**Effects of Body Mass Index and Drunkenness on**

**Physical Activity Levels of Adolescents in Ghana**

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**Abstract**

The purpose of this study was to assess the effects of Body Mass Index (BMI) and drunkenness on the physical activity levels of junior high (JHS) and senior high (SHS) school students in Ghana. The 2012 Ghana Global School-Based Student Health Survey served as the main data source. Participants included 2790 Ghanaian junior high and senior high school students aged 11-18. They were 1508 boys and 1282 girls. The study investigated the extent to which participants were physically active (PA) seven days per week and also attended physical education (PE) classes five days or more per week (PAPE). The predictor variables were age, gender, level of education, BMI, number of times being drunk (NBD), and number of times in trouble due to drunkenness (TTD). Results showed that 72.69% participants engaged in PA seven days per week and attended PE classes five days or more per week. Logistic regression analyses indicated that age, gender, BMI, NBD, and TTD were significant predictors of PAPE, while the level of education was not. Older participants were more likely to attain PAPE than their younger counterparts; and girls were more likely than boys to achieve PAPE. Those with higher BMI were less likely to achieve PAPE. The likelihood of achieving PAPE decreased with increase in NBD. In addition, the likelihood of achieving PAPE decreased with an increase in TTD. JHS and SHS students were equally likely to achieve PAPE. PA intervention programs should be multi-faceted and should target children in their pre-teens.

**Keywords:** Body Mass Index, drunkenness, Ghana, odds ratio, physical activity

**1 Introduction**

Low levels of health and education are two key factors resulting in low productivity and contributing to low economic growth [1]. Like several other public health challenges, overweight and obesity are public health concerns, and must be tackled early through proper diet and physical activity [2]. For example, more than 42 million children worldwide under the age of five years were overweight in 2013 [3]. Obesity increases the likelihood of diabetes, hypertension, coronary heart disease, stroke and certain types of cancer. Diabetes risk can be reduced by moderate weight loss and moderate daily physical activity in persons at high risk [3].

 Despite the evidence indicating how PA improves the quality of life, physical inactivity is on the increase resulting in physical, emotional, and economic consequences [4]. Once considered as problems for high income countries, overweight and obesity are now also prevalent in low and middle income countries [5]. Consequently, Ghana (like other developing countries) has seen an increase in cardiovascular disease (CVD) risk factors such as poor dietary practices, physical inactivity, alcohol consumption and obesity [6]. Over-nutrition is now becoming a public health concern in Ghana, thus, exacerbating the problems with lower physical activity levels [7].

Inadequate infrastructure, absence of policy for PE and sports in schools, lack of equipment and financial resources are mitigating participation in PA for children and youth in Ghana [8][9]. The 2014 Ghana PA card for children and youth, for example, indicated a grade “D” in the overall physical activity category [10]. It is for this reason that the Ghana School Health Education Program (SHEP) has one of its objectives as to promote healthy lifestyles including healthy diet, avoiding alcohol and tobacco consumption, and physical inactivity [8]. As [11] noted, the prevalence of overweight and obesity are on the increase in Ghana, and comprehensive and concerted efforts should be made to reverse the upward trend.

An appropriate avenue for children and youth to accrue recommended levels of PA is school physical education (PE). The International Council of Sport Science and Physical Education [ICSSPE] [12] asserted that PE is the only school subject whose primary focus is on the body, physical activity, physical development and health. PE helps children to become physically active which is essential for healthy development and which, in turn, lays the foundation for adult healthy lifestyles [12]. A considerable part of children’s physical activity is presently allocated to regular physical education (PE) classes in schools [13], because economic pressures [14] and parental concern for safety [15] often reduce children’s physical activity in non-school settings. PE is required twice a week in junior high; and senior high schools in Ghana [16, 17]. However, teachers do not implement the subject according to policy due to limitedinfrastructure and facilities [8], lack of adequate training, and lack of teacher’s guides [8, 19]. For example, only 65.9% of district coordinators of the School Health Education Program indicated they taught physical activity and fitness in their curriculum [20].

