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PHYSICAL ACTIVITY LEVELS OF RESIDENT UNIVERSITY OF GHANA UNDERGRADUATE STUDENTS

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DECLARATION

I, Bernard Opoku Ofosu declare that apart from other researchers' works, which have been duly acknowledged by means of referencing, this work is the result of my own original research under supervision, and this dissertation, either in whole or in part has not been presented elsewhere.

Date**: 29th May, 2020**

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DEDICATION

This work is first of all dedicated to the Holy Ghost. Also, to Rev. Dr. Oheneba Boadum in whom I find a great example of a Christ-centric scholar. Finally, to Dr. Pearl Kyei of the Regional Institute for Population Studies.

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ABSTRACT

Background: Insufficient physical activity (PA) has been linked to several non-communicable diseases. Studies describing the physical activity levels of Ghanaian young adults in reference to the global recommendations are seriously scanty. The university period offers policymakers a window of opportunity to promote healthy behaviours in a vast number of young adults accessing tertiary education. This study was conducted to provide data on the prevalence and patterns of physical activity among young adults residing on the campus of Ghana's largest university.

Objective: To determine the prevalence and patterns of physical activity among resident undergraduates.

Methods: Study design was descriptive cross-sectional. The long version of the International physical activity questionnaire (IPAQ-LF) was used to collect data on the physical activity behaviour of resident students. A stratified sampling technique was used to select a total of 398 undergraduates (281 males, 117 females) from five halls of residence. Sociodemographic data included weight, height and participation in competitive sports. Normality of data was tested using the Shapiro-Wilk test. Physical activity data were summarised as medians, first and third quartiles. Kruskal-Wallis test was used to determine differences in medians among non-normally distributed variables.

Results: Walking for at least 10 minutes was prevalent (92.7%) among resident undergraduates. More than one half of males spent 500 minutes in a week walking whiles more than one half of females spent 210 minutes walking across all domains. Transportation domain contributed highest (41.35%) to the PA levels of undergraduates. Analysis of PA data showed that 39.9% were highly active, 43.0% were moderately active and 17% were inactive. Overall, the prevalence of physical activity was 82.9% in reference to WHO global PA recommendations. By sex, prevalence of inactivity was

significantly ($p<0.01$) higher among females (24.8%) compared to males (13.9%). Sex, level of study, father's educational level and participation in competitive sports were significantly associated with PA levels in a bivariate analysis. Multivariate analysis showed that a level 100 student was 48% more likely to be inactive than moderately active compared to a level 400 student [OR=1.48 (95% CI=0.35-2.61)]. Also, a student whose father has never been through formal education was more likely to be highly active than a student whose father had obtained a first degree [OR=2.52 (95% CI= -4.70-0.35)].

Conclusion: Overall, walking in the context of transportation was the most common type of PA performed and participation in vigorous intensity PA was the lowest. Females spent more time in moderate intensity activities across all domains. Majority of resident undergraduates were sufficiently active. Transport domain contributed highest to the PA level of students. Majority of resident female undergraduates were not active during leisure times. Strategies targeted at promoting PA on campus should consider motivating female students to get involved in competitive sports.

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LIST OF ABBREVIATIONS

BMI	-	Body Mass Index
IPAQ-L	-	International Physical Activity Questionnaire Long form
LMIC	-	Lower-middle Income country
MET	-	Metabolic Energy Equivalent
NCD	-	Non-communicable Diseases
PA	-	Physical Activity
WHO	-	World Health Organization

DEFINITION OF TERMS

Intensity: The ease or difficulty with which a physical activity is performed

Metabolic equivalent (MET): A measure of energy expenditure such that one MET is the rate of energy expenditure whiles sitting at rest.

Moderate intensity activity: A physical activity that requires a moderate effort to perform and makes you breathe somewhat harder than normal. Examples include dancing, domestic chores, brisk walking and gardening.

Vigorous intensity activity: A physical activity that requires hard physical effort and makes you breathe much harder than normal. Examples include aerobics, sprinting, fast swimming, digging ditches and fast cycling.

Young Adult: Young people between the ages of 18 and 24 years.

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

The pertinence of physical activity (PA) information in the control and prevention of non-communicable diseases (NCD) has become indisputable considering the availability of global physical activity recommendations for all age groups. It is common nowadays to see physical activity (PA) featured in most public health strategies due to its numerous published health-related benefits like preventing obesity and reducing risk for type 2 diabetes, stroke and depression (Oyeyemi, Bello, Philemon, Aliyu, Majidadi & Oyeyemi, 2014).

Physical activity is performed when skeletal muscles contract to produce bodily movements leading to energy expenditure above the resting metabolic rate (Miles, 2007). Adults between the ages of 18 and 64 must perform at least 150 minutes of moderate to vigorous intensity activity each week in order to meet the global PA recommendations developed by the World Health Organization (WHO) (Vanhees, Lefevre, Philippaerts, & Martens, 2015). This corresponds to a minimum energy expenditure of 600 Metabolic equivalent minutes (MET-minutes) per week on at least 5 days of the week, which is known to be health-enhancing (Powell, Paluch, & Blair, 2011).

The epidemiological transition has caught up with several lower-middle income countries (LMIC) like Ghana. Current evidence has shown that physical inactivity is increasing globally across all age groups (Hallal et al., 2012). Although inactivity increases concurrently with the aging process, evidence points out that the increase in inactivity

occurring at the passage from late adolescence into early adulthood is exceptional and for most young people that is the period they gain admission into a university (Judge et al., 2012). A meta-analysis showed that inactive young adults live with a 20-30% increased risk of all-cause mortality as compared to active adults meeting global PA recommendations developed by the WHO (Samitz, Egger, & Zwahlen, 2011).

Although the availability of information and communication technology on campuses is intended to facilitate academic pursuits, many university students have been plunged into the frenzy on social media coupled with the multiple use of smartphones which has stifled participation in physical activities especially among undergraduates (Jr, Ory, Smith, Peres, Pickens, Metha & Benden, 2017). Assessing PA levels and understanding PA patterns of young adults can help policy makers implement strategic interventions but there is serious under-representation in literature regarding the PA patterns of young adults in several Sub-Saharan African countries and Ghana is not an exception.

A study conducted in Nigerian, found an inactivity prevalence of 41% among university students according to the WHO recommendations for healthy PA (Adegoke & Oyeyemi, 2011). Recently in Sudan, the prevalence of inactivity among medical students was reported to be 44.9% in reference to the global standards (Yousif & Kaddam, 2019). The same research tool was used in both studies, which allows valid comparisons to be made between Nigerian university students and Sudanese university students in terms of their PA levels in relation to the global standards.

Unfortunately, Ghanaian University students have been left out in such discussions due to severe data paucity in the area of PA research conducted with a standardized instrument

like the International Physical Activity Questionnaire (IPAQ). It has come to light that PA does not occur in one context but in multiple contexts. As a result, the WHO pinpointed four main domains or contexts that comprehensively captures modern-day performance of PA; work , transport (walking or cycling), domestic duties (general housework like washing and sweeping) and leisure time (mainly exercises, sports and recreational activities) (Sun & Azmutally, 2013).

An exploratory study conducted in the United States pointed out that only a few studies report on patterns (intensity and duration) of PA among university students and that lack of domain-specific data has impeded efforts to promote PA on campuses (Judge et al., 2012). This gap in research can be squarely addressed by using the IPAQ long form which is designed to elicit responses in the four domains highlighted by the WHO. Factors like sex, body mass index (BMI), socioeconomic status, age, level and programme of study have been identified as key correlates of PA among university students in several countries and it will be interesting to find out their associations with PA levels of resident undergraduates of the University of Ghana.

The paucity of data on the prevalence of PA among young adults (aged 18 to 24 years) per the WHO global recommendations is a driving force behind this study. The use of the IPAQ long form will generate data on the patterns of PA behaviour in specific domains among a typical young adult population like undergraduate students. Such data is more useful for designing tailored interventions.

1.2 Problem Statement

A study reported that physical inactivity is widespread on several campuses across the world (Lerner, Burns, & Róiste, 2011). University students are predominantly young people in the concluding stage of their formal education life with current evidence indicating that majority of them are inactive (Judge et al., 2012). Habits like inactivity adopted during young adulthood (18 to 24 years) may persist into late adulthood and influence health outcomes. Hence the university period is a critical window of opportunity that policymakers can take advantage of and promote sufficient PA performance (States, 2013).

Unfortunately, most Ghanaian university authorities have failed to conduct any surveillance and monitoring on PA behaviour of students due to lack of relevant empirical data and so efforts have not been made to devise strategic policies intended to promote PA on campuses as part of health promotion and wellness programmes.

The few PA studies conducted among University of Ghana students have assessed PA during leisure time alone which may not accurately reflect the PA status of an individual. The WHO recommends that physical activity can be performed in four different contexts (work, transport, domestic and leisure) and at three different intensities (low, moderate and vigorous) based on which global recommendations for healthy PA has been prescribed (Yousif & Kaddam, 2019).

Consequently, several studies have been conducted in universities worldwide with a common standardised instrument like the IPAQ. This tool can be used to assess the prevalence of PA among young adults in relation to the WHO global recommendations for

healthy PA. The tool has been used in some African countries like Egypt, Morocco, Libya, Sudan, Mauritius and Nigeria in assessing the PA levels of undergraduate students. Such studies are greatly valued by the international community because the results are comparable.

Physical activity studies of this nature among Ghanaian university students, and young people between the ages of 18 and 24 for that matter is severely under-represented in literature which does not augur well for NCD surveillance within the sub-region. Moreover, only a handful of studies in Africa have used the long form of the IPAQ due to its complicated nature even though it distinguishes between activities in specific domains and so useful for generating data on patterns of PA.

This study sought to measure the prevalence of physical activity with reference to global WHO recommendation and describe PA behaviour patterns among resident undergraduate students in four different domains (work, transport, domestic and leisure).

1.3 Conceptual Framework

The conceptual framework shows how independent variables influence PA level of undergraduates. Factors like sex, body mass index (BMI), socioeconomic status, age, level and programme of study have been reported as correlates of PA among university students in other countries (Singh, 2017). Hall of residence can affect a resident undergraduate's level of Physical activity. Students in non-traditional halls are most likely to patronise shuttles which reduces walking duration in the context of transportation. In addition, availability of recreational facilities in a hall can motivate students to engage in leisure time PA.

Also, level of study may influence a student's PA level. A study found out that being a first year student was significantly associated with inactivity (Otmani, Serhier, Housbane, & Othmani, 2016).

Moreover, college of affiliation may determine some courses a student takes, and students consistently exposed to knowledge of PA recommendations and benefits may get motivated to become more active. Undergraduates studying physical education were found to be more active than biochemistry and dentistry students in a study (Ferreira et al., 2007). Programmes with high academic workloads can affect leisure time participation in organised sports which will in turn affect overall PA level.

A study found a higher prevalence of inactivity among university students from families with high socioeconomic status but reported that such inactive behaviours were more pronounced in females (Uddin et al., 2017). Resident student from affluent homes may have the luxury of driving their own cars or have enough money to board taxis all the time on campus which eliminates the necessity to walk in the context of transport. A study explained that being obese may motivate female students to increase PA participation as means of controlling weight gain since they are motivated by such extrinsic factors (Adegoke & Oyeyemi, 2011). Therefore, socioeconomic status can affect PA level.

However, physical activity in the various domains can be influenced by sex, participation in sports and whether or not a student combines school with work irrespective of college, level of study, socioeconomic status, hall and BMI. Males have been reported consistently to be more active than females and sex has been found to be a strong predictor of physical activity among university students (Otmani et al., 2016). Performance of vigorous

activities during leisure and walking as means of transport can be influenced by sex. A study pointed out that males prefer outdoor sports during their leisure time (Uddin, Khan, & Burton, 2017). Again by sex, some studies have shown that female students spend more time than males performing moderate intensity activities in the domestic context (Ranasinghe et al., 2016). Undergraduates involved in sports train consistently in preparation for tournaments and competitions. Such training sessions include performance of several vigorous activities in efforts to improve fitness which has a resultant positive effect on overall PA level. Students who are also employed may be more active since they have an extra domain to accumulate more activities.

Physical activities can be performed in different contexts referred to as domains. Four domains recognised by the WHO are work, transport, domestic and leisure-time (Althoff et al., 2017). It does not take the same effort to perform all physical activities and all activities do not induce the same physiological effect in terms of breathing rate. Intensity tells how much of an effort is required to execute an activity (Swain, 2005). The intensity may be low as in walking, moderate as in brisk walking or vigorous as in a 100-metre competitive sprint.

The concept of metabolic energy equivalents was consequently introduced by scientists to mathematically quantify the energy cost of activities performed at different intensities. Walking is assigned a MET of 3.3, whiles moderate and vigorous intensity activities are assigned METs of 4 and 8 respectively (Lebacq et al., 2016). The harder the effort, the higher the energy expended and the higher the energy expenditure, the higher the physical activity level. Therefore, physical activity levels are simply categories created to characterize energy expenditure; energies are expended in domains by executing activities of specific intensities.

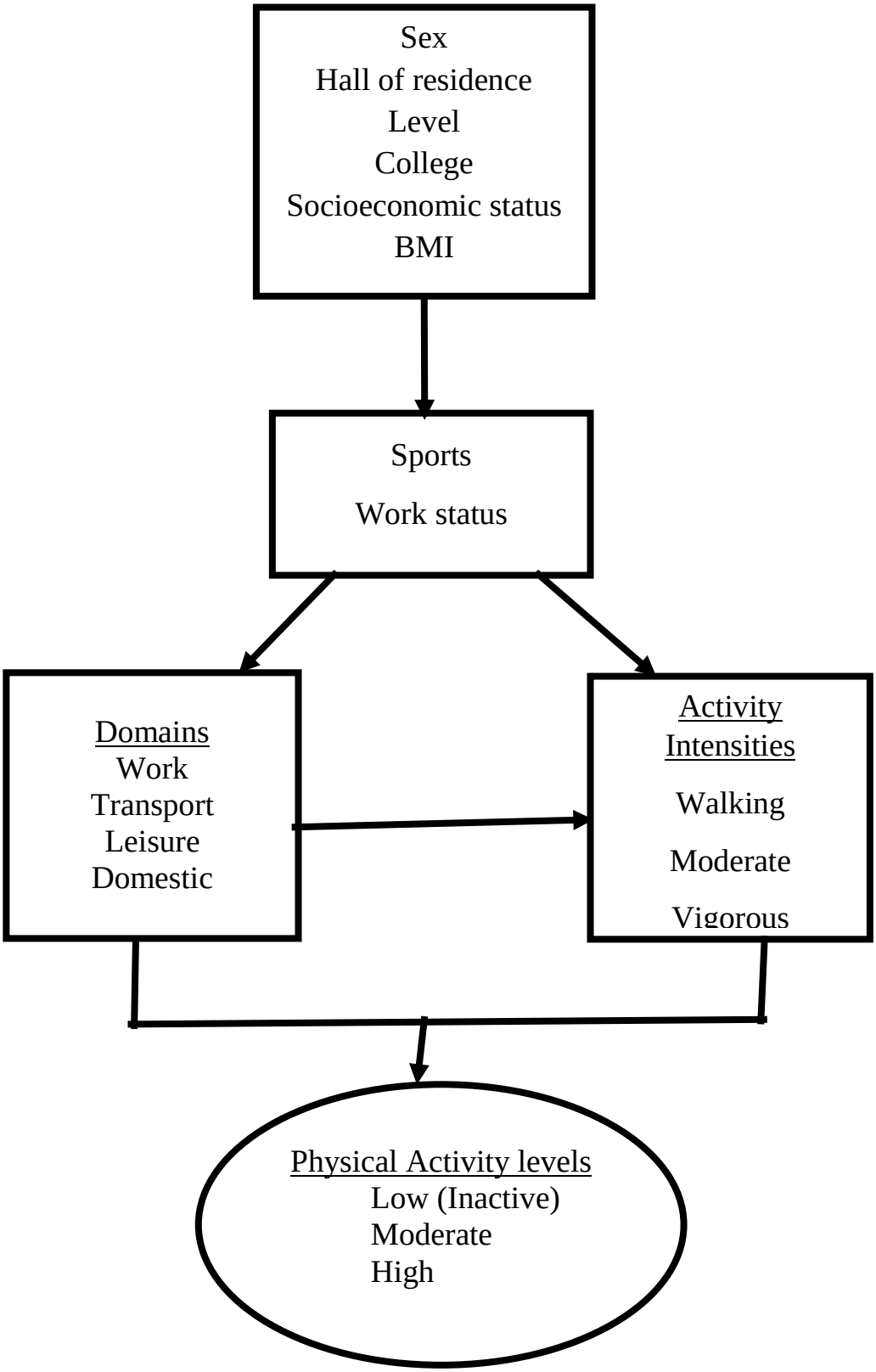

Figure 1.1: Conceptual Framework for Physical Activity Levels of resident University of Ghana undergraduates

1.4 Justification

Undergraduate students are mostly young adults in a major transitory phase of their lives. Resident students become free from parental supervision, take independent decisions and get exposed to a relatively new environment that comes with its own academic and social demands. Several cross-sectional studies have hinted that university students have a proclivity to be inactive.

