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The relationship between socio economic status and health metrics in adults. A case of South Western Township, South Africa

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ABSTRACT

There is an increasing number of people dying due to non-communicable diseases such as cardiovascular disease in South Africa and globally. The differences in socio economic status allows others to receive resources, buying powers and privileges while others remain disadvantaged. The aim of the study was to investigate the impact of socio-economic status on health metrics; blood pressure and adiposity in adults based in the SOWETO Township. Data used in the study was obtained from an ongoing South African Hypertension and Diet Study (SAHDS) that began in 2002. A total of 1211 people were selected from the SAHDS study. These participants had measurements of blood pressure, body mass index, and waist circumference. They also had a questionnaire with a record of their employment status, education level, and presence or absence of diabetes and hypertension. Moreover, those who smoked cigarettes and consumed alcohol were also recorded. The studied population sample had an average age of 44±18, with body mass index (BMI) measurements of 29.5±8.0 kg/m^2 with men having a BMI of 24.9±5.2 kg/m^2 while women had a BMI measurement of 31.9±8.0 kg/m^2. An average waist circumference (WC) reading of the total population was 90.6±16.9, men had a WC of 85.5±14.5 cm while women had a WC of 93.4±17.5 cm. Those who smoked cigarette accounted for 15.2% of the whole population studied with men accounting for a highest percentage (32.8%) than women (5.7%). Those who consumed alcohol were 20.8% in total, men had the higher percentage of alcohol consumption (34.75) than women (13.3%). Approximately 41% of the population was hypertensive, while 8.8% were diabetic, women were more hypertensive (42.8%) than men (36.5%). There was a negative correlation between BMI measurements and education level (R^2 = -0.13, p = 0.0049) and salary (R^2 = -0.18, p < 0.0001). However, there was a positive correlation seen between BMI and pension (R^2 = 0.19, p < 0.0001) as well as unemployment (R^2 = 0.19, p < 0.0001). There was a negative correlation observed between waist circumference and education level (R^2 = -0.13, p = 0.0001), pension (R^2 = -0.26, p <0.0001) and salary (R^2 = -0.18, p <0.0001). Whilst there was a positive correlation observed between waist circumference and unemployment (R^2 = 0.25, p < 0.0001). The systolic and diastolic blood pressure measurements revealed a negative correlation with education level (R^2 = -0.21, p < 0.0001), (R^2 = -0.13, p = 0.0001) respectively and salary for systolic (R^2 = -0.13, p < 0.0006) and diastolic (R^2 = -0.10, p = 0.0135). However, positive correlation

was observed between systolic and diastolic measurements and pension (R^2 = 0.34, < 0.0001), (R^2 = 0.10, p = 0.0018) respectively as well as unemployment (R^2 = 0.29, p < 0.0001), (R^2 = 0.10, p = 0.0218) respectively. There was high prevalence of hypertension in this population. It can be concluded that socioeconomic status determines adiposity and hypertension in the SOWETO community. Therefore, to reduce the high prevalence of hypertension and obesity in this population, future study should concentrate on addressing the impact of socio-economic disparities.

Keywords: Socio-economic status, Adiposity, Obesity, Hypertension, Education, employment, Lifestyle, SOWETO

CHAPTER 1. INTRODUCTION

1.1 Statement of purpose

This research will evaluate the interplay between socio economic status and health conditions in adults. Specifically, the study will investigate the impact of socio-economic status on blood pressure and adiposity.

1.2 Background of the study

Socio economic status plays a key role in accessibility of basic needs necessary for the survival and wellbeing of society. The high Inequality gap observed in South Africa has shown to have an effect in the health and life span of the South African population (Wits, 2022; Craig *et al*., 2022; Mtintsilana, 2023). A clear picture of inequality is seen in the locations people are occupying (Sandton suburb and Alexander Township in Gauteng, Lake Michelle and Masiphumele, Cape Town, Primrose and Makause, Johannesburg). The area one occupies mainly depends on the socio-economic group they belong to (low class group, middle and high-class group).

The low-class citizens are normally those that lack financial security characterised by low to no income at all and that consequent to no access to education, a stable nutrition diet and accessing operational health care facilities (Dlamini *et al*., 2023). While the middle to high class can afford stable food and reliable private facilities such as private health facilities.

Cardiovascular disease (CVD) is amongst the leading causes of death in South Africa (Woodiwiss, 2023). High blood pressure and obesity are the contributing factors of

CVD. Both these factors are usually caused by excess levels of stress, unhealthy diet which includes low consumption of fruits and vegetables, consumption of alcohol and beverages high in caffeine, lack of exercise and smoking (Heart & Stroke Foundation South Africa, 2017).

The study done by Craig *et al*. (2022) brought into light the prevalence of depression in middle income countries such as South Africa. The study revealed that retired and older adults over the age of 65, those who had primary education and living in metropolitans had high frequency for both probable depression and anxiety. Moreover, the study done by Mtintsilana *et al*. (2003) highlighted how socio-economic status is associated with the risk of non-communicable disease. Mental health issues previously were not recognised as serious illness and in other cultures especially in South Africa, it has been associated with not being able to overcome and handle difficult situations, being 'weak'. A study done by Wits University (2022) alluded that, about 25.7% of people living in South Africa are probably depressed. The study also revealed that low class citizens are more susceptible to mental health issues.

