

EVIDENCE ON PHYSICAL ACTIVITY AND SEDENTARY BEHAVIOUR IN GHANA: A RAPID SCOPING REVIEW

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ABSTRACT

In Ghana, more than four in ten deaths in 2016 resulted from non-communicable diseases (NCDs). Physical inactivity and sedentary behaviours are important risk factors for NCDs. No previous systematic reviews examining physical activity and sedentary behaviour among Ghanaians were identified. Therefore, this rapid scoping review was conducted to find and synthesise what is known about the epidemiology of physical activity and sedentary behaviour of children and adults in Ghana. MEDLINE was searched for eligible studies and a narrative synthesis was conducted based on 17 identified papers as well as the 2008 Demographic and Health Survey report. Little recent high-quality data on prevalence of physical activity or sedentary behaviour in Ghana was found. Existing nationally representative data is now more than ten years old. The data identified suggest that the majority of Ghanaian adults, aged 18+ years, are physically active, achieving or exceeding World Health Organisation (WHO) recommendations (84.3% according to data collected in 2007-2008). Studies reporting sedentary behaviour in adults further suggest that the majority of Ghanaians are minimally sedentary. The most consistent associations with physical activity were by gender (men achieved more than women), employment (the employed, particularly in skilled manual jobs, achieved more than the unemployed), urban or rural residence (rural inhabitants achieved more than urban inhabitants) and socio-economic status (lower physical activity with increasing socio-economic status). Meanwhile, the few existing studies of physical activity in children (all of which investigated children aged 12+ years) suggest that the proportion of children achieving WHO recommendations on physical activity may be lower than for adults. A similar gender trend exists for children as in the adult data, with boys achieving more physical activity than girls. Physical activity is accrued most frequently through active travel, and active occupations, while leisure time physical activity is low. This means that the Ghanaian population may be vulnerable to becoming increasingly inactive as work and travel become more frequently mechanised and sedentary.

Key words: Ghana, review, non-communicable disease, Epidemiology, Physical activity, behaviour



INTRODUCTION

Globally non-communicable diseases (NCDs) like cancers and cardiovascular diseases (CVDs) are the leading cause of death [1]. According to the World Health Organisation (WHO), low-and-middle-income countries (LMICs) are disproportionately affected, with 78% of all NCD deaths in 2018 occurring in LMICs [2]. In Ghana, 43% of all deaths in 2016 resulted from NCDs [2]. Physical inactivity and sedentary behaviour are important risk factors for NCDs [3].

The WHO recommends at least 150 minutes of moderate-intensity or at least 75 minutes of vigorous-intensity aerobic physical activity (PA) per week for adults (aged 18–64), or an equivalent combination of the two (known as moderate to vigorous physical activity or MVPA), to protect against disease [2]. The WHO further recommends that children and adolescents aged 5-17 years should do at least 60 minutes of MVPA daily [2].

In 2020, the Ghanaian ministry of health sought to develop food-based dietary guidelines and as part of this work sought evidence on the prevalence of behavioural risk-factors of non-communicable diseases. Literature synthesising evidence on physical activity and levels of sedentary behaviour in Ghana, and whether particular population sub-groups are at risk is lacking. A systematic search was conducted to identify published systematic reviews which examine the literature on PA in Ghanaians, but none were found. A systematic review published in 2007 that searched MEDLINE and EMBASE up to 2005 found no paper reporting on the prevalence of physical inactivity in Ghanaians [4]. For this reason, a rapid scoping review and evidence synthesis to answer the following research questions was undertaken.

1. What is reported in the published literature on the epidemiology of PA of children and adults in Ghana?
2. What is reported in the published literature about the epidemiology of sedentary behaviour of children and adults in Ghana?

MATERIALS AND METHODS

This was a rapid scoping review undertaken over a period of 3 weeks. The MEDLINE database was searched from inception until 7th September 2020 in one comprehensive systematic search including free text and Medical Subject Heading (MeSH) terms associated with (i) PA and sedentary behaviour and (ii) Ghana, with terms being combined using Boolean operators. MEDLINE was chosen as it is one of the largest health and medical databases globally with significant coverage of African journals. Studies were identified as eligible if they reported any quantitative data on PA or sedentary behaviour in a Ghanaian child or adult population, residing in Ghana. Papers reporting data collected from Ghanaian populations living in other countries were excluded. Titles and abstracts of identified records were screened by one reviewer (OO) and potentially relevant studies were retrieved in full. Full texts were reviewed and any relevant data were extracted from primary studies by one reviewer (either OO or DM). Studies that did not contain any relevant data were excluded, and where multiple papers



reported data from the same study, the most comprehensive or recent publications were selected for inclusion in the narrative synthesis.