Researchers in most developed countries have shifted their attention to the PA behaviour of young adults and so many studies have been conducted among undergraduates enrolled in universities across Europe and North America. On the surface it appears such studies are merely contributing to knowledge, but this is a strategic response to the rising prevalence of NCD's that has plagued the world in recent times. The use of a common standardised and validated research tool like the IPAQ has made it possible for a comparison the PA levels of young adults in different countries with reference to the WHO global recommendations.

Findings from this study will reflect the prevalence of physical activity and inactivity in relation to global recommendations for healthy PA. The prevalence of inactivity is especially useful for NCD surveillance.

In addition, the use of a global research tool like the IPAQ-LF allows for comparison of the PA level between university of Ghana undergraduates and other students across the world. This adds value to the present research in the sense that the international community can interpret the findings from a common reference.

Moreover, use of standardised multi-domain instruments like the IPAQ-LF is becoming increasingly compelling in present-day PA research due to under representation of studies regarding the PA patterns of young adults in literature. This study will generate data on the intensity, frequency and duration of PA in four different life domains. Domain-specific data will help in the design of interventions best fitted to the profile of young adult's PA behaviour.

Lastly, the study will also help in the identification of sub-populations of undergraduates with a high-risk of inactivity. Such information will be useful in guiding future policy directions. The university period offers policy makers a window of opportunity to positively influence the PA behaviours of many young people. Taking into account the growing number of young people who get admitted into the university each year, such positive influences may persist into later adult years and gradually help in the combat of NCD's.

1.5 Research Questions

1. What kind of physical activities do resident undergraduate students perform? In which domains are such activities performed and for how long?

2. What is the contribution of each domain score to the physical activity level of resident undergraduate students?

3. What is the prevalence of physical activity and inactivity among resident undergraduates in reference to the WHO global recommendations?

4. What is the obesity prevalence among resident students? Is there an association between BMI, BMI categories and physical activity levels?

5. What are the predictors of physical activity among resident undergraduates?

1.6 Objectives

1.6.1 General Objective

To measure the prevalence of physical activity and describe the physical activity patterns of resident undergraduates in terms of time spent in performing physical activities at specific intensities in different domains and the contribution of each domain to overall physical activity level.

1.6.2 Specific Objectives

1. Determine the prevalence of students engaged in PA across specific domains and intensities and the differences in time spent executing activities at specific intensities.
2. Determine the contribution of each domain to the PA level of undergraduates.
3. Determine the prevalence of physical activity and inactivity in reference to WHO global recommendations.
4. Determine the prevalence of obesity and the association between BMI and PA levels.
5. Determine the factors associated with physical activity among resident students.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Physical Activity

The WHO vision of reducing the prevalence of physical inactivity by 10% by 2025 is at the brink of failure as physical activity participation continues to decrease year in year out especially in developing countries. This represents a major setback in the fight against NCD's in the African region because decrease in physical activity prevalence will most likely exacerbate the current burden of NCD. Physical activity (PA) has been recognized globally as a significant health-improving behaviour and PA promotion is regarded as a public health priority world-wide. People who consistently engage in regular sufficient PA have a reduced risk for premature death, ischemic stroke, cardiovascular diseases, type 2 diabetes, colon cancer and depression (Carlson, Fulton, Pratt, Yang, & Adams, 2014). The total amount of PA is described in terms of intensity, duration and frequency within different domains (Samitz et al., 2011). Frequency looks at how often (days), duration looks at how long (time) and intensity captures the rate of energy expenditure required to perform an activity**.**

2.1.1 Definition of Physical Activity

Physical activity (PA) denotes all bodily movements produced by skeletal muscles resulting in energy expenditure above the basal metabolic rate (Cao, 2015). This term therefore encompasses the full scope of human movements from sports and exercise to hobbies and daily living activities (Cuddihy & Pangrazi, 2017). Physical activities which are planned, structured and repetitive and mostly executed to increase physical fitness during leisure times are termed exercises.

2.1.2 Patterns of Physical Activity

Even though the recent NCD epidemic has necessitated studies of young adults' PA behaviour in a move to safeguard the health of the future generation, evidence exists that there is serious under representation of PA patterns of young adults in literature (Judge et al., 2012). PA is performed in different domains or modes, often related to work, routines of daily living (domestic), transport (active commuting) and recreational activities and sports done at leisure-time (Yousif & Kaddam, 2019). The domains are important for understanding patterns of PA behaviour among a subpopulation since correlates may not be the same for all domains.

Most studies conducted among young adults have focused on determining the prevalence of inactivity and activity whiles only a handful have delved into generating data on PA patterns. Meta-analysis studies investigating the relationship between domain-specific PA and all-cause mortality found stronger positive associations in certain domains compared to others. Evidence of the protection offered by PA against the outcome of death from all causes was stronger in leisure domain than domestic domain (Samitz et al., 2011).

The use of multi-domain instruments has thus become necessary in PA research for comprehensive assessment of PA behaviour and for the implementation of domain-specific promotional strategies. PA studies conducted with tools which do not distinguish between domains often acknowledge that as a major limitation because of the inability of such studies to establish patterns associated with PA behaviour (Adegoke & Oyeyemi, 2011).

Among Egyptian university students, it was reported that the most common form of PA is walking and that students who joined sports clubs were active during their leisure time (Badawi & Awadalla, 2011). According to a study conducted in Malaysia, male young adults had a higher motivation to take part in sports and other activities than females (Lim, Othman, & Aman, 2015). Also, in Mauritius it was found out that males achieved higher PA scores than females in the leisure domain (Sun & Azmutally, 2013).

Moreover, work done by Singh (2017)**,** among Indian university students showed varying domain-specific contributions to the PA levels of students. In that study domestic domain contributed higher to the PA level of females (16.7%) than males (14.1) but leisure contributed higher among males (58.3%) than females (53.3%).

Furthermore, a study found higher domestic domain scores among females than males and stated that females may be active in other domains than males save the leisure domain (Ranasinghe et al., 2016). This clearly shows that gender may be a correlate of PA in the domestic and leisure domains. Such information is more valuable and useful in designing tailored interventions and planning programmes best suited to the behaviour of distinct subpopulations.

2.1.3 Physical Activity Recommendation

Global recommendation on PA for health was developed to give information on dose-response relationship between PA and health benefits. These recommendations on PA were intended basically for the primary prevention of NCD at the population level. Adults between the ages of 18 and 64 must perform a moderate or vigorous intensity activity lasting at least 30 minutes on at least 5 days as prescribed by the WHO to be considered

sufficiently active (Adegoke & Oyeyemi, 2011). Young adults usually defined by the age bracket of 18-24 years are therefore required to meet this recommendation since they fall within the age group of 18 and 64. Regular participation is very important, so primary emphasis is laid on the number of days such that individuals who exceed the minimum duration but for less than 5 days are not considered sufficiently active. On the other hand, individuals who go beyond 5 days of PA performance in durations greater than 30 minutes are said to have a PA level which is health-enhancing and associated with obtaining additional benefits (Powell et al., 2011).

2.1.4 Intensity of Physical activity

The World Health Organization recognizes three main forms of PA namely low-intensity, moderate-intensity and vigorous-intensity (Gul, Sultan, Moeinaddini, & Ahmed, 2018). The magnitude of effort required to carry out an activity or the rate at which an activity is performed explains the basis for these categories. A typical low-intensity activity is walking. Vigorous-intensity activities are performed at a faster rate making the individual breathe harder than normal and requires considerably greater effort as compared to moderate-intensity (WHO, 2010). Activities like heavy lifting, digging and aerobics are considered vigorously intensive. Cycling and swimming at regular pace, sweeping, scrubbing floors and carrying light loads are classified under moderate-intensity activities (Abdullah & Mohamad, 2016). Like vigorous-intensity activities, moderate -intensity activities confers health benefits such as reduced risk for cardiovascular diseases and osteoporosis (Da & Skrzypulec-plinta, 2013).

2.1.5 Measurement of physical activity

A variety of methods are available for measuring PA but it behoves on a researcher to consider factors such as feasibility, practicality, validity, reliability and sensitivity when choosing a particular PA assessment method (Dowd et al., 2018). Self-report or subjective methods like the use of diaries and questionnaires are predominantly used in Africa and most LMIC's because it is relatively cheaper, suitable for large samples, easy to use and carefully designed to capture domain-specific activities (Oyeyemi, Moss, Monyeki, & Kruger, 2016)

Accuracy in PA assessment is crucial in establishing risk for cardiovascular disease, stroke, cancer and obesity (Oyeyemi, Oyeyemi, Adegoke, Oyetoke, & Aliyu, 2011) . The validity of an assessment option looks at the extent to which a selected tool measures what it is designed to measure, and it's often determined by comparing obtained PA variables with another appropriate comparable measure (States, 2013). Reliability pertains to the degree to which a test can produce consistent results when repeated on different occasions while sensitivity measures the power of a test to detect variations over time (Dowd et al., 2018).

2.1.5.1 International Physical Activity Questionnaire (IPAQ)

Barely two decades ago, it was practically undoable to compare patterns linked to PA behaviour between subpopulations in two countries due to the absence of standardised tools like the IPAQ. Researchers involved in on-going global and regional estimations of inactivity highlighted a huge research gap in the area of domain-specific and internationally comparable data (Hallal et al., 2012). This compelled researchers to use data from the leisure domain as estimates for the other domains which raises issues of

accuracy in global systematic reviews and meta-analysis (Guthold et al., 2011). The IPAQ-LF was developed to address this gap but years on most Sub-Saharan countries like Ghana are yet to conduct national surveys with IPAQ-LF to assess PA patterns.

A Nigerian study conducted to ascertain the validity and reliability of the long version published that after translating the standard English version into a popular local language (Hausa) in Africa, the tool demonstrated appreciable test-retest reliability and construct validity (Oyeyemi et al., 2014). The tool is recognised by the international community and has been validated in many countries across different continents (Bergier, 2018).

This makes the IPAQ a valid instrument considering its stability and validity with respect to measuring PA in different domains (Malambo, Kengne, Lambert, Villiers, & Puoane, 2016). Evidence in literature suggests the instrument has showed good accuracy when used among young adult populations. It captures an individual's physical activity behaviour over the past seven days in different contexts (States, 2013).

Physical activity data gathered using the instrument is health related, comprehensive and comparable (Oyeyemi et al., 2016). Comparable data has become crucial in the global fight against the current surge of non-communicable diseases particularly in low and middle-income countries. This comparability of data will help key stakeholders like the National council for tertiary education understand and learn from specific PA intervention strategies that have worked for other university students elsewhere.

Additionally, the instrument has its own guidelines for data processing that allows a researcher to classify PA levels of people in reference to the WHO recommendations. Two

versions of the instruments are available; short form (IPAQ-SF) and long form (IPAQ-LF). The short form is more generic and elicits responses in terms of activity intensities (walking, moderate or vigorous) but does not clarify the context in which an activity was performed.

The long version is structured to assess PA more extensively across four main domains; leisure, work, transport and household (Oyeyemi et al., 2014). The long version enables activities to be placed in the specific context in which it was performed which is useful for establishing patterns and profiles associated with an individual's PA behaviour.

Two scores are possible in the use of the IPAQ-LF; domain-specific scores and activity-intensity scores (Bergier et al., 2018). The addition of all domain scores or the addition of all intensity-specific scores gives the total physical score based upon which the classification of PA level is done. A total PA score of 600 MET-minutes/week in 5 days is the minimum energy expenditure required to be classified sufficiently active. Data on the number of days and duration spent doing various intensity-specific activities in the context of work, transport, domestic and transport are collected over a period of 7 days (Bednarek, Pomykała, & Bigosińska, 2016). The data is cleaned by following guidelines clearly spelt out in a developer's manual.

All durations are converted into minutes at the start of data processing. Then each activity performed is converted to a metabolic energy equivalent (MET) which is simply a measure of energy expenditure. One MET is the energy cost of sitting down quietly (Blumchent, 1990). Walking is assigned a MET value of 3.3, moderate-intensity activities are assigned a value of 4 and 8 for vigorous-intensity activities (Awotidebe et al., 2014). The MET value multiplied by the product of duration and number of days yields a MET

score expressed as MET-minutes/week. MET scores are computed for every intensity-specific activity within a specific domain (Uses & Instruments, 2005). Then a PA level of lowly, moderately or highly active is assigned when the condition for that category is met exactly. Moderately active persons can be described as those who on 5 or more days executed any activity across various intensities and accumulated a minimum score of 600 MET-minutes per week (Barria, Barria, Moraga, Filho, & Floody, 2018). Highly active individuals describe those who accumulated a minimum score of 3000 MET-minutes/week on at least 7 days (Fagaras, Radu, & Vanvu, 2015). Next all those failing to satisfy the requirement for moderate or high categories are classified lowly active (Ranasinghe et al., 2016). The prevalence of inactivity is the proportion of individuals classified inactive whiles addition of the proportions of moderately and highly active individuals gives the prevalence of physical activity.

2.2 Contribution of domains and activity intensities to physical activity levels

The expression of domain-specific scores and intensity-specific scores as percentages of the total PA score generates valuable data on the contribution of each domain and activity intensity to the PA level of study participants. Among Indian University students it was reported that Leisure time domain contributed the highest (56.5%), followed by transportation (19.76%), domestic (15.17%) and then work (8.76%) (Singh, 2017). The same study reported that vigorous-intensity activities (45.84%) contributed highest to the overall PA level of study participants followed by walking (28.3%) and moderate (25.8%) (Singh, 2017).

2.3 Physical inactivity

Three trends currently affecting health globally are population-ageing, rapid unplanned urbanization and globalization, all of which contributes to unhealthy environments and behaviours. Physical inactivity has been identified as the fourth leading risk factor for global mortality and people who are insufficiently active have a greater risk of developing NCD's or becoming obese (Khalaf et al., 2013). Literature evidence pointed out that approximately 23% of adults world-wide aged 18 and older did not meet the WHO PA recommendation in a global estimation carried out in 2010 (Uddin et al., 2017).

The WHO STEPwise initiative afforded many LMICs like Ghana the opportunity of conducting maiden national surveys to generate data on NCD risk factors like physical inactivity. Since its inception in 2003, PA data from surveys carried out in 32 countries in the WHO African region pointed out increasing sedentary behaviour across the African continent; reported overall physical inactivity prevalence in Ghana was alarming (85.7%) ; 78.1% among males and 89.4% among females (*WHO*, 2015).