1.3 Research problem

There is an increasing number of people that are dying because of non-communicable diseases such as cardiovascular disease globally and in South Africa. Socioeconomic status factors such as income/financial security and education play a crucial role on the choice of food intake of the society (Craig *et al*., 2022; Mtintsilana, 2023). The study done by Dlamini *et al*. (2023) found that about 20.4% of South African households under the low-income class are unable to access sufficient food due to lack of financial security. While the study of Gilbert and Soskolne (2003) concluded that those in low economic class suffer the most when it comes to health issues.

The heart of Soweto study revealed that people from Soweto food intake consist of a less nutritious diet (Pretorius & Sliwa, 2011). People are moving toward the consumption of processed foods, junk foods and food containing more refined carbohydrates. These may be related to affordability, accessibility, lack of dietary knowledge/education and culture.

South Africa is one of the poverty-stricken countries with almost half of the population (49.2%) living below the upper-bound poverty line (Stat SA,2019) and high level of unemployment rate, 7.9 million were unemployed in the first and second quarter of

2023 (Stat SA, 2023). The deteriorating South African economy does not make the situation any better, the highest inflation rate has recently been seen with 2022 being the worst year with an inflation rate of 7.8% (Stat SA, 2023; Business Day, 2024).

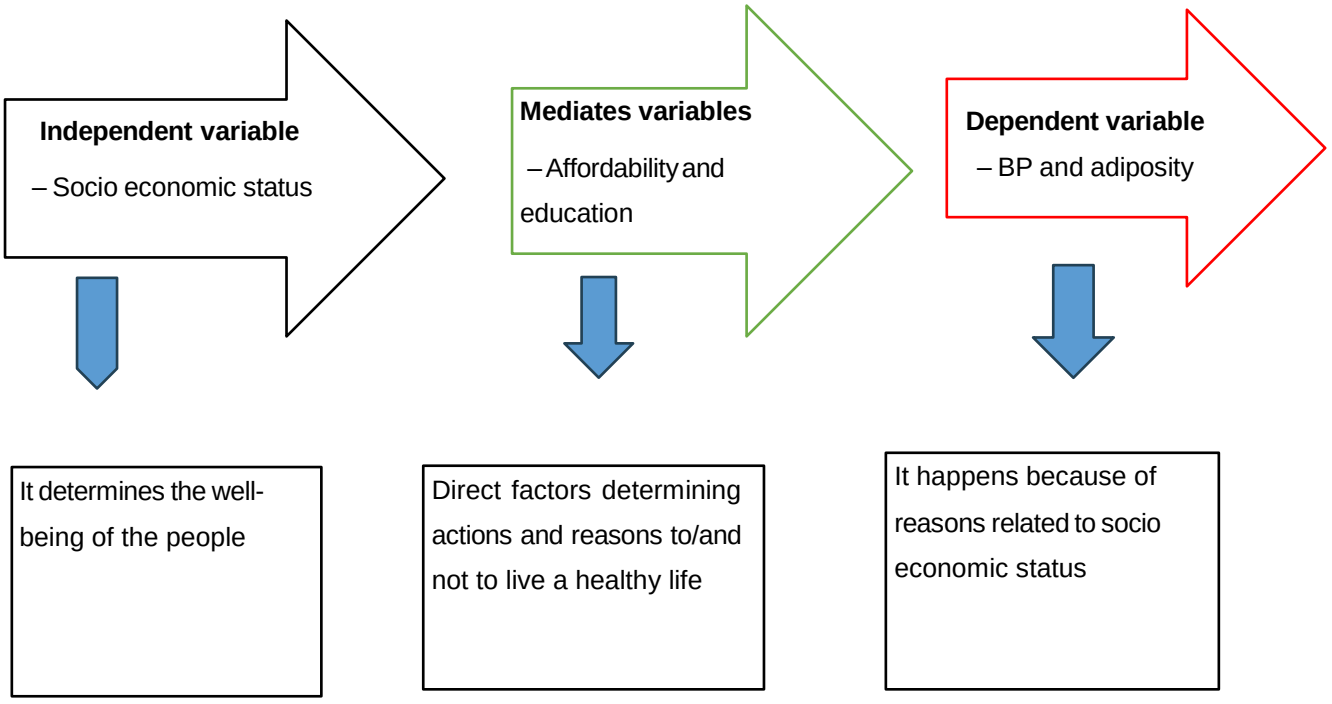
With all the socio-economic issues the country is facing currently, it will be interesting to study the effects it has on the population's health status. There have been studies done on the relationship between socio-economic status and health of South Africans in the lower end of the economy however, studies have been focusing on self-assessed health status without measuring health metrics (Gilbert & Soskolne, 2003; Atuga *et al*., 2011; Cramm & Nieboer, 2011; Craig *et al*., 2022; Mtintsilana, 2023). Therefore, there has not been scientific evidence on health but relying on self-assessed health status of people. This study assesses the impact of socio-economic factors such as education, income and employment status on health metrics such as blood pressure and body mass index which is an index of obesity in the Soweto community which took part in the South African Hypertension and Diet Study (SAHDS).