In addition to studies identified from our literature search, the 2008 and 2014 Demographic and Health Survey (DHS) reports were also examined for data relating to PA, sedentary behaviour, or recreational activities.

RESULTS

A total of 174 unique results were identified through the search. Of these, 47 were identified as potentially relevant and retrieved in full for review. Data from the WHO Study on global AGEing and adult health (SAGE) wave 1 and/or 2 were presented in 14 of the potentially relevant papers; 5 papers presented data from the “modelling the epidemiologic transition study” (METS); 3 papers presented data from the biennial Report Cards on Physical Activity for Children and Youth; 2 papers presented data from the 2012 Global School-based Student Health Survey.

The 2008 and 2014 Demographic and Health Survey (DHS) Reports were also examined for data relating to PA, sedentary behaviour or recreational activities. However, only the 2008 report presented relevant data. The narrative synthesis presented is based on 17 papers alongside the 2008 DHS Report.

Adults

Physical Activity

Six studies collected and reported data on PA in samples of the general population of Ghanaian adults. The findings of these studies are reported in Table 1.

The DHS programme collects nationally representative data at regular intervals in many LMICs, including Ghana. The 2008 survey questionnaire asked participants how many days they completed at least 15 minutes of vigorous PA in the previous week. A total of 4,916 women age 15-49, and 4,568 men age 15-59 from 6,141 households were interviewed. While these data are more than a decade old, and the measure does not map to WHO recommendations, because of the large nationally representative sample, these data are valuable in providing a snapshot of the proportion of Ghanaians who achieved any weekly vigorous PA, and which population groups were most likely to be physically active. The DHS found that, 53.3% of women and 27.2% of men aged 15-49 stated that they had not undertaken any vigorous PA in the past seven days. Women age 20-29 and men age 45-49, urban respondents, those living in the Central and Greater Accra regions, and those in the higher wealth quintiles were most likely to report that they did not engage in any vigorous PA during the seven days preceding the survey [5].

For women, descriptive statistics from the DHS 2008 report suggested that women aged 45-49 and those who are currently employed were generally more likely to be engaged in vigorous PA three or more times a week than women of other age groups and unemployed women. More rural women than urban women reported vigorous PA three or more days a week (36.6% and 23.6%, respectively). In terms of regional



variations, women in the Upper East region were the most likely to be engaged in vigorous PA three or more days a week, while women in the Greater Accra region were the least likely. The proportion of women reporting vigorous PA declined with increasing levels of education and wealth. For example, only 25% of women with higher education engaged in vigorous PA three or more days a week, compared with 39% of women with no education. Similarly, the proportion of women in the lowest wealth quintile (44%) to engage in vigorous PA three or more days a week was twice that of women in the highest wealth quintile (22%) [5].

For men, the DHS report suggests that never-married and currently married men, men age 30-34 years, and men employed for cash were more likely to report vigorous PA three or more days a week than formerly married men, men in other age groups, and men not employed for cash. As with women, rural men, men in the Upper East region, men with no education, and men in the poorest households were more likely to engage in vigorous PA three or more days a week than other men [5].

The WHO-SAGE survey, a nationally representative survey aged 18+, including 5,110 participants in Ghana in 2007-2008, used the validated Global PA Questionnaire (GPAQ) to assess levels of PA. As with the DHS data, these data are more than a decade old; however, being nationally representative and using a validated measure that allows comparison to WHO recommendations makes these valuable data. One study using WHO-SAGE data found that 84.3% met WHO recommendations of achieving 150 minutes of MVPA weekly [6]. Unlike the data from the DHS, this study found that those missing the WHO target increased with age in both men and women. However, in line with the DHS data, this study reported that PA was higher in rural than urban participants, and decreased with income quintile [7].

Another study used the WHO-SAGE data to examine those achieving PA recommendations through occupational or leisure time PA and active travel respectively. In this case 24.0% did fewer than 150 minutes of MVPA at work, 83.4% did fewer than 150 minutes of MVPA in their leisure time and 18.8% did fewer than 150 minutes of MVPA through walking and cycling. Rural-urban migrants and urban participants were less likely to achieve PA at work than rural participants in the study. However, leisure time PA was higher in migrant and urban participants than in rural participants, although this was not a significant difference [8].

The METS collected accelerometry data from 500 participants aged 25-45 in rural Ghana (Nkwantakese in the Afigya-Kwabre District of the Ashanti Region and surrounding villages) in 2010-2012. One study using these data reported that 39.1% of participants were physically active, but no definition of physically active was included in the study report. Individuals with low education and wealth were more likely to do PA [9]. In a further published study using these data, 35.3 minutes/day of moderate or vigorous activity were achieved by participants on average. Participants in skilled manual occupations showed the highest levels of MVPA in Ghana (41.8 minutes/day). Car ownership was also associated with lower MVPA [10].



