are; policy on children, policy on school travel, and whether the policy includes active walking and cycling. Both policies had goals targeted towards vulnerable populations including children and seek to create environmentally friendly cities with infrastructure and design that meets the needs of children whilst paying attention to both pedestrians and cyclists. Whereas the National Road Safety Policy seeks to conduct road safety education in schools, the National Transport Policy seeks to support young people with access to affordable bicycles for school journeys and therefore the need to ensure that school and school neighbourhoods have the necessary infrastructure to support cycling among children and adults. Critical for school infrastructure development, the Ghana Building Code (2018) provides important guidelines for the development of bicycle infrastructure that connects to key public spaces such as schools, playgrounds and homes to encourage cycling among people of all ages.

Despite the fact that some of these policies are seeking to increase physical activity, the Medium-term expenditure framework (2020-2023) shows otherwise in the distribution of resources. It rather seeks to increase children's use of public transport to school with no direct investment towards children engaged in active travel to school. Meanwhile the government's initiative "An agenda for jobs: creating prosperity and equal opportunity for all (first step) 2018-2021" although does not specifically talk about school travel, seeks to develop infrastructure in built environments for Non-Motorised Transport (NMT) as well as protect the needs of pedestrians and cyclist through sustainable road design and providing legislation to protect children in order to reduce road traffic deaths and disabilities as well as enhancing capacities of motorists through education.



**Table 4: An examination and evaluation of some of Ghana's major policy documents**

Policy	Relevant Policy Goal/Strategy	Policy on children	Policy on school travel	Policy includes walking and cycling
National Youth Policy (2010)	It encourages young people to participate in sports, recreation, and healthy activities, particularly through providing playgrounds	✓	X	X
Ghana National Urban Policy Framework & Action Plan (2012)	Ensuring efficient urban Infrastructure and service delivery by promoting efficient and effective public transport systems. It also promotes policy actions to safeguard open spaces and ecologically sensitive area such open spaces, green belts and enhance visual amenities.	X	X	X
Child and Family Welfare Policy (2015)	The policy takes a close look at a coordinated system for child and family welfare that fosters children's wellbeing, stops abuse, and shields kids from danger. Regarding children's mobility in constructed surroundings, there is no defined purpose.	✓	X	X
National Spatial Development Framework, (2015–2035)	In order to boost physical and social inclusion, particularly for the young, disabled, and elderly parts of the population, the framework encourages communal contact with the environment. It also gives priority to pedestrians and cyclist on urban streets. Although the policy targets pedestrians and cyclist, there was no specific mention of children.	X	X	X
National Transport Policy,	The overall target of the policy is to create a sustainable, affordable,			

Table 4:Cont.

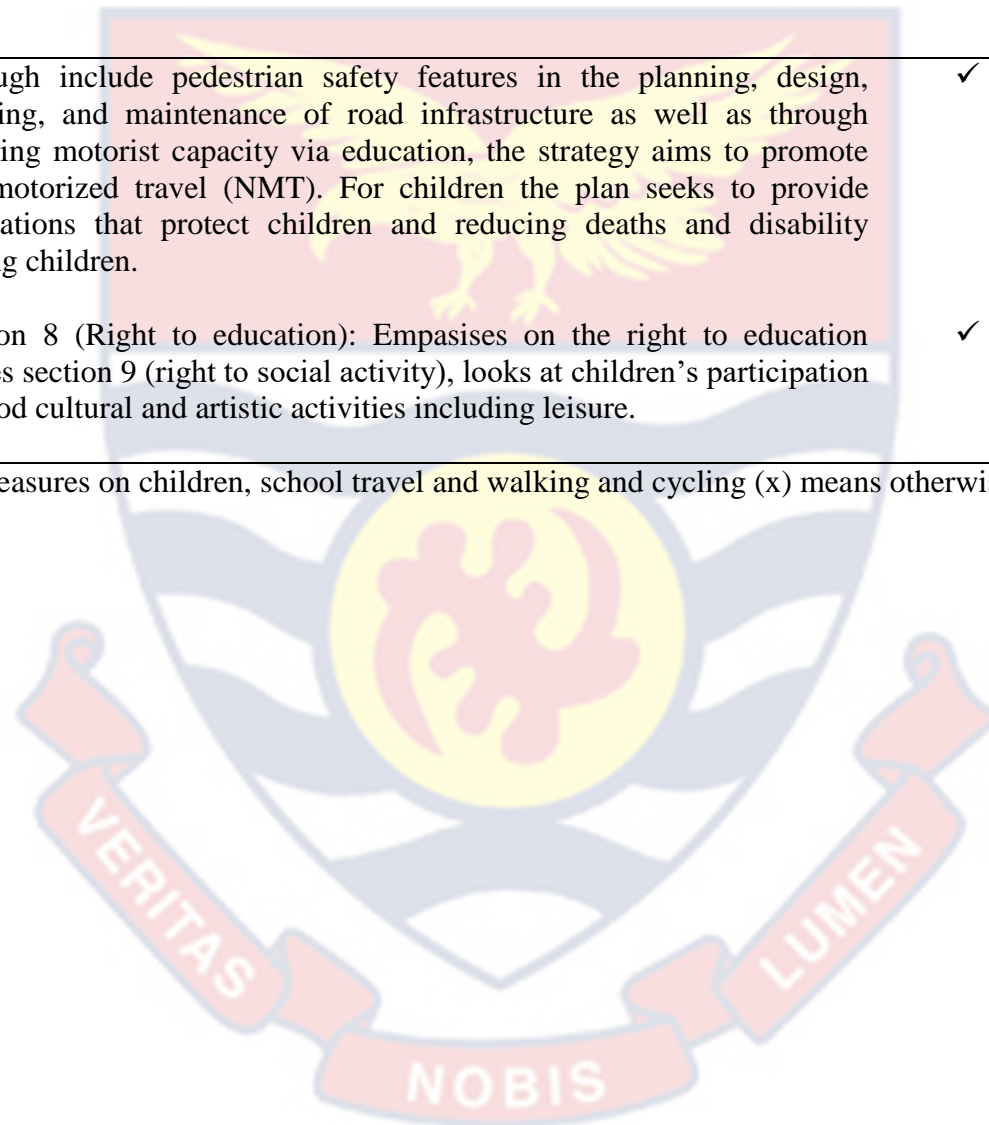
(2008)	effective, accessible and efficient transport system that meets the needs of road users. The policy looks at providing accessibility to vulnerable populations such as women, children and physically challenged persons by providing essential transport infrastructure as well as raise awareness to careful driver attention to pedestrians and cyclist. It seeks to support students purchase and maintenance of bicycles at affordable prices and also providing infrastructure (parking spaces) that support for bicycles in school.	✓	✓	✓
National Road Safety Policy, 2010	This policy pays attention to safety of vulnerable road users through efficient road design and management. It seeks to promote road safety education among school children through public campaigns and in-school education. It makes provisions for the use of NMT while protecting pedestrian road users.	✓	✓	✓
Ghana Building Code, 2018	Provides guideline for the provision of open/social spaces such as playground for children. It also provides guidelines for walkway and bicycle path connectivity to schools and other essential public spaces for children. It makes provisions for bicycle parking spaces in school and essential public facilities.	✓	X	✓
Ministry of Transport: Medium term expenditure framework (MTEF) (2020-2023)	The framework specifically seeks to increase children's use of public transport to/from school. There were no direct policy initiatives that support walking and cycling.	✓	✓	X



Table 4:Cont.

An agenda for jobs: creating prosperity and equal opportunity for all (first step) (2018-2021)	Through include pedestrian safety features in the planning, design, building, and maintenance of road infrastructure as well as through boosting motorist capacity via education, the strategy aims to promote non-motorized travel (NMT). For children the plan seeks to provide legislations that protect children and reducing deaths and disability among children.	✓	X	✓
Children's (Amended) Act (Act 937), (2016)	Section 8 (Right to education): Empasises on the right to education while section 9 (right to social activity), looks at children's participation in good cultural and artistic activities including leisure.	✓	X	X

Note: (✓) indicates policy has measures on children, school travel and walking and cycling (x) means otherwise.  
Source: Manieson (2022)



Analysis of the selected policies and strategies generally shows that there is a vacuum in policy about initiatives and plans that support children's school travel especially with regard to walking and cycling. The vacuum in policy is evident drawing insight from the Global Report Card on Physical Activity for Children and Youth (2014) by Active Healthy Kids Global Alliance's "Global Matrix 1.0" which for the first time Ghana participated and the subsequent once Global Matrix's 2.0 and 3.0" presented in Table 5. The matrix grades indicators relating to physical activity of children and youth in Ghana. Each indicator is measured against certain benchmarks in percentage used for grading. The indicators and their respective benchmarks for measurement can be seen in Table 6.

