EFFECTS OF LIFESTYLE FACTORS ON WEIGHT VARIATIONS AMONG ADOLESCENTS IN SOUTHERN CROSS RIVER STATE, NIGERIA

1UDONWA, Rose Ekaete, 2ENEYO, Violet Bassey., 3IYAM, Mary Arilko
1Department of Vocational Education, Home Economics unit, Faculty of Vocational and Science Education, University of Calabar, Nigeria
2Department of Tourism Studies, Faculty of Social Sciences, University of Calabar, Nigeria
3Department of Vocational Education, Home Economics unit, Faculty of Vocational and Science Education, University of Calabar, Nigeria
rudonwa@yahoo.com.
violeteneyo@unical.edu.ng
maryiyam@unical.edu.ng

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Abstract
This study investigated the impact of lifestyle factors on adolescent weight variations in Southern Cross River State, Nigeria, targeting students aged 10 to 22 from 37 secondary schools. The study employed a cross-sectional design and a multistage sampling technique. It included 481 participants, ensuring demographic representation. The methodology involved stratified sampling, systematic student selection, and data collection via questionnaires and personal interviews, focusing on dietary patterns, physical activity, and anthropometric measurements. Analysis using Epi-Info 2002 software revealed significant correlations between lifestyle factors and weight variations, highlighting differences in dietary habits and physical activity levels across genders and between urban and rural students. The findings underscore the need for tailored health education and lifestyle interventions, addressing the socio-cultural context of adolescent health in Southern Cross River State. This research contributes to understanding the determinants of adolescent obesity, emphasizing the development of targeted public health strategies and obesity prevention programs.

Keywords: Adolescent Obesity; Lifestyle Influences on Weight; Dietary Patterns; Physical Activity and Health

Introduction
The escalating rates of obesity among adolescents globally, and particularly in Southern Cross River State, Nigeria, highlight a pressing need for comprehensive research to identify underlying factors and develop effective intervention strategies (Enayo, 2018; Gonzalez Ramírez & Bolaños Muñoz, 2023; Pepe et al., 2023; Catunda & Laurindo, 2017). This study, targeting adolescents aged 10 to 22 years within the Southern Senatorial District, emphasises the importance of region-specific research in understanding weight variations during adolescence, a critical developmental phase with significant implications for nutritional requirements and eating habits.
Addressing gaps in existing literature (Darand et al., 2023; Chen et al., 2023; Maillet & Grouzet, 2023; Eneyo et al., 2017; Pepe et al., 2023; Gonzalez Ramirez & Bolaños Muñoz, 2023; Velluzzi et al., 2023) regarding the impact of lifestyle factors such as dietary habits and physical activity on adolescent weight fluctuations, this research delves into the influence of these factors within the unique environmental and socio-economic contexts of Southern Cross River State, Nigeria. The exploration includes dietary patterns, such as regular breakfast intake and tendencies towards consuming meals outside the home, and their impact on adolescents' body weight. The study aims to elucidate the prevalence and primary causes of obesity within this youthful demographic, thereby providing essential insights for shaping specialised school-based health education programmes.

Thus, recognising the multifaceted nature of overweight conditions, characterised by excessive body fat accumulation typically measured using Body Mass Index (BMI) (Eneyo et al., 2023; Chen et al., 2023), this research also considers BMI's limitations, especially its inability to distinguish between fat and muscle mass, thus necessitating cautious interpretation regarding an individual's overall health. The study explores various aetiological factors of overweight, including genetic, behavioural, environmental, and cultural aspects (Eneyo et al., 2023; Ismail & Hamed, 2023; Vizmanos et al., 2023; Nwosu et al., 2023). It examines the trend towards high-calorie, low-nutrient diets and the increase in physical inactivity attributed to technological advancements and lifestyle changes, which significantly contribute to the rising prevalence of overweight conditions. Additionally, this trend is examined in the context of genetic predispositions, environmental factors, and complex socio-economic dynamics that affect access to nutritious foods and physical activity opportunities (Eja et al., 2015; Ismail & Hamed, 2023; Hu, 2023; James Stubbs et al., 2023; Eneyo, 2018). This study also investigates the role of psychological factors, such as stress and anxiety, in influencing eating behaviours and activity levels, potentially leading to weight gain.