The Research on Obesity and Diabetes among African Migrants (RODAM) study recruited participants in Ghana (and other study sites) between 2012 and 2015. A total sample of 596 urban women, 326 rural women, 234 urban men and 214 rural men aged 18-70 completed the GPAQ. The data were used to determine PA in metabolic equivalent of task (MET) h/week, including PA at work, while commuting and in leisure time. Participants were classified into one of three groups based on their total PA: Ideal (150+ minutes MVPA weekly, equal to the WHO recommendations), intermediate (up to 149 minutes MVPA weekly), poor (0 minutes of MVPA weekly). They found that the vast majority of rural women and men met WHO recommendations, 85.5% and 86.8%, respectively. Most urban men and women also achieved this, 75.2% and 60.5%, respectively. The percentage who did not achieve any MVPA weekly ranged from 11.1% of rural women and 11.3% of rural men to 23.1% of urban men and 36.5% of urban women [11]. The urban-rural trend here matching that reported by the studies discussed above. Regarding gender, PA in this study is similar for men and women in rural settings; however, in urban settings women achieve less PA than men in line with the studies discussed above.

A cross-sectional study of 204 Ghanaian adults aged 25+, completed in Kumasi in 2018, used 3 questions to assess PA “Do you regularly exercise?” “What kind of exercise do you engage in?” “How long does it take when you are exercising”. The study did not report how the answers to these questions were translated into what was reported in the paper. The paper reported that 76.5% of respondents stated that they did at least 30 minutes of daily walking and 21.6% stated that they “undertook exercise routinely” [12].

The 2011 Urban Poverty and Health Survey collected data from 201 participants aged 15-24. Self-reported leisure time PA was collected by asking a question on the number of times a participant was active in their ‘free time’ in the week preceding the survey. In this study most of the sample had not undertaken any PA in their ‘free time’ (84.1%) which was higher in female (94.7%) than for males (70.5%). A small percentage had done PA in their free time one-four times in the last week (9.5%) and just 6.5% had done PA five times or more. Males were much more likely than females to be in this latter (more active) group (13.6% vs 0.9%) [13].

Four further studies examined PA behaviour in specific population groups. The GPAQ was used to measure PA in 61 older urban adults recruited through church groups [14]. Eighty-two percent reported meeting PA recommendations, 16% reported no PA, with the remainder active to some degree. A study of 218 women aged over 40 years, recruited through an urban mega-church, found that 75.9% reported exercising sometimes or often and 24.1% reported never having exercised [15]. A study of 180 employees of a financial institution in Accra (aged 19-54) found that 46.6% were inactive (held a sedentary job and did not engage in any physical exercise or cycling), 16.7% were active either achieving >180 minutes of PA through leisure and travel despite having a sedentary job, or a standing, physical or heavy manual job alongside reduced leisure and travel PA [16]. The GPAQ was used to measure PA in 53 participants aged 18-60 with sickle cell disease and recruited from Korle-Bu Teaching Hospital, Accra. In total, male participants achieved 5713.5 ± 4168.0 metabolic

equivalents (METs) per week while female participants achieved 3184.4 ± 2895.2 METs per week, which translates roughly to 19 hours of MVPA for men and 10 hours of MVPA for women, far exceeding WHO recommendations. Male participants achieved a large proportion of this through occupational PA. Male participants achieved $33.3 (\pm 107.6)$ METs per week of vigorous PA at work, while females achieved zero at work. Male participants achieved $1834.45 (\pm 1919.2)$ METs per week of moderate PA at work and females achieved $432.5 (\pm 899.9)$ [17].

Sedentary behaviour

Just three studies measured and reported sedentary behaviour in Ghanaian adults, and only one of these used a general population sample. Participants of the WHO-SAGE survey were asked to state the total time they usually spent sitting or reclining including at work, at home, getting to and from places, or with friends (for example, sitting at a desk, sitting with friends, travelling in car, bus, train, reading, playing cards or watching television). This did not include time spent sleeping. A paper reporting these data stated that 6.4% of participants were sedentary for 8 hours or more daily (95% confidence interval: 5.1–8.1%) [6].

The GPAQ was used in both a study of older Ghanaian adults recruited through church groups in urban areas and in patients aged 18-60 with sickle cell disease. These studies found that mean (\pm SD) sedentary time was 233.9 (\pm 164.4) minutes per day or between 3 and 4 hours in the older urban adults and 535.7 (\pm 193.1) for male participants and 478.3 (\pm 143.2) for female participants with sickle cell disease or 8-9 hours approximately [14,17].

The Population, Health and Poverty project, using GPAQ to collect data from 675 urban poor participants aged also found that 46.3% to be sedentary for one to three hours per day with 34.1% spending more than 3 hours per day doing nothing [18].