Evaluation by Ocansey et al (2014) on 2014 Report Card on Physical Activity for Children and Youth in Ghana in Table 5 shows that there is not enough information on the levels of physical activity among children and teens, and much less information on community-based activities or governmental programs to encourage physical activity., which indicates that in 2014 the overall physical activity levels among children and youth was graded D. On the other hand, there has been improvement in physical activity in 2018.

With regard to active transportation among children and youth, Ghana scored a D in 2014, C and C+ in 2016 and 2018 respectively. This shows an improvement in active transportation to school and other public spaces. The improvement could be as a result of recent attention given to the needs of pedestrians and vulnerable populations such as women and children in the SDGs (Porter & Turner, 2019). This is because studies have shown that 53

percent of children were going to attend schools less than a kilometer with about seven percent living five or more kilometers away from school. Majority (74%) of children walked to school with about seven percent of children cycling to and from school (Adom-Asamoah et al., 2015; Alangea, 2014; Ocansey et al, 2014; Ocansey et al, 2016).

With regard to school infrastructure, policies and programs, Ghana continuously performs woefully this is due to the fact that most schools did not meet the requirements of good curriculum for the establishment of a school which are the promotion of Physical Activity (PA) and the provision of playground (Ocansey et al, 2014; Ocansey et al, 2016). It is important to also note that Ghana unlike some sub-Saharan African countries does not have a school travel policy that protects the needs of children in their daily commute to and from school.

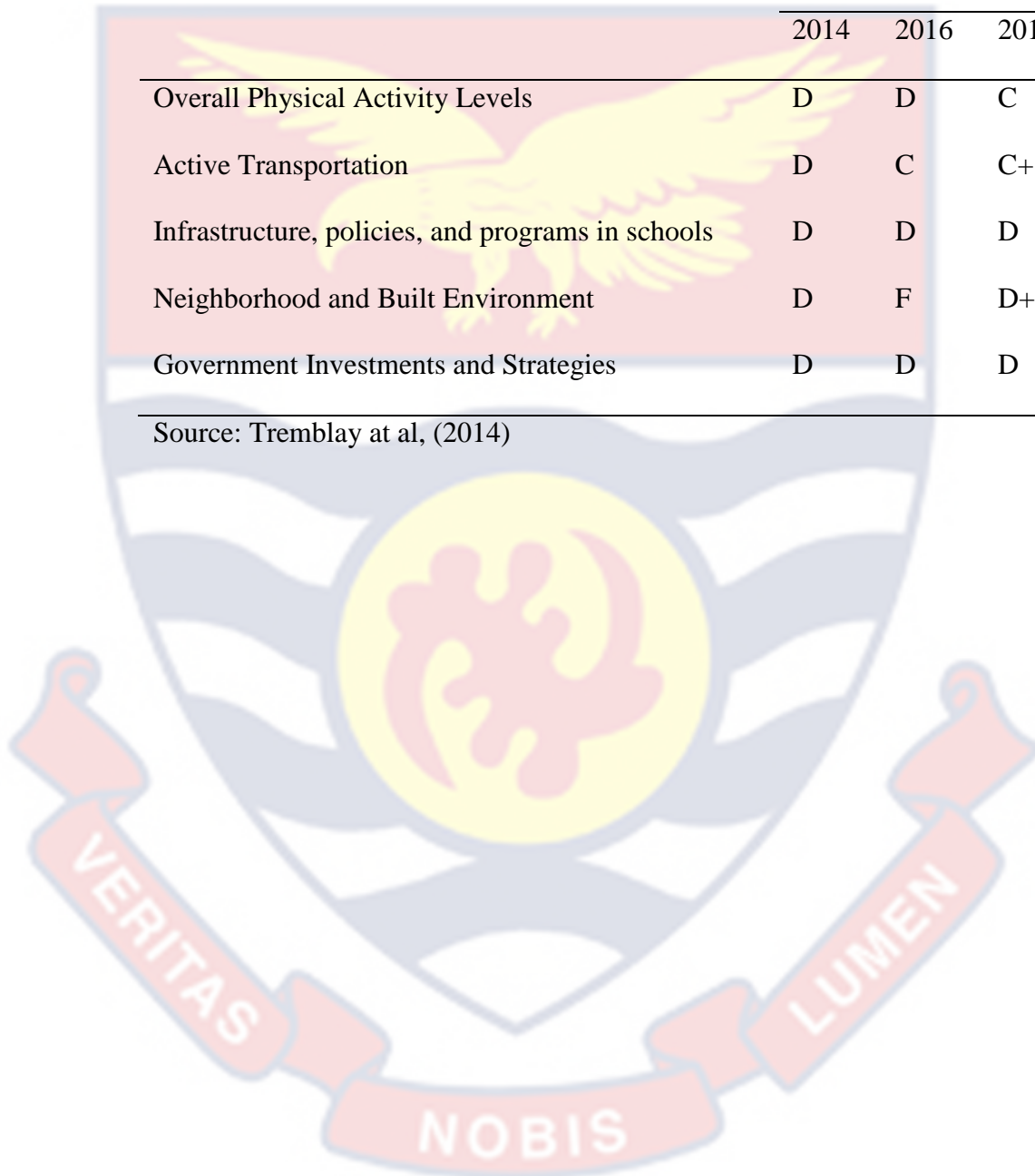
With regard to community and the built environment, there has been an improvement in 2018 (D+) and compared to 2014 (D+) despite the fall in performance in 2016 (F). The increase in performance in 2018 was as a result increase in community day school for senior high school education with safe environment which led to increase in physical activity (Nyawornota et al, 2018). Despite this efforts Ghana is still graded low due to the insufficient infrastructure to support physical activity in and around school neighbourhoods, lack of policy direction and resources and the lack of training for physical education teachers for primary and junior high schools (Ocansey et al, 2014; Ocansey et al, 2016). Government policies, strategies and investments have always performed poorly in all the years under review given the fact that there is no policy on school travel as well as physical education,

which is just a requirement for schools (Ocansey et al, 2014; Ocansey et al, 2016; Nyawornota et al, 2018; Adjei-Boadi et al., 2022).

**Table 5: The Ghana Report Card on Physical Activity for Children and Youth; Grades on physical activity indicator for 2014, 2016 and 2018.**

Indicator	Grade		
	2014	2016	2018
Overall Physical Activity Levels	D	D	C
Active Transportation	D	C	C+
Infrastructure, policies, and programs in schools	D	D	D
Neighborhood and Built Environment	D	F	D+
Government Investments and Strategies	D	D	D

Source: Tremblay et al, (2014)



**Table 6: Benchmarks used for grading indicators**

Indicator	Benchmark in percentage (%)
Over Physical Activity Level	Children and adolescents who exercise according to the recommended criteria
Active Play	Children and young people who comply with the requirements can play actively for several hours in an unstructured or unorganized environment.
Active Transportation	Children and youth who engage active travel to and from public spaces such as schools, playgrounds, mall etc.
Infrastructure, policies, and programs in schools	This has to do with schools with active travel policies, provision of key infrastructures such as bike racks, traffic calming such as speed bumps as well as physical education programs.
Neighborhood and Built Environment	Looks at municipalities that reports on infrastructures such as sidewalks, bike lanes, trails etc. that promote towards physical activities. Living in environments that parents/children feel it's safe and others.
Government Investments and Strategies	Commitment towards public policies, strategies and investments towards achieving targeted which seeks to increase physical activities among children and youth.

Source: Tremblay et al, (2014)



## CHAPTER FIVE

### SUMMARY, CONCLUSION AND RECOMMENDATIONS

#### Introduction

The main research results, the study's conclusions, and its recommendations are summarised in this chapter. The study also outlines opportunities for further studies in the subject area and the contributions to knowledge in the subject area.

#### Context of Study

The main objective of the study was to explore the relationship between the design of public spaces and travel safety among school children to and from school in the Kumasi Metropolis. The study specifically sought to:

1. Conduct a streetscape audit using the Pedestrian Environmental Data Scan.
2. Examine incidences of pedestrian RTCs involving children in the Kumasi Metropolis
3. Examine the factors that influence active school travel among children in Kumasi Metropolis
4. Examine how existing policies/strategies/infrastructure support active school travel in urban Ghana.

