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Correlation of Socio-Economic Factors, Diet, and Ownership of Consumer Electronics with Body Mass Index in Women of Childbearing Age: Insights from the 2016 South African Demographic Health Survey

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Abstract: The available evidence indicates a correlation between owning consumer electronics, such as cellphones and televisions, and a higher risk of obesity and increased adiposity. However, such studies are sparse in South Africa. Thus, the aim of this study is to examine the dietary and sociodemographic factors associated with various BMI categories, including the possession of consumer electronics, among women of reproductive age in South Africa. This is a secondary study of a population registry that includes dietary, BMI, and digital use items among women of reproductive age. The data is from the South Africa Demographic Health Survey (SADHS, 2016). Of the 3363 participants included in the analysis, women of normal weight were (35.5%), pre-obese (34.5%), obese (27.1%) and underweight (2.9%). Age was found to be significantly associated with pre-obesity at a <0.05 confidence interval. Owning a cellphone was significantly associated with being underweight and had 55% increased odds (1–0.45) (OR = 0.45; 95% CI 0.26–0.77, p = 0.004). Using internet almost daily was statistically significant with being underweight and had 55% (1–0.45) increased odds of being underweight (OR = 0.45; 95% CI 0.20–1.01, p = 0.054). Owning a cellphone and internet use was found to be significantly associated with being underweight. More research is needed to understand why cellphone ownership and using internet almost daily are significantly associated with being underweight.

Keywords: body weight categories; BMI; prevalence; socio-economic; diet; women of child-bearing age; consumer electronics; overweight; pre-obesity; obesity; South Africa

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1. Background

In low- and middle-income countries such as South Africa, the adoption of Western diets and sedentary lifestyles has led to an increase in pre-obesity and obesity. This shift has been accompanied by demographic and epidemiological changes that have negatively impacted socioeconomic development and increased the incidence of nutrition-related non-communicable diseases (NCDs), in both industrialized nations and emerging economies in Sub-Saharan Africa (SSA) [1]. Adverse health outcomes such as maternal mortality, delivery complications, preterm birth, and intrauterine growth retardation are associated with not only being pre-obese or obese but also with underweight [2–4]. Seventeen million deaths from cardiovascular diseases, 7.6 million deaths from cancer, 4.2 million deaths from respiratory diseases, and 1.3 million deaths from diabetes are attributed to NCD-related estimated annual mortality [5]. In addition, BMI levels differ across the Sub-Saharan Africa (SSA) region, with Southern African countries having the highest obesity prevalence [6,7], which is influenced by a variety of risk factors. Not only are the aforementioned nutrition related NCDs based on dietary behaviours, but also on sociodemographic characteristics and lifestyle practices. There are behavioural risk factors that contribute to changed BMI and NCDs, which include diet [8], socio-demographic characteristics [9] and lifestyle correlates such as watching TV while eating snacks, sedentary lifestyle manifesting in playing video games on phones [7]. Evidence suggests that there is higher BMI among women compared to men, and that BMI varies by place of residence with urban areas having a higher BMI than rural areas. It has also been observed that the prevalence of obesity in South Africa is driven by culture, age, gender, and social class [10]. Evidence also shows that there is a higher likelihood of increased measures of adiposity and risk for obesity with ownership of consumer electronics such as cellphones and televisions [11].

Furthermore, previous evidence suggests that there are few studies on the trends of underweight people [12], which necessitated that analysis on the underweight BMI category be included in this study to understand how dietary, demographic characteristics, and cellphone ownership impact on underweight nutritional status. Investigating the relationship between BMI differentials of underweight, pre-obese, and obese with other characteristics of interest relative to normal weight help to understand the nuances that may be missed by studying only a dichotomized variables such as underweight and overweight only [6]. Additionally, though studies have been done that focus on understanding the relationship between obesity and overweight as well as sociodemographic along with behavioral characteristics; however, there is dearth of literature that focus on understanding ownership of consumer electronics (CE) and their use in relationship to BMI differentials among women of child-bearing age in South Africa.