Children

Physical Activity

Five studies in total reported data on PA in children. Three of these collected empirical data from child or adolescent participants and the findings are summarised in Table 2.

The 2012 Global School-based Student Health Survey measured PA in a nationally representative sample of 1,542 13-17-year-old school attenders, with a single validated self-reported question: "During the past 7 days, on how many days were you physically active for a total of at least 60 minutes per day?". Using the WHO recommendation that children should be active for at least 60 minutes on five days or more per week, 25.0% (29.0% males and 21.9% females) of secondary high school students were sufficiently physically active. Female students (Adjusted Prevalence Ratio (APR) = 0.78, 95% CI = 0.65, 0.94), students in form 2 (APR = 0.76, 95% CI = 0.577, 0.941) and form 3 (APR = 0.79, 95% CI = 0.63, 0.93), and those who went hungry (APR = 0.77, 95% CI = 0.65, 0.92) were less likely to be sufficiently physically active compared to males, those in form 1 and those who did not go hungry, respectively. On the other hand, students who actively commuted to school (APR = 2.40, 95% CI = 1.72, 2.42) and got support from



their peers (APR = 1.62, 95% CI = 1.09–2.41) were more likely to be sufficiently physically active [19].

A further study conducted in senior high schools, published in 2013, collected data from 480 participants (aged 15-19) in 2 schools using the IPAQ to measure PA. Based on these data, 151 students (34.0%) were considered to achieve “high” levels of PA, at least 7 days of any combination of walking, moderate or vigorous intensity activities accumulating at least 3000 MET-minutes/week. A total of 219 (49.3%) students were considered to have moderate levels of PA, at least 5 days of any combination of walking, moderate-intensity or vigorous intensity activities achieving between 600 and 2999 MET-minutes/week. The remainder were considered to have low levels of PA (74, 16.6%). The gender trend was in line with other studies, with 45% of males and 27% of females engaging in high levels of PA, while 11% of males and 19% of females engaged in low levels [20].

A cross-sectional survey carried out June-August 2008 with students aged 12-18 years of 30 schools from Eastern, Greater Accra and Volta regions investigated PA by asking participants to self-report how physically active they were. Response options were ‘not physically active’, ‘a little physically active’, ‘physically active’ and ‘very physically active’. Almost 70% were determined to be physically active or very physically active by this measure [21].

One study collected data from school head teachers or administrators on the frequency and length of weekly time-tabled PA sessions. This study found an average of 69 minutes timetabled weekly PA: 76.5 minutes in private schools and 60.0 minutes in public schools [22].

The 2018 Report Card on PA for Children and Youth stated based on expert observations that 48% of children and youth engage in some kind of moderate or vigorous PA, although this appears to contradict an additional reported finding that 54-59% of children and youth are engaged in organised school-based sports and that 54% of children and youth walk to school and back home covering about 2km, and that 60% of Ghanaian children and youth engage in various forms of play-based activities at school, home and in open spaces [23].

Sedentary behaviour

The 2018 Report Card on PA for Children and Youth did not identify data relating to children or youth’s sedentary behaviour and/or screen time [23].

DISCUSSION

This rapid scoping review finds that the majority of Ghanaian adults appear to be physically active, achieving or exceeding WHO recommendations (84.3% according to data collected in 2007-2008). This is in line with, or slightly better than data from 22 African countries participating in the STEPwise approach to chronic disease risk-factor surveillance (2003-2009) which found that overall 83.8% of men and 75.7% of women met WHO PA recommendations [24]. The most consistent associations with PA were



by gender, employment, urban or rural residence and socio-economic status. Meanwhile, the few existing studies of PA in children suggest that the proportion of children (at least within the adolescent age-groups that have been studied) achieving WHO recommendations on PA may be lower than for adults. Although few studies reported this finding, it appears to be consistent with global trends [25,26].

Gender differences in PA are supported by qualitative findings of perceptions among Ghanaian women indicating that vigorous PA is for young men and athletes [15]. Many Ghanaian women are reported to view daily activities and house chores as the main means of engaging in PA [15,27]. Historically, there have been deep-rooted cultural expectations for African women to possess some buxomness, which is largely viewed as the ideal body size, although this is changing according to some recent studies [28, 29, 30]. There are also findings of women not knowing PA recommendations or what type of exercises are safe for them [14,27]. Qualitative studies have found that adult Ghanaian women express little or no preference for organised fitness facilities [14,15].