The study employed a mixed method approach. The study employed the use of interview guide, questionnaires and secondary data collected from the Building and Road Research Institute (BRRI) as well as the National Road Safety Authority (NRSA). The primary data collected consisted of the street audit using the pedestrian environmental data scan to audit the street

infrastructure along the selected route in the Kumasi Metropolis. The questionnaires looked at assessing factors influencing active travel among school children. Secondary data collected from the BRRI and NRSA were on crash statistics involving pedestrians within the municipality in order to assess the nature of road traffic crashes among child pedestrian in the Kumasi Metropolis. The data collected were analysed and presented using percentages, frequencies, regression and direct quotations which puts participants' comments in the right context

### **Summary of Findings**

The main findings of the study are as follows:

1. Generally, the environment along the school neighbourhoods were flat (69.7%) with few areas of relatively hilly (30.3%) areas.
2. The most common land use along school neighbourhoods was for institutional or office (24.1%) purposes which was followed by commercial activities (21.7%). Other facilities such as multi-family (20.7%) housing and single-family housing (17.2%) were also predominant which helps to ensure eyes on the street for children.
3. Parts of the land use were for industrial purposes (10.8) around school neighbourhoods which could be dangerous to the health and wellbeing of school children given the environmental pollutions (noise and fumes from chimneys) associated with such industries.
4. Areas for recreational purposes such as children's parks and were generally absent with the exception of school packs especially in the public schools. These parks were not properly developed to aid children in the playing activities and to ensure safety of children.

5. About 80 percent of the school selected were located in mixed land use areas which had commercial activities on going therefore increasing vehicular traffic around school neighbourhoods.
6. Essential speed calming amenities such as speed limit sign boards, speed ramps were absent in all the schools studied.
7. Zebra crossing were available in 30 percent of the schools studied, most of which were faded and needed re-spraying to ensure their visibility to pedestrians. In most of the school there were no zebra crossings within the school neighbourhoods putting children at risk when crossing the roads to and from school in the Kumasi Metropolis.
8. In many of the commercial areas around school neighbourhoods on-street parking and street vending were common practices which puts children at risks of road traffic crashes in the Kumasi Metropolis
9. With regard to the services of street wardens, both schools that have and the ones that do not emphasised on the need for street wardens to ensure the safe crossing of children in and around school neighbourhoods in the Kumasi Metropolis
10. Results from the crashes analysis indicates that more boys (52.3%) children are involved in road traffic accident as compared to their girl (47.7%) counterparts. Between 2009 and 2020 more boys were killed on the roads than girls throughout the decade. In 2013 and 2016 twice as much boys were killed as compared to girls indicating that boys are much at risk of road traffic crashes while crossing the road.

11. Child pedestrian under the age 10 (67%) are more likely to be killed in road traffic crashes as compared to children between the ages of 10 -14 (25.8%) and 14-16 years (8.1%).
12. A child crossing road where there is no zebra crossing is at risk of being hit by a vehicle while crossing the road.
13. Age, pedestrian location, light condition and road surface types have positive correlation with regards to accident severity among child pedestrians in the Kumasi Metropolis. On the other hand, the younger the child the more severe the accident. Good road is also associated to high fatalities especially in places where speed calming measures are absent. With regards to lighting, a child is more likely to be killed on the road during the day as compared to night hours. This is because most children go to school during the hours of the day.
14. With regard to factors influencing active travel to and from school, parental influence was the most significant in deciding whether a child should walk or cycle to school.
15. Distance to school is an essential determinant as to whether a child would walk or cycle to school.
16. Essential amenities such as zebra crossing greatly influence a child choice of route to and from school.
17. Analysis of policy/strategies suggests a policy vacuum with regard to active (walking and cycling) school travel among children.
18. There is insufficient Investments by government in pedestrian infrastructures that support walking and cycling.



19. Schools did not meet approved standards in terms of infrastructure support for active travel and play among children.

20. Ghana's performance in the physical activity report card gradings indicate that the country is still lagging in all indicators regarding active travel and physical activity.

### **Conclusion**

The design of the street infrastructure in the metropolis presents child pedestrians and other pedestrians with a lot of challenges due to insufficient pedestrian walkways and bicycle lanes to aid active travel (walking and cycling) in the Kumasi Metropolis. In most school neighbourhoods, essential street infrastructure such as sign posts indicating the presence of school, speed limit for motorists, and pedestrian crossing were unavailable. The only evident sign of post in school neighbourhood were usually sign post indicating the name of the school. On street parking and street vending were also major issues in the metropolis. In most cases few sidewalks that were provided were being hijacked by street vendors to sell their goods leaving children with no or little space for walking. In most cases they have to compete with vehicles on the road while on their journey to school which puts them at a risk of road traffic crashes in the metropolis. All the school neighbourhoods studied does not meet the UN requirements for safe school neighbourhoods due the absence of safety measure to protect school children from road traffic crashes.

Child pedestrians are greatly are risk of road traffic crashes while crossing the road at places where there is no pedestrian crossing points. In some cases, children have been hit on the road whilst crossing at a pedestrian crossing point at the center of the road. It is important to note that boys are



twice as much affected by road traffic crashes compared to girls in the Kumasi Metropolis. Children below 10 years and below suffers severe injuries as compared to older children. It is also important to note that children have been hit on road considered to be in good conditions. Good asphalted roads lead to increase speed in the case where there are no proper infrastructures to decrease vehicular speed along pedestrian environments.

Among the factors that influence active (walking and bicycling) travel to and from school, parental influence and shorter distance to the school are seen as the major influencers. Other road infrastructures such as zebra crossing, public toilets, trees and benches along the street are considered by children to be essential infrastructure elements that support active travel to school.

With regard to policies and strategies that promote active travel (walking and cycling), Ghana as a country does not have a specific policy that promotes the safety of pedestrians while promoting walking and cycling, yet, in many of the policies/strategies analysed in the study, it is evident that there are efforts to promote active travel and increase pedestrian safety especially for vulnerable population like children in urban areas. Reports from the Ghana report card on physical activity confirms the insufficient investments by government to build sustainable infrastructures that promote active travel.

### **Recommendations**

The following recommendations were made in light of the research findings and study's conclusion:

### ***Modification of the Pedestrian Environment***

1. To encourage walking and cycling among school children, the Department of Urban Roads both OTMA and KMA must provide sidewalks in and around school neighbourhoods along busy streets in the Kumasi Metropolis.
2. The Department of Urban Roads and the National Road Safety Authority must provide street calming measures such as speed ramps, posted speed limits and pelican crossing along school neighbourhoods in the Kumasi Metropolis.
3. The Department of Urban Roads must provide street buffers along available sidewalks in school neighbourhoods such as the Wesco Demonstration School to protect child pedestrian from motorist.
4. The Motor Traffic and Transport Department of the Ghana Police Service must station around school neighbourhoods with high traffic during rush hours to assist school children commute to and from school safely.
5. Encourage the use of street wardens in and around the school environment especially for schools that are located in commercial areas with high vehicular traffic.
6. The National Road Safety Authority should encourage schools in neighbourhoods with heavy vehicular traffic to hire the services of wardens to assist children in crossing the road.

### ***Intensification of Education for Road Users and Pedestrians***

1. The National Road Safety Authority must intensify its education for both commercial and private road drivers on the need to pay close attention to pedestrians.

2. There is the need to also intensify road safety education for school children concerning the use of the road whiles on their journey to and from school.

### **Reflection on Conceptual Framework**

The conceptual framework employed for the study was very useful in directing and shaping the results of this study. All variables in the conceptual framework were analysed in the study and findings in tune with the direction of the framework. All variables in the urban infrastructure section, individual factors, external factors were fully applied in the study and directed the study findings.

Despite the conceptual framework indicating the influence of external and individual factors shaping walking and cycling to and from school, factors such as parental factors were strong factors in determining the mode choice of children.

In relation to external factors, variables such as institutional policy played a major role since some school deterred children from cycling to school due to safety concerns. National policies had little or no influence since the findings showed a huge gap between the policies and reality.

Key to the framework is children perception of safety on the streets. The findings revealed that children had little choice and therefore despite feeling unsafe on the roads they are left with little or no choice in their situation and would have to adjust to the present road traffic situations.

### **Contributions to Knowledge**

According to Silverman (2003) the four areas that may be used to evaluate a research's contribution to knowledge include technique or

generating an idea, critically evaluating an approach, expanding on an existing study, and being willing to alter course. The aforementioned assertion states that this study offers three unique additions to knowledge. First, the study has brought to light the experiences of children use of urban spaces while on the journey to and from school within the Kumasi Metropolis. The study also brings to bare child pedestrian most at risk of road traffic crashes in the Kumasi Metropolis. The study also reveals a gap in pedestrian infrastructure provisions that ensures the safety of school children while accessing their school neighbourhoods in the Kumasi Metropolis with regards to vulnerable populations such as children. Also, the study confirms several literatures on the factors that influence active travel; with parental influence and shorter distance to school being the main influencers. Lastly, the study brings to bare the gap in terms of policy with regards to school travel, walkability and cycling as well as pedestrian safety especially in the built environment.