The study is going to add value by producing results that will show if there is a link between socio-economic status and non-communicable diseases and how to find measures to reduce prevalence of these diseases through tackling social issues of people living in Soweto. The study will also be used to assess whether socio-economic status of the people living in Soweto has changed over the period of 22 years (2002 to 2024).

1.4 Research objectives

1. To determine the prevalence of obesity and hypertension in the Soweto community
2. To investigate the correlation between socio-economic status, adiposity and high blood pressure (hypertension)

1.5 Conceptual proposition



1.6 Rationale

Studies done are showing that there is an association between socio economic status and prevalence of non-communicable diseases (Nyundu, 2018; Heart and Stroke Foundation South Africa, 2017; Woodiwiss, 2023). The study will confirm the impact of socio-economic status on adiposity and hypertension.

1.7 Delimitations of the study

The study will not do an experiment where it takes in or away mediates variables from the participants to see the change in their blood pressure and adiposity due to ethical clearance consideration and time constrains. Moreover, the study will not use income segments to categorize the population and to evaluate the prevalence of obesity and hypertension based on income segments due to unavailability of income data in values.

1.8 Hypothesis

- Socioeconomic status influences the choice of food consumed by people in

Soweto.

- There is a relationship between unemployment and hypertension in Soweto.

CHAPTER 2. LITERATURE REVIEW

2.1 Introduction

South Africa has a sad history of inequality which dates to the days of colonisation and apartheid. During the reign of the apartheid regime, racism was institutionalized. Black people were not part of the economy as they were landless, semiskilled, marginalised, and merely workers (Christopher, 1992). Where else whites were owning mines, farms, lands and were top entrepreneurs (Rehbein, 2018). Through racial segregation, Black people were moved to dwell in rural areas owned by white farmers, and others were moved to crowded places called Bantustans (SAHO, 2019).

Soweto was one of the townships that Black people who were labourers were all moved to from Johannesburg to be separated from white people and were separated from their families. The population of Soweto in August 2023 was about 1 895 921 people (SAHO, 2023). The Soweto Township is divided into different suburbs that range from modest RDP houses, shacks to mansions. These divisions provide a diversity of people belonging to different socio-economic groups (SEG). Living in overcrowded locations with non-functional systems such as health facilities, education, and family structure. The study done by Cramm and Nieboer (2011) brought into the light the negative effect segregation caused to the health of those affected, it further alluded that segregation in South Africa led to bad health conditions and formed various health patterns within the society.

The segregated communities were forced to only interact with one another and form their own social capital, culture and certain lifestyle that is influenced by what is around them. However, there were supportive social networks that were developed in Soweto as people will open businesses and stockvels that will flourish (Gilbert & Soskolne, 2003). The lifestyle and the culture that was predominant amongst blacks in the township included meeting in groups for different reasons, such as talking about struggles and ways to end it, to relax after a long day at work. Meetings will happen in places where there will be alcohol and food. Hence this day, places that sell food/fast food and beverages in the townships are seen more.

The literature review will provide a review on socio-economic status and factors contributing to it, limitations imposed by belonging in the low SEG and explore theoretical and conceptual frameworks.

2.2 Socio economic status in the South African context

The Oxford dictionary describes socio economic status as the position where an individual is in society in terms of the economy, occupation, and education level (Oxford, 2007). While Noël (2018) describes SES as the position of a person or a group in the society which is measured by blend of wealth, income, education, and occupation. There are contributing factors such as race, family type and size, home ownership and type of stores one purchases their goods and services at that play a role in defining an individual/group SES (Alwin & Wray, 2005).

2.2.1 Household Income

The Bureau of market research defined low-income earners, middle income earners and high-income earners in 2021 as those earning from R0 – R69 974 per annum (pa), R69 975 – R575 885 pa and more than R575 886 pa respectively. The shopping basket in January 2024 contained vegetables (8kg), fruits (6kg), milk (10L), bread (10 loaves), rice (1.5kg), Eggs (20pcs), cheese (1kg) and meat (6kg) amounted to R1 503, while the minimum wage in South Africa is R4 353 (Business Day, 2024).

2.2.2 Education levels

The education system in South Africa is divided into three bands (Hall, 2023).

- General Education and Training – Grade 0 to 9 (7 to 15 years old)
- Further Education and Training – Grade 10 to 12 (16 to 18 years old)
- Higher Education and Training – Undergraduate and postgraduate degrees

Unfortunately, not everyone has equal opportunities to receive education and training in South Africa. Statistics on children in South Africa reported 300 000 children in 2022 between the age of 7 to 17 years who were not attending school (Hall, 2024).