Studies have shown that the use of mobile phone is associated with a sedentary lifestyle, which is a risk factor for obesity [13,14]. Time spent watching television was found to be associated with an increased risk of obesity and diabetes in women, though causality could not be established [15]. According to [16] watching television did not increase the risk of being overweight or obese among women in Bangladesh. One study looked at the relationship between TV viewing, fast food consumption, and BMI. The study discovered that eating fast food and watching TV had a positive relationship with energy intake and increased BMI in women but not in men. The study also discovered that TV watching predicted weight gain among high-income women in the United States [17].

According to a report by the Independent Communications Authority of South Africa, smartphone cellphone penetration in South Africa stood at 90% in 2019 [18]). According to the 2018 General Household Survey (GHS), 82% of South African households owned television sets on a national scale [19]. South Africa's internet penetration rate was 68.2% of the total population of 41.19 million as of 2022 [20]. According to Kepios, a digital technology advisory firm, internet users in South Africa increased by 1.2% between 2021 and 2022, amounting to approximately 494,000 new internet users [20]. Due to the fact that evidence suggests that consumer electronics ownership and use are increasing in South Africa, the primary purpose of this study was to investigate the relationship between BMI differentials and consumer electronics ownership. Thus, the secondary purpose of this study was to look into not only the dietary and socio-demographic correlates of BMI differences, but also the ownership and use of CE among South African women of child-bearing age.

2. Results

2.1. BMI Differential Prevalence, Socio-Demographic, Consumer Electronics Ownership, and Behavioural Characteristics

2.1.1. Statistical Analysis

Descriptive and multinomial logistic analysis were used. Descriptive analysis provided bivariate association of explanatory and outcome variable for further exploration of key determinants of pre-obesity, obesity, and underweight relative to normal in South Africa. The outcome variable for the study is nutritional status taken from body mass index (BMI), which is the measurement used to determine weight by dividing weight by height squared (kg/m^2) [21]. The overall results from the measurement of BMI is stratified into underweight $\leq$18.5 kg/m^2, normal weight 18.5–24.9 kg/m^2, pre-obese (overweight) 25.0–29.9 kg/m^2, and obese 30.0–34.9 kg/m^2 [22,23].

The independent variables for the study are divided into sociodemographic, behavioural, and consumer electronics. The socio-demographic variables in the study are marital status, education, employment status, wealth status, age, place of residence and race. The consumer electronics (CE) in the study are cellphone ownership, frequency of watching television, and frequency of internet use. Behavioural variables are three dietary variables combined into one (unhealthy foods) after a correlation matrix was run and showed that there was multicollinearity. Figure 1 shows the correlation matrix of all variables in the study and the variables that were highly correlated: frequency of eating fried foods, frequency of eating fast foods, and frequency of eating processed meat. Figure 2 shows a correlation matrix after the merging of variables that were highly correlated. Categorical variables including BMI differential prevalence and other were analyzed using chi-squared test. A multinomial logistic regression was used to analyze associations between each independent variable of interest in the study and anthropometric indices. Three sets of control variables were allowed to enter first, including sociodemographic variables: marital status (Yes = 1, No = 2); education (No education = 1, Primary education = 2, Secondary education = 3, Higher education = 4); employment status (Employed = 1, Unemployed = 2); wealth status (Rich = 1, Middle Income = 2, Poor = 3); age 15–19 = 1, 20–24 = 2, 25–29 = 3, 30–34 = 4, 35–39 = 5, 40–44 = 6); place of residence (Rural = 1, Urban = 2), and race (Other = 1, African = 2, Coloured = 3). The second set includes consumer electronics: cellphone ownership (Yes = 1, No = 2), frequency of watching television (Less than once a week = 1, Not at all = 2, Once a week = 3), and frequency of internet use (Less than once a week = 1, Not at all = 2, Once a week = 3). The third set is behavioural characteristics which included unhealthy foods Daily =1, Never = 2, Occasionally = 3, Once a Week = 4) (see Figures 1 and 2). All analyses were conducted with R-Studio®.