### **Suggestions for Further Research**

While the study contributes to knowledge towards raising awareness on the associated road traffic risks associated with walking and cycling among school children in the Kumasi Metropolis whilst on their journey to and from school as well as the factors that influence active travel, further research can look specifically at the design of school neighbourhoods and a framework for ranking the differences in safety from one school neighborhood to the other.



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## APPENDICES

## APPENDIX A

## UNIVERSITY OF CAPE COAST

## COLLEGE OF HUMANITIES AND LEGAL STUDIES

## FACULTY OF SOCIAL SCIENCES

## QUESTIONNAIRES

**Title: Effects of Urban Infrastructural Design on Travel Safety Among School Children in the Kumasi Metropolis**

Good morning/afternoon. My name is \_\_\_\_\_. I am a postgraduate student at the Department of Geography and Regional Planning, University of Cape Coast (UCC). We are doing a research on **Effect of Urban Infrastructural Design on Travel Safety Among School Children in Kumasi Metropolis**. We want to understand how children travel and whether they are safe as they do so. We are interested in understanding about your travel experiences, as you go to school from home and back, and whether you experience any difficulties. We would also wish to understand how you travel to school and other places and how this decision is made. For example, whether you use a school bus/van, walking, cycling, using a motorcycle; and who decides on this. We would be glad to get your general views about children travel safety in Kumasi, and whether there is anything that can be done to ensure that children travel safely. The information which you are going to share with us will not be shared with anyone else. We have selected you because your parent and/or school principal has given us permission to talk to you. If you however do not feel comfortable to talk to us, please let us know. If you refuse to talk to us, please note that you will not be punished in



	g) Troto <input type="checkbox"/> h) Tricycle/Pragia <input type="checkbox"/> i) Motor cycle (Okada) <input type="checkbox"/> k) other.....
Time taken to get to school	
Who do you usually travel to school with?	a) Parent(s) <input type="checkbox"/> b) Other adults (eg. Friend's parents) <input type="checkbox"/> c) Sibling (s) <input type="checkbox"/> d) Friends <input type="checkbox"/> e) Alone <input type="checkbox"/>

**SECTION B: ROUTE CHOICE**

1. How many routes are there to your school from your house?
  - a) 1
  - b) 2
  - c) 3 or more
2. Indicate the type of route (most frequently used route)
  - a) Exclusive pedestrian path
  - b) Multi-modal routes
  - c. Combination
3. What is the nature of the route to school?
  - a) Paved
  - b) Unpaved

**SECTION C: MODE CHOICE**

4. Who decides on how you should travel to school?
  - a) Parents/Guardians
  - b) School Authorities
  - c) Self
  - d) Other

(Specify).....
5. What is your most preferred mode?
  - a) Walk
  - b) Bicycle
  - c) School bus
  - d) Private car
  - e) Motorcycle (private)
  - f) Taxi
  - g) Troto
  - h) Tricycle/Pragia
  - i) Motor cycle (Okada)
  - k)

Other.....





9. What influences your mode choice for school?

Factor	Response	
	Yes	No
Infrastructure provision like roads, sidewalks etc		
Condition of mode or vehicle, motor etc		
Economic factors		
Social factors		
Safety		
Aesthetics		
Curiosity		
Convenience and comfort		
Policy factors		
Parental influence		

10. What are the specific influencers?

Kindly indicate respondent's knowledge on the presence of the following facilities on the routes used to school

		Yes	No
Infrastructure Provision	There are traffic lights		
	There is no modal conflict		
	There are sidewalks		
	There are zebra crossings		
	There are school zone signs		
	There are dedicated lanes for cyclist		
	The street to my school is paved		
	Presence of bus stop		
	There are playgrounds on the way to school		
	There are street cameras on the way to school		
Economic	My parent/guardian does not own a car		
	My parents cannot afford my fare		
Convenience and Comfort	The distance to my school is short		
	There are benches on the way to/from school		
	There are drinking taps on the road to school		
	There are public toilets on the road		
	There are shelters along the stretch?		
	There are trees along the stretch		
	There are playgrounds along the stretch		
There are obstructions (rubbish, broken bottles) on			

	the road		
	It allows me to do physical distancing		
<b>Social Factors</b>	My siblings walk/cycle to school		
	Most of my friends walk/cycle to school		
	I want to play/chat with my friends after school		
<b>Parental Factors</b>	My parents think it's safe to walk to school		
	My parents prefer me walking to school		
	My parents say it's more secured because I can walk with others to school		
	My parents say it's the cheapest		
<b>Policy Factors</b>	That is what my school insists I use		
	My school allows for the use of bicycles		
	There are rules governing the use bicycles in my neighbourhood		
	There are rules governing walking to school in my neighbourhood		
<b>Aesthetics</b>	I enjoy watching the beautiful buildings		
	I enjoy watching the beautiful landscape		
<b>Safety</b>	Drivers stop for us to cross		
	There is no modal conflict on the road to school		
	There are no on-street parking on my way to school		
	The drivers adhere to safe driving speeds		
	There are buffers protecting pedestrian from vehicles		
<b>Curiosity</b>	I want to see new things in town		
	I have seen people walk		
<b>Policy Factors</b>	Children traveling more than a kilometre are required to use public/private transport		
	Vehicles are not allowed to stop at the entrance of my school		
	The school supervises children who walk or cycle to school		
	The school encourages cycling to school		

**SECTION D: EFFICACY OF CHILD SAFETY MEASURES AND EDUCATION**

**10.** Do you know about Road Safety?

- a) Yes  b) No

**11.** Where did you obtain your knowledge on road safety?

- a) My Parents/Guardian  b) From T.V/Radio (Mainstream media)  
c) From School  d) From Social Media

**12.** Indicate your most important source of knowledge on road safety

- a) My Parents  b) From T.V/Radio (Mainstream media)  
c) School  d) From Social Media

**13.** Do you know how to do the following? (Tick all that applies)

- a) Select a safe crossing point   
b) Do the crossing drill before crossing the road   
c) Use the zebra crossing   
d) Use the traffic light   
e) Cross the road after alighting from a vehicle

**14.** What does the school curriculum cover on road safety education?

- a) Keeping safe on the road   
b) Safe crossing points   
c) First aid in road safety   
d) Road signs   
e) The use of paratransit and school buses  
f) Others  (specify).....

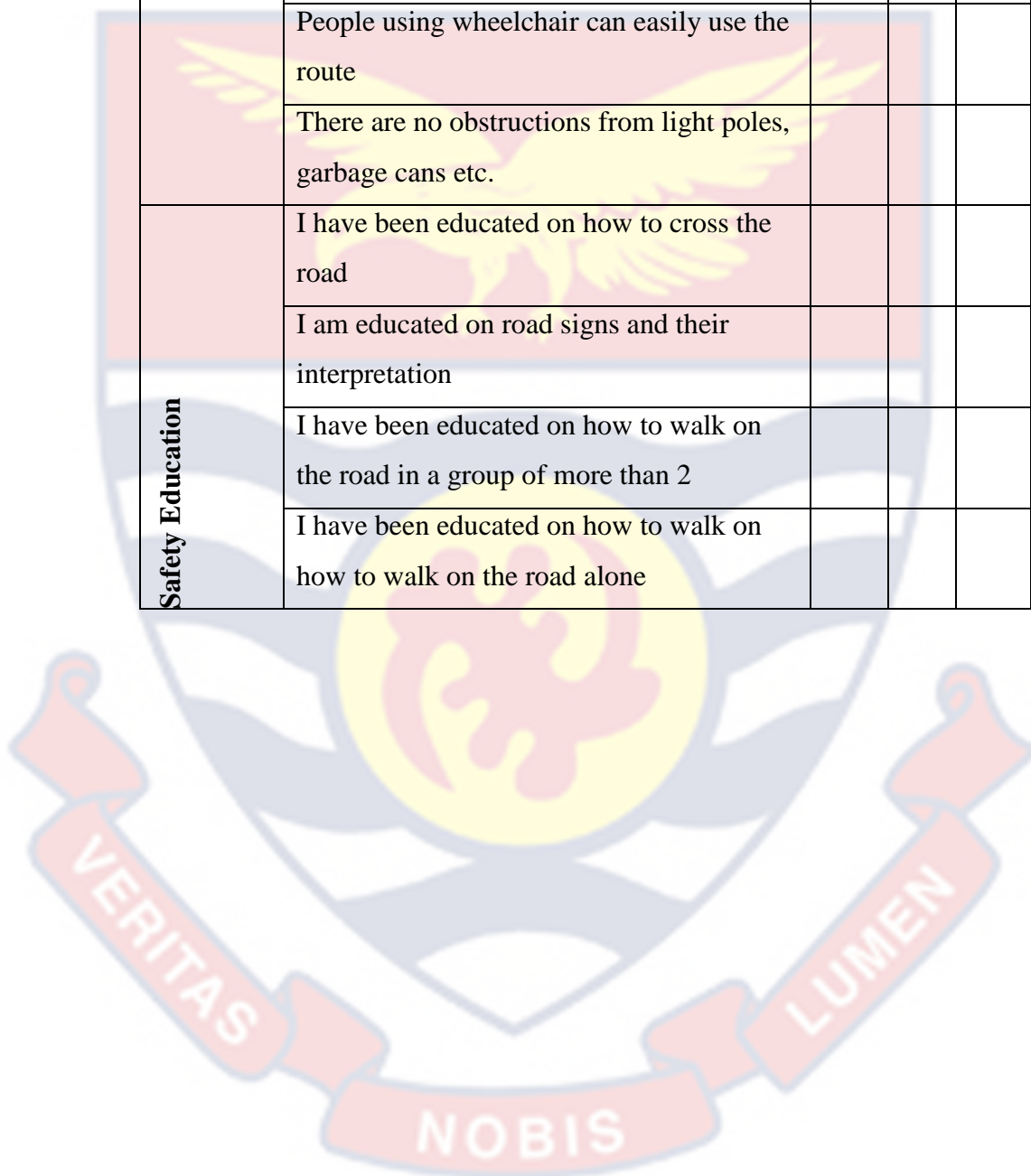
**15.** Under which subject area do you have road safety education?.....

