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# Research Article
# The Prevalence of Underweight, Overweight and Obesity Among Primary School Learners in the Eastern Cape Province, South Africa

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## Abstract

**Objective:** The aim of this study was to determine the prevalence of body weight disorders among primary school learners in the Eastern Cape Province of South Africa. **Materials and Methods:** A school based cross-sectional survey was conducted among 876 primary school learners aged 9-14 years, using multistage sampling techniques. Body mass, stature and body mass index (BMI) were calculated. **Results:** Out of 876 participants, 61.8% were underweight, 32.3% were normal, 3.8% were overweight and 2.1% were obese. The prevalence of underweight was significantly higher (n = 541; 61.8%), as compared to other BMI classifications. Boys had higher prevalence of underweight (n = 251; 70.5%), as compared to the girls (n = 290; 55.8%). About 70.5% boys were underweight, 27.3% were normal, 1.1% were overweight and 1.1% were obese, whereas, 55.8% girls were underweight, 35.8% were normal, 5.6% were overweight and 2.9% were obese. The highest prevalence of underweight (77.7%) was observed in the age group 9-10 years followed by the age group 11-12 years (62.7%), which showed a significant association between age and BMI. The high number of underweight children were in rural (n = 298; 64.8%) and semi-urban (n = 144; 60.3%) areas, as compared to urban areas (n = 99; 56.3%). **Conclusion:** The high prevalence of underweight among the primary school learners in the study setting requires a serious stakeholder intervention strategy.

Key words: Body mass index, body weight, nutritional status, primary school, South Africa

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Competing Interest: The authors have declared that no competing interest exists.

Data Availability: All relevant data are within the paper and its supporting information files.

## INTRODUCTION

Problem of overweight and obesity in high, middle and low incomes countries, including South Africa, have increased rapidly[1-6]. A global study on body mass index (BMI), underweight, overweight and obesity trends from 1975-2016 shows that the global number of children and adolescents aged 5-19 years who are moderately or severely underweight remains higher than those who are obese[7]. Both obesity and underweight in childhood are linked to chronic adult diseases, including diabetes and cardiovascular disease[4,8,9]. Although, there is an abundance of literature on the epidemic of obesity, underweight also places a major global burden on children and adolescents, particularly in developing countries[10-13].

Approximately 16% of children in developing countries are classified as severely malnourished[14]. Severe problem of underweight is associated with developmental delays and significant cognitive effects[15,16]. It reduces immunity, increases the risk of chronic diseases and increases the risk of mortality[17-19]. An estimated percentage (52.5%) of all deaths among young children are attributed to underweight[20]. It is also estimated that underweight children are 8.4 times more likely to die[21]. In addition, the issue of underweight is associated with an increased risk of contagious diseases, such as diarrhoea and pneumonia[20].

The burden of underweight and overweight remains a problem for children in South Africa[22]. According to the 2002 South Africa National Youth Risk Behaviour Survey[23], the prevalence of underweight among children aged 13-19 years was 9% and about 17% were overweight. A systematic review reported that 0.7-66% of children in rural areas were observed to be underweight, compared with 3.1-32.4% of overweight children in urban areas[22]. The causes of the problem of underweight are multidimensional and interrelated and often vary from one setting to another, emphasizing the importance of local data and context[12]. This is especially true, since this information is essential for local programming and policy makers. The aim of this study was therefore to present data on the nutritional status of primary school students in the Eastern Cape Province of South Africa using the BMI proxy measure calculated as weight in kilograms divided by height in square meters (kg/m$^2$).

## MATERIALS AND METHODS

**Design, sample and sampling:** Data for this study was obtained from a project entitled 'Mentoring and Promoting Healthy Lifestyles of Learners in the Eastern Cape: An Evaluation of the 2012 Integrated School Health Policy'. This was a school-based community project to assess whether the provision of a comprehensive, integrated school health program provided as part of a primary health care package within the Care and Support for Teaching and Learning (CSTL) framework is adequately implemented in the Eastern Cape Province of South Africa. This was a cross-sectional study involving a random sample of 876 participants (356 boys and 520 girls) aged 9-14 years, attending urban, peri-urban and rural primary schools. Acutely ill, psychotic or physically disabled participants were excluded.