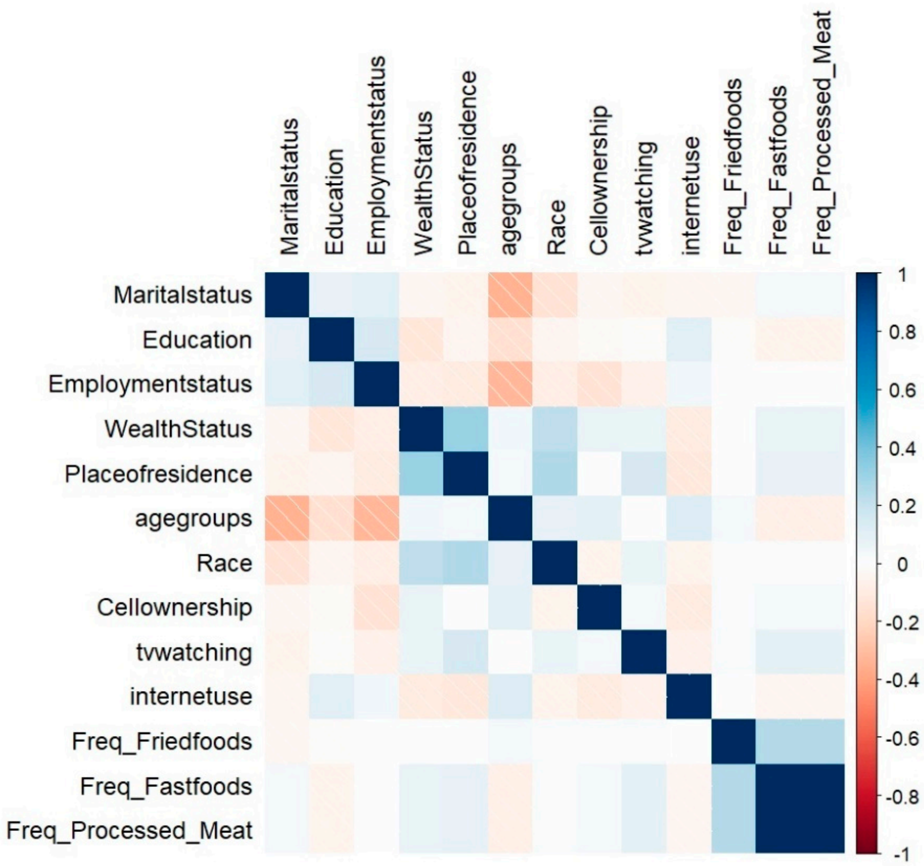

Figure 1. Correlation matrix of the study variables.

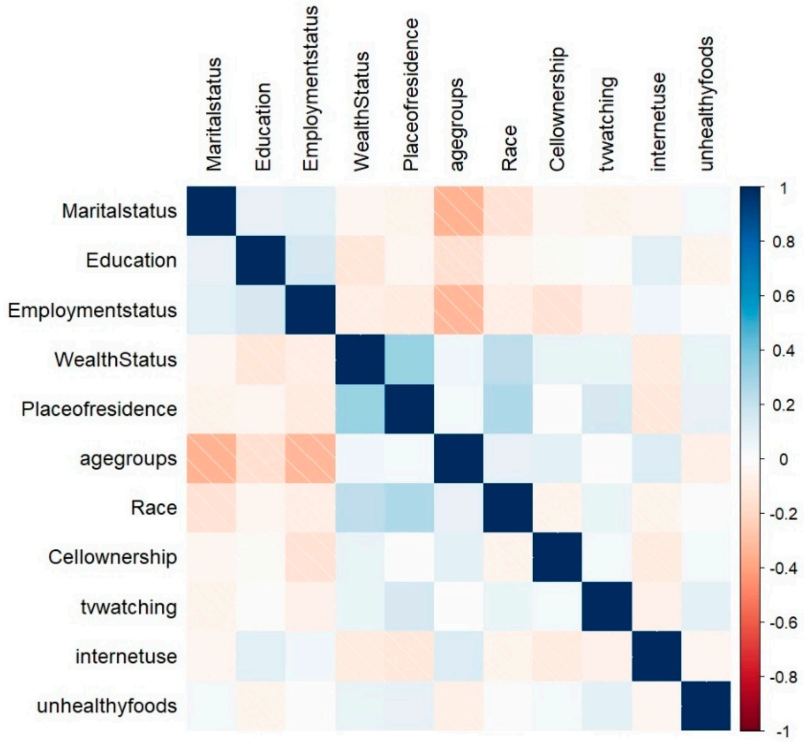

Figure 2. Correlation Matrix of the study variables with unhealthy foods variable.