2.2.3 Lifestyle and culture

The SOWETO Township is famously known for its vibrant street life which includes its social life, food, music, dance, fashion, parties, museums, heritage houses and the significant role SOWETANS played in the struggle.

The study done by Mukoma *et al*. (2023) in SOWETO, revealed that those between the ages of 18 to 24 live a sedentary lifestyle and consume energy-dense diets low in micronutrients. This lifestyle may be attributed to factors like, less knowledge, crime (not feeling safe to jog or walk), affordability, and culture. The youth usually indulge in foods containing starch, high fat and sugar such as quarter loaves of white bread filled with fried potatoes, processed cheese and processed meat, known as Kota, fat cakes (deep-fried dough balls) and fizzy drinks. These are known as “township food/street food” (Wrottesley, et al., 2021). Moreover, the high consumption of alcohol and smoking of cigarette among those living in the township in South Africa is prevalent and seen as fashionable, as a norm and a must when there are celebrations and events (Mokganyana, 2024).

2.3 Relationship between socio-economic status and health

People living in low SEC have limited access to resources that can better their lives and as a result, they find themselves living in worse conditions that are detrimental to their health. Cramm and Nieboer (2011) demonstrated that education, employment, and social capital are correlated to health in the South African township in Eastern Cape. The study found that those that did not feel well based on self-report were stressed because they were unemployed and had a low level of education.

The overburdened public health facilities that experience shortage of doctors, lack of financial support, mismanagement of funds and of the health facilities in South Africa further disadvantages those who cannot afford private hospitalisation or doctors. Studies done on the relationship between socio-economic status (SES) and communicable and non-communicable demonstrated that those under low SEG tend to suffer more from ill-health and disability than those in middle to upper class in South Africa (Atuga *et al*., 2011; Cramm & Nieboer, 2011; Craig *et al*., 2022; Mtintsilana, 2023). The relationship between SES and health has been the study of interest for more than a decade. Gilbert and Soskolne (2003) conducted research in Soweto and

found that the self-assessed health of unemployed, lower income and no education were worse.

2.4 Health metrics

Health metrics are measurements used to measure the state of health, determinants, and outcomes (Murray, 2008). The study will focus on two health metrics, namely, high blood pressure and adiposity to measure general health status.

Hypertension/high blood pressure is when the pressure in blood vessels is considered high (140/90 mmHg or higher) (WHO, 2023). There is a prevalence of high blood pressure in Africa, and it has been seen to be more in black adults residing in urban areas (Rooyen, 2000; Steyn, 2001; Schutte, 2012; Kagura, 2015). Moreover, studies show that adults that have it started to have it from childhood (Schutte, 2012; Kagura, 2015).

Adiposity refers to the body fats that are stored in the body (Bays *et al*., 2013). Excessive body fats can create negative metabolic consequences such as being overweight and obesity. Overweight and obesity are usually measured using body mass index and waist circumferences, as BMI has limitations such as not considering that muscles contribute to the weight of the person and not just fats (Van Der Merwe *et al*., 2006; Bays *et al*., 2013). The study done by Goetjes *et al* (2021) in South Africa linked socio- economic inequality with obesity as the study found that 26.72% of the population studied was obese, based on BMI measures which was equal to or higher than 30 kg/m^2.

2.5 Theory frameworks and concepts of the relationship between socio-economic status and health

There are several theories, frameworks and models that seek to shed some light on the relationship between SES and health such as life course perspective cumulative exposure model, social trajectories and health economics theories (William, 1990; Alwin & Wray, 2005; Corna, 2013).

Life course perspective depicts that childhood conditions have an impact on the entire growing stage of a person. If a child has been socio economically disadvantaged from birth, that child will be socio-economically disadvantaged even later in life as a

teenager and as an adult resulting in their health being affected too (Corna, 2013). Meaning, if a child did not get essential nutrients necessary for their development in their early life, there is a high chance that they will grow up with health issues. **Figure 1** shows the impact of Socio-economic status on different life stages.

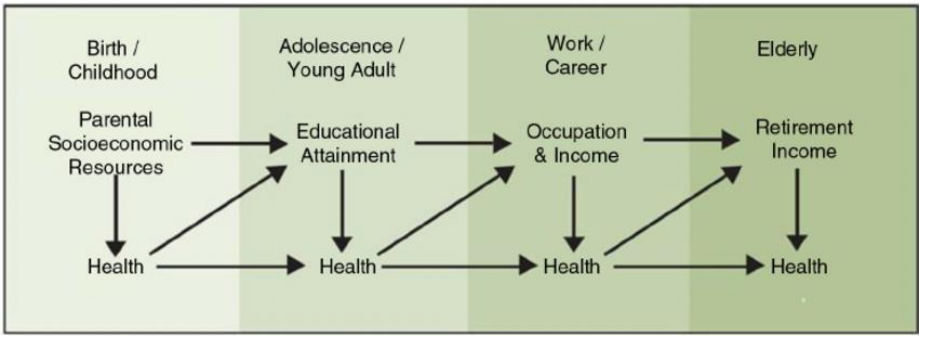


Figure 1: Life course perspective diagram showing the impact of SES factors on health from birth to retirement.