In line with the World Health Organization's focus on diet and physical activity as key factors in obesity development (Heslin & McNuly, 2023; Eneyo et al., 2023; Tarsitano et al., 2022; Chen et al., 2023; Aballay et al., 2013; Eneyo et al., 2023; Ismail & Hamed, 2023; Vizmanos et al., 2023), this research scrutinises the relationship between lifestyle changes and the rising incidence of obesity. It examines the association between reduced physical activity, particularly during the later stages of adolescence, and weight gain, irrespective of caloric intake. Furthermore, several studies have evaluated the deviation of modern adolescent eating patterns from traditional norms, influenced by busy lifestyles and social habits, and assess their impact on energy levels and academic performance (Nwosu et al., 2023; Eneyo et al., 2017; Lowden et al., 2010; Ekmeckioğlu & Touitou, 2011; Maillet & Grouzet, 2023; Kaufman et al., 2023; Bateson & Pepper, 2023; Alberga et al., 2012; Velluzzi et al., 2023). However, similar studies have not been carried out in the study area, further necessitating this research. The research aims to unravel the complex interplay between diet, physical activity, and weight gain, focusing on BMI. An extensive analysis of dietary habits and physical activity levels in both rural and urban areas of Southern Cross River State was conducted to thoroughly comprehend the determinants of obesity in this demographic. The study also evaluated environmental and socio-economic factors that shape these lifestyle choices.

The ultimate goal is to provide a comprehensive understanding of the factors leading to adolescent obesity in the region, thereby guiding the development of effective health promotion strategies and tailored obesity prevention programmes that cater to the specific needs and circumstances of the area. The study sets specific objectives, including investigating adolescent dietary patterns, examining physical activity levels, assessing the correlation between lifestyle factors and weight variations, exploring the impact of socio-cultural factors on adolescent health choices, and providing insights for developing targeted health interventions.
In pursuit of these objectives, the research poses pertinent questions: How do dietary habits differ among adolescents in urban and rural areas of Southern Cross River State, Nigeria, and what are their health implications? What are the prevalent physical activity patterns among adolescents in this region, and how do they vary across different weight categories (underweight, normal weight, obese)? To what extent do lifestyle factors influence weight variations among adolescents? How do socio-cultural factors impact adolescents' dietary choices and physical activity levels in the study area? Based on the findings, what targeted health interventions can be developed to address the specific health challenges faced by adolescents in Southern Cross River State, Nigeria? These objectives and research questions guide an in-depth investigation into the lifestyle factors affecting adolescent health in Southern Cross River State, Nigeria, ultimately contributing to the development of effective health promotion strategies in this context.

Methodology

The methodology adopted in this study was intricately designed to facilitate a rigorous analysis of the multifaceted factors contributing to adolescent obesity in Southern Cross River State. By employing a comprehensive approach, the research seeks to unearth pivotal insights that are instrumental in shaping the formulation of customized health promotion strategies and obesity prevention programmes. These strategies are intended to be acutely attuned to the local population's unique needs and contextual nuances, thereby enhancing their effectiveness and applicability.

Study Design and Target Population: This research was conducted as a cross-sectional study to evaluate the influence of lifestyle factors on adolescent weight variation. The focus was on a diverse group of students aged 10 to 22 from 37 secondary schools within the Southern Senatorial District of Southern Cross River State, Nigeria.

Sampling Strategy and Size Determination: A multistage sampling technique was utilised to select a representative sample of 481 students from an initial group of 6,129. This stratified approach ensured a broad demographic representation integral to the study's validity.

Categorisation of Schools for Stratified Sampling: The schools were strategically classified into urban and rural categories based on their geographical locations to capture the study area's diversity effectively.

Random Selection of Schools: A simple balloting method was applied to randomly choose schools from each stratum, guaranteeing a balanced representation of varied educational environments.

Systematic Student Sampling Procedure: The study used class registers as the sampling frame; students from classes JSS1 to SS3 were systematically selected. A specific sampling interval for each class was determined by dividing the total number of students by the sample size needed, ensuring an impartial selection process.

Alternate Selection for Non-Participating Students: Where a selected student was unavailable or declined participation, the next student on the register was approached, maintaining the sample's integrity.

Data Collection Methodology: Data collection involved a semi-structured questionnaire complemented by personal interviews. The questionnaire encompassed questions on demographic information, anthropometric data, lifestyle habits, and family health history.

Anthropometric Data Acquisition: Weight measurements were taken using a calibrated bathroom scale accurate to 125 kg, with readings rounded off to the nearest 0.8 kg. Measurements were standardised by having students in school uniforms, excluding heavy clothing and footwear.

Analytical Approach for Data Interpretation: Data analysis was executed using Epi-Info 2002 software (version 6.1). The analysis adopted a
comparative approach, examining dietary habits and physical activity levels across genders and comparing students from urban and rural schools to determine correlations between lifestyle factors and weight variations among adolescents.

**Ethical Compliance and Consent:** The research adhered to ethical standards, including obtaining informed consent from participants, ensuring confidentiality, and securing approval from relevant ethical review boards and educational authorities.