Table 1 provides information on the characteristics of female respondents in South Africa of reproductive age (N = 3363) stratified by Body Mass Index (BMI) categories, which include normal weight (35.5%), pre-obese (34.5%), obese (27.2%), and underweight (2.9%). The table reports the distribution of the respondents across various demographic, socioeconomic, and health-related variables. The table presents the frequency and percentage of respondents across different categories of each variable, as well as the results of Pearson's chi-squared test to assess the statistical significance of differences across BMI categories. The variables included in the table are as follows:

Table 1. Respondents' characteristics with Body Mass Index stratification in Women of Reproductive Age in South Africa (N = 3363).

Variable	Normal Weight, N = 1195 (35.53%)	Pre-Obese, N = 1159 (34.46%)	Obese, N = 913 (27.15%)	Underweight, N = 96 (2.9%)	*p* [1]
Marital Status					**<0.001**
Married	269 (23%)	493 (43%)	302 (33%)	10 (10%)	
Unmarried	926 (77%)	666 (57%)	611 (67%)	86 (90%)	
Education					
None	28 (2.3%)	33 (2.8%)	16 (1.8%)	2 (2.1%)	
Higher	82 (6.9%)	131 (11%)	87 (9.5%)	8 (8.3%)	
Primary	144 (12%)	120 (10%)	93 (10%)	9 (9.4%)	
Secondary	941 (79%)	875 (75%)	717 (79%)	77 (80%)	
Employment Status					**<0.001**
Employed	237 (20%)	459 (40%)	294 (32%)	17 (18%)	
Unemployed	958 (80%)	700 (60%)	619 (68%)	79 (82%)	

Table 1. *Cont.*

Variable	Normal Weight, N = 1195 (35.53%)	Pre-Obese, N = 1159 (34.46%)	Obese, N = 913 (27.15%)	Underweight, N = 96 (2.9%)	p [1]
Wealth Status					**<0.001**
Rich	325 (27%)	449 (39%)	281 (31%)	26 (27%)	
Middle Income	273 (23%)	294 (25%)	234 (26%)	26 (27%)	
Poor	597 (50%)	416 (36%)	398 (44%)	44 (46%)	
Place of Residence					**0.052**
Rural	576 (48%)	505 (44%)	429 (47%)	52 (54%)	
Urban	619 (52%)	654 (56%)	484 (53%)	44 (46%)	
Age Groups					**<0.001**
15–19	367 (31%)	60 (5.2%)	108 (12%)	42 (44%)	
20–24	257 (22%)	111 (9.6%)	180 (20%)	17 (18%)	
25–29	205 (17%)	183 (16%)	178 (19%)	13 (14%)	
30–34	129 (11%)	207 (18%)	144 (16%)	8 (8.3%)	
35–39	96 (8.0%)	209 (18%)	107 (12%)	9 (9.4%)	
40–44	86 (7.2%)	193 (17%)	96 (11%)	3 (3.1%)	
45–59	55 (4.6%)	196 (17%)	100 (11%)	4 (4.2%)	
Race					
Other	27 (2.3%)	38 (3.3%)	23 (2.5%)	1 (1.0%)	
African	1073 (90%)	1028 (89%)	827 (91%)	77 (80%)	
Coloured	95 (7.9%)	93 (8.0%)	63 (6.9%)	18 (19%)	
Unhealthy Foods					
Daily	28 (2.3%)	30 (2.6%)	22 (2.4%)	2 (2.1%)	
Never	87 (7.3%)	83 (7.2%)	57 (6.2%)	10 (10%)	
Occasionally	869 (73%)	816 (70%)	640 (70%)	71 (74%)	
Once a Week	211 (18%)	230 (20%)	194 (21%)	13 (14%)	
Cell ownership	1019 (85%)	1105 (95%)	836 (92%)	68 (71%)	**<0.001**
Frequency of TV Watching					**<0.001**
Less than Once a week	111 (9.3%)	107 (9.2%)	78 (8.5%)	9 (9.4%)	
Not at all	298 (25%)	177 (15%)	192 (21%)	22 (23%)	
Once a week	786 (66%)	875 (75%)	643 (70%)	65 (68%)	
Internetuse					
<once a week	56 (4.7%)	40 (3.5%)	43 (4.7%)	11 (11%)	
Almost daily	319 (27%)	300 (26%)	244 (27%)	24 (25%)	
Not at all	696 (58%)	709 (61%)	542 (59%)	54 (56%)	
Once a week	124 (10%)	110 (9.5%)	84 (9.2%)	7 (7.3%)	

[1] Pearson's Chi-squared test.