16. This section seeks to investigate safety issues relating to walking and cycling to/from school. Please indicate by ticking a response that best fit the following statements.

SAFETY		Response		Efficacy	
		Yes	No	Yes	No
Infrastructure provision	There are traffic lights on the road				
	There are road signs on route indicating children crossing				
	There are lollipop crossing points on my route				
	There are road signs indicating presence of a school				
	There are speed limit signs around school neighborhood				
	There are pedestrian crossings on route				
	Speed calming measures (ramps/strips)				
	There are sidewalks on route				
	There are curbs to separate sidewalks from the road				
	There are buffers such as guard rails or trees separating pedestrian path from road				
	Sidewalks are wide enough to allow two adults walk side-by-side				
	There are street cameras on route				
	The sewers on my route are covered/sealed				
Individual/Local Authority initiative	There are traffic wardens/volunteers to assist me in crossing				
	Drivers stop for me to cross				
	On-street parking is not allowed on my route				



	Surface of sidewalk is even and not dislodged				
	The roads are tared				
	The routes are free from broken bottles, weeds etc				
	People using wheelchair can easily use the route				
	There are no obstructions from light poles, garbage cans etc.				
<b>Safety Education</b>	I have been educated on how to cross the road				
	I am educated on road signs and their interpretation				
	I have been educated on how to walk on the road in a group of more than 2				
	I have been educated on how to walk on how to walk on the road alone				



**SECTION E: TRAVEL NEEDS**

17. This section identifies child's travel needs and whether he/she assess them as adequately met while travelling to/from school.

Does the route you use to/from school have the following?

Travel Need	Child's needs		Responsible agent's Concern	
	Yes	No	Yes	No
Bus stop				
Street bench with shelter				
Wide sidewalks				
Paved sidewalks				
Buffer				
Traffic light				
Visible zebra crossing				
School zone signs				
Children crossing signs				
Speed bumps				
Speed limit sign				
Public toilet				
Trees for shade				
Drinking tap				
Presence of Traffic warden/volunteers				
Driver cooperation to cross safely				
Playground				
Bicycle lane				
Cycling crossing sign				
Helmet for cyclist				
Reflectors on bicycle				
CCTV cameras				
Other pedestrians/cyclists on street				
Police on street				
Other (Specify)				

**SECTION F: INCIDENTS OF ROAD TRAFFIC CRASHES**

20. Have you/a friend ever had an accident or been injured while travelling to/from school?

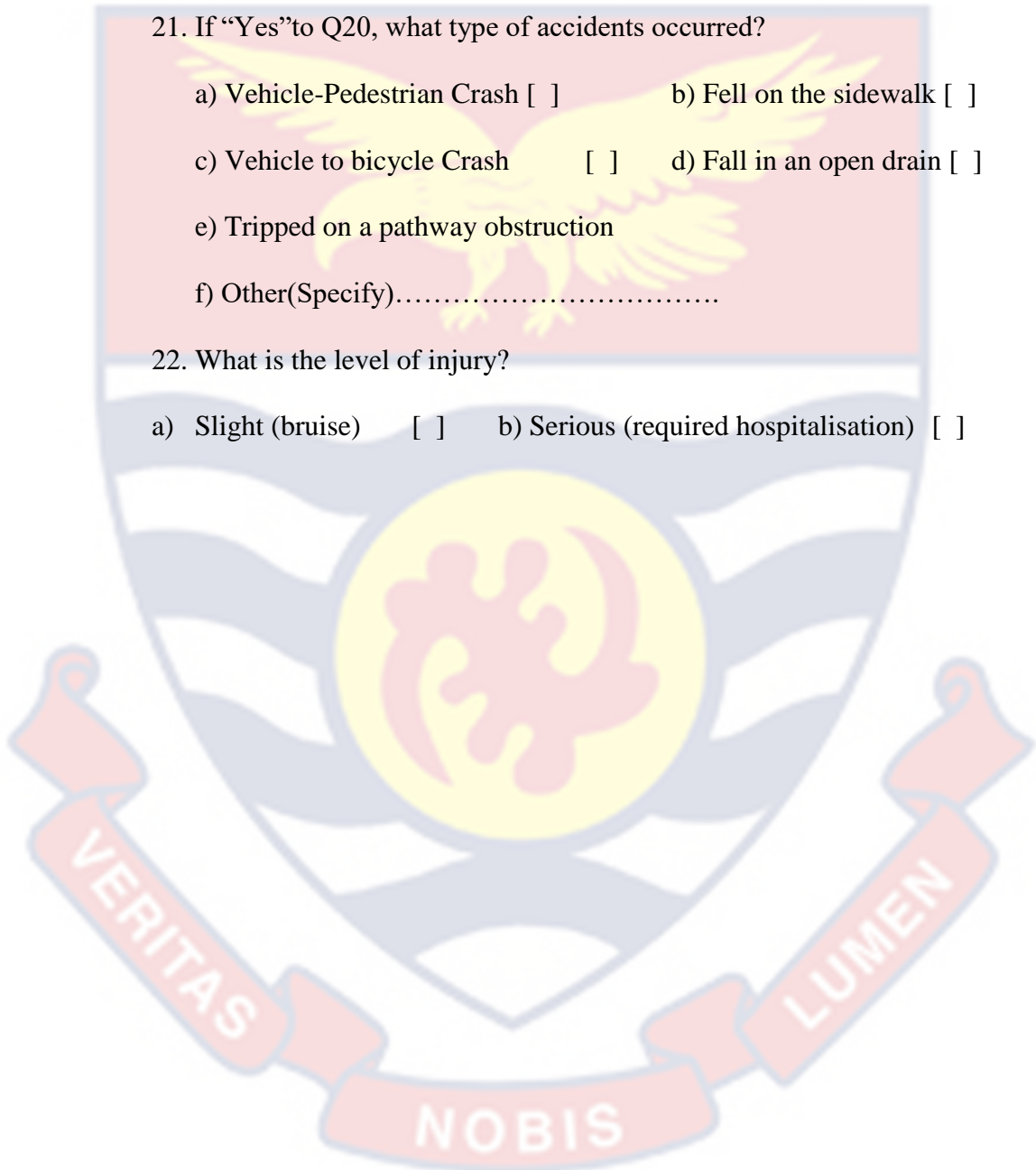
- a) Yes [ ]                      b) No [ ]

21. If “Yes” to Q20, what type of accidents occurred?

- a) Vehicle-Pedestrian Crash [ ]                      b) Fell on the sidewalk [ ]  
c) Vehicle to bicycle Crash [ ]                      d) Fall in an open drain [ ]  
e) Tripped on a pathway obstruction  
f) Other(Specify).....