Prevalence of NCD's and their risk factors have increased over time in most parts of the world putting pressure on a lot of national health systems. In the absence of a chronic disease policy, young adults were singled out as targets for future public health interventions in a Ghanaian narrative on reducing the rising NCD burden in the country (Addo & Ofei, 2012). Conducting studies to generate data on the inactivity prevalence of young people is considered a top priority by most researchers for reducing the prevalence of NCD's such as type 2 diabetes and coronary heart disease but data is scant in most LMIC's (Oyeyemi et al., 2016).

In 2001, global prevalence of inactivity among adults was reported to be 28.5%; another global estimation which used data from 146 countries showed that inactivity declined to 23.3% among adults aged 18 years and older in 2010 as published by the Lancet (Guthold, Stevens, Riley, & Bull, 2016). Then in 2012, data from 122 countries revealed that 31. 1% of adults (15 years and older) failed to meet global PA recommendations and were thus described as physically inactive (Hallal et al., 2012). Although such individuals were doing some form of physical activity, it was insufficient or not health-enhancing. Also, a meta-analysis by the Lancet reported the global prevalence of physical inactivity to be 27.5% in 2016 (Guthold et al., 2016). However, this observed decrease in physical inactivity between 2001 and 2016 was described by researchers as insignificant.

2.3.1 Physical inactivity among university students

Contemporary research investigating PA behaviour of young adults has pointed out time and again that physical activity reduces throughout life with the most staggering decline reported to occur during the transition from late adolescence to early adulthood, a period usually spent in universities worldwide (Cao, 2015). A systematic review of 27 studies from Australia, Canada, Europe and United States found strong associations between physical activity levels during adolescence and at follow-up into adulthood (Agbozo, Colecraft, Jahn, & Guetterman, 2018).

However, monitoring patterns of PA behaviour among young adults in the general population could be difficult since majority pursue higher education during such periods of their lives. Most researchers in high-income countries have turned their attention to university campuses which offers them a typical representative population of young adults from diverse backgrounds to sample from. This notwithstanding, a study uncovered that

for many undergraduate students, the university years offers them the opportunity to be independent for the first time and they go through an entirely different academic, social and environmental experiences which often leads to inactivity (Movement, 2016) . This has been identified as a problem in several developed countries, but the number of PA studies conducted with validated tools like IPAQ among Ghanaian university students is seriously very low.

An appreciable number of PA studies in Nigeria have been conducted using the IPAQ-SF. A study conducted among undergraduates in Nigeria revealed that 41% of students were inactive and thus not meeting WHO global recommendations (Adegoke & Oyeyemi, 2011). Another study among young adults in Nigeria studying health found a lower inactivity prevalence of 14.7% (Oyeyemi, Muhammed, Oyeyemi, & Adegoke, 2017). Moreover Awotidebe et al., (2014) also reported the prevalence of inactivity to be 10.6% among other Nigerian university students.

More than 50% of university students in Europe, the United States and Canada were described as insufficiently active; likewise 45.8% and 11.3% of Saudi Arabian and Egyptian university students were not meeting the global recommendations on PA to be considered active (Radu, F, & Vanvu, 2015). A meta-analysis on university students PA levels across 27 countries disseminated that one-half of students had a low level of PA (Abdullah & Mohamad, 2016).

The number of studies conducted world-wide with the IPAQ reflects its wide acceptability and reliability in PA assessment. An American study reported an inactivity prevalence of 17% among college students using the IPAQ-SF (Radu et al., 2015). Another study comparing American and Taiwanese college students' PA levels reported overall

inactivity prevalence's of 7.26% and 25% respectively with a higher proportion of females than males being inactive (States, 2013).

In North Africa, the prevalence of inactivity was found to be 17.1% among Moroccan medical students in a study that used the short version of the IPAQ (Otmani et al., 2016). Likewise, there were significant ($p<0.001$) proportional differences in inactivity prevalence by sex [males (11.35%), females (20.32%)] in reference to that study.

In Sri Lanka, inactivity prevalence was higher and was reported to be 48.7% among young adults studying in a university (Ranasinghe et al., 2016). Among Indian university students, the prevalence of inactivity was found to 11.37% (Singh, 2017).

Among Polish university students, the prevalence of inactivity was reported to be 11% (Bednarek et al., 2016). In South America, results of a study conducted among Chilean university students showed that 27.9% of students were inactive (Barria et al., 2018). Still in south America, results of a study showed that 26.7% of Brazilian university students were inactive (Ferreira et al., 2007). Another study in India, found an inactivity prevalence of 16.4% among university students (Krishna et al, 2013).

The version either short or long may account for the variations in prevalence observed in studies conducted with the IPAQ. The use of the long version has been found to lead to over reporting of duration spent in executing moderate intensity activities (Lebacq et al., 2016). The repetition of similar questions in each domain coupled with social desirability is likely to produce this effect.

2.4 Prevalence of Obesity

The prevalence of Obesity among Nigerian undergraduates was found to be 4.3% (Adegoke & Oyeyemi, 2011). The prevalence of Obesity (6.5%) among Sudanese University students was comparatively high (Yousif & Kaddam, 2019). In Italy, the prevalence of obesity (1.4%) among university students was very low (Teleman et al., 2015) but among American University students prevalence of obesity was as high as 11.4% (Jr et al., 2017).

2.5 Factors Associated with physical activity and inactivity among university students

The number of studies reporting higher prevalence of inactivity among females as compared to males is overwhelming across all continents and cultures (Guthold et al., 2016). Domain-specific data from several studies showed that females were less active in the leisure domain which consistently led to majority of them being classified inactive (Ranasinghe et al., 2016). This stems from lack of participation in vigorous intensity activities usually performed by males during leisure time. A south African study found out that males usually prefer outdoor organized physical recreational activities (Malambo et al., 2016).

It is more common to see males involved in non-competitive sports-related activities like basketball, football or sprinting as compared to females. Such vigorous activities lead to high energy expenditures resulting in higher total physical activity scores. Moreover, a researcher pointed out that males prefer more physically demanding activities like heavy weight than females and this may explain the gendered proportional differences when it

comes to vigorous PA (Uddin et al., 2017). Thus, majority of males in studies which used all-domain instruments are classified sufficiently active due to leisure time PA patterns having a pronounced effect on overall PA level (Badawi & Awadalla, 2011).

A study conducted in Nigeria found no statistically significant association between BMI categories and PA levels of university students but reported a significant association ($p<0.05$) between the socioeconomic status of students and PA levels (Adegoke & Oyeyemi, 2011). Also, a study conducted among Sudanese university students submitted that no association was found between BMI and physical activity levels (Yousif & Kaddam, 2019). However, a study conducted in Malaysia, found a significant association between BMI categories and physical activity (Rajappan, Selvaganapathy, & Liew, 2015). Nevertheless, it was stated in a study that lower BMI was positively associated with PA levels (Teleman et al., 2015)

With regards to college, a study found a statistically significant association between course of study and Physical activity levels (Ferreira et al., 2007). Among Egyptian students, father's education, level, mother's education and socioeconomic status were found to be associated with PA levels of university students (Badawi & Awadalla, 2011).

Evidence from cross-sectional studies is mixed on the association between age and PA especially among young adults in LMIC's with some studies reporting an inverse relationship where PA decreases with age (Malambo et al., 2016). But a couple of studies conducted in Nigeria found no significant associations between age and PA (Awotidebe et al., 2014).

Multivariate analysis from a study in Nigeria showed that female students were 93% more likely to be inactive (OR= 1.93; CI: 1.49-2.49) as well as obese students (OR= 2.88, CI:1.16-7.17) (Adegoke & Oyeyemi, 2011). Among Moroccan medical students, participation in sports ($p<0.001$) and sex ($p<0.001$) were significantly associated with PA (Otmani et al., 2016).

In Egypt, female university students were more likely to be inactive compared to males (OR=1.1; CI: 1.4-2.6) and college of medicine students were also reported to be more likely to be inactive (OR=1.5; CI:0.9-2.5) (Badawi & Awadalla, 2011).

Review of contemporary literature exposed some gaps in knowledge which the present study seeks to address. Literature review revealed that research evidence on the PA levels of Ghanaian undergraduates and young adults aged 18 to 24 years for that matter is very limited. The number of PA studies conducted among Ghanaians with standardised tools like the IPAQ in reference to the WHO recommendations is very scanty. The few existing studies in Ghana assessed PA in a single domain (mostly recreational or leisure) which does not accurately reflect the PA levels of individuals since PA can be performed in multiple domains.

Judge et al (2010), stated emphatically that there is under representation of PA studies conducted among university students with multi-domain instruments world-wide resulting in severe data paucity on the patterns of PA among this distinct group. The present study employs a multi-domain tool like the IPAQ-LF which will generate an inclusive PA data on undergraduates in four distinct domains; work, transport, domestic and leisure. Such

inclusive PA data helps in establishing the patterns of PA which is very useful in health promotion activities.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Study Design

The study design was descriptive cross-sectional. A self-administered IPAQ-LF was used to collect data on the physical activity of undergraduate university of Ghana students residing on campus.

3.2 Study Area

The study area was the University of Ghana main campus at Legon. The University is situated about thirteen kilometres north-east of Accra, the capital city of Ghana. The University has two other campuses at different locations; which are the Korle-Bu campus and Accra city campus. The main campus is situated at an altitude of between 90 and 100 metres. The University being the largest and oldest among other public universities was founded in 1948 as the University College of the Gold Coast. The college attained a full university status through an act of parliament in 1961 ("Facts Figures," 2016). It has thrived to become the nation's premier university and regarded as one of the best in West Africa. The University has adopted a collegiate system with four colleges; college of basic and applied sciences, college of education, college of health sciences and college of humanities. Overall student population comprising regular, sandwich and distance is estimated to be over 38,000. Undergraduates and Ghanaians constitute 85% and 98% of total student population respectively; by gender, 57% of total student population are males whiles female students make up the remaining 43%. ("Facts Figures," 2016).

The iconic Balme Library, built in 1948 and named after the first principal David Mowbray Balme, is located centrally on the Legon campus and serves as the main library

of the University of Ghana. Radio Universe, a media house located on the main campus provides students with the latest news as well as entertainment.

The university is home to a number of institutes and research centres. These include Noguchi Memorial Institute for Medical Research (NMIMR), Institute for Statistical, Social and Economic Research (ISSER), Legon Centre for International Affairs and Diplomacy (LECIAD), Regional Institute for Population Studies (RIPS), Institute for Environmental and Sanitation Studies (IESS), West Africa Centre for Cell Biology of Infectious Pathogens (WACCBIP), Centre for Climate Change and Sustainability Studies and West Africa Centre for Crop Improvement.

Some distinguished schools under the various colleges in the university include University of Ghana Business school, University of Ghana Medical school, Dental school, school of Law, school of Public Health, School of Nursing and Midwifery, school of Pharmacy, school of Biomedical and Allied Health sciences, school of Agriculture, school of Veterinary, school of performing arts and school of engineering sciences. The school of graduate studies takes care of all matters pertaining to postgraduate learning.

3.2.1 Residential Facilities and Transportation within the University

The University has 16 residential facilities for both undergraduate and post-graduate students. These include five traditional halls, four unisex hostel facilities, two postgraduate hostels and five privately owned hostels. The halls are located at different sections on campus with distinct physical demarcations. For instance, all five traditional halls are situated at one section and all four unisex halls are found along the same land stretch near the School of Public Health and Noguchi Memorial Institute for Medical Research. The

third group of residential facilities are situated close to the School of Engineering and beyond. Most of these halls have within their premises libraries and reading rooms as well as dining halls and private restaurants that provide students with both local and exotic meals. The halls also have a TV room where students gather to watch their favourite TV shows and mostly live football games. Wireless Internet connectivity is available to enhance learning and for entertainment. In addition, there are several shops and mini supermarkets at different sections both within and outside the residential facilities.

The distribution of recreational sports facilities is not the same across all residential facilities. For instance, all four unisex halls mentioned above have a basketball court within the hall, but the five traditional halls share one basketball court as well as one handball court located at a neutral place. In addition, the University also has a sports directorate resourced with its own gym, swimming pool, lawn tennis and basketball court. There are several fields, parks and walkways either on campus or near residential halls to promote physical activity.

In terms of transportation, there are both state-owned and private shuttle buses to move students around on the Legon campus; thus, from one lecture hall to the other or from one residential facility to the other. Also, there are moving taxis all over campus and taxi ranks at vantage points which makes commuting on main campus very easy.

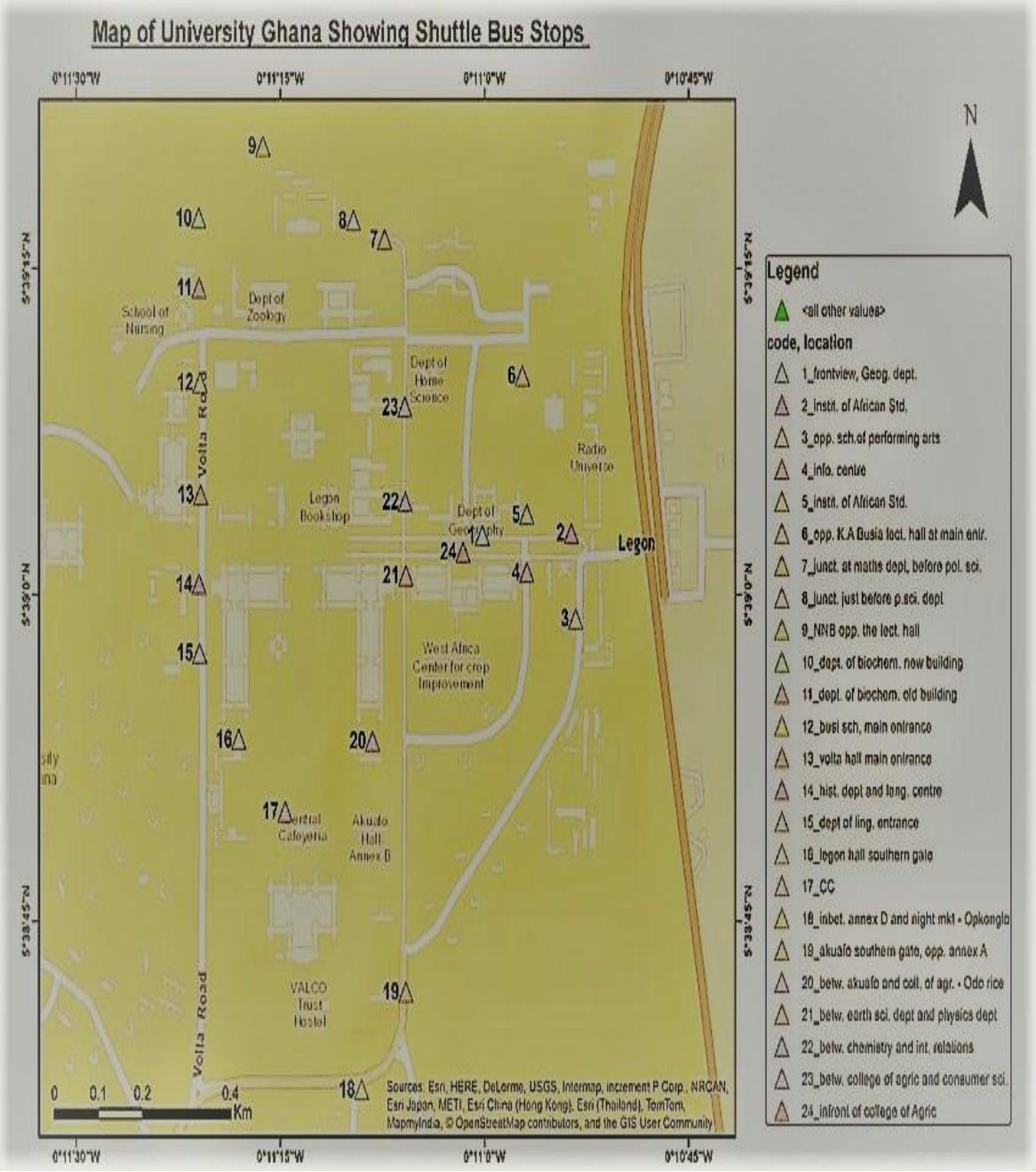

Figure 3.1: Map of the University of Ghana showing some halls of residence

3.3 Variables

3.3.1 Independent variables

Sex, age, marital status, level, college, parent's educational level, participation in competitive sports (Senior High school and university).