**Results**

### Table 1: Demographics and Breakfast Consumption Habits

<table>
<thead>
<tr>
<th>Location</th>
<th>Total Students</th>
<th>Age Range (Years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calabar South</td>
<td>240</td>
<td>10-22</td>
</tr>
<tr>
<td>Bakassi</td>
<td>241</td>
<td>10-22</td>
</tr>
</tbody>
</table>

The study examined students from Calabar South and Bakassi, with a balanced age range distribution of 10-22 years (see Table 1). In terms of breakfast habits, Calabar South students are more inclined to eat breakfast at home (60%) compared to those in Bakassi (55%). Conversely, Bakassi has a higher percentage of students eating breakfast outside (45%) than Calabar South (40%).

### Physical Activity and Weight Distribution

Regarding physical activity, 50% of Calabar South students regularly exercise compared to 45% in Bakassi. However, Bakassi has a slightly higher rate of infrequent exercisers (35%). Both regions have 20% of students not exercising. In weight distribution, Calabar South has 10% underweight, 60% normal weight, and 30% overweight students. Bakassi shows a similar trend with 12% underweight, 58% normal weight, and 30% overweight.

### Table 2: Dietary Habits

<table>
<thead>
<tr>
<th>Location</th>
<th>High Fat Diet (%)</th>
<th>Balanced Diet (%)</th>
<th>Low Nutrition Diet (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calabar South</td>
<td>35</td>
<td>50</td>
<td>15</td>
</tr>
<tr>
<td>Bakassi</td>
<td>40</td>
<td>45</td>
<td>15</td>
</tr>
</tbody>
</table>

The dietary patterns indicate that 50% of Calabar South students maintain a balanced diet, while in Bakassi, this figure is 45%. High-fat diet preference is slightly higher in Bakassi (40%) compared to Calabar South (35%). The percentage of students opting for a low-nutrition diet is equally 15% in both areas (see Table 2).

### Lifestyle of Underweight Students

Underweight students, particularly in rural areas, show a higher tendency to consume more than three meals daily (60% rural vs. 55% urban) and eat breakfast (70% rural vs. 65% urban). Snack consumption is higher in urban areas (40%) compared to rural (35%).

### Physical Activities of Underweight and Obese Adolescents

Underweight subjects in household settings are less active, with 40% not engaging in sports, compared to a lower 25% outdoors. For obese adolescents, physical inactivity is notable, especially in household environments, where 65% do not engage in sports activities. Outdoor activities are slightly more prevalent.

### Lifestyle of Obese Students

Obese students in rural areas tend to eat more than three meals a day (33%) compared to urban areas (35%). A majority of these students, both rural and urban, seldom eat at school. The preference for snacks is higher in urban areas (50%) compared to
rural (45%), with rural areas showing a slightly higher consumption of fruits (27% rural vs. 20% urban).

Physical Activities for Overweight Subjects

The data suggests a positive correlation between meal frequency and healthy eating habits among overweight subjects. Higher meal frequency is associated with increased likelihood of eating breakfast and frequently eating at school. These findings provide valuable insights into the dietary and physical activity patterns of adolescents in Southern Cross River State, Nigeria, highlighting the need for targeted health and nutritional interventions.

Discussion of Findings

The results of this study offer a comprehensive exploration of lifestyle factors influencing weight variations among adolescents in Southern Cross River State, Nigeria, providing significant insights into adolescent health in developing countries. The demographic balance between urban (Calabar South) and rural (Bakassi) students, as highlighted by Heslin and McNulty (2023) and Eneyo et al. (2023), ensures a representative sample, crucial for understanding diverse lifestyle patterns across different settings. The study revealed a higher prevalence of home-based breakfast consumption in Calabar South compared to Bakassi, aligning with Festi et al. (2009) and Aballay et al. (2013), suggesting the influential role of the home environment in shaping adolescent nutritional habits.

Furthermore, the correlation between physical activity levels and weight categories in Calabar South and Bakassi is noteworthy. Lower physical activity in Bakassi is associated with higher obesity rates, consistent with the findings of Eneyo et al. (2022), emphasizing the importance of physical activity in managing adolescent obesity. The specific trends in weight distribution, such as the higher percentage of underweight students in Bakassi compared to Calabar South, call for targeted health interventions. The study also highlights dietary preferences, particularly the inclination towards high-fat diets in urban areas, which reflects broader urban dietary shifts towards calorically dense and nutritionally poor food choices, as noted by Eneyo et al. (2021). These trends, along with the balanced diet observed in both regions, underscore the necessity of promoting healthier dietary choices among adolescents.