Alcohol is another preventable risk factor [21] pertinent to the current study. **C**hildren who drink at an early age have a higher risk of developing health problems in adulthood [22, 20]. Furthermore, research shows that the prevalence of lifetime alcohol consumption among secondary students and a national sample of youth in Ghana [20, 23] was approximately 25%. Globally, alcohol is the third leading risk factor after childhood underweight and unsafe sex [24]. Research suggests that taking alcohol at an early age can result in greater risk of abusive consumption and other development problems [25]. For example, [22] reported participants in their study who started to drink at ages 11-14 were at the greatest risk of developing alcohol abuse.

Literature on alcohol use in sub-Saharan Africa has focused on its consumption and sexual behavior among adolescents and adults [26]. Similarly, studies on physical activity have traditionally examined its relationship with BMI. It is important for research to investigate the influence of alcohol consumption and other risk factors on the physical activity levels of adolescents and adults. Therefore, the purpose of the present study was to assess the effect of BMI and drunkenness on the physical activity levels of junior high and senior high school adolescent students in Ghana. An understanding of the effects would help policy makers and educational administrators identify effective strategies to increase the activity levels of adolescents.

**2 Method**

**2.1 Participants**

Participants included 2790 Ghanaian junior high (1188) and senior high (1602) school students aged 11-18. They were 1508 boys and 1282 girls. Some observations were excluded due to missing data for variables pertinent to this study.

**2.2 Instrument**

The 2012 Ghana Global School-Based Student Health Survey (GSHS) [27] served as the main data source. The study investigated the extent to which participants were physically active seven days per week and also attended physical education (PE) classes five days or more per week (PAPE). The predictor variables were age, gender, level of education, body mass index (BMI), number of times being drunk (NBD), and number of times being in trouble due to drunkenness (TTD). The GSHS operationally defined PA as any activity that increases your heart rate and makes you get out of breath some of the time [27]. The response variable, PAPE, utilized two items: “During the past 7 days, on how many days were you physically active for a total of at least 60 minutes per day?” and “During this school year, on how many days did you go to physical education (PE) class each week?” BMI was computed from the body weights and heights that students self-reported.

**2.3 Statistical Analysis**

The study utilized two-way tables to classify and count participants by the extent to which they were physically active seven days per week and also attended physical education (PE) classes five days or more per week (PAPE) and each of the predictor variables.  The authors calculated the conditional percentage of dependent variable by each predictor variable [28]. The percentage distribution of each predictor variable was computed for each level of the dependent variable.

To model the relationship between the dependent variable and the predictor variables, the authors used binary logistic regression model because the response outcome is count or dichotomous – that is, the response variable “PAPE” can take one of two possible outcomes representing “yes to PAPE” or “no to PAPE”. The odds ratio and the associated $\left(1-alpha\right)\%$ confidence interval from the estimated model were used to establish statistical significance of the predictor variables on the dependent variable. Alpha represented the level of significance. RStudio version 0.98.1103 [29] statistical package was used for data analysis.

**3** **Results**

**3.1 Prevalence of physical activity**

The results showed that 72.69% participants exercised seven days per week and also attended PE classes five days or more per week (PAPE). Table 1 presents descriptive data for BMI and PAPE. Students who achieved PAPE had a slightly lower (20.22) mean BMI than those who did not. That is, participants with higher BMIs were less likely to meet PAPE.

Table 1: Mean BMI scores and percentages meeting PAPE

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|   | **Min** | **Max** | **Mean** | **St. Dev** |
| **Met (%)** | 12.74 | 53.98 | 20.22 | 2.90 |
| **Not Met (%)** | 14.06 | 54.88 | 20.41 | 3.23 |

Table 2 presents data on gender, level of education and PAPE. Of the 2028 (72.69%) participants who achieved PAPE, 53.16% were male and 46.48% female. More SHS (56.66%) than JHS (43.34%) achieved PAPE.