3.3.1.1 Anthropometric measurement

Weight and Height

3.3.2 Dependent Variables

Physical Activity level

3.4 Study Population

The study population was resident undergraduate students on the University of Ghana main campus.

3.5 Sampling

3.5.1 Sample size Calculation

Cochran's formula (1997) was used to estimate the sample size at 95% confidence interval and 0.05 margin of error

$$n = \frac{Z^2 * p * (1-p)}{e^2}$$

n= minimum number of respondents

Z= Z value

p= Prevalence of Physical activity from previous studies

e= margin of error

where, Z= 1.96 at 95% confidence interval

p= Physical activity prevalence of 31% reported in a previous study involving 180 School of Public Health students (Birukundi ,2016)

e= 5%

Thus

$$\mathbf{n= \frac{1.96^2 * (0.31) * (0.69)}{0.05^2}}$$

n= 328 students

This was increased to 356 based on a non-response rate of 8.4% (Uddin et al., 2017) reported in a similar study.

3.5.2 Inclusion criterion

All resident undergraduate students on University of Ghana main campus

3.5.3 Exclusion criterion

Students taken with illness or in conditions that prevented them from engaging freely in any physical activity of their choice were excluded.

3.5.4 Sampling procedure

A combination of proportionate stratified sampling and simple random sampling techniques were used in this study. The type of residential facility (traditional, new halls or private hostel) on the main campus was used as the basis to stratify resident undergraduate students into three strata. The reason being that there may be variations in physical activity levels between resident students based on the type of residential facility largely due to availability of recreational facilities and proximity to lecture halls. Traditional halls were grouped into one stratum. The four unisex halls (popularly called diaspora) located south

on the main campus off the road to the Noguchi Memorial Institute for Medical Research were also placed in a second stratum. Finally, the third stratum comprised of all private hostels on the main campus beyond the School of Engineering.

In proportionate stratified sampling, the number of participants sampled from each stratum is proportionate to the relative number of potential participants in each stratum. A total of 13 residential halls were grouped into three strata by type of residential facility (traditional, private hostel and new halls) and the number of undergraduates in each hall was requested from senior hall tutors. Five halls were then selected by simple random sampling (Table 3.1).

The number of eligible participants recruited in each of the five halls was calculated in proportion to the total number of undergraduate residents in each of the selected halls. Thus, the total number of undergraduates in a hall was divided by the sum of undergraduates in all five selected halls and resulting quotient was multiplied by the estimated sample size of 356 to determine the minimum number of participants to be recruited in each hall. Since the residential halls are divided into blocks designated by alphabets, a block was selected using simple random sampling. In a selected block, the rooms to recruit participants from were determined by balloting. A student was called at random to pick from two pieces of folded paper labelled “odd” and “even”. For instance, when the paper labelled “even” was selected, participants were recruited from only even-numbered rooms on the block.

One undergraduate per room was interviewed. Upon entering a room, the nature and scope of study were explained to undergraduates who were present at the time. Then the undergraduates were made to understand that only one participant can be recruited per

room. If only one undergraduate was present, he/she was interviewed right away. But in cases where two or more undergraduates were present, balloting was used to select one person. The calculations performed to arrive at the number of selected participants from each hall are shown in Table 3.2.

Table 3. 1: Selection of Halls per Stratum

Strata	**Total number of undergraduates**	**Number of Halls selected**
Stratum 1	3327	1
Stratum 2	6422	2
Stratum 3	6671	2

Table 3. 2: Selection of Participants per hall of residence

Name of Hall	**Undergraduate Population (n)**	**Hall Sample (n / N) * 356**	**Number of participants recruited**
Evandy	777	42	58
Commonwealth	985	53	79
Legon Hall	1600	85	78
Elizabeth Sey	1670	89	110
Jean Nelson	1631	87	89
Total (N)	6663	356	414

3.6 Data collection techniques and tools

Questionnaire: Data on PA was collected using a self-administered International Physical Activity Questionnaire long form (IPAQ-LF) designed to assess physical activity levels and sedentary behaviour of adults (15-69 years). The five-part questionnaire was adapted

from the website (www.ipaq.ki.se). The IPAQ was developed by a group of researchers from Europe, Asia, North and South America, Australia and Africa in a joint effort to create a standardized instrument for use in different populations and to generate relevant PA data which is internationally comparable. The maiden evaluation of the instrument at 14 centres in 12 different countries yielded satisfactory evidence of validity and reliability (Badawi & Awadalla, 2011). The test-retest reliability of spearman correlation coefficients was reported to be in the range of p=0.67 to 0.91 (States, 2013). The tool was used to obtain responses on the frequency, duration and intensity of students' PA behaviour in four different domains; work-related, transport-related, domestic activities and recreational activities performed at leisure-times. Sociodemographic and anthropometric data was captured using a self-created questionnaire.

Anthropometry: Weight and height of participants were measured with a standard weighing scale and stadiometer respectively to determine the BMI of participants.

Weight: A SECA digital scale was used to measure weight of all participants with their shoes off. Participants wearing jackets, sweaters, watches, belts and heavy jewellery were politely asked to take them off and empty their pockets. All scales were checked prior to measurements to ensure there were no zero errors. Weighing scales were put on a hard-flat surface during measurements. Two measurements were taken per participant and the average recorded as the final measurement.

Height: Heights were measured using a stadiometer with a least count of 0.1cm. Subjects were asked to stand straight with buttocks, shoulders and back of head touching the wall while ensuring that heels were flat and together, shoulders relaxed and arms hanging

down. Also, it was ensured that participant kept their heads erect and looked straight forward. The headpiece of the stadiometer was lowered gently, pressing down the hair of the participant. Height measurements were duplicated and their average recorded.

Body mass index: BMI was calculated as weight (kg) divided by the square of height (m^2) and results were classified using the WHO criteria (Aragones, Ley, & Fernandez-navarro, 2018).

(i) A BMI less than 18.5kg/m^2 was classified as underweight; whiles

(ii) BMI from 18.5kg/m^2 to 24.9kg/m^2 was considered normal weight.

(iii) Likewise, participants whose BMI ranges fell between 25.0kg/m^2 to 29.9kg/m^2 were classified as overweight (pre-obese)

(iv) Those with a BMI of 30kg/m^2 and above were considered obese.

Physical Activity level: The IPAQ long form consists of 24 questions on PA and 3 questions on sedentary behaviour (time spent sitting). The IPAQ long form ask questions on how long and the number of days that a participant was engaged in intensity-specific activities within the last 7 days in the context of work, transport, domestic activities and leisure. These intensities (walking, moderate-intensity and vigorous-intensity) are recognized by the WHO as reflected in the global PA recommendations. Unlike the short form, the long form of the instrument allows for the computation of domain-specific PA scores for all 3 activity intensities in four different contexts (work, transport, domestic and leisure). Domain-specific PA scores were obtained by summing the scores for walking, moderate-intensity and vigorous-intensity activities within each domain. This yields four variables; work score, transport score, domestic score and leisure-time score. Additionally, Intensity-specific PA scores were computed by separately adding the PA scores obtained

by walking, and by doing moderate and vigorous intensity activities across all four domains. This yields 3 variables walking score, moderate-intensity score and vigorous-intensity score. Hence a researcher has two options for calculating the overall PA score;

(i) Adding domain-specific scores (work score + transport score + domestic score + leisure-time score)

(ii) Adding intensity-specific scores across all four domains (walking score + moderate-intensity + vigorous-intensity score).

Either way results in the same overall PA score which forms the basis for how active a person has been in the past one week.

All scores were expressed in Metabolic Energy equivalent (MET) as MET-minutes/week, all frequencies were expressed as days and all durations were expressed as minutes. Therefore, a score in MET-minute/week was computed by multiplying a MET value of an activity by the number of minutes spent executing that activity on one typical day by the number of days that activity was undertaken over a 7-day span. A MET value simply tells the amount of energy expended during the performance of a physical activity in reference to the resting metabolic rate or how expensive (energy wise) an activity's cost is. One Met is defined as the energy expended when an individual is at rest. Walking is assigned 3.3 METS, moderate PA is equivalent to 4 METS and vigorous PA is given a MET value of 8 as specified in the IPAQ scoring protocol (www.ipak.ki.se). Results were reported in three PA categories; low, moderate or high in consonance with the WHO global recommendations as follows;

Moderate PA level

(i) For moderate PA, one should perform either 3 or more days of vigorous-intensity for at least 30 minutes per day or 5 or more days of moderate-intensity activity or walking for at least half an hour per day and

(ii) Also, 5 or more days of walking plus moderate-intensity activity or vigorous-intensity activities resulting in energy expenditure of at least 600 MET-minutes in a week.

Vigorous PA level

(i) Scoring high PA level was interpreted as having engaged in vigorous intensity activity for at least 3 days and accumulating a total PA of at least 1500 MET minutes per week or

(ii) Alternatively doing 7 or more days of any combination of walking, moderate intensity or vigorous intensity accumulating at least 3000 MET minutes of total physical activity in a week.

Low PA level

(i) Students who perform no activity or some activity but not enough to meet the requirements of the other two categories were described as having a low PA level.

3.7 Quality Assurance

Research assistants were trained sufficiently before data collection to ensure accurate understanding of the items on the tool. This was done to enable them respond squarely to questions that participants may ask in the absence of the principal investigator. All

sections of the questionnaires were thoroughly discussed, and it was ensured that all research assistants obtained a good understanding of the study and anthropometric measurement techniques before being dispatched to collect data. Practical sessions were held on anthropometry to reduce observer bias during measurement. Observer bias describes the situation where an observer consistently under-reports or over-reports a variable. Weighing scales and stadiometer were checked and adjusted appropriately before and after work each day. For consistency, scales were checked periodically during data collection to minimise systematic errors. Completed questionnaires were audited daily by the principal investigator to ascertain correctness.

3.7.1 Pilot or Pre-test study

A pilot study was conducted to test student's comprehension of the IPAQ questionnaire in an unsampled residential facility. 30 students were interviewed, and their feedbacks were very helpful. Attention was drawn to difficulties in understanding the following; preamble to part 3, item 16 and item 18. The students initially thought the preamble to part 3 was limited to domestic activities they had performed when they visited their actual homes and so those who had not visited home during the 7 day period of assessment skipped that part even though they had carried out several domestic activities like washing, cleaning and sweeping within the hall of residence.

This misinterpretation would have affected study results significantly, especially among female students, who usually engage in more of such activities per literature evidence. This issue was addressed spot on by slightly modifying the preamble to suggest to resident students that part 3 was asking about domestic activities they had done within the halls of residence since it has now become their "temporary home". For the other case, pre-test

participants thought Item 18 was a repetition of item 16, when in fact they were different. This was also clarified by boldening the text that conveys the difference and adding a check at the end of item 18 that it was different from item 16 based of the contexts in which they were asked. Consequentially, comprehension of the tool was improved and such issues never resurfaced during the main work.

3.8 Data Processing and Analysis

3.8.1 Physical Activity Data Processing

Data were cleaned by following guidelines developed by the IPAQ research committee. All duration recorded in hours were converted into minutes. Durations expressed in weekly hours or weekly minutes were converted into daily average time by dividing by 7. In addition, activity bouts which were greater than 3 hours (180 minutes) were truncated. For instance, if say the total duration for walking across all domains adds up to 350 minutes, such a case was truncated to 180 minutes. This is a core quality assurance measure executed to prevent misclassification of people who may have per an unusual condition, perform a physical activity for many hours on just one day, which does not reflect daily performance. “Don’t know”, “refused” or missing data on duration or number of days were excluded from the analysis.

All cases in which the summation of walking, moderate and vigorous duration variables exceeded 960 minutes were considered unreasonably high and so were excluded from the analysis. Besides, only durations of 10 minutes and above were included in the computation of activity scores as prescribed by the WHO. Therefore, responses of less than 10 minutes were recoded to zero and not considered in the analysis.

3.8.1.1 Calculating MET-minute/week Scores

To ensure that results were in line with the conditions defined in meeting the global recommendations, a series of actions were carried out in the right order before computing the PA scores.

(i) Outliers were excluded first

(ii) Durations which were less than 10 minutes were recoded to zero and excluded

(iii) Finally, extremely high values were truncated to the maximum allowable 180 minutes limit before computing the MET-minute/week score

(iv) MET score (MET-mins/week) = MET value* frequency (days)* duration (minutes)

3.8.2 Data Analysis

Socio-demographic characteristics of participants were summarised by sex using descriptive statistics (frequencies and percentages). Age was summarised using mean and standard deviation. Normality of data was tested using the Shapiro-Wilk W test at 5% significance level. Independent t-test was used to determine differences in means among normally distributed variables. Kruskal-Wallis test was used to compare medians among non-normally distributed variables. Association between categorical variables were analysed using Pearson chi-square tests.

3.8.2.1 Domain-specific and intensity specific prevalence

Participation in physical activities across domains (work, transport, domestic, leisure) and intensities (walking, moderate, vigorous) was expressed as frequencies and proportions

3.8.2.2 Domain-specific and intensity specific duration

All durations were expressed in minutes. The time spent by participants who did not perform any activity was expressed as zero. Durations were summarised as median minutes and first and third quartiles.

3.8.2.3 Domain-specific and intensity specific scores

Domain-specific and intensity specific scores were computed using guidelines spelt out in the IPAQ data management manual.

3.8.2.4 Domain-specific and intensity-specific contributions

Contributions of each domain and activity intensity to the PA level of participants were expressed as percentages of the total physical activity score.

$$\text{Domain contribution} = \frac{\text{Domain score} * 100}{\text{Total PA score}}$$

$$\text{Intensity contribution} = \frac{\text{Activity intensity} * 100}{\text{Total PA score}}$$

3.8.2.5 Multinomial Logistic Regression

Multinomial logistic regression was used to assess how strongly significant socio-demographic variables (with p-value <0.05) were associated with PA levels. PA levels categories (Moderate=1, High=2, Inactive =3) were used as the dependent variables with low PA as reference in a multinomial logistic regression model. All socio-demographic factors were entered in one block using one category as a reference category for each variable and the likelihood of being moderately active or highly active were interpreted using odds ratio at 95% confidence interval.

3.9 Ethical Considerations

This study posed no substantial risk to participants. Ethical clearance was received from the Ghana Health Service Ethics Review Committee with **ID NO: GHS-ERC046/02/19** Permission was sought from selected hall authorities before recruiting students from the residential facilities.

3.9.1 Voluntary participation/ Refusal Right

A written informed consent designed to communicate every detail about the study was given to all eligible participants and they were included in the study after reading and signing it. Participation was entirely voluntary, and respondents were told they had the right to withdraw at any time or refuse to participate.