The most consistent finding in children reflects this same gendered difference in PA prevalence. This is consistent with findings in other African populations in Burkina-Faso, Ethiopia, Nigeria, Uganda [36], and appears to be a global phenomenon [25]. In their pooled analysis of cross-sectional data on adolescents in 146 countries, including Ghana, Guthold and colleagues found that the prevalence of insufficient PA reduced significantly in boys between 2001 and 2016 with no major change in girls. This difference was attributed to societal norms that, for example, require girls to support domestic work at home [25]. In some cultures, including many parts of Africa [37,38], there is a longstanding belief that the girls' place is in the home, while male children are allowed more time outdoors. Such stereotypes are believed to afford both boys and men more opportunities to engage in PA. A systematic review of qualitative studies also found that competitive PA put adolescent girls off and reduced self-efficacy, due to pressure to win (which "takes the fun out") and the fear of stigma of failure in the presence of peers [39], compared to boys who appeared to value competition [40]. Girls were motivated by activities that enabled interactions with their friends, or to keep in shape [39,40].

Employment is found to be associated with higher levels of PA in men and women both in the DHS, the METS, and WHO-SAGE data showing that more PA is accrued through working hours rather than leisure time. There was a much higher proportion of participants who were not physically active in the study of workers in a financial institution, and few participants in the Urban Poverty and Health survey undertook PA in their leisure time. It is likely that finding ways to keep people active either at work or increasing leisure time PA will be increasingly important.

It is likely that urban residence and socio-economic status are partially correlated. Both are risk-factors for lower PA. Given that little PA is accrued during leisure time, it is not surprising that rural residents, compared to urban residents whose jobs are more likely to be sedentary and rely increasingly on motorised transport and electronic gadgets for housework, would be more physically active. Apart from using assistive gadgets, many educated middle-and-upper-class women resident in cosmopolitan cities



are likely to rely on domestic workers for housework which may explain the larger gender difference in PA for urban than for rural residents [41,42].

CONCLUSION

There is little recent high-quality data on prevalence of PA or sedentary behaviour in Ghana. Existing nationally representative data are now more than 10 years old. Other studies take specific populations or convenience samples, so although they report characteristics associated with PA levels, they are unable to estimate the proportion of the Ghanaian population currently meeting PA recommendations. WHO-SAGE suggests that in 2007-2008 a large majority of Ghanaian adults were meeting PA recommendations of 150 minutes per week. Sedentary behaviour appears to be low.

Being female, unemployed, residing in an urban area, higher socio-economic status (wealth, income, education) and car ownership are all likely to be associated with lower PA. Being formerly married (for men) and living in Central and Greater Accra regions may also be risk factors for reduced PA. Although increasing age is reported to be a risk-factor for reduced PA, there is also a finding that PA was lowest in women aged 20-29 years in the DHS 2008. For children, some associations appear to be similar to adult populations: being female and older is associated with less PA, and active commuting to school is associated with more PA. One difference is that rather than being poor being associated with greater PA, in the one study reporting such an association “going hungry” was associated with less PA.

In Ghana, PA is mainly achieved through walking and cycling, with occupational PA also high. This may mean the Ghanaian population is vulnerable to becoming increasingly inactive as work and travel become increasingly mechanised and sedentary.

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Table 1: Summary of studies reporting PA data for the general population of adults

Study	Key methodological consideration	Key findings	Populations at risk
DHS 2008	Nationally representative sample aged 15-49 A single PA question, asking about weekly vigorous PA	53.3% of women and 27.2% of men did not achieve any vigorous PA in the past week	Risk factors for lower achievement of vigorous PA: <ul style="list-style-type: none"> • Being female • Living in Central and Greater Accra regions • Higher wealth • Urban residence • Increasing education • Unemployment • For men only: being formerly married • Aged 45-49 (the oldest age-group in the data) For women only: <ul style="list-style-type: none"> • Aged 20-29
WHO-SAGE study reported in Wu et al, 2015 and Oyebode et al, 2015	Nationally representative sample aged 18+ GPAQ, validated questionnaire which maps to WHO recommendations	15.7% did not meet WHO recommendations on PA (<150 minutes of MVPA weekly) The majority of MVPA was achieved through occupational PA, walking and cycling.	Risk factors for failure to meet recommendations: <ul style="list-style-type: none"> • Urban residence • Increasing income • Increasing age
METS reported in Stingham et al, 2016 and Shoham et al, 2015.	Rural participants only, aged 25-45. Random sample based on the census in a	39.1% were physical active (undefined) An average of 35.3 minutes of	Risk factors for lower PA: <ul style="list-style-type: none"> • Higher education • Greater wealth • Unemployment