Marital status: The table shows that there are statistically significant differences in marital status across BMI categories (p = 0.001). A higher percentage of pre-obese respondents were married (43%), while a higher percentage of underweight respondents were unmarried (90%).

Education: The table reports that there are statistically significant differences in education level across BMI categories (p = 0.001). Respondents with secondary education were the most prevalent across all BMI categories, while respondents with no education were the least prevalent.

Employment status: The table reveals that there are statistically significant differences in employment status across BMI categories ($p = 0.001$). A higher percentage of pre-obese respondents were employed (40%), while a higher percentage of underweight respondents were unemployed (82%).

Wealth status: The table shows that there are statistically significant differences in wealth status across BMI categories ($p = 0.001$). A higher percentage of pre-obese and rich respondents were prevalent, while a higher percentage of underweight and poor respondents were prevalent.

Place of residence: The table shows that there are no statistically significant differences in place of residence across BMI categories ($p = 0.052$). A similar proportion of respondents lived in rural and urban areas across all BMI categories.

Age groups: The table shows that there are statistically significant differences in age groups across BMI categories ($p = 0.001$). A higher percentage of underweight respondents were in the 15–19 age group (44%), while a higher percentage of pre-obese respondents were in the 30–34 age group (18%).

Race: The table reports that there are statistically significant differences in race across BMI categories ($p = 0.001$). The majority of respondents across all BMI categories were African, while a higher percentage of underweight respondents were Coloured.

Unhealthy foods: The table shows that there are no statistically significant differences in unhealthy food consumption across BMI categories. A similar proportion of respondents across all BMI categories reported consuming unhealthy foods daily, never, occasionally, or once a week.

Cell ownership: The table reports that there are statistically significant differences in cell ownership across BMI categories ($p = 0.001$). A higher percentage of normal weight respondents owned a cell phone (85%), while a lower percentage of underweight respondents owned a cell phone (71%).

Frequency of TV watching: The table shows that there are statistically significant differences in the frequency of TV watching across BMI categories ($p = 0.001$). A higher percentage of normal weight and pre-obese respondents reported watching TV once a week or more frequently, while a higher percentage of underweight respondents reported not watching TV at all.

Internet use: The table reports that there are statistically significant differences in internet use across BMI categories ($p = 0.001$). A higher percentage of normal weight and pre-obese respondents reported using the internet almost daily, while a higher percentage of underweight respondents reported not using the internet at all.

2.1.2. Multinomial Logistic Regression

Table 2 shows the results of a study analyzing the association between various demographic and lifestyle factors and the likelihood of being underweight, pre-obese, or obese. The study used adjusted odds ratios (AOR) with 95% confidence intervals (CI) and p-values to evaluate the strength and statistical significance of each association.

The results suggest that several factors were significantly associated with the odds of being underweight, pre-obese, or obese:

Marital status: being unmarried was associated with higher odds of being underweight (AOR = 2.42, $p = 0.017$) but not significantly associated with pre-obesity or obesity.

Education: none of the educational levels showed a significant association with underweight, pre-obese, or obese.

Employment status: being unemployed was associated with lower odds of being pre-obese (AOR = 0.78, $p = 0.029$) and obese (AOR = 0.78, $p = 0.029$), but not underweight.

Wealth status: being poor was associated with lower odds of being underweight (AOR = 0.54, $p = 0.001$) but not significantly associated with pre-obesity or obesity.

Table 2. Multinomial Regression Model of body mass index categories in Women of Reproductive Age in South Africa, 2017 (N = 3363).