The project involved three randomly selected district municipalities, that is, Chris Hani, Amathole and OR Tambo. Two educational districts from each municipality were randomly selected then schools were selected randomly that were used to draw the sample. The District Education Department of each selected municipality provided a list of schools on which the random selection was based. In total, 18 primary schools from quintiles 1, 2 and 3 in each district were randomly selected using a computer-generated program. Figure 1 shows the procedure for the sampling framework.

**Anthropometric measurements:** Anthropometric evaluations were conducted using International Standards for Anthropometric Assessment (ISAK)[24]. A calibrated SECA stadiometer and scale with a precision of up to 0.1 kg was used to measure body mass. Stature was measured to the nearest 0.5cm, using a stadiometer. The body mass index (kg/m$^2$) was calculated as weight in kilograms divided by the square of height in meters. Based on the Centres for Disease Control's (CDC's) age and sex-specific cut-off points, a BMI less than the 5th percentile indicates underweight, over the 85th percentile indicates excessive weight and above the 95th percentile indicates obesity[25].

**Ethical considerations:** The study protocol was approved by the Research Ethics Committee of the University of Fort Hare (REC-270710-028-RA Level 01). Permission to conduct the study was obtained from the Eastern Cape Department of Education and the Eastern Cape Provisional Department of Health Research Ethics Committee. The nature and scope of the study were explained to the children and their parents, who gave informed consent. In order to enlist the interest and participation of the selected schools, details about the study, including the objectives and procedures to be followed, were provided to teachers, parents and children.

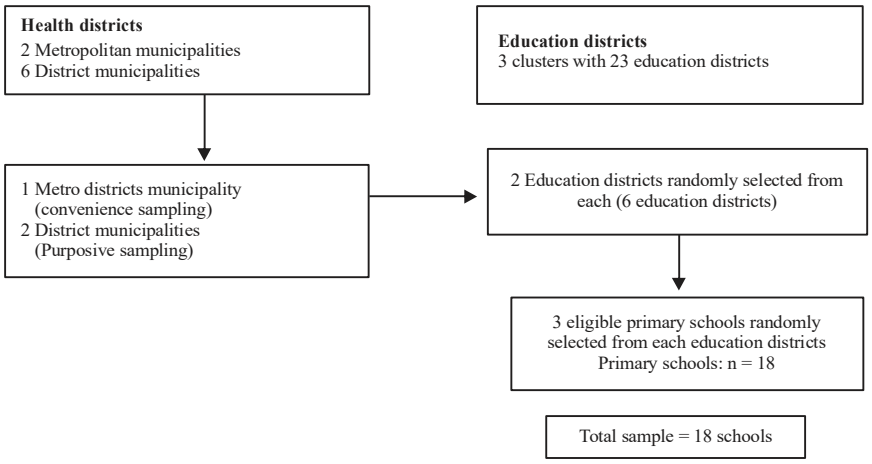


Fig. 1: Sampling framework

Table 1: Anthropometric characteristics of the participants

| | Mean±SD | | | |
|---|---|---|---|---|
| Variables | Total (n = 876) | Boys (n = 356) | Girls (n = 520) | p-values |
| Age (years) | 11.0±1.5 | 11.2± 1.5 | 10.9±1.4 | 0.0010 |
| Body mass (kg) | 39.3±10.3 | 37.9±8.6 | 40.3±11.3 | 0.0066 |
| Stature (cm) | 144.0±10.9 | 144.2±10.4 | 143.9±11.1 | 0.7132 |
| Body mass index (kg $m^{-2}$) | 18.9±4.2 | 18.1±3.0 | 19.3±4.7 | 0.0001 |