22. What is the level of injury?

- a) Slight (bruise) [ ]                      b) Serious (required hospitalisation) [ ]



## APPENDIX B

## UNIVERSITY OF CAPE COAST

## COLLEGE OF HUMANITIES AND LEGAL STUDIES

## FACULTY OF SOCIAL SCIENCES

## DEPARTMENT OF GEOGRAPHY AND REGIONAL PLANNING

## FOCUS GROUP DISCUSSION FOR SCHOOL CHILDREN

Good morning/afternoon. My name is \_\_\_\_\_. I am a postgraduate student at the Department of Geography and Regional Planning, University of Cape Coast (UCC). We are doing a research on **Effect of Urban Infrastructural Design on Travel Safety Among School Children in Kumasi Metropolis**. We want to understand how children travel and whether they are safe as they do so. We are interested in understanding about your travel experiences, as you go to school from home and back, and whether you experience any difficulties. We would also wish to understand how you travel to school and other places and how this decision is made. For example, whether you use a school bus/van, walking, cycling, using a motorcycle; and who decides on this. We would be glad to get your general views about children travel safety in Kumasi, and whether there is anything that can be done to ensure that children travel safely. The information which you are going to share with us will not be shared with anyone else. We have selected you because your parent and/or school principal has given us permission to talk to you. If you however do not feel comfortable to talk to us, please let us know. If you refuse to talk to us, please note that you will not be punished in any way, either by your parent or school. We are not going to share any information about our discussion with you, your parent or school principal or

teachers, or with anyone else. We are not giving any rewards for participation in the study. We thank you for your willingness to take part in this study. This interview should take about 15 minutes. Please confirm that you have understood why we are doing this study and whether I can continue with the interview. If you need get any other information, please contact Bert Nii Odoi Manieson via email: [albertodoi92@gmail.com](mailto:albertodoi92@gmail.com) (0262316419)

### **SECTION A: INTERVIEW INFORMATION**

- a) Name of Assembly ..... b) Name of Community.....  
 c) Name of School..... d) Date of interview.....  
 e) Name of interviewer..... f) Number of Participants.....  
 f) Time Started..... g) Time Ended.....

### **SECTION B: BACKGROUND ISSUES**

- a) Let pupil(s) tell you about their about themselves (Age, Class, Religion, Place of residence, hometown, parent(s) or guardian living with and their occupation, etc.

Probe for how long they have lived in the community and how long they have been in the school.

- b) Ask what they think of their school. What they like or dislike about their school? [Probe]

### **SECTION C: KNOWLEDGE OF ROAD SAFETY**

- a) What are some of the things you learn at school? [Probe for course contents and ask about lessons related to road safety education and their personal safety] Also probe for songs and rhymes
- b) Have you ever heard of road safety? Where did you hear it? From whom? Tell us what you know about road safety.



- c) Who taught you how to cross the road? [Probe for whether it's their parents or teachers] Let pupils share what they know.
- d) Who teaches them about their personal safety and security when commuting to/from school? What are the lessons they learn? [Probe for differences in lessons regarding their gender]

#### **SECTION D: JOURNEY TO/FROM SCHOOL**

- a) Tell us about your journey to school? How far is your home from the school, describe?
- b) What time do you leave home? Probe for reasons
- c) What informs your choice of route to/from school? Probe for reasons
- a) Are you accompanied to school? If yes, why? If no, why?
- b) Do you walk/ride alone or in a group? Why? If they use bicycle why?
- c) How many minutes/hours does it take you to reach school?
- d) Which routes do you use to/from school and why? [Probe for the conditions of the routes to school e.g., dusty, paved, unpaved availability of trees etc. and how it affects the commute to/from school. Do they experience modal conflict on route to/from school?]
- e) Do you have to cross roads when going to and from school?
- Probe on whether they cross the streets by themselves and how easy it is for them?
  - Probe for drivers' attitude towards children to and from school
  - Probe for the existence of zebra crossing, traffic lights and wardens and the availability of important street signs. Probe for whether drivers stop for them to cross?

- f) Have you ever been knocked by a vehicle or have witnessed a colleague being hit by a vehicle on their way to/from school? Tell us the story [Be sensitive]

## **SECTION E: URBAN ENVIRONMENT AND PEDESTRIAN**

### **INFRASTRUCTURE**

- a) How would you describe your routes to school?

Probe for the presence of;

- i. Sidewalks [Probe for neatness]
  - ii. Pedestrian crossing [probe for visibility if any]
  - iii. Modal conflict (vehicles and pedestrians together)
  - iv. Speed calming i.e., speed bumps around school environment
  - v. Availability of benches you can sit on when tired
- i. Are the buildings arranged on your way to school?
  - ii. Are there trees serving as shades on the route to school?

- b) How attractive are the routes to school?

Probe for;

- i. Cleanliness of routes e.g., absence of rubbish
- ii. Whether or not sewers are covered or open
- iii. Does the presence of trees provide shades for you?
- iv. Are there attractive buildings on the routes to school?

### **SECTION F: SECURITY ON ROUTE**

- a) How safe do you feel on your commute to/from school
- b) Have you or a friend been attacked by strangers on your way to/from school
- c) Tell us about the number of people on your routes to school [Probe]

- d) Do you see the presence of policemen on the routes to school?
- e) Have you heard about story involving the kidnapping of a school child or a school child who got lost of their way to school? Tell us about it

#### **SECTION G: CLOSING REMARKS**

- a) Is there any other thing you would like us to discuss that we have not talked about? Please share with us.

Thank you for your cooperation. We would contact your teachers if we need any other information.



## APPENDIX C

## UNIVERSITY OF CAPE COAST

## COLLEGE OF HUMANITIES AND LEGAL STUDIES

## FACULTY OF SOCIAL SCIENCES

## DEPARTMENT OF GEOGRAPHY AND REGIONAL PLANNING

## SEMI-STRUCTURED INTERVIEW GUIDE FOR PARENTS

**Introduction and Informed Consent Statement**

Good morning/afternoon. My name is \_\_\_\_\_ a postgraduate student of the Department of Geography and Regional Planning, University of Cape Coast (UCC). The purpose of this interview is to gather information on **Effect of Urban Infrastructural Design on Travel Safety Among School Children in Kumasi Metropolis**. The study seeks to understand how children travel and whether they are safe as they do so. With regards to ethical guidelines underlying scientific research involving human participants, formal consent is required. The information which you are going to share with us will not be shared with anyone else. I humbly, want to seek your consent to participate in this study. Your participation is voluntary and you may refuse to participate in or withdraw from this study at any time. However, your participation in this study is key since the intention is to aid in policy drafting and implementation. The interview will last between 30 to 40 minutes. Thank you for your willingness to take part in this study. Please confirm that you have understood why we are doing this study and whether I can continue with the interview. If you need to get any other information, please contact **Bert Nii Odoi Manieson** via email: [albertodoi92@gmail.com](mailto:albertodoi92@gmail.com) (0262316419)

**A. BIO-DATA**

1. Name of Municipality .....
2. Age
3. Sex Name/Identity of interviewee .....
4. Marital status.....
5. Number of children      Male: .....      Female: .....
6. Number of children in primary school .....
7. Occupation: .....
8. Level of education: .....

**B. BACKGROUND ISSUES**

1. Please tell us about yourself. [Probe for how long he/she have lived in the community?]
2. What do you like about this community or what don't you like about the community?
3. What work do you do? [Probe for kind of work, level of education, availability of cars in the house etc]
4. How many children or wards do you have? [Probe to know how many boys or girls and their class]
5. Which school does your ward(s) attend? [Probe for reasons for the choice of school]
6. Does your child walk or bike to school? Why?
7. Tell us why you chose to let your ward engage in active commute (walking or cycling to school) Probe for reasons of distance, income, etc.)
8. Would you want your child to bike to school (if he/she has a bicycle)?



9. Would you buy a bicycle for your ward if he/she requests for one to ride to school? [Probe for the gender differences in the use of bicycle for school travel]

### **C. KNOWLEDGE ON ROAD TRAFFIC EDUCATION**

1. How familiar are you with road safety issues?
2. Do you educate your wards on road safety?
3. How do you teach your wards about their safety when commuting to school? What do you teach them?
4. Between parents and teachers, who do you think should teach children road safety drills and why?
5. Which other body do you think should be interested in education school children on road safety drills?

### **D. JOURNEY TO/FROM SCHOOL**

1. Tell us about the routes that your child commutes to/from school.
2. At what time does your ward leaves/returns home for/from school [Probe for why]
3. How far is your wards school from the house? Probe for the reason for the selection of school despite the distance of the school.
4. How involved are your ward(s) in the selection of the school? If no, why? And if yes, why? Probe for children's choice in school selection.
5. What do you think about accompanying your child to school? Probe for why he/she does/does not accompany their ward to/from school. Probe for environmental factors.
6. Have you ever witnessed an incident where your ward or any school child was involved in an accident? [Be sensitive]

7. If you could afford, would you rather your travel by vehicle? And why?

#### **E. URBAN ENVIRONMENT AND PEDESTRIAN INFRASTRUCTURE**

1. In your own words, how safe do you feel in your movement within the community? [Probe for concerns when walking along streets or when riding a bicycle. Probe for interaction between pedestrians and vehicles and the availability of pedestrian infrastructure.]