(Adler *et al*., 2007).

Cumulative exposure model emphasizes the importance of the length of exposure while highlighting the fact that early exposure to privileges and disadvantage conditions sets an individual on that path over time (Berkman, 2009). Research done by (Raghunathan, & Kaplan, 2007; Gruenwald *et al*., 2012) shows that being exposed to low socio -economic conditions for long is associated with high mortality due to bad health conditions in middle aged and older adults. **Figure 2** shows how early life circumstances relate to adult circumstances as well as adult health conditions.

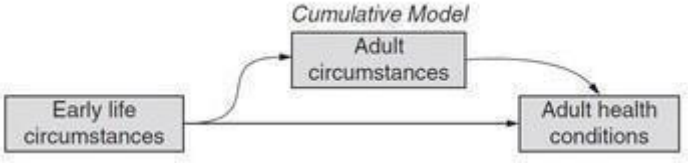


Figure 2: Cumulative model diagram, linking early life circumstances with adult circumstances as well as health.

The social structure and personality perspective provides a framework that describes how social groups associated with social position in society and social ties have an impact on health (William, 1990). Corna (2013) wrote a review about society

structure where the author alluded that negative exposure in terms of surroundings creates chains of risks associated with socio-economic conditions, which influences health. For instance, research done found that low SES experienced in childhood was linked to low SES in adulthood and increased risk of depression, stress, and heart attack in women (Hamil & O'Rand, 2007). When the environment one is exposed to is surrounded by unemployment, disease prevalence and mortality, it creates fear, stress and despair to an individual or a group of people.

Health economics is a field of economics that focuses on the allocation of resources, planning, and management of health care system (Mooney & Drummond, 1982). It involves theories that consist of behavior of health care individuals, providers and policy makers as well as allocation of resources in the health care system. Examples of health economics are, The Grossman Model and The Beveridge Model (Frimpong, 2016; Sydorchuk, 2017).

The Grossman model view health as an aspect of both a consumption that depreciates as one age and a capital good that gives direct utility (Frimpong, 2016). The Grossman model view health as an investment and a consumption commodity. While the Beveridge model focuses on the providence of free health care services which should be financed using tax (Sydorchuk, 2017). This model is considered by the South African government through the Nation Health Insurance model. This model may be challenging in South Africa due to insufficient resources in the country and mismanagement of funds in the public health care sector.

2.6 Conclusion/recommendations of literature review

There is no doubt that there is a positive relationship between socio-economic status and health that negatively affects communities subjected to it. The environment one is surrounded by has a direct impact on their quality of life/health. Theories explain that most social issues start from one generation and move to the next one. Moreover, one disease causes the other and ends up creating multiple health issues. Therefore, it is important to break a cycle and understand the extent and variables involved have the potential to assist in finding solutions/approaches to deal with these social issues.

CHAPTER 3. METHODOLOGY

The research used secondary data from an ongoing South African Hypertension and Diet Study (SAHDS) that was conducted in Soweto in the year 2002. Secondary data was used to understand how life (health and socio-economic status) of people living in SOWETO has been in the past 22 years. Due to the time constraints of the research project deadline, gathering of primary data was not feasible. Moreover, data from SAHDS was available to use. Participants were randomly recruited from Soweto communities. The standard questionnaire from EPOGH (1998) was conducted to collect data such as age, health metrics using a clinical chart and socio-economic status of individuals. Statistical analysis such as descriptive and association analysis was performed using Statistical Analysis Software (SAS) version 9.4 (SAS Institute, Inc, 2004).

3.1 Research approach

The study used quantitative data to calculate the average age, body mass index (BMI), waist circumferences (WC) and percentages of cigarette smokers and those who consume. Moreover, the study conducted the association between socio economics (education level and employment status) as well as health metrics (BMI, WC, systolic and diastolic blood pressure) using data gathered from the questionnaire.

Body mass index and WC measurements were used to measure adiposity. The reason for including WC measurement in the study was to avoid depending on BMI measurements only for adiposity as BMI has limitations of not considering fats of an individual but only weight based on muscles (Van Der Merwe *et al*., 2006; Bays *et al*., 2013).

Other health metrics measured were systolic and diastolic blood pressure as well as diabetes. Systolic and diastolic blood pressure gave an indication of the prevalence of hypertension individuals in the study. Moreover, socio economic status was used to evaluate the impact it has on systolic and diastolic blood pressure measurements.

3.2 Research design, data collection methods and population

The research used data obtained from a questionnaire survey to investigate the social standing of participants in terms of their education level and employment status. The use of a questionnaire survey was to gather information to be used for analysis to

answer research questions. The number of participants in the study was 1219. The recruitment team distributed flyers around the Soweto communities to get participants based on their interest (volunteered). Data collected from that study was captured in excel then coded.