Table 2: Prevalence of underweight, overweight and obesity among the participants

| | Under weight | | Normal weight | | Over weight | | Obese | | |
|---|---|---|---|---|---|---|---|---|---|
| | No. | Percentage | No. | Percentage | No. | Percentage | No. | Percentage | Test statistics |
| **Gender** | | | | | | | | | |
| Boys | 251 | 70.5 | 97 | 27.3 | 4 | 1.1 | 4 | 1.1 | Chi-square statistics = 26.3, df = 3, p<0.0001 |
| Girls | 290 | 55.8 | 186 | 35.8 | 29 | 5.6 | 15 | 2.9 | |
| **Age (years)** | | | | | | | | | |
| 9-10 | 174 | 77.7 | 41 | 18.3 | 5 | 2.2 | 4 | 1.8 | Fisher's exact statistic = 56.8, p<0.0001 |
| 11-12 | 267 | 62.7 | 139 | 32.6 | 14 | 3.3 | 6 | 1.4 | |
| 13-14 | 100 | 44.2 | 103 | 45.6 | 14 | 6.2 | 9 | 4.0 | |
| **Area of residence** | | | | | | | | | |
| Urban | 99 | 56.3 | 65 | 36.9 | 10 | 5.7 | 2 | 1.1 | Fisher's exact statistic = 17.8, p = 0.005 |
| Semi-urban | 144 | 60.3 | 73 | 30.5 | 10 | 4.2 | 12 | 5.0 | |
| Rural | 298 | 64.8 | 145 | 31.5 | 13 | 2.8 | 4 | 0.9 | |

**Data analysis:** All statistical analysis was performed using SPSS version 24.0. The level of significance was set at 0.05. Descriptive statistics were used to describe the demographic variables as well as other basic features in the study. The Chi-square test for association and the Fisher's exact test were used for further inferences on the study's main theoretical variables.

## RESULTS

Of the 876 participants, 356 (40.6%) and 520 (59.4%) were males and females, respectively. As shown in Table 1, the mean values and associated standard deviations of the participants' anthropometric variables and body composition were 11.0±1.5, 39.3±10.3 kg, 144.0±10.9 cm and 18.9±4.2 kg/$m^2$ respectively for age, body mass, stature and BMI. Table 2 shows that boys had a higher prevalence of underweight (70.5%), compared to the girls (55.8%). About 251 (70.5%), 97 (27.3%), 4 (1.1%) and 4 (1.1%) boys were underweight, normal weight, overweight and obese, respectively. The corresponding figures for girls were 290 (55.8%), 186 (35.8%), 29 (5.6%) and 15 (2.9%) for underweight, normal weight, overweight and obesity, respectively. Problem of Underweight was higher among age groups 9-10 years (n = 174; 77.7%) and 11-12 years (n = 267; 62.7%), which decreases with age. The BMI weight classifications showed

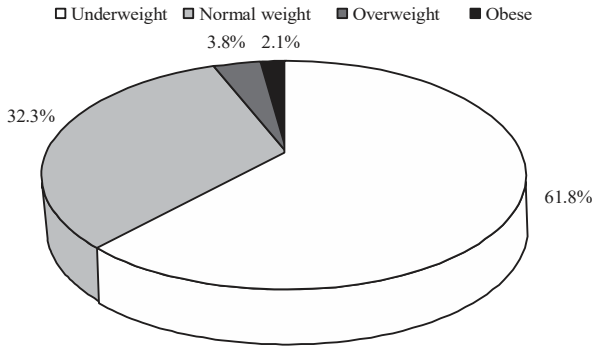


Fig. 2: Body weight disorders of the participants according to BMI classifications

significant association with gender (Chi-square statistic = 26.3; p<0.0001), age (Fisher's Exact statistic = 56.8; p<0.0001) and area of residence (Fisher's Exact statistic = 17.8; p = 0.005) among the participants. Geographically, the prevalence of underweight was predominant in rural (n = 298; 64.8%) and semi-urban (n = 144; 60.3%) children compared to urban children (n = 99; 56.3%).