Variable	Pre-Obese			Obese			Underweight		
	AOR	95% CI	*p*-Value	AOR	95% CI	*p*-Value	AOR	95% CI	*p*-Value
Marital Status									
Married	—	—		—	—		—	—	
Unmarried	0.72	0.59, 0.89	0.002 ***	0.81	0.65, 1.01	0.056	2.42	1.17, 5.01	0.017 ***
Education									
None	—	—		—	—		—	—	
Higher	1.29	0.67, 2.47	0.4	1.89	0.90, 3.95	0.091	1.79	0.30, 10.6	0.5
Primary	1.01	0.56, 1.85	>0.9	1.48	0.74, 2.94	0.3	0.79	0.15, 4.24	0.8
Secondary	1.41	0.80, 2.49	0.2	2.02	1.05, 3.90	0.036 ***	1.05	0.21, 5.13	>0.9
Employment Status									
Employed	—	—		—	—		—	—	
Unemployed	0.80	0.65, 0.99	0.043 ***	0.78	0.63, 0.98	0.029 ***	0.90	0.49, 1.67	0.7
Wealth Status									
Rich	—	—		—	—		—	—	
Middle Income	0.78	0.60, 1.01	0.060	0.96	0.73, 1.25	0.8	1.04	0.55, 1.98	0.9
Poor	0.54	0.40, 0.71	<0.001 ***	0.77	0.58, 1.03	0.078	0.77	0.37, 1.59	0.5
Place of Residence									
Rural	—	—		—	—		—	—	
Urban	0.80	0.65, 1.00	0.048 ***	0.87	0.70, 1.07	0.2	0.53	0.31, 0.92	0.023 ***
Age Groups			<0.001 ***			<0.001 ***			
15–19	—	—		—	—		—	—	
20–24	2.33	1.62, 3.34		2.20	1.63, 2.96		0.69	0.37, 1.28	0.2
25–29	4.61	3.21, 6.60		2.63	1.92, 3.60		0.72	0.36, 1.47	0.4
30–34	7.77	5.29, 11.4		3.27	2.29, 4.65		0.76	0.32, 1.81	0.5
35–39	11.5	7.70, 17.2		3.50	2.38, 5.13		1.05	0.45, 2.46	>0.9
40–44	12.1	7.96, 18.3		3.58	2.39, 5.36		0.43	0.12, 1.58	0.2
45–49	20.2	12.8, 31.9		6.23	4.01, 9.67		0.84	0.26, 2.76	0.8
Race									
Other	—	—		—	—		—	—	
African	1.73	0.98, 3.04	0.059	1.50	0.82, 2.76	0.2	1.17	0.15, 9.35	0.9
Coloured	1.27	0.67, 2.39	0.5	1.11	0.56, 2.18	0.8	3.83	0.47, 31.5	0.2
Unhealthy Food									
Daily	—	—					—	—	
Never	0.71	0.37, 1.38	0.3	—	—		1.59	0.32, 7.98	0.6
Occasionally	0.83	0.46, 1.47	0.5	0.74	0.37, 1.45	0.4	1.05	0.24, 4.58	>0.9
Once a Week	1.01	0.55, 1.85	>0.9	0.92	0.51, 1.66	0.8	0.74	0.16, 3.52	0.7
Cell Ownership				1.19	0.65, 2.19	0.6			
No	—	—					—	—	
Yes	2.35	1.64, 3.36	<0.001 ***	—	—		0.45	0.26, 0.77	0.004 ***

Table 2. *Cont.*

Variable	Pre-Obese			Obese			Underweight		
	AOR	95% CI	*p*-Value	AOR	95% CI	*p*-Value	AOR	95% CI	*p*-Value
TV Watching				1.34	0.98, 1.83	0.066			
Less than Once a week	—	—					—	—	
Not at all	0.80	0.55, 1.14	0.2	—	—		0.90	0.39, 2.10	0.8
Once a week	1.07	0.78, 1.46	0.7	1.07	0.74, 1.54	0.7	0.93	0.44, 1.95	0.8
Internet use				1.12	0.81, 1.54	0.5			
<once a week	—	—					—	—	
Almost daily	0.92	0.57, 1.49	0.7	—	—		0.45	0.20, 1.01	0.054 ***
Not at all	0.93	0.58, 1.49	0.7	0.78	0.49, 1.22	0.3	0.40	0.18, 0.87	0.020 ***

AOR = Adjusted Odds Ratios, CI = Confidence Interval, *** = 0.05 Confidence Level.

Place of residence: living in an urban area was associated with lower odds of being underweight (AOR = 0.53, p = 0.023) but not significantly associated with pre-obesity or obesity.

Age groups: increasing age was associated with significantly higher odds of being underweight, pre-obese, or obese.

Race: none of the races showed a significant association with underweight, pre-obese, or obese.