	purposively sampled study site. PA measured using an accelerometer	MVPA were achieved daily.	<ul style="list-style-type: none"> • Car ownership
RODAM reported in (van Nieuwenhuizen et al, 2018)	Multi-stage probability sample from purposively sampled urban and rural sites. WHO STEPS questionnaire, including the GPAQ, used to compute MET h/week	11.1% of rural women, 36.5% of urban women, 11.3% of rural men and 23.1% of urban men did not achieve any MVPA weekly. 85.5% of rural women, 60.5% of urban women, 86.8% of rural men and 75.2% of urban men achieved WHO recommendations of PA.	Risk factors for lower PA <ul style="list-style-type: none"> • Urban resident • Being female, if urban
Oweridu et al, 2019	Two stage random sampling of adults aged 25+ from one purposively sampled urban site. Three questions on PA that don't obviously match what was reported	76.5% stated they did at least 30 minutes of daily walking. 21.6% stated that they "undertook exercise routinely"	None reported.
The Urban Poverty and Health Survey Reported in Afrifa-Anane et al, 2015	Systematic sampling of adults aged 16-24 from 29 randomly selected enumeration areas within three localities. Self-reported leisure time PA was collected using a question on the number of times a participant	84.1% had not undertaken any PA in their 'free time', 94.7% of females and 70.5% of males. 6.5% had done PA 5 times or more in the past week, 13.6% of males, 0.9% of females.	Risk factors for lower levels of PA: <ul style="list-style-type: none"> • Being female

	was active in their free time in the past 7 days preceding the survey.		
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Table 2: Summary of studies reporting PA data for children

Study	Key methodological details	Key findings	Populations at risk
2012 global school-based student health survey reported in Seidu et al, 2020	Two-stage cluster sampling design to select 25 secondary high schools to represent all the then 10 regions in Ghana. Majority of participants aged 13-17. A validated single question on the number of days per week the participant was physically active was used to measure PA.	25% of secondary high school students met WHO recommendations (29.0% of males, 21.9% of females)	Risk factors for failing to meet WHO recommendations: <ul style="list-style-type: none"> • Being female • Being in older year groups • Going hungry • Not actively commuting to school • Not getting support from peers
Nyawornota et al, 2013	Participants aged 15-19. IPAQ was used to measure PA.	83.4% of secondary high school students achieved moderate or high levels of PA	Risks for lower levels of PA: <ul style="list-style-type: none"> • Being female
Doku et al, 2013	Participants were randomly selected students from a random sample of schools across 3 regions. Participants were asked “how active are you?” with response on a 4 point scale from “not physically active” to “very physically active”	69% were physically active according to their self-report	None reported

REFERENCES

1. **GBD 2015 Risk Factors Collaborators.** Global, regional, and national comparative risk assessment of 79 behavioural, environmental and occupational, and metabolic risks or clusters of risks, 1990-2015: a systematic analysis for the Global Burden of Disease Study 2015. *Lancet* (London, England) [Internet]. 2016 Oct 8;**388(10053)**:1659–724. Available from: <https://pubmed.ncbi.nlm.nih.gov/27733284> *Date accessed: 19/11/2020.*
2. **World Health Organization (WHO).** Physical activity: Key facts [Internet]. Fact sheets. World Health Organization; 2018 [cited 2020 Nov 19]. Available from: <https://www.who.int/news-room/fact-sheets/detail/physical-activity> *Date accessed: 19/11/2020.*
3. **Lee I-M, Shiroma EJ, Lobelo F, Puska P, Blair SN and PT Katzmarzyk** Effect of physical inactivity on major non-communicable diseases worldwide: an analysis of burden of disease and life expectancy. *Lancet* (London, England). 2012 Jul;**380(9838)**:219–29.
4. **Abubakari A-R and RS Bhopal** Systematic review on the prevalence of diabetes, overweight/obesity and physical inactivity in Ghanaians and Nigerians. *Public Health*. 2008;**122(2)**:173–82.
5. **Ghana Statistical Service.** Ghana demographic and health survey 2008. Accra, Ghana: Ghana Statistical Service (GSS), Ghana Health Service (GHS) and ICF Macro. Accra, Ghana; 2009.
6. **Koyanagi A, Stubbs B and D Vancampfort** Correlates of sedentary behavior in the general population: A cross-sectional study using nationally representative data from six low-and middle-income countries. *PLoS One*. 2018;**13(8)**:e0202222.
7. **Wu F, Guo Y, Chatterji S, Zheng Y, Naidoo N, Jiang Y, Biritwum R, Yawson A, Minicuci N and A Salinas-Rodriguez** Common risk factors for chronic non-communicable diseases among older adults in China, Ghana, Mexico, India, Russia and South Africa: the study on global AGEing and adult health (SAGE) wave 1. *BMC Public Health*. 2015;**15(1)**:1–13.
8. **Oyebode O, Pape UJ, Lavery AA, Lee JT, Bhan N and C Millett** Rural, urban and migrant differences in non-communicable disease risk-factors in middle income countries:A cross-sectional study of WHO-SAGE data. *PLoS One*. 2015;**10(4)**:1–14.
9. **Stringhini S, Forrester TE, Plange-Rhule J, Lambert E V, Viswanathan B, Riesen W, Korte W, Levitt N, Tong L and LR Dugas** The social patterning of risk factors for noncommunicable diseases in five countries: evidence from the modeling the epidemiologic transition study (METS). *BMC Public Health*. 2016;**16(956)**.