3.9.2 Potential risks/benefits

A study of this nature posed no risks to participants. However, taking their weights and heights in which case they were asked to take off their shoes and heavy jewellery was quite demanding. It was explained to every single participant that such precautions were necessary to minimise errors since heavy jewellery and shoes can significantly add to the true weight of participants and affect BMI calculation leading to BMI misclassification. The results of this study will inform university authorities on student's physical activity behaviour and provide direction for future interventions.

3.9.3 Compensation

There was no compensation in cash or in kind for participating in this study.

3.9.4 Confidentiality

Questionnaires were coded to ensure anonymity and names of participants were not required. Participants were interviewed privately and not in the presence of other roommates. Questionnaires were coded to ensure anonymity and names of participants were not required. Participants were interviewed privately and not in the presence of other room mates

3.9.5 Data Storage and Usage

Participant data was kept completely confidential. Names of participants were not required, and responses were coded in a way that no response could be traced to a respondent. Data was kept secured in a cabinet in the home of the principal investigator and locked. Only principal investigator had access to the keys of cabinet containing the completed questionnaires. Once data was entered onto the computer, the containing folder was password-protected, and a soft copy was sent to the e-mail address of the principal investigator to guard against data loss.

3.9.6 Conflict of Interest

The researcher declares no conflict of interest.

3.10 Funding

This study was self-funded.

CHAPTER FOUR

4.0 RESULTS

4.1 Sociodemographic Characteristics of Participants

A total of 414 undergraduates from 5 halls of residence took part in this study. Sixteen participants were excluded for providing implausible data as described by the IPAQ core group (www.ipaq.ki.se). Hence a total of 398 validated questionnaires were used in data analysis. Majority of study participants were males (70.6%) and affiliated to the college of Humanities (59.1%). Almost all participants had never married (99.6%) and 95.2% were young adults between the ages of 17 and 24 years. Overall mean age was 21.44 (SD=1.91). The mean age for males was 21.44 (SD=1.91) and the mean age for females was 20.86 (SD=1.73). The difference in mean age between males and females was statistically significant ($p<0.05$).

The difference in proportions of participants across type of residential facility by sex was very highly significant ($p<0.001$). Over 80% of study participants were not engaged in either paid or unpaid work (internship) or more than half (78.6%) did not own a car or have access to a private vehicle. Table 4.1 presents details (frequencies and proportions) on participants' sociodemographic characteristics by sex. P-value shows significance of proportional differences across categories by sex.

Table 4.1: Sociodemographic characteristics of participants by sex

Characteristics	Male n=281	Female n=117	All N=398	
	n (%)	n (%)	N (%)	p-value[1]
Mean Age(±SD)	21.44±1.91	20.86±1.73	21.27±1.87	**<0.05**
Age Groups				
17-20years	91(32.4)	48(41.0)	139(34.9)	**<0.05**
21-24years	172(61.2)	68(58.1)	240(60.3)	
25-27years	18(6.4)	1(0.9)	19(4.8)	
Marital Status				
Single	280(99.6)	117(100)	397(99.8)	0.518
Married	1(0.4)	0(0)	1(0.3)	
Level of Study				
100	34(12.1)	17(14.5)	51(12.8)	0.697
200	69(24.6)	25(21.4)	94(23.6)	
300	73(26.0)	35(29.9)	108(27.1)	
400	105(37.4)	40(34.2)	145(36.4)	
College				
Applied Science	77(27.4)	30(25.6)	107(26.9)	0.738
Humanities	168(59.8)	67(57.3)	235(59.1)	
Health Sciences	25(8.9)	14(12.0)	39(9.8)	
Education	11(3.91)	6(5.1)	17(4.3)	
Education (Mother)				
No education	13(4.63)	2(1.7)	15(3.8)	0.152
Primary	16(5.7)	8(6.8)	24(6.0)	
JHS/JSS	56(19.9)	35(30.0)	91(22.3)	
SSS/SHS	91(32.4)	39 (33.3)	130(32.7)	
Undergraduate	73(26.0)	25(21.4)	98(24.6)	
Postgraduate	32(11.4)	8(6.84)	40(10.1)	
Education (Father)				
No education	10(3.6)	0(0)	10(2.5)	0.058
Primary	5(1.8)	0(0)	5(1.3)	
JHS/JSS	25(8.9)	16(13.7)	41(10.3)	
SSS/SHS	88(31.3)	30(25.6)	118(29.7)	
Undergraduate	79(28.1)	42(36.0)	121(30.4)	
Postgraduate	74(26.3)	29(24.8)	103(25.9)	
Type of Residence				
Private	27(9.6)	31(26.5)	58(14.6)	**<0.001**
Traditional	132 (47.0)	15(12.8)	147(36.9)	
New Halls	122(43.4)	71(60.7)	193(48.5)	
Currently Working				
Yes	30(10.7)	16(13.7)	46(11.6)	0.394
No	251(89.3)	101(86.3)	352(88.4)	
Car ownership or Access				
Yes	65(23.1)	20(17.1)	85(21.4)	0.181
No	216(76.9)	97(82.9)	313(78.6)	

[1]Pearson Chi-square for categorical variables, independent t-test for continuous variables, significance at p<0.05

4.1 (b) Participation in Competitive Sports

Table 4.2 shows data on current and previous participation in competitive sports at the University and Senior High School respectively. About a fourth of respondents (25.4%) were involved in competitive sports currently at the university. But close to half (46.5%) of participants were sports students during their senior high school days. The proportion of males (32.7%) currently involved in competitive sports was significantly ($p<0.001$) higher than females (7.7%). Similarly, the difference in proportions of males and females previously engaged in competitive sports during high school was statistically significant ($p<0.05$).

It is worth noting that 36% of female participants in the present study were involved in competitive sports during senior high school but only 7.7% continued with such pursuits upon entering university.

Table 4.2: Participants Involvement in Competitive sports by sex

Characteristics	Male n=281	Female n=117	All N=398	
	n (%)	n (%)	N (%)	p-value[1]
Sports (University)[2]				
Yes	92(32.7)	9(7.7)	101(25.4)	**<0.001**
No	189(67.3)	108(92.3)	297(74.6)	
Sports (SHS)*				
Yes	142(50.5)	43(36.8)	185(46.5)	**<0.05**
No	139(49.5)	74(63.3)	213(53.5)	

[1]Pearson chi-square for categorical variables, significance at $p<0.05$
[*]Previous participation limited to active engagement in competitive sports during Senior High School (SHS)
[2]Current participation at the university defined as active participation in the past 3 months

4.2 Domain-specific and intensity-specific prevalence

Physical activity prevalence represents proportions who reported execution of a physical activity in each of the domains for at least 10 minutes. Overall, only 14.6% of participants reported doing a work-related physical activity with majority being females (18.8%). Active transportation was very common among resident undergraduates (88.7%). Notably, a higher proportion of females (80.3%) compared to males (68.3%) reported engagements in domestic activities. More males (68.3%) than females (40.2%) had performed a physical activity during leisure or for recreational purposes as shown in Table 4.3.

Table 4.3: Prevalence of participants engaged in domain-specific physical activities by sex

PA Domains	ALL (N=398) N (%)	Male (n=281) n (%)	Female (n=117) n (%)
Work			
Work-Related PA	58(14.6)	36(12.8)	22(18.8)
Transportation			
Transport-related PA	353(88.7)	251(89.3)	102(87.2)
Domestic[1]			
Domestic activities Related PA	286(71.9)	192(68.3)	94(80.3)
Recreation and Leisure time			
Leisure-related PA	239(60)	192(68.3)	47(40.2)

[1]Typical housework activities performed within halls of residence like washing, sweeping etc.
PA-Physical Activity

Prevalence of participation in respect of activity intensity was also computed. 92.7% of entire participants had walked for at least 10 minutes within the period of assessment and about three-quarters (75.6%) of the sampled students reported involvement in moderate-intensity activities. Remarkably, more females than males (82.9% vs. 72.6%) executed a

moderate-intensity activity. Conversely only a fifth of females (20.5%) undertook a vigorous PA within the week assessed. The details are shown in Table 4.4.

Table 4.4: Prevalence of participants engaged in physical activities of specific intensities by sex

Activity Intensity	ALL (N=398) N (%)	Male (n=281) n (%)	Female (n=117) n (%)
Low intensity (Walking)			
Walking PA	369(92.7)	264(94)	105(89.7)
Moderate- intensity			
Moderate intensity PA	301(75.6)	204(72.6)	97(82.9)
Vigorous- intensity			
Vigorous intensity PA	137(34.4)	113(40.2)	24(20.5)

Note: Proportions are composite of all domains and activities were assessed in bouts of 10-minutes

4.3 Time spent in performing physical activities in different domains

All durations were expressed in minutes. There were no significant differences in mean durations of activities performed in the work domain. The overall median minutes per week for time spent walking from one place to another in the context of transport was 30 minutes (IQR 15, 85). Also, females spent significantly ($p<0.05$) more time [30 mins/week (IQR 10, 60)] in moderate intensity activities than males [20 mins/week (IQR 0, 60)] in the domestic (household) domain (not shown in table)

4.4 Time spent in Performing PA at different intensities

The Kruskal-Wallis test was used to determine significant differences in median duration by sex. There was a significant difference ($p<0.001$) in median time spent walking across all applicable domains by sex. Males spent more time walking [500 mins/week (IQR 150, 1450)] than females [210 mins/week (IQR 60, 585)] across all domains.

On the other hand, females spent significantly ($p<0.05$) more time in moderate-intensity activities across all domains [240 mins/week (IQR 60, 675)] compared to males [140

mins/week (IQR 60, 675)]. Overall, males again spent more time in vigorous-intensity activities than females (Table 4.5). Even though the medians are the same, the third quartile for males was greater (IQR 0, 180) than females (IQR 0, 0).

Table 4.6 shows differences in duration spent walking, performing moderate and vigorous intensity activities across all domains by type of residential facility. Undergraduates in traditional halls recorded the highest time walking as shown by the median and interquartile range [60 mins/week (IQR 30, 150)]. One fourth of students in traditional halls spent more than 150 minutes walking in a week.

Table 4.5: Activity-intensity durations by sex

Activity-Intensity	Sex of Respondent		Chi2	p-value[1]
	Male	Female		
Median Walking (minutes/week)	500	210	21.0	<0.001
IQR	(150, 1450)	(60, 585)		
Median Moderate-Intensity (minutes/week)	140	240	4.50	<0.05
IQR	(0, 540)	(60, 675)		
Median Vigorous-Intensity (minutes/week)	0	0	14.68	<0.001
IQR	(0, 180)	(0, 0)		

[1]Kruskal-Wallis test, p<0.05 considered significant
IQR- Interquartile range (first quartile, third quartile with respect to all participants).
Median duration presented is the second quartile with respect to all participants, hence zeros are indicative of no activity performed.

4.5 Domain-specific scores and Intensity specific scores

Three continuous scores generated by the IPAQ long form are; domain-specific scores, intensity-specific scores and total PA score. The computed domain-specific scores are shown in Table 4.7. All domain-specific scores were expressed as MET-minutes/week. A score of zero indicates no performance of a physical activity in a domain. The overall median total physical activity scores among males [2772 MET-minutes/week] was almost

twice that of females [1494 MET-minutes/week]. The difference in median total physical activity scores between males and females was statistically significant. Median work domain score was the same for both males and females. Expectedly females had a significantly ($p<0.01$) higher median domestic PA score (420 MET-minutes/week) than males (225 MET-minutes/week). In the leisure domain, males scored significantly ($p<0.001$) higher which is reflective of increased participation and longer durations compared to females. The intensity-specific scores showed significant differences in median walking and vigorous score by sex. The median walking score was higher among males (1039.50 MET-mins/week) compared to females (544.5 MET-mins/week). However, the difference in median moderate intensity score by sex was not significant (not shown in table).

Differences in PA scores with respect to activity intensity by type of residential facility were not statistically significant. However, walking scores for resident traditional hall students was the highest (990 MET-minutes/weeks). In terms of moderate intensity activities, score for students in private hostels was the highest as shown in Table 4.8.

Table 4.6 Activity-Intensity durations by type of residential facility

Activity Intensity	Type of facility			p-value[1]
	Private Hostels	Traditional halls	New Halls	
Median Walking (minutes/week)	47.50	60	60	0.301
IQR	(20, 135)	(30, 150)	(30, 120)	
Median moderate Intensity (minutes/week)	60	60	60	0.987
IQR	(10, 120)	(0, 140)	(10, 120)	
Median Vigorous Intensity (minutes/week)	0	0	0	0.223
IQR	(0, 30)	(0, 60)	(0, 22)	

[1]Kruskal-Wallis test, $p<0.05$ considered significant

IQR- Interquartile range (first quartile, third quartile with respect to all participants).

Median duration presented is the second quartile with respect to all participants; hence zeros are indicative of no activity performed.

Table 4.7: Domain specific physical activity scores by sex

PA Score	Sex of Respondent		Chi(2)	p-value[1]
	Male	Female		
Median Work Score (MET-minutes/week)	0	0	2.68	0.1014
IQR	(0,0)	(0, 0)		
Median Transport Score (MET-minutes/week)	693	297	25.92	<0.001
IQR	(297, 2079)	(99, 693)		
Median Domestic Score (MET-minutes/week)	225	420	6.95	<0.01
IQR	(0, 700)	(100,950)		
Median Leisure Score (MET-minutes/week)	346.5	0	39.92	<0.001
IQR	(0, 1920)	(0, 231)		
Median Total PA Score (MET-minutes/week)	2772	1494	15.62	<0.001
IQR	(1068, 5459)	(623, 3042)		

[1]Kruskal-Wallis test, p<0.05 considered significant
IQR- Interquartile range (first quartile, third quartile with respect to all participants).
Median score presented is the second quartile with respect to all participants; hence zeros are indicative of no activity performed.

Table 4.8 Activity-Intensity physical activity scores by type of residential facility

Physical Activity score	Type of facility			p-value[1]
	Private Hostels	Traditional Halls	New Halls	
Median Walking (MET-minutes/week)	693	990	726	0.033
IQR	(198, 1947)	(478.5, 2772)	(264, 1980)	
Median Moderate (MET-minutes/week)	467.5	360	450	0.942
IQR	(80, 1260)	(0, 1400)	(60, 1185)	
Median Vigorous (MET-minutes/week)	0	0	0	0.137
IQR	(0, 720)	(0, 1440)	(0, 320)	

[1]Kruskal Wallis test, significance at $p<0.05$
IQR- Interquartile range (1st quartile, 3rd quartile with respect to all participants)
Median score presented is the second quartile with respect to all participants; hence zeros are indicative of no activity performed

4.6 Contribution of each domain and activity intensity to the overall PA levels

Contributions of each domain and activity intensity were computed using domain-specific scores and activity-intensity scores. Overall, transport domain contributed the highest (41.35%) to the PA levels of entire participants followed by leisure (25.50%). Among females, domestic domain contributed the highest (37.08%) followed by transportation (35.47%). Among males, transport domain contributed the highest (43.74%) followed by Leisure (25.50%). Work domain contributed least to the overall PA levels of participants (8.13%) and categorically among males (6.40%) and females (12.36%) as shown by figure 4.1

Table 4.9 and 4.10 show the contributions of the various intensity-specific activities to PA levels of participants by sex and type of residential facility respectively. Walking (a low intensity activity) was the overall highest contributor (54.78%) to PA levels followed by

moderate-intensity activities (30.77%). Also, the contribution of walking across all domains was highest among both males (57.60%) and females (47.82%). Vigorous intensity activities contributed least to the PA levels of undergraduates on the whole and by sex categories as shown in Table 4.9.