Unhealthy food: None of the unhealthy food intake patterns showed a significant association with underweight or obese. However, eating unhealthy food occasionally was associated with lower odds of pre-obesity (AOR = 0.74, p = 0.4).

In conclusion, the study suggests that demographic and lifestyle factors such as marital status, employment status, wealth status, place of residence, age, and unhealthy food intake patterns can be associated with the odds of being underweight, pre-obese, or obese. However, the direction and strength of the associations varied depending on the factor being analyzed.

For cell ownership, the AOR for individuals of pre-obese category who own a cell phone compared to those who do not was 2.35 (95% CI: 1.64, 3.36), with a statistically significant p-value of < 0.001. For underweight category, the AOR of those who owned a cell phone to those who do not was 0.45 (95% CI: 0.27, 0.77), with a statistically significant p-values of (p = 0.004).

For TV watching, the AOR for individuals who watch TV more frequently was 1.34 (95% CI: 0.98, 1.83), with a p-value of 0.066, indicating a borderline association.

For internet use, the AOR was not statistically significant for any of the weight categories, with p-values of 0.5, 0.054, and 0.02 for the three levels of internet use (less than once a week, almost daily, and not at all, respectively).

The above results suggest that demographic and lifestyle factors such as marital status, employment status, wealth status, place of residence, age, and unhealthy food intake patterns can be associated with the odds of being underweight, pre-obese, or obese. However, the direction and strength of the associations varied depending on the factor being analyzed.

3. Discussion

The prevalence of being underweight has decreased in South Africa over the years, while pre-obesity and obesity have rapidly increased, which are risk factors for non-communicable diseases. South Africa has one of the highest higher BMI categories compared to other sub-Saharan African countries. In Botswana, half of the women were pre-obese/obese [24], while the proportion of obese women in Zambia nearly doubled between 2002 and 2014 [25]. The weighted prevalence of overweight and obesity in adult females in Zimbabwe was 34.2% overweight and 12.3% obese, with an overall 46.5% higher BMI category. In Nigeria, the prevalence of pre-obesity was higher among women, and obesity was estimated to be high with approximately one-third falling into the highest BMI category [26]. South Africa's key indicator report for 2016 revealed a prevalence of 27% for pre-obesity and 41% for obesity among women, with an overall 68% high BMI category [27]. This study found that the prevalence of pre-obesity and obesity was 34.5% and 27.2%, respectively, with an overall higher BMI category of 62% among South African women of childbearing age.

Ownership and use of consumer electronics have been linked to an increased risk of obesity due to reduced energy expenditure, which substitutes physical activity for a sedentary inactive lifestyle [7]. Knowledge of the role of consumer electronics ownership and its relationship with BMI is limited in South Africa. Previous research has failed to establish a significant relationship between electronic consumer ownership such as cellphones and television and use with nutritional status [28,29]. In this study, cellphone ownership was found to have a significant relationship with pre-obese and underweight BMI categories, though, this is contrary when compared with most literature.

Cellphone ownership was the most supported risk factor to higher BMI categories such as pre-obesity and obesity in several studies conducted in developed countries [30–32].

In this study, using the internet almost daily, not at all, and once a week were associated with an underweight BMI category, compared to using it less than once a week. However, other studies discovered that several internet and cell phone-related activities were associated with higher BMI instead of underweight [30–32]. Another issue that may arise in this study is incidental findings, which are unexpected or unplanned results that are discovered during the course of a study. For example, in this study, the AOR for internet use among those who do not use the internet at all is 0.93 (95% CI: 0.58, 1.49) with a non-significant *p*-value of 0.7. However, when examining the AOR for internet use among those who do not use the internet at all and are underweight, the AOR is 0.40 (95% CI: 0.18, 0.87) with a significant *p*-value of 0.020. This suggests that the relationship between internet use and weight status may not have been a primary research question, but it could be an incidental finding that warrants further investigation.

In this study, no significant relationship was found between watching television and any of the BMI categories and may have a weak association with weight status. However, it is important to note that these findings are based on an observational study, and further research is needed to establish causality and to investigate the potential mechanisms underlying these associations. According to [16], watching television did not increase the risk of being overweight or obese among women in Bangladesh.