Lastly, Fig. 2 shows the prevalence of underweight, normal weight, overweight and obesity of the participants. Out of 876 participants, 61.8% (n = 541), 32.3% (n = 283), 3.8% (n = 33) and 2.1% (n = 19) were underweight, normal weight, overweight and obese, respectively. This simply reveals that the prevalence of underweight (n = 541; 61.7%) was significantly higher (Chi-square value = 829.9; df = 3; p<0.0001), as compared to other BMI weight classifications.

## DISCUSSION

There was a high prevalence of underweight among primary school learners. However, only a few of the learners were overweight and obese. Considering the schools sampled, which were all public schools, it may be logically correct to designate the type of school attended as a proxy for the socio-economic status of the parents or guardians of the children. Rich parents are more likely to send their children to private schools compared to poor households. In this context, the samples in our study are from children with a lower socio-economic status. This indicates that children attending public schools were more likely to become underweight than those attending private schools. Several studies have reported high prevalence of underweight among children attending public schools in Ghana[26-28]. In the present setting, the prevalence of underweight in children is similar to other studies in South Africa[22,23,29-34]. The high proportion of underweight among school children in the current study could be attributed to their low socio-economic levels. In South Africa, the burden of economic and social disparity coexists with child malnutrition[22]. As in the present study, the discrepancies in the prevalence of underweight within different geographical settings in South Africa can be explained by the imbalances in health and health care systems between areas with different household incomes[35].

Notably, the Eastern Cape Province, where the sample was drawn, is one of the poorest provinces in South Africa. Poverty is common, especially among families in rural areas and even for the majority of household families living in urban areas. Most of the people are unemployed and some rely on daily menial jobs to survive. A higher proportion of underweight in children living in rural areas is associated with food insecurity and household poverty in poorer communities[33]. Socioeconomic status like poverty is also a major predictor of child underweight[12]. Children from poor family backgrounds are more likely to be underweight when compared with children from wealthier families[36]. Several studies have shown that household food insecurity and low parental education are the main factors for prevalence of underweight among school children[12,13,37,38]. The World Bank statistics report indicated that children who live in households lacking access to sufficient food are more likely to be predisposed to poor nutrition and health related problems than children from food secure households[39].

Given that a large proportion of the Eastern Cape population is living in poverty and, as such, is unable to afford nutritious food or access improved health care facilities, the task of reducing the prevalence of underweight in children becomes extremely challenging. The introduction of child support grants and old-age pensions are measures instituted by the South African government to reduce food insecurity. Notwithstanding, the food insecurity remains a problem, as 35% of households in South Africa are facing food insecurity[40]. It should be noted that most people in this setting are poor, without land to practice subsistence farming and thus rely solely on purchased food. Their low purchasing power may result in food insecurity and consequent undernutrition. The Sustainable Development Goals (SDGs), which address poverty, education, nutrition and universal health coverage, provide an opportunity to address the issues of underweight and overweight in children, as well as their health consequences[7]. As South Africa strives to attain the SDGs by the year 2030, ensuring that nutritional well-being is crucial, the fact that the issue of HIV/AIDS has an effect on undernutrition in our study setting cannot be ignored.

## CONCLUSION

Our study has highlighted the high prevalence of underweight among school children in the setting, which is concerning considering the implications of underweight status in relation to their development, health and well-being. The promotion of the government school feeding scheme, physical activity and dietary interventions are crucial in mitigating the menace of underweight among South African children. However, the findings of this study can only be generalised to quintile 1, 2 and 3 schools, which is a limitation of the study.

## SIGNIFICANCE STATEMENT

This is the first study to assess the nutritional status of learners attending primary school in the Eastern Cape Province, South Africa, under the 2012 Integrated School Health Policy programme. The findings highlight that the majority of the children are underweight. The undernutrition status of the children requires institutionalised stakeholder intervention.

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