3.3 The research instrument

The current study used data from the coded spreadsheet collected in the SAHDS study. The current research only uses age, education level and employment status for socio economic status variables. The SAHDS classified socio-economic groups by dividing the economically active from the inactive according to *Mules of the office of population censuses and surveys (London), 1998*: those who were economically inactive were those that were unemployed and not contributing to the economy in any way. The study also utilised data of those that were employed (salary) and those who received pension money (they do not work).

To understand the health status of the population we utilised BMI, WC, systolic and diastolic measurements as well as diabetes measurements of 1219 participants. The reason to use these specific measurements was to check the prevalence of cardiovascular disease in participants and find the association between health measurements/metrics and socio-economic status. Adiposity measurements can detect if a person is overweight, obese, and underweight or have normal weight.

Criteria that determined if the population was normal, overweight and obese are in the table below. Measurements for BMI (kg/m^2) were done using weight measurement (kg) of the electronic scale (Healthometer Professional) and height was measured using a stadiometer (Seca portable stadiometer) in centimetres (cm). Waist circumferences were determined using a tape measure that measured the waist, patients had minimum clothing on.

Central blood pressure (aortic) measurements, which is the pressure exerted on the brain and the heart, will be used to categorise patients as having hypertension or not. Hypertension will be categorised as; with hypertension and no hypertension, 140/90 will be the indicator for hypertension while under 14/90 will represent no hypertension.

Body measurement criteria for body mass index and waist circumference

	BMI (kg/m²)	Waist circumference
Underweight	<18.5	
Normal	18.5 - 24.9	Men ≤ 94 cm/ Women ≤ 80 cm
Overweight	25 - 29.9	Men > 94 - 102 cm/ Women > 80 - 88 cm
Obesity	>30.0	Men > 102 cm/ Women > 88 cm

3.4 Statistical analysis

The SAS program version 9.4 was used for our statistical analysis. Continuous variables were presented as means ± standard deviation, and categorical variables were presented as percentages. A student's t-test was used to assess differences in the general characteristics between males and females. Correlation analysis was analysed using Pearson's correlation coefficient (r^2) to find the correlation between Socio-economic factors and health metrics. A p-value < 0.05 was considered significant.

3.5 Ethical considerations

Ethics clearance was obtained from the Wits Business School Ethics Committee (WBS/BA1831708/351).

CHAPTER 4. DATA PRESENTATION

4.1 General characteristics of the studied population

The study population n = 1211 shown in **Table 1** consists of the total population with an average age of 44±18 which was considered insignificant (p = 0.1618). The age group of men had a mean ± standard deviation (SD) of 43.0±19.5, while women had a 44.6±17.7. The average reading of BMI of the population studied was 29.5±8.0 kg/m^2 with men having a BMI of 24.9±5.2 kg/m^2 while women had a BMI measurement of

31.9±8.0 kg/m^2. The average WC reading was 90.6±16.9 cm, men had a WC of 85.5±14.5 cm while women had a WC of 93.4±17.5 cm.

The percentage of people with hypertension in the study was 40.6%, there were 36.5% of men that were hypertensive while there were 42.8% women who were hypertensive. The total of those that were diabetic in the study accounted for 8.8%, there were 8.7% men that were diabetic, and 8.8% were women, values were considered insignificant (p = 0.9565).

Regarding lifestyle behaviour, those who smoked cigarette accounted for 15.2% of the whole population studied with men accounting for a highest percentage (32.8) than women (5.7%). Those who consumed alcohol were 20.8% in total, men had the higher percentage of alcohol consumption (34.75) than women (13.3%).

Table 1 General characteristics of the population stratified y gender

	Total	Men	Women	P value
Number	1211	424	787	
Age (Years)	44.1±18.3	43.0±19.5	44.6±17.7	0.1618
BMI (kg.m^{-2})	29.5±8.0	24.9±5.2	31.9±8.0	<0.0001
WC (cm)	90.6±16.9	85.5±14.5	93.4±17.5	<0.0001
Hypertensive (%)	40.6	36.5	42.8	<0.0001
Diabetic (%)	8.8	8.7	8.8	0.9565
Cigarette Smokers (%)	15.2	32.8	5.7	<0.0001
Alcohol intake (%)	20.8	34.7	13.3	<0.0001

BMI, body mass index; WC, waist circumference. Data expressed as mean ± SD. A value < 0.05 is considered significant.

4.2 The relationship between health metrics and socio-economic status factors

The correlation analysis (R^2) between BMI and socio-economic status factors and between WC and socio-economic status factors are presented in **Table 2**. The relationship between BMI with pension, unemployment and salary were highly significant with p < 0.0001 while education level had a p-value of 0.0049. There was a negative correlation between BMI measurements and education level (R^2 = -0.13) and salary (R^2 = -0.18). However, there was a positive correlation seen between BMI and

pension (R^2 = 0.19) as well as unemployment (R^2 = 0.19).

There was a negative correlation observed between WC and education level (R^2 = -0.13), pension (R^2 = -0.26) and salary (R^2 = -0.18). Whilst there was a positive correlation observed between WC and unemployment (R^2 = 0.25).