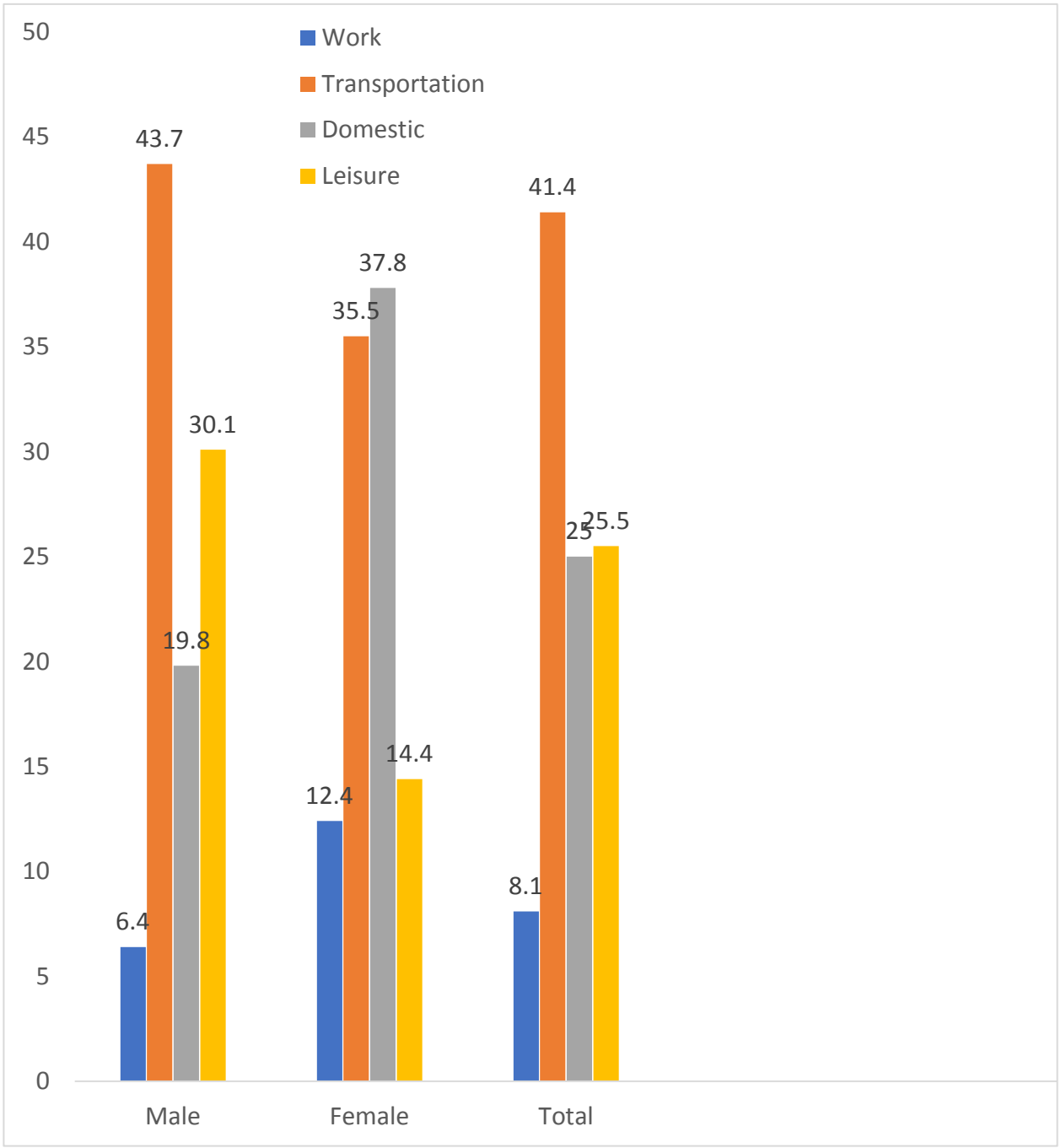

Figure 4.1: Contribution of each domain to the physical activity levels of participants by sex

Table 4.9: Contribution of Intensity-specific activities to physical activity levels of participants by sex

Intensity	Male (%)	Female (%)	All (%)
Walking	57.60	47.83	54.77
Moderate	25.63	43.36	30.77
Vigorous	16.78	8.81	14.46

Table 4.10: Contribution of intensity-specific activities to PA levels of participants by type of residential facility

Intensity	Private Hostels (%)	Traditional Halls (%)	New Halls (%)	All (%)
Walking	53.31	56.96	53.51	54.77
Moderate	32.90	25.38	34.31	30.77
Vigorous	13.79	17.66	12.19	14.46

4.7 Prevalence of physical activity and inactivity

The prevalence of inactivity in this study was 17.1% (Table 4.11). The proportions of participants in the moderate group (43.0%) plus the proportion of participants in the high group (39.9%) gives the prevalence of physical activity (82.9%) in reference to WHO global recommendations. Majority (43%) of participants were moderately active and a greater proportion of males were highly active (45.6%) compared to females (26.5%). Prevalence of inactivity among females (24.8%) was higher compared to males (13.9%). But a higher proportion of females were moderately active (48.7%) compared to males (40.6%). The difference in proportions between males and females across PA categories was significant ($p<0.01$).

By type of residential facility, majority of undergraduates in traditional halls were highly active but majority of students in both private hostels and new halls were moderately active. Proportional differences in PA levels across the different types of residential facilities were not statistically significant as shown in Table 4.12.

Table 4.11: Physical activity levels by sex of participants

Characteristic	Male n=281 n (%)	Female n=117 n (%)	All N=398 N (%)	p-value
Median Total PA score	2772	1494	2083.75	**<0.001***
Interquartile Range	(1068, 5459)	(623, 3042)	(885, 4839)	
Inactive	39(13.9)	29(24.8)	68(17.1)	**<0.01**[1]
Moderate	114(40.6)	57(48.7)	171(43.0)	
High	128(45.6)	31(26.5)	159(39.9)	

*P-value from Kruskal-Wallis equality-of-populations rank test, significance at p<0.05
[1] Pearson chi-square, significance at p<0.05
Median score expressed in MET-minutes/week
Interquartile range (first quartile, third quartile)

Table 4.12 Physical activity levels of participants by type of residential facility

PA level	Private hostels n (%)	Traditional halls n (%)	New Halls n (%)	p-value[1]
Low	15 (25.9)	16 (10.8)	37 (19.2)	0.056
Moderate	22 (37.9)	63 (42.9)	86 (44.6)	
High	21 (36.2)	68 (46.3)	70 (36.3)	

[1] Pearson chi-square, significance at p<0.05

4.8 Prevalence of Obesity

More than half (68.8%) of sampled students had a normal weight with a higher proportion of females (27.4%) being overweight than males (12.1%). A Shapiro-Wilk test confirmed that BMI data was non-parametric ($p<0.001$). Prevalence of obesity among present study participants was 4.5% as shown in Table 4.13. Majority of resident students had a normal BMI score (68.8%). There were more overweight students (16.6%) than underweight students (10.1%). Differences in proportions between males and females across BMI categories was statistically significant ($p<0.001$). Consequently, a Kruskal-Wallis test was used to determine significant differences in median BMI scores by sex. The result of the test confirmed that there was a statistically significant difference in median BMI scores between males and females ($p<0.05$).

Table 4.13: BMI by sex of participants

Characteristic	Male n=281 n (%)	Female n=117 n (%)	All N=398 N (%)	p-value
Median BMI Interquartile Range	20.91 (19.5, 23.0)	22.18 (19.8, 25.7)	21.19 (19.5, 23.9)	**<0.05***
Underweight	27(9.6)	13(11.1)	40(10.1)	**<0.001**[1]
Normal	211(75.1)	63(53.9)	274(68.8)	
Overweight	34(12.1)	32(27.4)	66(16.6)	
Obese	9(3.2)	9(7.7)	18(4.5)	

*P-value from Kruskal-Wallis equality-of-populations rank test, significance at $p<0.05$
[1] Pearson chi-square, significance at $p<0.05$
Interquartile range (first quartile, third quartile)
BMI in kg/m^2

4.9 Association between BMI categories and Physical activity levels

The proportion of inactivity decreased with increasing body mass index. The prevalence of inactivity was highest (25%) in underweight students across BMI categories. Majority of

normal weight (44.2%) and overweight (43.9%) students were moderately active but majority of underweight students (42.5%) were highly active. Among obese participants, majority were found to be either highly active (44.4%) or moderately active (44.4%).

Table 4.14 shows that the association between BMI categories and PA levels was not significant.

4.10 Association between BMI and physical activity levels

A Kruskal-Wallis test was performed to determine if there were differences in the median BMI scores across physical activity levels (low, moderate and high). The test was done at a significance of 0.05. The results of the test showed that frequency distributions of BMI for physical activity levels were identical (p-value = 0.4442). Hence the association between BMI and physical activity level was not statistically significant (not shown in Table).

Table 4.14: Association between BMI categories and Physical activity levels of participants

Characteristics	ALL N (%)	Physical Activity Levels n (%) High	Moderate	Low	P-value[1]
BMI[2]					
Underweight	40(10 .1)	17(42.5)	13(32.5)	10(25)	0.703
Normal	274(68.8)	106(38.7)	121(44.2)	47(17.2)	
Overweight	66(16.6)	28(42.4)	29(43.9)	9(13.6)	
Obese	18(4.5)	8(44.4)	8(44.4)	2(11.1)	

[1]Pearson chi-square, significance at p<0.05
[2]Body mass index

4.11 Sociodemographic variables by physical activity levels

Table 4.15 shows data on sociodemographic characteristics by PA levels. Most students in level 200 were highly active (44.7%) and the proportion of inactive students was highest (27.5%) in first year students across levels of study. Prevalence of inactivity was highest (25.2%) in the lowest age group (17-20 years), but the prevalence of highly active students was highest (47.4%) in the highest age group (25-27 years). Undergraduates from college of Basic and applied science (48.6%) as well as Humanities (43.8%) were predominantly moderately active but students from the college of health science had the highest prevalence (46.2%) in the highly active category across colleges.

4.12 Socioeconomic status by physical activity levels

Majority of participants had fathers who had attained undergraduate education (30.4%) and mothers who had completed Senior High school (32.7%). The prevalence of inactivity was higher among participants whose parents had attained post-secondary education. For participants who had fathers with primary school as the highest level of education reached, none was inactive. About half (48.2%) of participants who owned or had access to private cars were moderately active (Table 4.16).

4.13 Participation in sports by physical activity levels

Almost half (49.2%) of participants with a history of participating in competitive sports were classified as highly active (Table 4.17). More than half (58.4%) of current sports students were highly active. Among current university sports students the proportion classified inactive was less than a tenth (7.9%). For participants not involved in any competitive sports currently, about one-fifth (20.2%) were inactive.

4.14 (a) Association between Sociodemographic Characteristics and Physical activity levels

The association between sex and PA levels was statistically significant ($p<0.01$). Likewise, age, level and being employed were significantly associated with PA levels. Table 4.15 shows how sociodemographic characteristics were associated with PA levels.

(b) Association between Socioeconomic status and Physical activity levels

Highest educational level reached by both parents and car ownership were used as proxy socio-economic status indicators in this study. A significant association ($p<0.05$) was found between father's level of education and PA level as shown in Table 4.16

(c) Association between participation in competitive sports and Physical activity levels

The association between previous participation in competitive sports during senior high school and PA levels was statistically highly significant ($p<0.01$). Likewise, current participation in competitive sports at the university was significantly associated with PA level ($p<0.001$). Details are presented in Table 4.17

Table 4.15: Sociodemographic characteristics of participants by physical activity levels

Characteristics	Total N (%)	Levels			p-value[a]
		High[3] n (%)	Moderate[2] n (%)	Low[1] n (%)	
All	398(100)	159(40)	171(43%)	68(17.1)	
Sex					
Male	281(70.6)	128(45.6)	114(40.6)	39(13.9)	**<0.01**
Female	117(29.4)	31(26.5)	57(48.7)	29(24.8)	
Age					
17-20years	139(34.9)	50(36)	54(38.9)	35(25.2)	**<0.05**
21-24years	240(60.3)	100(41.67)	108(45.0)	32(13.3)	
25-27years	19(4.8)	9(47.4)	9(47.4)	1(5.3)	
Marital Status					
Single	397(99.8)	159(40.1)	171(43.1)	67(16.9)	0.088
Married	1(0.3)	0(0)	0(0)	1(100)	
Level					
100	51(12.8)	22(43.1)	15(29.4)	14(27.5)	**<0.05**
200	94(23.6)	42(44.7)	36(38.3)	16(17.0)	
300	108(27.1)	41(38.0)	45(41.7)	22(20.4)	
400	145(36.4)	54(37.2)	75(51.7)	16(11.0)	
College					
Applied Science	107(26.9)	39(36.5)	52(48.6)	16(15.0)	0.218
Humanities	235(59.1)	95(40.4)	103(43.8)	37(15.7)	
Health Sciences	39(9.8)	18(46.2)	10(25.6)	11(28.2)	
Education	17(4.27)	7(41.2)	6(35.3)	4(23.5)	
Currently[4] Working					
Yes	46(11.6)	32(69.6)	12(26.1)	2(4.35)	**<0.001**
No	352(88.4)	127(36.1)	159(45.2)	66(18.8)	

[a] Pearson chi-square, significance at p<0.05
[1]Did not perform a moderate-to-vigorous intensity PA for at least 30 minutes on at least 5 days
[2]Performed moderate-to-vigorous intensity PA for at least 30 minutes on at least 5 days
[3]Performed moderate-to-vigorous intensity PA on every day of the week with a minimum PA score of 3000MET-minutes/week.
[4]Connotes both paid jobs (includes self-employment) or unpaid ventures like internship

Table 4.16: Socioeconomic status of Resident Undergraduate Students by physical activity levels

Characteristics	All	Physical Activity Levels			
	N (%)	High n (%)	Moderate n (%)	Low n (%)	p-value[1]
Education (Father)					
No education	10(2.5)	1(10.0)	8(80.0)	1(10)	<0.05
Primary	5(1.3)	4(80.0)	1(20.0)	0(0)	
JHS/JSS	41(10.3)	17(41.5)	21(51.2)	3(7.3)	
SSS/SHS	118(29.7)	56(47.5)	47(39.8)	15(12.7)	
Undergraduate	121(30.4)	44(36.4)	50(41.3)	27(22.3)	
Postgraduate	103(25.9)	37(35.9)	44(42.7)	22(21.4)	
Education (Mother)					
No education	15(3.8)	3(20.0)	11(73.3)	1(6.7)	0.061
Primary	24(6.0)	8(33.3)	11(45.8)	5(20.8)	
JHS/JSS	91(22.9)	40(44.0)	44(48.4)	7(7.7)	
SSS/SHS	130(32.7)	59(45.4)	47(36.2)	24(18.5)	
Undergraduate	98(24.6)	35(35.7)	42(42.9)	21(21.4)	
Postgraduate	40(10.1)	14(35.0)	16(40.0)	10(25.0)	
Car Ownership or Access*					
Yes	85(21.4)	36(42.4)	41(48.2)	8(9.4)	0.101
No	313(78.6)	123(39.3)	130(41.5)	60(19.2)	

[1]Pearson chi-square, significance at p<0.05
*Having a vehicle belonging to another in one's custody or having friends who own cars

Table 4.17: Association between Participation in competitive sports and physical activity levels of Resident Undergraduate Students

Characteristics	All	Physical Activity Levels			
	N (%)	High n (%)	Moderate n (%)	Low n (%)	p-value[1]
Sports (SHS)*					
Yes	185(46.5)	91(49.2)	69(37.3)	25(13.5)	<0.01
No	213(53.6)	68(31.9)	102(47.9)	43(20.2)	
Sports (University)**					
Yes	101(25.4)	59(58.4)	34(33.7)	8(7.9)	<0.001
No	297(74.6)	100(33.7)	137(46.1)	60(20.2)	

[1]Pearson chi-square, significance at p<0.05
*Participation in competitive sports during senior high school period
****Participation in competitive sports currently in the university

4.15 Factors associated with Physical Activity levels

Multinomial logistic regression was used to test the strength of selected independent variables that were significantly associated with PA levels. Moderately active was used as the reference category for the dependent variable.