2. How concerned are you for the safety of your ward(s) when he/she leaves for school? Probe for modal conflict between pedestrian and vehicles and security concerns of parents towards the child?

3. How would you describe your ward(s) route to school? Probe for the availability of;

- a) Sidewalks [Probe for neatness]
- b) Pedestrian crossing [probe for visibility if any]
- c) Modal conflict (vehicles and pedestrians together)
- d) Speed calming i.e., speed bumps around school environment
- e) Availability of benches you can sit on when tired
- f) Is the buildings arrange on your way to school?
- g) Are there trees serving as shades on the rout to school

4. How attractive are the routes to school? Probe for:

- a) Cleanliness of routes e.g., absence of rubbish
- b) Whether or not sewers are covered or open
- c) Does the presence of trees provide shades for you?
- d) Are there attractive buildings on the routes to school?

## F. SECURITY ON ROUTE

1. Tell us about stories involving the kidnapping of a child going to school.
2. Tell us about the number of people that ply the route of the ward while commuting to school? Probe for why that matters to the safety of the child.
3. Tell us about the presence of police officers on the streets and why that matters to the safety of the school child.
4. In your view, does school children moving in groups anyway provide security for the school child? Tell us why?

## 1. G. OPTIONS FOR PROMOTING SAFE SCHOOL TRAVEL

1. What do you think can be done to improve safety on the journey to school? Probe for the provision of specific road infrastructures;
  - a. Side walks
  - b. Pedestrian crossing
  - c. Traffic signs indicating the presence of school
  - d. Speed calming measures around school neighbourhoods
  - e. Buffers
  - f. Presence of street wardens
  - g. Bicycle lanes
  - h. Playground around school neighbourhood
  - i. Clear street paths devoid of obstruction (motorist and street vendors and street parking)
  - j. Education by the school on safer road drills for school children

Is there any other thing you would like us to discuss that we have not talked about? Please share with us.

Thank you for your cooperation. We would contact you when we need further clarification on the matter

## APPENDIX D

## UNIVERSITY OF CAPE COAST

## COLLEGE OF HUMANITIES AND LEGAL STUDIES

## FACULTY OF SOCIAL SCIENCES

## DEPARTMENT OF GEOGRAPHY AND REGIONAL PLANNING

## IN-DEPTH INTERVIEW GUIDE FOR MOTOR TRAFFIC &amp;

## TRANSPORT DEPARTMENT (MTTD)

**Introduction and Informed Consent Statement**

Good morning/afternoon. My name is \_\_\_\_\_ a postgraduate student of the Department of Geography and Regional Planning, University of Cape Coast (UCC). The purpose of this interview is to gather information on **Effect of Urban Infrastructural Design on Travel Safety Among School Children in Kumasi Metropolis**. The study seeks to understand how children travel and whether they are safe as they do so. With regards to ethical guidelines underlying scientific research involving human participants, formal consent is required. The information which you are going to share with us will not be shared with anyone else. I humbly, want to seek your consent to participate in this study. Your participation is voluntary and you may refuse to participate in or withdraw from this study at any time. However, your participation in this study is key since the intention is to aid in policy drafting and implementation. The interview will last between 30 to 40 minutes. Thank you for your willingness to take part in this study. Please confirm that you have understood why we are doing this study and whether I can continue with the interview. If you need to get any other information, please contact **Bert Nii Odoi Manieson** via email: [albertodoi92@gmail.com](mailto:albertodoi92@gmail.com) (0262316419)



1. Brief background of yourself and your role at MTTD
2. Mandate of the MTTD
3. What are your views on children's journey to school within Kumasi and its environs? (probe for views on both children who walk to school and children those who utilise public transport)
4. Are there specific guidelines on child safety as they travel to school in and round Kumasi? (Probe for safety within school neighbourhoods and along routes to school)
5. What are your views on the use of micro mobilities (bicycle, scooter, skateboard, e-bikes, etc) by children on our roads?
6. Are there any guidelines from the MTTD governing the use of micro mobilities such as bicycles, skates and skateboards among children?
7. How best can children using micro mobilities be protected in various communities?
8. Are there any educational programmes by the MTTD to educate child pedestrians, paratransit and micro-mobility users on road safety within the municipality? (Probe if these categories of road users are specifically targeted and the content of such educational programmes)
9. What are your views on the use of tricycles (Pragya) for commercial purposes? Its legality and safety.
10. What is the nature of collaboration between your department other institutions such as the Urban Roads Department, NRSA, Physical Planning Department, DVLA and Ministry of Transport?  
  
What challenges does your Directorate face in the implementation of its mandate? (Financial, logistics, staff strength etc.)



## APPENDIX E

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## DEPARTMENT OF GEOGRAPHY AND REGIONAL PLANNING

## IN-DEPTH INTERVIEW GUIDE FOR NATIONAL ROAD SAFETY

## AUTHORITY (NRSA)

**Introduction and Informed Consent Statement**

Good morning/afternoon. My name is \_\_\_\_\_ a postgraduate student of the Department of Geography and Regional Planning, University of Cape Coast (UCC). The purpose of this interview is to gather information on **Effect of Urban Infrastructural Design on Travel Safety Among School Children in Kumasi Metropolis**. The study seeks to understand how children travel and whether they are safe as they do so. With regards to ethical guidelines underlying scientific research involving human participants, formal consent is required. The information which you are going to share with us will not be shared with anyone else. I humbly, want to seek your consent to participate in this study. Your participation is voluntary and you may refuse to participate in or withdraw from this study at any time. However, your participation in this study is key since the intention is to aid in policy drafting and implementation. The interview will last between 30 to 40 minutes. Thank you for your willingness to take part in this study. Please confirm that you have understood why we are doing this study and whether I can continue with the interview. If you need to get any other information, please contact **Bert Nii Odoi Manieson** via email: [albertodoi92@gmail.com](mailto:albertodoi92@gmail.com) (0262316419)

1. Brief background of yourself and your role at NRSA
2. Mandate of the NRSA
3. What are your views with children's travel?
4. How would you describe the incidence of child pedestrian crashes within the Kumasi Metropolis?
5. What are your plans for ensuring the safety of children's school travel in urban environment?
6. Does the department take into consideration the role of urban design in shaping travel needs of children's school travel? (Probe for the provision of pedestrian walkways, bicycle lane and safety measures long school neighbourhoods)
7. With the emergence of micro mobilities such as skates, scooters, e-bikes etc., what sensitization programmes do you have for all road users?
8. Are there any sensitization programs / instruction on safety measures for ensuring sustainability of safe trips to and from school? [probe for how it is implemented]
9. What has already been done, what had worked and what had not worked before? [probe for reasons]

What is the level of collaborations between your institution and the other institutions such as the Urban Roads Department and the Physical Planning Department?