10. **Shoham DA, Dugas LR, Bovet P, Forrester TE, Lambert E V, Plange-Rhule J, Schoeller DA, Brage S, Ekelund U and RA Durazo-Arvizu** Association of car ownership and physical activity across the spectrum of human development: Modeling the Epidemiologic Transition Study (METS). *BMC Public Health*. 2015;**15(1)**:173.
11. **van Nieuwenhuizen B, Zafarmand MH, Beune E, Meeks K, Aikins A de-G, Addo J, Owusu-Dabo E, Mockenhaupt FP, Bahendeka S and MB Schulze** Ideal cardiovascular health among Ghanaian populations in three European countries and rural and urban Ghana: the RODAM study. *Intern Emerg Med*. 2018;**13(6)**:845–56.
12. **Owiredu E-W, Dontoh E, Essuman SES and BB Bazanfara** Demographic and lifestyle predictors of prehypertension: a cross-sectional study among apparently healthy adults in Kumasi, Ghana. *Biomed Res Int*. 2019;2019.
13. **Afrifa-Anane E, Agyemang C, Codjoe SNA, Ogedegbe G and A de-G Aikins** The association of physical activity, body mass index and the blood pressure levels among urban poor youth in Accra, Ghana. *BMC Public Health*. 2015;**15(1)**:269.
14. **Balis LE, Sowatey G, Ansong-Gyimah K, Ofori E and SM Harden** Older Ghanaian adults' perceptions of physical activity: an exploratory, mixed methods study. *BMC Geriatr*. 2019;**19(1)**:85.
15. **Tuakli-Wosornu YA, Rowan M and J Gittelsohn** Perceptions of physical activity, activity preferences and health among a group of adult women in urban Ghana: a pilot study. *Ghana Med J*. 2014;**48(1)**:3–13.
16. **Addo PNO, Nyarko KM, Sackey SO, Akweongo P and B Sarfo** Prevalence of obesity and overweight and associated factors among financial institution workers in Accra Metropolis, Ghana: a cross sectional study. *BMC Res Notes*. 2015;**8(1)**:599.
17. **Nyante GG, Oppong C and E Bonney** Sex differences in physical activity among Ghanaian patients with sickle cell disease. *Pan Afr Med J*. 2019;32.
18. **Dake FAA, Thompson AL, Ng SW, Agyei-Mensah S and SNA Codjoe** The Local Food Environment and Body Mass Index among the Urban Poor in Accra, Ghana. *J Urban Heal* [Internet]. 2016;**93(3)**:438–55. Available from: <http://link.springer.com/10.1007/s11524-016-0044-y>
19. **Seidu A-A, Ahinkorah BO, Agbaglo E, Darteh EKM, Ameyaw EK, Budu E and H Iddrisu** Are senior high school students in Ghana meeting WHO's recommended level of physical activity? Evidence from the 2012 Global School-based Student Health Survey Data. *PLoS One*. 2020;**15(2)**:e0229012.