A first-year student was 48% more likely to be inactive than moderately active than a final year student [OR=1.48 (95% CI= 0.35-2.61)] but the association was not significant. Also, a sports student was 26% less likely to be highly active than moderately active than an undergraduate not involved in competitive sports [OR=0.74 (95% CI= 0.18-1.29)], although the association was not significant (Table 4.18).

Moreover, the results showed that a student whose father has not gone through any formal education was non-significantly more likely to be highly active than moderately active compared to a student whose father had an undergraduate degree [OR=2.52 (95% CI= -4.70-0.35)]

Table 4.18: Multivariate analysis of selected sociodemographic characteristics by Physical activity levels using moderately active as reference

Characteristics	Highly Active		Inactive	
	OR	95% CI	OR	95%CI
Sex				
Male (Ref)				
Female	0.51	-1.05-0.03	0.24	-0.38-0.86
Age				
21-24years (Ref)				
17-20years	0.36	-0.98-0.27	0.28	-0.46-1.03
25-27years	0.24	-0.84-1.32	0.64	-2.81-1.52
Level				
400 (Ref)				
100	1.01	0.07-1.94*	1.48	0.35-2.61*
200	0.70	-0.00-1.40	0.59	-0.36-1.54
300	0.46	-0.14-1.05	0.77	-0.32-1.57
Sports (SHS)				
No (Ref)				
Yes	0.43	-0.04-0.90	0.17	-0.79-0.45
Sports (University)				
No (Ref)				
Yes	0.74	0.18-1.29**	0.35	-1.24-0.55
Education (Father)				
Undergraduate (Ref)				
No education	2.52	-4.70-0.35*	0.99	-3.22-1.25
Primary	1.03	-1.30-3.36	13.36	-2399.64-2372.92
JHS/JSS	1.76	-0.91-0.73	1.76	-3.11-0.41*
SHS/SSS	0.23	-0.37-0.82	0.63	-1.41-0.16
Postgraduate	0.04	-0.67-0.58	0.14	-0.87-0.58

Reference category for categorical dependent variable is moderately active
(Ref) connotes reference category
*p<0.05
**p<0.01

CHAPTER FIVE

5.0 DISCUSSION

5.1 Background Characteristics of Participants

This study assessed the prevalence and patterns of physical activity among resident undergraduates. There were significant differences in the proportion of males and females with respect to background characteristics like age groups and halls of residence. Participants were between the ages of 17-27 years with a mean age of 21.4 (SD=1.9). Participants aged 17-24 years constituted 95.2% of total participants. About 70.6% of participants were males and 29.4% were females. About a third of all male participants (32.7%) reported engagements in competitive sports at the university level whiles less than a tenth (7.7%) of females were involved in such endeavours.

Study results showed that 88.7% reported execution of a PA in the transportation domain and 92.7% had engaged in walking for at least 10 minutes. More females (80.3%) than males (68.3%) performed moderate-intensity activities in the domestic domain but in the leisure domain, the prevalence of students reporting PA performance among males (68.3%) was higher compared to females (40.2%). On the whole, one half of males spent more than 8.3 hours walking and half of females spent more than 3.5 hours walking in a week across all domains. Males spent more time walking in the transport domain compared to females, but females spent more time carrying out moderate intensity activities compared to males. Further analysis showed that transportation contributed the highest (41.35%) to the PA levels of participants followed by leisure (25.50%). Among females, domestic domain contributed the highest (37.1%). Data analysis showed that 82.9% of participants were sufficiently active whiles 17.1% were inactive. Age, sex, level, socioeconomic status and participation in sports were significantly associated with PA

levels. However, no association was found between BMI and physical activity levels in the present study.

5.2 Patterns of Physical activity behaviour

5.2.1 Domain-specific prevalence of physical activities

Transport-related physical activity was the most predominant (88.7%) across all domains. This pattern of PA behaviour may be driven most of the time by necessity and not choice. Lecture halls may be distant from residential facilities which create a need for active commuting. More males (89.3%) than females (87.2%) reported executing an activity in the context of transportation. These findings were higher compared to a study carried out among undergraduates in Bangladesh which reported that 58% of males and 47% of females were involved in transport-related physical activities (Uddin et al., 2017). This suggests that the decision of active or passive commuting may be influenced by gender. Again, males dominated the leisure domain which hints that a lot more females do not spend their leisure time engaged in PA. However, in the domestic domain, the prevalence of students engaged in PA was higher among females (80.3%) than males (68.3%). This gendered difference could be explained culturally and more particularly in the Ghanaian context, where females are raised to accept the performance of domestic duties as feminine. Overall, performance of PA during leisure time was lower compared to domestic and transport. More recreational facilities are needed on campus and female undergraduates need to be motivated to overcome barriers to outdoor PA during their free times.

5.2.2 Intensity-specific prevalence of physical activities

The most common type of PA performed by undergraduates in the present study was walking (92.7%). This was close to a study which found 93.1% of university students engaged in walking as a type of PA (Otmani et al., 2016). Walking is a ubiquitous PA, so a very large proportion reporting engagement in walking is probable. Efforts to increase engagements in PA among resident students should not overlook programmes like health walks since majority of students irrespective of sex are more likely to participate in such pursuits. Notably, more females (82.9%) compared to males (72.6%) were engaged moderate-intensity PA across all domains. This was contrary to a PA study which found a higher male (71.6%) prevalence in the performance of moderate intensity physical activities compared to females (65.3%) (Otmani et al., 2016). Overall, the prevalence of students engaged in vigorous intensity PA was the least (34.4%) across all domains. This implies that participants may occasionally engage in such activities within a typical week, but the general pattern shows predominant participation in low and moderate intensity PA.

5.2.3 Domain-specific duration

The concept of dose-response relationship in PA suggests that spending more time yields additional health benefits (Powell et al., 2011). One half of both males [30(IQR 20, 120)] and females [30(IQR 15, 40)] spent more than 30 minutes walking in a week in the transportation domain. But looking at the third quartiles reveal that time spent walking was higher among males than females; 25% of males spent over 2 hours per week walking compared to 25% of females who spent more than 40 minutes walking in a week for transport purposes. This difference in walking time was found to be statistically very highly significant. Therefore, although the proportion of students who reported walking was appreciable in both sexes, a gendered difference in duration was found. This suggests

that distances considered walkable may be influenced by gender amongst other factors since longer distances require more time to cover. In the domestic domain, females spent significantly more time than males in the performance of moderate intensity activities. A study pointed out that females are more active than males when it comes to the performance of household chores (Ranasinghe et al., 2016). Yet again, in terms of time spent walking and doing vigorous activity during leisure times, males spent relatively longer time and the differences in median duration by sex was statistically very highly significant. Barriers to female engagement in organised sports may account for the inactivity observed in the leisure domain. A study conducted in Ireland explained that the mental and social factors motivating a person to engage in organised sports are more pronounced in males than females (Lerner et al., 2011).

5.2.4 Intensity-specific duration

Differences in duration spent executing activities at specific intensities by type of residential facility were not statistically significant. However, resident students in traditional halls spent the highest number of minutes walking. The proximity of traditional halls to lecture halls, restaurants, supermarkets and departments may have motivated students to walk frequently. The median time spent walking (combining all domains) was significantly higher in males [500 mins/week (IQR 150, 1450)] than females [210 mins/week (IQR 60, 585)]. This means that 50% of males spent more than 8 hours walking in a week but among females, 50% spent more than 3.5 hours walking as communicated by the medians. The presence of shuttles, commercial taxis and quite recently “Uber” on the University of Ghana main campus to a large extent may have influenced passive commuting especially among female students in non-traditional halls. Time spent in vigorous intensity activities was the least compared to the other activity

intensities. Three-fourth of all females were not engaged in any vigorous PA, but a quarter of males spent over 3 hours executing vigorous intensity PA which emphasises the need for the promotion of outdoor recreational activities particularly among females.

Nevertheless, a half of females spent over 4 hours engaged in moderate intensity PA weekly [240 mins/week (IQR 60, 675)]. Female dominance in moderate intensity activities is a finding that may inform the design of interventions best fitted to the preferences of female young adults.

5.2.5 Contribution of domains to physical activity levels

Transportation domain contributed the highest (41.4%) to the PA levels of participants. This is different from a study which found out that leisure domain contributed highest to the PA levels of Indian University students (Singh, 2017). Among females, activities of daily living (domestic) contributed the highest (37.08%) followed closely by transportation (35.47%). Therefore, females who met the global recommendation expended more energy in the context of domestic activities than transportation. Therefore, programmes intended to promote PA among resident females must pay due attention to this finding because any commitment that interferes with the performance of domestic activities will most likely exacerbate inactivity.

Among males, transportation contributed the highest (43.7%) followed by leisure (30.1%). This means even though males were more active than females on the whole, the necessity of moving from one place to the other was a key driving force influencing that PA behaviour. Therefore, among male undergraduates any condition that eliminates the necessity of active commuting such as holidays or free days may significantly affect their PA level.

By activity intensity, walking contributed the highest (54.78%) whiles vigorous activities contributed least (30.77%) to the PA level of undergraduates. This was different from findings in a study conducted in India which reported that vigorous intensity activities contributed the second highest (35.15%) (Singh, 2017). The pattern of dominant engagement in walking and minor performance of vigorous intensity activities was same across the different types of residential facility. It can be deduced that walking executed consciously or unconsciously as a form of PA is an integral part of campus life. The PA pattern identified among present study participants is one of overriding engagements in low intensity PA and minimal engagements in vigorous intensity PA.

5.3 Prevalence of physical activity and inactivity

By type of residential facility, study findings indicated that majority of students in the traditional halls were highly active whiles majority of students in the private hostels and new halls were moderately active. The proximity of multiple parks suitable for football, basketball courts, handball court, athletic oval and sports directorate to traditional halls may have motivated resident students to regularly engage in vigorous intensity outdoor PA. On the other hand, regular patronage of shuttles and taxis by students in non-traditional halls can negatively affect walking in the context of transportation leading to reduced PA scores. But the proportional differences in PA levels across the different types of residential facilities were not significant.

Findings from the current study showed that 43% were moderately active, 39.9% were highly active and 17.1% were inactive. Majority of males were highly active (45.6%) compared to females (26.5%) whiles majority of females were moderately active (48.7%) compared to males (40.6). The prevalence of physical activity in reference to WHO global recommendations was found to be 82.9%. This means that 82.9% of participants were

sufficiently active and expended at least 600 MET over 5 or more days in a week. This was higher compared to a similar study conducted among undergraduate students (mean age=23.4, SD=1.0) in Sri Lanka which used the same instrument and found the prevalence of activity to be of 51.7% (Ranasinghe et al., 2016). Additionally, the present finding was again higher compared to an activity prevalence of 78% reported by a study conducted in Malaysia with a short form of the same tool (Rajappan et al., 2015). These variations in the prevalence of PA may be due to the use of either long or short forms of the IPAQ instrument. A study revealed that using the long form may lead to over-reporting of PA compared to the short version (Lebacq et al., 2016).

The prevalence of inactivity in this study was 17.1%. This represents the proportion of participants who did not meet the minimum requirement per the WHO global recommendation. A relatively higher inactivity prevalence (41%) was found among Nigerian university students in a similar study (Adegoke & Oyeyemi, 2011). Also, the proportion of inactive females (24.8%) was significantly ($p<0.01$) higher than the proportion of inactive males (13.9%) in the present study. A meta-analysis of worldwide PA trends involving 1.9 million participants confirmed this gendered difference in the participation of physical activities across different cultures (Regina Guthold et al., 2016).

5.4 Prevalence of Obesity

The overall prevalence of Obesity in this study was 4.5%. But more females (7.7%) were obese compared to males due to higher prevalence of inactivity. Strategies to improve PA on campus must treat the female sex as a priority. This overall obesity prevalence was higher compared to a PA study carried out among university students in Italy which found

the prevalence of obesity to be 1.4%. Additionally, another study reported a 12% obesity prevalence among university students (Jr et al., 2017).

5.5 Association between BMI, BMI categories and PA levels

In this study, the association between BMI categories and PA levels was not statistically significant. This finding was contrary to a study conducted in Malaysia which found a statistically significant association between BMI categories and PA levels (Rajappan et al., 2015). Moreover, results from non-parametric tests showed that there was no correlation between continuous BMI scores and PA levels. A similar study among Sudanese university students also found no statistically significant relationship between BMI and PA levels (Yousif & Kaddam, 2019)

5.6 Association between sociodemographic characteristics and PA levels

The association between sex and PA levels was very highly significant ($p<0.001$). This finding is consistent with a study conducted in the United states among university students (Jr et al., 2017). Level of study was associated with physical activity in this study ($p<0.05$). However, this finding is contrary to a study conducted among Nigerian University students which found no statistically significant association between level of study and PA (Awotidebe et al., 2014). Moreover, the association between age and PA level was significant ($p<0.05$). A study conducted in Malaysia reported a similar finding (Rajappan et al., 2015).

Three variables were used as proxy of socioeconomic status in this study; mother's level of education, father's level of education and car ownership. In Ghana higher post-secondary education is usually associated with higher earnings especially among public

sector workers. A statistically significant association ($p<0.05$) was found between a father's highest educational level and physical activity levels. This is consistent with a Nigerian study which discovered a significant association between socioeconomic status and PA level (Oyeyemi, Oyeyemi, Jidda, & Babagana, 2013).

5.6.1 Association between participation in competitive sports and PA level

The participation was tiered into current participation at the university (within the past 3 months) and previous participation during senior high school.

5.6.1.1 Current Participation

The association between current participation in competitive sports and PA level was statistically very highly significant ($p<0.001$). This is consistent with a study conducted among Egyptian university students which found out that students who joined sports clubs were more likely to be sufficiently active (Badawi & Awadalla, 2011). The positive contribution of university sports to PA levels of young adults in this study is irrefutable and participation in sports was found to be a correlate of high PA level among this group.

5.6.1.2 Previous Participation

Identically, the association between previous participation in competitive sports and current PA levels was statistically very significant ($p<0.01$). Overall 86.5% of students with a history of competitive sports met the global recommendations. This was higher than the proportion of sufficiently active students with no such previous commitments (79.8%). Hence encouraging participation in competitive sports at the secondary education level may have a rippling effect on PA levels during university. More research especially longitudinal studies are needed to fully understand the dynamics involved but reinforcing old PA habits may be easier than forming new ones.

5.7 Predictors of physical activity

None of the independent variables in the multinomial logistic regression was significant. However, study results showed that freshmen were more likely to be inactive than moderately active compared to seniors.

In addition, undergraduates engaged in competitive sporting activities were 26% less likely to be highly active than moderately active than those not involved in competitive sports [OR=0.74 (95% CI= 0.18-1.29)]. A study in Egypt conducted among university students reported that students who were not members of sporting clubs on campus were 1.6 times more likely to be physically inactive compared to students who had joined sports clubs (Badawi & Awadalla, 2011).

Educational level of parents was used as proxy for socioeconomic status in this study. The odds of a student whose father had not gone through any formal education being highly active was 2.52 times as great as the odds of a student whose father had obtained an undergraduate degree. It was explained in a study that adults with higher educational levels like first degree were more likely to be employed in white-collar jobs and earn more income than adults who are less educated (Malambo et al., 2016). Therefore, highly educated adults are more likely to have a higher socioeconomic status which enables them to give their wards sufficient money for upkeep or even buy them cars which may negatively affect PA. Similarly, a study conducted among Egyptian university students, reported that the odds of a university student from a high socioeconomic class being inactive was 2.1 times the odds of a student coming from a family with low socioeconomic status [OR=2.1 (95% CI=1.4-3.1), $p<0.001$] (Badawi & Awadalla, 2011). Undergraduates from affluent homes have a natural tendency to be sedentary and the situation may worsen when they become independent as in the case of resident students.