Contrary to findings by Eneyo et al. (2023), underweight students in this study showed high breakfast consumption and lower engagement in sports activities, particularly in household settings, suggesting unique socio-cultural or environmental influences in Southern Cross River State (Van Baak & Mariman, 2023; Okam, 2023; Eneyo et al., 2021). The study also reveals a notable lack of physical activity among obese adolescents, especially in household environments, aligning with Zhang et al. (2023) and Okam (2023). However, the regular breakfast consumption observed among these students contrasts with St-Onge et al. (2023) and Timlin & Pereira (2007), who linked breakfast skipping with a higher risk of obesity, indicating that in this region, obesity might be influenced more by food quality and quantity rather than meal frequency.

Interestingly, the study indicates a positive correlation between meal frequency and healthy eating habits among overweight subjects, suggesting a significant role of meal frequency in weight management, contrary to the findings of Yoo et al. (2018) and Jung et al. (2018). Overall, this study provides valuable insights into the complex relationship between dietary habits, physical activities, and weight variations in Nigerian adolescents. These findings highlight the need for health education and lifestyle interventions tailored to the socio-cultural context of Southern Cross River State. They contribute to the broader discourse on adolescent health, particularly in environments where urbanization and lifestyle changes are rapidly impacting health outcomes. This research is vital for informing public health policies and preventive strategies in the face of increasing global trends in adolescent obesity and related non-communicable diseases.
(Ekong & Eneyo, 2018; Eneyo et al., 2022; Alfahel et al., 2023).

**Conclusion**

The findings of this study elucidate the pivotal role of lifestyle determinants, notably dietary patterns and physical activity levels, in the weight variance among adolescents in Southern Cross River State, Nigeria. The investigation highlights the significant influence of the domestic milieu on nutritional preferences, as evidenced by the predominant trend of home-based breakfast consumption in specific locales. A salient correlation emerges between the frequency of physical activities and the distribution of weight categories, with a marked association of diminished physical activity with elevated obesity rates in certain areas. These insights collectively underscore the imperative of integrating both dietary and physical activity considerations in addressing adolescent health and well-being.

This research further illuminates the intricate nexus between socio-cultural influences and lifestyle choices among adolescents. Variations in dietary preferences, such as the propensity for high-fat diets in urban settings, mirror broader societal trends, emphasizing the urgency of advocating for healthier dietary options. The nuanced understanding of the diverse physical activity patterns among underweight and obese adolescents presented in this study provides critical perspectives for formulating targeted interventions.

This study's outcomes significantly augment the corpus of knowledge regarding adolescent health in a developing country context, stressing the necessity for comprehensive approaches in tackling the health challenges prevalent in this demographic. These conclusions hold considerable relevance in light of global trends indicating an escalation in adolescent obesity and associated non-communicable diseases, highlighting the exigency for specialized public health policies and strategies.

**Recommendations**

1. **Nutritional Education Enhancement:** It is imperative to institute robust nutritional education initiatives within educational and community settings. These programs should prioritize the promotion of balanced diets and elucidate the health risks associated with diets high in fats and low in nutritional value.

2. **Physical Activity Advocacy:** The development and propagation of customized physical activity programs tailored for adolescents are crucial. These initiatives should underscore the integral role of regular exercise in sustaining a healthy weight and be adaptable to diverse geographic contexts to ensure broad reach and impact.

3. **Specialized Interventions for Diverse Weight Categories:** The design and implementation of distinct intervention strategies catering to the unique requirements of underweight and obese adolescents are essential. For underweight adolescents, the focus should be on advocating balanced dietary practices and healthy weight gain methodologies, whereas for obese adolescents, emphasis should be placed on the significance of physical activity and nutritious eating habits.

4. **Community Engagement and Consciousness-Raising Campaigns:** Engaging with community stakeholders, parents, and guardians is pivotal in raising awareness about the critical role of a health-conducive home environment in shaping adolescents' dietary and physical activity patterns.

5. **Policy Formulation and Execution:** Policymakers are encouraged to formulate and enact policies that foster environments conducive to healthy lifestyles. These policies could include enhancing access to nutritious food options in school canteens and promoting safe environments for physical activities.

6. **Expanded Research Endeavors:** There is a pronounced need for further research to delve into the socio-cultural dynamics that influence dietary and physical activity
preferences among adolescents, particularly in developing countries. This research is vital for the creation of more effective and culturally attuned intervention strategies.

The application of these recommendations is anticipated to substantially ameliorate the health and well-being of adolescents in Southern Cross River State, Nigeria, thereby contributing to the overarching objective of addressing adolescent health challenges in analogous contexts globally.

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