Table 2: Gender, level of education and PAPE

|  |  |  |
| --- | --- | --- |
| **Gender** | **Met** | **Not Met** |
|  | f | **%** | f | **%** |
|  Male | 1078 | 53.16 | 430 | 21.20 |
|  Female | 950 | 46.84 | 332 | 16.37 |
| **Total** | **2028** | 100.00 | **762** | **37.57** |
|  |  |  |  |  |
| **Level of Education** |  |  |  |  |
|  JHS | 879 | 43.34 | 309 | 40.55 |
|  SHS | 1149 | 56.66 | 453 | 59.45 |
| **Total** | **2028** | **100.00** | **762** | **100.00** |

Table 3 shows data on age and PAPE. The 18 years or older age group had the highest percentage (32.94%) of participants achieving PAPE, followed by the 16 year olds. The 11 years of younger age group had the lowest percentage (.74%). of participants achieving PAPE.

Table 3: Frequencies and percentages for age and PAPE

|  |  |  |
| --- | --- | --- |
| **Age Group** | **Met** | **Not Met** |
|  | f | % | f | % |
|  11 years or younger | 15 | 0.74 | 11 | 0.54 |
|  12 years | 87 | 4.29 | 40 | 1.97 |
|  13 years | 159 | 7.84 | 58 | 2.86 |
|  14 years | 221 | 10.90 | 69 | 3.40 |
|  15 years | 293 | 14.45 | 100 | 4.93 |
|  16 years | 238 | 11.74 | 103 | 5.08 |
|  17 years | 347 | 17.11 | 120 | 5.92 |
| 18 years or older | 668 | 32.94 | 261 | 12.87 |
| **Total** | **2028** | **100.00** | **762** | **100.00** |

Table 4 presents data on number of times participants were drunk, and number of times they got into trouble due to being drunk and PAPE. The data show that the highest percentage of students who achieved PAPE were those who never had a drink (89.69%). In addition, students who were never in trouble due to drunkenness had the highest percentage (91.37%) achieving PAPE

Table 4: Frequencies and percentages for number of times drunk, number of times in trouble, and PAPE

|  |  |  |
| --- | --- | --- |
| **Number of Times Drunk** | **% (Met)** | **% (Not Met)** |
|  | f | % | f | % |
| None | 1819 | 89.69 | 661 | 86.75 |
| 1-2 times | 151 | 7.45 | 70 | 9.19 |
| 3-9 times | 36 | 1.78 | 19 | 2.49 |
| 10 or more times | 22 | 1.08 | 12 | 1.57 |
| **Total** | **2028** | **100.00** | **762** | **100.00** |
|  |  |  |
| **Number of Troubles due to Being Drunk** |  |  |
|  None | 1853 | 91.37 | 709 | 93.04 |
|  1-2 times | 114 | 5.62 | 34 | 4.46 |
|  3-9 times | 35 | 1.73 | 10 | 1.31 |
|  10 or more times | 26 | 1.28 | 9 | 1.18 |
| **Total** | **2028** | **100.00** | **762** | **100.00** |

**3.2 Predictors of physical activity levels**

Table 4 presents the logistic regression data for each of the predictor variables in the present study. The analyses indicated that age, gender, BMI, number of times being drunk, and the number of times one got into trouble due to drunkenness were significant predictors of PAPE, while the level of education was not. JHS and SHS students were equally likely to achieve PAPE. Participants 11 years or younger were used as the comparison or reference group for age. The data show no significant difference in PAPE for students 12 or 13 years old and those 11 years or younger. However, there were significant differences between those 13-18 plus years and those 11 years or younger. That is, participants 13-18 years plus years were two-fold more likely to achieve PAPE than those 11 years or younger.