Table 2 the relationship between the indices of obesity and socio-economic status factors

	R^2	CI			P-value
BMI vs					
Education level	-0.13	-0.16	to	-0.03	0.0049
Pension	0.19	0.14	to	0.24	<0.0001
Unemployment	0.19	0.11	to	0.27	<0.0001
Salary	-0.18	-0.18	to	-0.11	<0.0001
Waist circumference vs					
Education level	-0.13	-0.19	to	-0.10	0.0001
Pension	-0.26	-0.20	to	0.31	<0.0001
Unemployment	0.25	0.17	to	0.33	<0.0001
Salary	-0.18	-0.26	to	-0.11	<0.0001

BMI, body mass index; CI, confidence intervals; p<0.05 considered different.

The blood pressure measurements (systolic and diastolic) revealed a negative correlation with education level and salary. However, positive correlation was observed between systolic and diastolic measurements and pension and unemployment **Table 3**.

Table 3 the relationship between blood pressure measurements and socio-economic status factors

	R^2	CI			P-value
Systolic blood pressure vs					
Education level	-0.21	-0.28	to	-0.15	<0.0001
Pension	0.34	0.28	to	0.39	<0.0001
Unemployment	0.29	0.22	to	0.37	<0.0001
Salary	-0.13	-0.20	to	-0.10	0.0006
Diastolic blood pressure vs					
Education level	-0.13	-0.19	to	-0.06	0.0001
Pension	0.10	0.03	to	0.15	0.0018
Unemployment	0.10	0.01	to	0.18	0.0218
Salary ,	-0.10	-0.16	to	-0.02	0.0135

CHAPTER 5. DATA ANALYSIS

The aim of the study was to evaluate the interplay between socio economic status and health conditions in adults. Specifically, the study investigated the prevalence of adiposity and hypertension and the impact of socio-economic status on adiposity and hypertension.

5.1 General characteristics

The study found a high percentage of men who smoked and consumed alcohol than women, this agreed with the study done by tobacco control data initiative 2021 statistics and the South African Medical Research Council. The tobacco control data initiative 2021 statistics revealed that, there were 39.1% men, and 9.7% women aged 15 years and over that smoked cigarettes in South Africa. The South African Medical Research Council found that 43% of South African men drink alcohol while only one in five women are alcohol drinkers (SAMRC, 2020). Smoking and drinking are the culture in most South African townships influenced by social environment (Mokganyana, 2024). Most family gatherings, celebrations, concerts, sport games, parties and funerals that are accompanied by after tears (celebrating the life of a deceased), involve consumption of alcohol as a recreational activity. Others justify drinking alcohol

and smoking cigarettes as a way of coping with stress and numbing the pain of losing a loved one, failing in life and suffering. The drinking and smoking habit amongst South Africans especially those within the low-income group started back in the history of apartheid where there was a dop system (workers given alcohol, bread and tobacco as an employment benefit) (London, 1999).

Research done by health specialists and scientists revealed that smoking and heavy drinking (seven or more drinks per week) are unhealthy habits that are risk factors of lung cancer, heart attack, stroke and coronary artery disease (smoking), gastric problems, liver cancer, liver cirrhosis, pancreatitis, adiposity, high blood pressure and various psychological conditions (alcohol) (Traversy & Chaput, 2015; Chia, 2020).

5.1 Prevalence of obesity in the Soweto community

The BMI and WC measurements of the study revealed that women were obese while men were within the normal weight range (WHO, 1983). The findings of this study are following the same trend as the study done by Shozi *et al*. (2022) who found that women were more overweight (26%) and obese (33%) than men (13% overweight, 8% obese). The study done by Mchiza *et al*. (2019) alluded that women are more at risk of being overweight and obese than men.

There are various contributing factors such as, unhealthy diets, inactive lifestyle, high level of stress, lack of sleep, genetics, medicine and the environment that leads to obesity in an individual. Moreover, being overweight/obese pose a risk of getting diseases such as diabetic, hypertension and heart failure (Woodiwiss, 2023).

There was a significant percentage (8.85%) of those that were diabetic in the study with women being a percentage more diabetic compared to men, which demonstrates that being overweight may lead to other diseases in the body such as diabetic, hypertension and consequence, heart failure.

5.2 Prevalence of hypertension in the Soweto community

The population studied revealed a significant number of people that had high blood pressure/hypertensive (40.6%), with women possessing the highest percentage of those hypertensive (42.8%) compared to men (36.5%). However, the study that was done in SOWETO the previous year (2023) reported 54% of hypertensive individuals with males accounting for the highest percentage, 62% (Naidoo *et al*., 2023). There

has been a shift observed in the last 22 years, men are more affected by hypertension than women these days compared to the past 22 years when the study was conducted.

Obesity and hypertension are the contributing factors of cardiovascular disease (CVD) in South Africa and globally (Heart & Stroke Foundation South Africa, 2017; Woodiwiss, 2023). Both these factors are usually caused by excess levels of stress, unhealthy diet (low consumption of fruits and vegetables, consumption of alcohol and beverages high in caffeine), lack of exercise and smoking (Heart and Stroke Foundation South Africa, 2017). Studies done in urban areas in South Africa revealed that black Africans have more hypertension prevalence compared to whites and the hypertension is associated with target-organ damage (Lindhorst *et al*., 2007).