20. **Nyawornota VK, Aryeetey R, Bosomprah S and M Aikins** An exploratory study of physical activity and over-weight in two senior high schools in the Accra Metropolis. *Ghana Med J.* 2013;**47(4)**:197.
21. **Doku D, Koivusilta L, Raisamo S and A Rimpelä** Socio-economic differences in adolescents' breakfast eating, fruit and vegetable consumption and physical activity in Ghana. *Public Health Nutr.* 2013;**16(5)**:864–72.
22. **Adom T, Kengne AP, De Villiers A and T Puoane** Association between school-level attributes and weight status of Ghanaian primary school children. *BMC Public Health* [Internet]. 2019;**19(1)**:577. Available from: <https://doi.org/10.1186/s12889-019-6937-4>
23. **Nyawornota VK, Luguterah A, Sofu S, Aryeetey R, Badasu M, Nartey J, Assasie E, Donkor SK, Douglor V and H Williams** Results from Ghana's 2018 report card on physical activity for children and youth. *J Phys Act Heal.* 2018;**15(s2)**:S366–7.
24. **Guthold R, Louazani SA, Riley LM, Cowan MJ, Bovet P, Damasceno A, Sambo BH, Tesfaye F and TP Armstrong** Physical Activity in 22 African Countries: Results from the World Health Organization STEPwise Approach to Chronic Disease Risk Factor Surveillance. *Am J Prev Med* [Internet]. 2011 Jul 1;**41(1)**:52–60. Available from: <https://doi.org/10.1016/j.amepre.2011.03.008>
25. **Guthold R, Stevens GA, Riley LM and FG Bull** Global trends in insufficient physical activity among adolescents: a pooled analysis of 298 population-based surveys with 1·6 million participants. *Lancet Child Adolesc Heal.* 2020;**4(1)**:23–35.
26. **Guthold R, Stevens GA, Riley LM and FC Bull** Worldwide trends in insufficient physical activity from 2001 to 2016: a pooled analysis of 358 population-based surveys with 1·9 million participants. *Lancet Glob Heal* [Internet]. 2018;**6(10)**:e1077–86. Available from: <http://www.sciencedirect.com/science/article/pii/S2214109X18303577>
27. **Ozodiegwu ID, Littleton MA, Nwabueze C, Famojuro O, Quinn M, Wallace R and HM Mamudu** A qualitative research synthesis of contextual factors contributing to female overweight and obesity over the life course in sub-Saharan Africa. *PLoS One* [Internet]. 2019 Nov 4;**14(11)**:e0224612. Available from: <https://doi.org/10.1371/journal.pone.0224612>
28. **Frederick DA, Forbes GB and B Anna** Female body dissatisfaction and perceptions of the attractive female body in Ghana, the Ukraine, and the United States. *Psihol teme* [Internet]. 2008;**17(2)**:203–19. Available from: <https://hrcak.srce.hr/32439>
29. **Appiah CA, Steiner-asiedu M and GE Otoo** Predictors of Overweight / Obesity in Urban Ghanaian Women. 2014;**2(3)**:60–8.



30. **Aryeetey R** Perceptions and experiences of overweight among women in the Ga East District, Ghana. *Front Nutr.* 2016;**3**:13.
31. **Benkeser RM, Biritwum R and AG Hill** Prevalence of overweight and obesity and perception of healthy and desirable body size in urban, Ghanaian women. *Ghana Med J [Internet]*. 2012;**46**(2):66–75. Available from: <https://www.ajol.info/index.php/gmj/article/view/82036>
32. **Pedro TM, Micklesfield LK, Kahn K, Tollman SM, Pettifor JM and SA Norris** Body image satisfaction, eating attitudes and perceptions of female body silhouettes in rural South African adolescents. *PLoS One.* 2016;**11**(5):e0154784.
33. **Puoane TR, Fourie JM, Tsolekile L, Nel JH and NJ Temple** What do black South African adolescent girls think about their body size? *J Hunger Environ Nutr.* 2013;**8**(1):85–94.
34. **Keshk MM, Fahim HI, Hassan AM and DNK Boulos** Body Image Perception and Self-Esteem among University Students in Cairo. *Egypt J Community Med.* 2019;**37**(1).
35. **Arday M, De-Gaulle VF, Agyabeng K and R Aryeetey** “I Did Not Choose to Be Obese”—Experiences of Stigma among Market Women in Kaneshie, Ghana. *Open Access Libr J.* 2020;**7**(5):1–13.
36. **Darling AM, Sunguya B, Ismail A, Manu A, Canavan C, Assefa N, Sie A, Fawzi W, Sudfeld C and D Guwattude** Gender differences in nutritional status, diet and physical activity among adolescents in eight countries in sub-Saharan Africa. *Trop Med Int Heal.* 2020;**25**(1):33–43.
37. **Hanrahan KB** ‘Mɔn’(to marry/to cook): negotiating becoming a wife and woman in the kitchens of a northern Ghanaian Konkomba community. *Gender, Place Cult.* 2015;**22**(9):1323–39.
38. **Robson E** The ‘Kitchen’ as Women’s Space in Rural Hausaland, Northern Nigeria. *Gender, Place Cult [Internet]*. 2006 Dec 1;**13**(6):669–76. Available from: <https://doi.org/10.1080/09663690601019869>
39. **Martins J, Marques A, Sarmiento H and F Carreiro da Costa** Adolescents’ perspectives on the barriers and facilitators of physical activity: a systematic review of qualitative studies. *Health Educ Res.* 2015;**30**(5):742–55.
40. **McGovern J, Drewson SR, Hope A and JF Konopack** Gender Differences in a Youth Physical Activity Intervention: Movement Levels and Children’s Perceptions. *Am J Heal Educ [Internet]*. 2020 Mar 3;**51**(2):109–19. Available from: <https://doi.org/10.1080/19325037.2020.1712667>



41. **Atteh E, Martin G, Oduro AT, Mensah FA and R Gyamfi** An Overview on Influence of Work-family Life Conflict among Female Teachers and their Job Satisfaction in Schools. *Asian J Educ Soc Stud.* 2020;48–58.
42. **Muasya G** Work–family balance choices of women working in Kenyan universities. *SAGE Open.* 2016;**6(1)**:2158244016630772.