 Females were more likely than males to achieve PAPE. In addition, those with higher BMI were less likely to achieve PAPE. The likelihood of achieving PAPE decreased with increase in NBD. That is, those who were never drunk were more likely to achieve PAPE than those who used were drunk at least once.

Participants who were “never in trouble” served as the comparison or reference group for the variable TTD. There was a significant difference between those who were in trouble 1-2 times and 3-9 times and those who were never in trouble. Those who were in trouble 1-2 times and 3-9 times were less likely than those who were never in trouble to achieve PAPE. There was no significant difference between those who were never in trouble and those who were in trouble 10 or more times.

Table 5: Logistic regression for age, educational level, BMI, number of times drunk, number of times in trouble and PAPE

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  | **OR** |  **95% CI for the OR** |  |
| **Parameter** | **Estimate** | **P-value** | **Lower Limit** | **Upper Limit** |  |
| Intercept | 0.720 | 0.126 | 2.055 | 0.822 | 5.258 |  |
| Age (12 years old) | 0.464 | 0.294 | 1.591 | 0.657 | 3.768 |  |
| Age (13 years old) | 0.764 | 0.074\* | 2.146 | 0.909 | 4.935 |  |
| Age (14 years old) | 0.939 | 0.026\*\* | 2.558 | 1.093 | 5.830 |  |
| Age (15 years old) | 0.901 | 0.032\*\* | 2.463 | 1.059 | 5.571 |  |
| Age (16 years old) | 0.713 | 0.093\* | 2.040 | 0.868 | 4.665 |  |
| Age (17 years old) | 0.982 | 0.021\*\* | 2.669 | 1.136 | 6.107 |  |
| Age (18 years plus) | 0.897 | 0.034\*\* | 2.453 | 1.049 | 5.582 |  |
| Level (SHS) | -0.141 | 0.238 | 0.869 | 0.687 | 1.096 |  |
| Gender (Female) | 0.179 | 0.045\*\* | 1.196 | 1.004 | 1.424 |  |
| Body mass index | -0.028 | 0.058\* | 0.972 | 0.944 | 1.001 |  |
| Number of Times Drunk (1-2 times) | -0.396 | 0.015\*\* | 0.673 | 0.491 | 0.929 |  |
| Number of Times Drunk (3-9 times) | -0.628 | 0.040\*\* | 0.534 | 0.295 | 0.987 |  |
| Number of Times Drunk (10 or more) | -0.794 | 0.046\*\* | 0.452 | 0.209 | 1.010 |  |
| Number of troubles (1-2 times) | 0.513 | 0.019\*\* | 1.671 | 1.101 | 2.599 |  |
| Number of troubles (3-9 times) | 0.632 | 0.099\* | 1.881 | 0.920 | 4.192 |  |
| Number of troubles (10 or more) | 0.480 | 0.254 | 1.617 | 0.735 | 3.894 |  |

\*\* significant at 5%; \* significant at 10%

**4 Discussion and Conclusions**

The current study investigated the influence of BMI and drunkenness on the physical activity levels of adolescent students in Ghana. The findings have three policy implications. First, the results showed that adolescents 13 years or older were significantly more likely to achieve high levels of PA than their younger counterparts. Therefore, intervention programs should target students during their pre-teen years to help them become physically active early. Second, alcohol consumption and getting into trouble due to drunkenness significantly predicted adolescents’ ability to be physically active. Therefore, intervention programs should aim at delaying the age of first alcohol use to after 14 years, consistent with recommendations by [22]. Delaying the age of first alcohol use would be particularly beneficial to males, since the prevalence of alcohol consumption and drunkenness are higher in Ghanaian adolescent males than females [30]. Finally, to be effective, interventions intended to increase adolescents’ PA levels should be multi-faceted. The findings that the number of times being drunk and the number of times adolescents got into troubles due to drunkenness significantly predicted PA levels support this assertion. Thus, rather than focusing solely on physical fitness components, PA intervention programs should incorporate education on alcohol consumption and other risk factors.

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