5.8 Study limitations

1. The use of the IPAQ-LF is associated with over reporting of PA performance so PA levels may be over-estimated due to increased number of items as compared to the short version of the tool.
2. Data was collected close to revision week and so there is likelihood that PA levels may not reflect usual patterns due to increased commitments to academic work.
3. Recall bias especially with respect to activities that were done for at least 10 minutes

CHAPTER SIX

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusion

The predominant physical activity undertaken by resident undergraduates was walking in the context of transportation. Females spent significantly more time in moderate-intensity activities in the household domain than males and males spent significantly longer times in vigorous-intensity activities during leisure time compared to females. However, the differences in PA level by type of residential facility were not significant. Also, the association between BMI categories and PA level was not significant. Being a first-year student and having a high socioeconomic status were significantly associated with inactivity in a bivariate analysis. Majority of resident undergraduates met the WHO global recommendations for adults, but the low prevalence of female participation in leisure time physical activity is worrisome. The results of this study are comparable to the PA behaviour of young adults in other parts of the world.

6.2 Recommendations

1. The key performance indicators in the University of Ghana Strategic plan (2014-2024) under internal stakeholders (Priority 3) should be expanded to include 100% improvements in sports facilities on campus in order to increase participation in competitive sports.

2. The University of Ghana Academic Board should consider the inclusion of selected sporting disciplines in the list of university required courses for selection especially by first year students which should count in their final CGPA score.

3. Only 1.3% of participants in the present study reported cycling for transport. It will be valuable for a research to be done to determine the Bikeability index on campus to ascertain if it is a basic or underlying cause in this regard.

4. Transport-related PA contributed highest to the PA level of undergraduates and the proportions of inactivity were relatively high among non-traditional halls compared to traditional halls. A qualitative and quantitative research to find out barriers to walking on campus especially among female undergraduates and to determine walkability indices around non-traditional halls should be conducted respectively.

5. The SRC through the women's commission should promote leisure time physical activity among female undergraduates through education and provide extra incentives for female sports students.

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APPENDICES

APPENDIX 1

Participant Information Sheet

Physical Activity Levels of Resident University of Ghana Undergraduate Students.

Introduction

My name is Bernard Opoku Ofosu, a Master of Public Health student at the School of Public Health, University of Ghana. My contacts are **0558310179/0262644907**. My e-mail address is benofosuphd@gmail.com.

Background and Purpose of Research

We invite you to take part in a research project entitled: **Physical Activity Levels of Resident University of Ghana Undergraduate students.** We are gathering data on Physical activity behaviour of resident university undergraduate students. Data for this research will be collected by one of the members of the research team. Your voluntary approval is required for inclusion in this study. This research is designed to measure and describe physical activity levels of resident undergraduate students of the University of Ghana.

This information sheet will give you a basic idea of what the research is about and what your participation will involve.

General information about Research

Physical activity (PA) refers to bodily movements that is produced by contraction of skeletal muscle resulting in a considerable increase in energy expenditure. Regular PA is essential in the control and prevention of non-communicable diseases. Performing sufficient amount of PA confers on the individual enormous physical and psychosocial benefits like improved learning abilities, prevention of obesity and reduction in depression and stress levels. Investigating the PA levels of young adults like university students is important since PA behaviour may persist into later adult years and affect health. Three

forms of physical activity are recognized by the world health organization (WHO). These are low-intensity (e.g. walking), moderate-intensity (e.g. carrying light loads) and vigorous-intensity (e.g. digging). PA can be described in terms of frequency, duration and intensity of an activity. Duration and frequency refer to how long and how often an activity is performed respectively. Intensity looks at how much energy is required to perform an activity.

Nature of the Study

This study is descriptive cross-sectional and so data will be collected just once. Physical activity is usually performed across different domains (modes) so this study will look at your PA over **the last 7 days** across four modes; which are transportation, occupation, domestic and leisure-time. This will help us measure your total PA over the one week period.

This study is a Master of Public Health degree project work for the principal investigator (PI). It has the support of the University of Ghana and Ghana Health Service to be carried out. You have been selected to participate in this study because you are a resident undergraduate student. Results from this study will generate evidence on the prevalence of PA among resident students and provide direction for future interventions aimed at increasing PA among students. The interview process will last for a maximum of 30 minutes or less.

Who can participate in the research?

Healthy Undergraduate resident students who do not have any condition that prevents them from engaging freely in any physical activity of their choice.

What should I expect during my participation?

A research assistant will measure your height and weight followed by an interview on your physical activity behaviour with respect to work, transportation, household and domestic chores and leisure-time.

What are the possible discomforts and risks of participation?

Although there are no known discomforts and risks associated with this research, the research team has taken reasonable safeguards to minimise potential but unknown risks. If you experience psychological distress or other discomforts as a result of your participation in this study, please contact the principal investigator.

Possible benefits

There are no direct benefits to you for participating in this research. The results obtained from this study that will inform authorities on student's PA behaviour and generate evidence for future interventions.

Cost

Participants will not incur any cost for taking part in this study.

Compensation for Participation

There will be no compensation for your participation. Your participation is greatly appreciated.

Will the privacy and confidentiality of my research records be protected?

The confidentiality of data collected at your facility and its environment will be maintained by keeping identities and research records anonymous, storing data securely and making it accessible to investigators only, and removing identifiers and using a pseudonym to protect your identity.

Voluntary Participation and Withdrawal

Your participation in this project is entirely voluntary. You can withdraw from the study any time you want to without any penalty.

Outcome and Feedback

The outcome of this study will be published on the University of Ghana online thesis portal.

Funding

This study is funded solely by the principal investigator without support from any organization.

Sharing of Participant Data

Data generated from this study will be in the custody of only the principal investigator and will not be shared or transmitted to any third party. The principal investigator has exclusive ownership of the data.

Storage of Data

Research data will be retained for 5 years just in case the original data set needs to be referred to by an authorized Academic board. Also, another protocol will be submitted to an appropriate Ethical Review committee before use as secondary data in the future. Data on paper questionnaires will be destroyed after 5 years by shredding and stored electronic data will be deleted permanently.

Provision of Information and Consent

Participants will be given personal copies of information sheet and signed consent to keep as part of ethical requirements for this study.

Contacts for Additional Information on the study

If you have a complaint or you wish to seek further clarification, please contact:

Principal Investigator: Bernard Opoku Ofosu, Department of Population, Family, and Reproductive Health, School of Public Health, Box LG 13 University of Ghana Email: benofosuphd@gmail.com **Telephone:** +233 (0) 558310179

Administrator at the Ghana Health Service Ethical Review Committee Office: Madam Hannah Frimpong, between the hours of 8am-5pm via telephone 0507041223 or email address: Hannah.Frimpong@ghsmail.org.

CONSENT FORM

Study Title: PHYSICAL ACTIVITY LEVELS OF RESIDENT UNIVERSITY OF GHANA UNDERGRADUATE STUDENTS

PARTICIPANTS' STATEMENT

I acknowledge that I have read the purpose and contents of the Participants' Information Sheet read and that all questions have been satisfactorily explained to me in a language I understand (English). I fully understand the contents and any potential implications as well as my right to change my mind (i.e. withdraw from the research) even after I have signed this form. I voluntarily agree to be part of this research.

Name or Initials of Participant……. ID Code …….

Participants' Signature …….

Date: …….

INVESTIGATOR STATEMENT AND SIGNATURE

I certify that the participant has been given ample time to read and learn about the study. All questions and clarifications raised by the participant have been addressed.

Researcher's name…….

Signature …….

Date…….

APPENDIX 2

UNIVERSITY OF GHANA

School of Public Health

Questionnaire for Study Titled: PHYSICAL ACTIVITY LEVELS OF RESIDENT UNDERGRADUATE UNIVERSITY OF GHANA STUDENTS.

SECTION A: Background Information

1. Sex of Respondent (1). Male [ ] (2). Female [ ]
2. How old are you? …… years (age on your last birthday)
3. Marital status 1. Single/Never married (2) Married (3) Divorced
4. What is your current level of study? (1) Level 100 (2) Level 200 (3) Level 300 (4) Level 400
5. Indicate college based on your programme of study (1) College of basic and applied science (2) College of humanities (3) College of Health sciences (4) College of education
6. What is your mother's highest level of education? (1) No education (2) Primary (3) JHS/JSS (4) SSS/SHS (5) Undergraduate (6) Postgraduate
7. What is your father's highest level of education? (1) No education (2) Primary (3) JHS/JSS (4) SSS/SHS (5) Undergraduate (6) Postgraduate
8. Have you been involved in any competitive sports in the past 3 months? (1) Yes (2) No
9. Were you involved in any competitive sports during your secondary school days? (1) Yes (2) No
10. Did you drive your own car on campus or have you had access to a private vehicle (e.g. a friend's vehicle) in the past 3 months? (1) Yes (2) No

SECTION B: Anthropometry (measure weight and height twice and record average).

W 1(kg) …… **W2 (kg) ……** **WEIGHT (KG)** | |

H1 (m)…….. **H2 (m) ……** **HEIGHT (m)** | |

BMI (kg/m^2) |

SECTION C: PHYSICAL ACTIVITY

We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives. The questions will ask you about the time you spent being physically active in the **last 7 days.** Please answer each question even if you do not

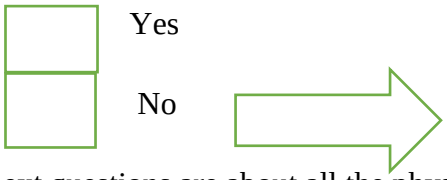
consider yourself to be an active person. Please think about the activities you do at work, as part of your house work and yard work, to get from place to place and in your spare time for recreation, exercise or sport.

Think about all the vigorous and moderate activities that you did in the last 7 days. Vigorous physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. Moderate activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal.

PART 1: JOB-RELATED PHYSICAL ACTIVITY

The first section is about your work. This includes paid jobs, farming, volunteer work, course work and any other unpaid work that you did outside your home. Do not include unpaid work you might do around your home like housework, yard work, general maintenance and caring for your family. These will be asked in Part 3.

1. Do you currently have a job or do any unpaid work outside your home?



Yes

No → **Skip to Part two**

The next questions are about all the physical activity you did in the last 7 days as part of your paid or unpaid work. This does not include travelling to and from work.

2. During the last 7 days, on how many days did you do vigorous physical activities like heavy lifting, digging, heavy construction or climbing upstairs as part of your work? Think about only those physical activities that you did for at least 10 minutes at a time.

   ……. days per week

   ☐ No Vigorous job-related physical activity → **Skip TO Q4.**

3. How much time did you usually spend on one of those days doing vigorous physical
   Activities as part of your work?

   …… hours per day **Total (mins)** ☐
   …… minutes per day

4. Again, think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days,** on how many days did you do moderate physical activities like carrying light loads as part of your work? Please do not include walking.

   …….. days per week

☐ No moderate job-related physical activity → **Skip TO Q6**

5. How much time did you usually spend on one of those days doing moderate physical activities as part of your work?
   …….hours per day **Total (mins)** ☐
   …….minutes per day

6. During the **last 7 days,** on how many days did you **walk** for at least 10 minutes at a time as part of your work? Please do not count any walking you did to travel to or from work.
   ……. days per week

   ☐ No job-related walking → **Skip to Part 2**

7. How much time did you usually spend on one of those days walking as part of your work?
   …… hours per day **Total (mins)** ☐
   …… minutes per day

PART 2: TRANSPORTATION PHYSICAL ACTIVITY

These questions are about how you travelled from place to place, including to places like work, stores, movies and so on.

8. During the **last 7 days,** on how many days did you travel in a motor vehicle like a train, bus, or car?
   ..... days per week

   ☐ No travelling in a motor vehicle → **Skip to Q10**

9. How much time did you usually spend on one of those days travelling in a train, bus, car, or other kinds of vehicle?
   ……hours per day **Total (mins)** ☐
   ……Minutes per day

10. During the **last 7 days,** on how many days did you bicycle for at least 10 minutes at a tie to go from place to place?
    ……. days per week

    ☐ No bicycling from place to place → **Skip to Q12**

11. How much time did you usually spend on one of those days to bicycle from place to place?
    ……hours per day **Total (mins)** ☐
    ……minutes per day

12. During the **last 7 days,** on how many days did you walk for at least 10 minutes at a time to go from one place to another place?
…….. days per week

☐ No walking from place to place → **Skip to Part 3**

13. How much time did you usually spend on one of those days walking from place to place?
…….hours per day **Total (mins)** ☐
……Minutes per day

PART 3: HOUSEWORK, HOUSE MAINTENANCE AND CARING FOR THE FAMILY.

This section is about some of the physical activities you might have done in the **last 7 days** in and around your Hall (and if you went home) like housework, gardening, yard work, general maintenance work and caring for your family.

14. Think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days,** on how many days did you do vigorous physical activities like heavy lifting, chopping wood, shoveling snow, or digging in the **garden or yard?**

..... days per week

☐ No vigorous activity in garden or yard → **Skip to Q16**

15. How much time did you usually spend on one of those days doing vigorous physical activities in the garden or yard?
…….hours per day **Total (mins)** ☐
…… minutes per day

16. Again, think of only those physical activities that you did for at least 10 minutes at a time. During the last 7 days, on how many days did you do moderate activities like carrying light loads, sweeping, washing windows and raking **in the garden or yard?**
…… days per week

☐ No moderate activity in garden or yard → **Skip to Q18**

17. How much time did you usually spend on one of those days doing **moderate** physical activities in the garden or yard?
…….hours per day **Total (mins)** ☐
…….minutes per day

18. Once again, think about only those physical activities that you did for at least 10 minutes at a time. During the last 7 days on how many days did you do moderate activities like carrying light loads, washing windows, scrubbing floors and sweeping **inside your home/hall? (it's different from Q16 above).**

……. days per week

☐ No moderate activity inside home → **Skip to Part 4**

19. How much time did you usually spend on one of those days doing moderate physical activities inside your home?
……hours per day **Total (mins)** ☐
……minutes per day

PART 4: RECREATION, SPORT, AND LEISURE-TIME PHYSICAL ACTIVITY

This section is about all the physical activities that you did in the **last seven days ON CAMPUS OR OFF-CAMPUS** solely for recreation, sport, exercise or leisure. Please do not include any activities you have already mentioned.

20. Not counting any walking you have already mentioned, during **the last 7 days,** on how many days did you walk for at least 10 minutes at a time in your leisure time?

…… days per week

☐ No walking in leisure time → **Skip to Q22**

21. How much time did you usually spend on one of those days **walking** in your leisure time?
……hours per day **Total (mins)** ☐
……minutes per day

22. Think about only those physical activities that you did for at least 10 minutes at a time, during the **last 7 days,** on how many days did you do vigorous physical activities like aerobics, running, fast bicycling or fast swimming **in your leisure time?**

.....days per week

☐ No vigorous activity in leisure time → **Skip to Q24**

23. How much time did you usually spend on one of those days doing **vigorous** physical activities in your leisure time?
……hours per day **Total (mins)** ☐
……minutes per day

24. Again, think about only those physical activities that you did for at least 10 minutes at a time. During **the last 7 days,** on how many days did you do **moderate** physical activities like bicycling at a regular pace, swimming at a regular pace, tennis etc.?

……days per week

☐ No moderate activity in leisure time ⇨ **Skip to PART 5**

25. How much time did you usually spend on one of those days doing moderate physical activities in your leisure time?

……hours per day **Total (mins)** ☐
……minutes per day