## APPENDIX F

## UNIVERSITY OF CAPE COAST

## COLLEGE OF HUMANITIES AND LEGAL STUDIES

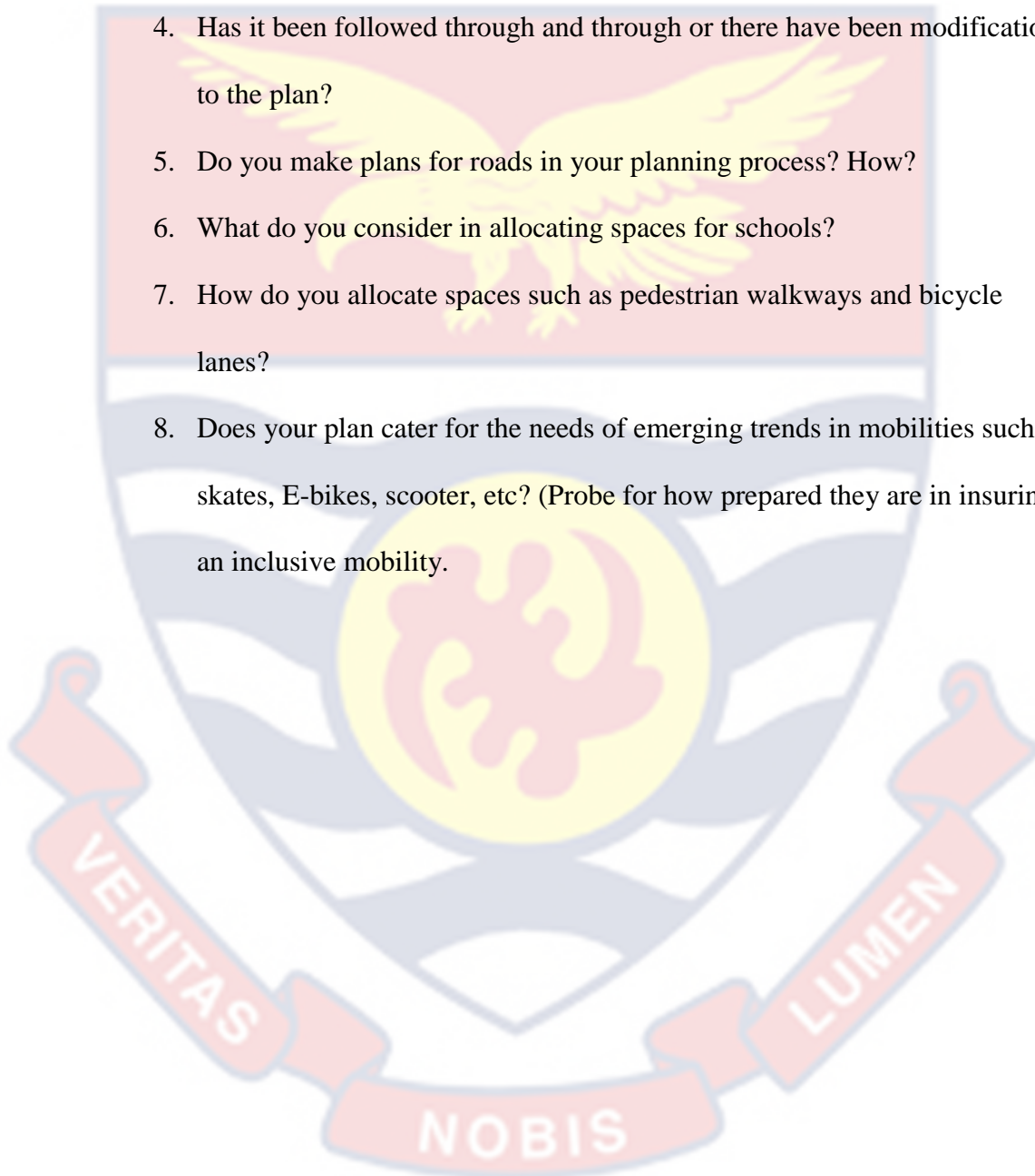
## FACULTY OF SOCIAL SCIENCES

## DEPARTMENT OF GEOGRAPHY AND REGIONAL PLANNING

IN-DEPTH INTERVIEW GUIDE FOR DEPARTMENT OF PHYSICAL  
PLANNING**Introduction and Informed Consent Statement**

Good morning/afternoon. My name is \_\_\_\_\_ a postgraduate student of the Department of Geography and Regional Planning, University of Cape Coast (UCC). The purpose of this interview is to gather information on **Effect of Urban Infrastructural Design on Travel Safety Among School Children in Kumasi Metropolis**. The study seeks to understand how children travel and whether they are safe as they do so. With regards to ethical guidelines underlying scientific research involving human participants, formal consent is required. The information which you are going to share with us will not be shared with anyone else. I humbly, want to seek your consent to participate in this study. Your participation is voluntary and you may refuse to participate in or withdraw from this study at any time. However, your participation in this study is key since the intention is to aid in policy drafting and implementation. The interview will last between 30 to 40 minutes. Thank you for your willingness to take part in this study. Please confirm that you have understood why we are doing this study and whether I can continue with the interview. If you need to get any other information, please contact **Bert Nii Odoi Manieson** via email: [albertodoi92@gmail.com](mailto:albertodoi92@gmail.com) (0262316419)

1. Brief background of yourself and your role at the Physical Planning Department
2. Mandate of the Department of Physical Planning
3. Is there a blueprint (spatial plan) available for the municipality?
4. Has it been followed through and through or there have been modification to the plan?
5. Do you make plans for roads in your planning process? How?
6. What do you consider in allocating spaces for schools?
7. How do you allocate spaces such as pedestrian walkways and bicycle lanes?
8. Does your plan cater for the needs of emerging trends in mobilities such as skates, E-bikes, scooter, etc? (Probe for how prepared they are in insuring an inclusive mobility.



## APPENDIX G

## UNIVERSITY OF CAPE COAST

## COLLEGE OF HUMANITIES AND LEGAL STUDIES

## FACULTY OF SOCIAL SCIENCES

## DEPARTMENT OF GEOGRAPHY AND REGIONAL PLANNING

## IN-DEPTH INTERVIEW GUIDE FOR DEPARTMENT OF URBAN

## ROADS

**Introduction and Informed Consent Statement**

Good morning/afternoon. My name is \_\_\_\_\_ a postgraduate student of the Department of Geography and Regional Planning, University of Cape Coast (UCC). The purpose of this interview is to gather information on **Effect of Urban Infrastructural Design on Travel Safety Among School Children in Kumasi Metropolis**. The study seeks to understand how children travel and whether they are safe as they do so. With regards to ethical guidelines underlying scientific research involving human participants, formal consent is required. The information which you are going to share with us will not be shared with anyone else. I humbly, want to seek your consent to participate in this study. Your participation is voluntary and you may refuse to participate in or withdraw from this study at any time. However, your participation in this study is key since the intention is to aid in policy drafting and implementation. The interview will last between 30 to 40 minutes. Thank you for your willingness to take part in this study. Please confirm that you have understood why we are doing this study and whether I can continue with the interview. If you need to get any other information, please contact **Bert Nii Odoi Manieson** via email: [albertodoi92@gmail.com](mailto:albertodoi92@gmail.com) (0262316419)



1. Brief background of yourself and your role at the Physical Planning Department
2. Mandate of the Department of Physical Planning
3. How do you plan for the provision of walking spaces? (probe further for the consideration for children in walking spaces development)
4. What are the key infrastructure for walking for children in this metropolis?
5. What do you take into consideration in the determination of walking infrastructure provision for specific location? (Probe for laid down codes for streetscape and general street design)
6. How child friendly is the urban environment in KMA, OTMA and SMA?
7. In your view, are there enough pedestrian facilities in this municipality to promote safe road infrastructure crossing behaviour among children?
8. What should be done to ensure that children travel safely to schools and other places that they need to travel?
9. Do you think drivers are responsive to children's crossing behaviour?
10. What are the challenges do you face as a department in the provision of roads and traffic infrastructure?
11. Which other institutions do you collaborate with in the provision of urban road traffic infrastructure? (Probe for NRSC, Physical Planning Department, LUSPA, etc)?
12. What is the nature of collaboration between your department and those institutions?
13. In your opinion, what modifications will be needed to promote a safer walking environment in this municipality.

## APPENDIX H

## ETHICAL CLEARANCE

## UNIVERSITY OF CAPE COAST

## INSTITUTIONAL REVIEW BOARD SECRETARIAT

TEL: 0558093143 / 0508878309  
 E-MAIL: [irb@ucc.edu.gh](mailto:irb@ucc.edu.gh)  
 OUR REF: UCC/IRB/A/2016/1119  
 YOUR REF:  
 OMB NO: 0990-0279  
 IORG #: IORG0009096

7<sup>TH</sup> OCTOBER 2021

Mr. Bert Nii Odoi Manieson  
 Department of Geography and Regional Planning  
 University of Cape Coast

Dear Mr. Manieson,

**ETHICAL CLEARANCE – ID (UCCIRB/CHLS/2021/35)**

The University of Cape Coast Institutional Review Board (UCCIRB) has granted Provisional Approval for the implementation of your research titled *Effect of Urban Infrastructural Design on Travel Safety Among School Children in Kumasi Metropolis*. This approval is valid from 7<sup>th</sup> October 2021 to 6<sup>th</sup> October, 2022. You may apply for a renewal subject to submission of all the required documents that will be prescribed by the UCCIRB.

Please note that any modification to the project must be submitted to the UCCIRB for review and approval before its implementation. You are required to submit periodic review of the protocol to the Board and a final full review to the UCCIRB on completion of the research. The UCCIRB may observe or cause to be observed procedures and records of the research during and after implementation.

You are also required to report all serious adverse events related to this study to the UCCIRB within seven days verbally and fourteen days in writing.

Always quote the protocol identification number in all future correspondence with us in relation to this protocol.

Yours faithfully,

Dr. Samuel Aseidu Owusu,  
**UCCIRB Administrator**

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 ADMINISTRATOR  
 INSTITUTIONAL REVIEW BOARD  
 UNIVERSITY OF CAPE COAST