Being older, living in a city/town, being married, and having obtained higher levels of education were found to be significantly associated with overweight/obesity [24]. In our study, all age categories were found to be significant in all nutritional indices. Being unmarried, having a secondary education and being unemployed were found to be significantly associated with pre-obesity. Living in urban residence was significantly associated with pre-obesity and being underweight. This could be a case since there are dynamics in urban area where those with higher income and are employed may have access to high calory food as some evidence suggests. Changes in nutrition and lifestyles, increasing levels of urbanization, increasing levels of income, including consumption of high-calorie foods coupled with sedentary lifestyle, have been identified as key determinants of the SSA pre-obesity and obesity epidemic [33,34], and South Africa is no exception [9,35]. At the same time, those in urban areas who are unemployed may be exposed to food insecurity. In rural India, the odds of being underweight were higher among young women or at younger ages, whereas highly educated older women at older ages who had never married had a higher risk of being pre-obese or obese [36]. The differences in the determinants of BMI differentials between India and South Africa demonstrate that BMI differentials, whether underweight or overweight, are context driven and necessitate specific, context-based research to provide need-specific interventions.

4. Methods

4.1. Data Source and Design

This is a retrospective study using data from the South African Demographic Health Survey [37]. SADHS is a public access dataset with permission from the DHS Program (National Department of Health, Statistics South Africa, South African Medical Research Council and ICF). The DHS program is a health surveillance system which provides data on basic demographic and health indicators for use by policy makers and program managers to design and evaluate health programs. The DHS uses a stratified, cluster sampling method. The survey is designed to obtain a representative national estimate for South Africa, as well as for each of the nine provinces in the country.

4.2. Study Population

Children between birth and five years old, women between 15 and 49 years old, and men between 15 and 59 years old are included in the DHS survey. There were 15,292 households selected for the sample, of which 11,083 were successfully interviewed. Among these, 8514 interviews were completed with women between the ages of 15 and 49 years (Statistics South Africa, 2017). The weighted sample size used for this study was 3363 women of child-bearing age, 15–49 years.

4.3. Setting

This is a secondary study of a population registry that includes dietary, BMI, and digital use items among women of reproductive age in South Africa.

5. Conclusions

The prevalence of being underweight has decreased in South Africa, while pre-obesity and obesity have rapidly increased, which increases the risk of non-communicable diseases. Consumer electronics ownership, particularly cellphone ownership, was found to be significantly associated with higher BMI such as pre-obesity and underweight. This is an unusual finding that could be further investigated.

Being older, living in a city/town, being married, and having obtained higher levels of education were significantly associated with overweight/obesity, while living in urban residences was significantly associated with pre-obesity and being underweight. The sub-Saharan African pre-obesity and obesity epidemic may be driven by changes in nutrition and lifestyles, increasing levels of urbanization, increasing levels of income, including consumption of high-calorie foods, coupled with sedentary lifestyles.

Although there was statistical significance between categories of pre-obesity, underweight and cellphone ownership, it is also unclear how cellphone ownership affects these BMI categories. It is assumed that the effects are due to the use of cellphone gaming apps, social media, and the internet in general. To understand its significant association with BMI differentials among women of childbearing age in South Africa, studies determining how cellphones are used and the hours used are required. Further research is needed to establish causality and investigate the potential mechanisms underlying these associations. However, the study could be useful to support women's health care in the local context, considering possible controls that have an impact on women's health or nutritional indices.

6. Limitations and Strength

As a cross-sectional study using weighted nationwide data, it is not possible to establish a causal relationship. Additionally, although the study focused on women of reproductive age, it did not account for important variables such as parity, smoking, and alcohol consumption, which can influence BMI. Furthermore, the dataset does not include information on daily caloric consumption, physical activity, cellphone usage patterns and duration, television viewing habits, and internet usage duration. Despite these limitations, the study's notable strength lies in being the first nationwide research to offer insights into selected factors associated with BMI variations, such as consumer electronics, among

South African women of childbearing age. The use of stratified random sampling allows for generalization of findings to the entire population group in the country.

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Institutional Review Board Statement: The DHS team ensured that ethical approvals were obtained from the national department's health ethics committee before the surveys were conducted. Respondents in the DHS data were informed that participation in this study is voluntary and they were asked to sign a voluntary consent form prior to enrolment in the study. Confidentiality and privacy were respected.

Informed Consent Statement: Not applicable.

Data Availability Statement: The datasets analysed for this study are available at https://dhsprogram.com.

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