Having established that the community of African ancestry has a high prevalence of obesity and hypertension which are associated with serious cardiovascular complications as explained above, the next step was to determine whether these two cardiovascular risk factors are associated with indices of socio-economic status.

5.3 Relationship between BMI, WC and pension

In South Africa, an average black person lives in worse life conditions as well as in worse socio-economic conditions than those of other races (Lindhorst *et al*., 2007), especially in townships such as Soweto. Black townships are characterized by limited resources, crumbling infrastructure, unemployment, and crime as well as nonfunctional health facilities. Therefore, a possibility exists that the high prevalence of hypertension and obesity in our study population, is directly related to the low socio-economic status in this population.

There was a positive correlation observed between BMI and pension however, a negative correlation between WC and pension was observed. The positive correlation with BMI indicates that there is no problem of food scarcity in pensioners. However,

negative correlation between WC with pension observed can imply that pensioners may not be well fed or nourished. Studies done on pensioner's diets revealed that the consumption of food and drinks by pensioners due to the money received from the government did not translate to improved health outcomes (Lloyd-Sherlock *et al*., 2020). Hence the high BMI measurements observed in pensioners by another study were associated with higher inflammation due to lower serum iron levels and not because they were overweight (Oldewage-Theron *et al*., 2015). Pensioners in the township are usually a group of old age people (> 65 years) that are unemployed and receive money from the government monthly as a source of income. The study also studied the relationship between BMI, WC and unemployment to find out how unemployment has an impact on the health of the individual that is unemployed.

5.4 Relationship between BMI, WC and unemployment

Our results showed a positive correlation between the two indices of obesity (BMI and WC) and unemployment. Indicating that in this community, obese individuals are likely to be unemployed compared to normal weight individuals. These results were confirmed by findings of another study which showed that people that were unemployed were more obese than those that were employed (Mchiza *et al*., 2019). A possible explanation for this disparity in employment between overweight people and normal weight people is, unemployed people stay at home doing nothing therefore, they gain weight due to different factors such as unhealthy diets, sedentary lifestyle and stress. This is supported by the negative correlation observed between BMI and salary as well as WC and salary. As people are employed, they can choose the kind of food they eat and are more active as they wake up and go to work. However, Alaba and Chola, (2014) revealed that wealthy individuals who attained tertiary education were more obese. This may be due to the accessibility of choice of food one can consume based on their affordability.

5.5 Relationship between BMI, WC and education level

Contrary to the positive association between the indices of obesity and employment status, the relationship between these indices and education level was negative. The implication of this negative correlation is that, as an individual gets more educated, the less their BMI gets as they receive more knowledge on healthy diets, and they live a

healthy lifestyle. However, the study done by Mchiza *et al*. (2019) found that those with high levels of education are associated with high risk of being overweight; however, those with high levels of education were healthier (39.4%) compared to those with no education (38.1%). High level of education may be associated with a high level of income and buying power as low education is associated with disadvantaged or poor individuals. Findings by Alaba and Chola, (2014) revealed that obesity is more concentrated on wealthy individuals and low education is more concentrated among the poor in their study of socioeconomic inequalities in adult obesity in South Africa. Similar to the indices of obesity, BP also had a relationship with the indices of socio-economic status.

5.6 Relationship between BP, education level and employment status

People that are suffering from obesity, depression and stress have high chances of becoming hypertensive. In the current study, it was observed that, as people got educated and employed, their level of blood pressure decreased. The current study results are supported by the study done by Madela *et al*. (2023) who found that education level and employment status were negatively associated with hypertension.

Hypertension/ high blood pressure is usually caused by high levels of stress and being inactive. Those that are employed become active when they wake up and go to work. Usually in South Africa, people who stay in townships occupy low level jobs that require them to use their strengths and muscles. Such jobs include gardening, cleaning and construction work to name the few. Those that are unemployed tend to sit at home and do less activities that require them to be physically active. Others become stressed and depressed due to their inability to provide for themselves and their families.

The current study revealed a positive correlation between systolic and diastolic measurements and pension as well as unemployment. These results are supported by other researchers who found that low socio-economic status individuals are more prone to hypertension and cardiovascular disease (Cramm & Nieboer, 2011; Craig *et al*., 2022; Mtintsilana, 2023).

Results of the current study support the cumulative exposure model, which emphasizes generational socio-economic status - early exposure to privileges and

disadvantage conditions set an individual on that path over time (Berkman, 2009). The SOWETO Township was built for black people who were economically excluded in the 1930s, even in the early 2000 up to now, they are still disadvantaged by inequality, unemployment and lack of financial freedom.

There were 7.9 million people that were unemployed in the first and second quarter of 2023 (Stat SA, 2023). The deteriorating South African economy does not make the situation any better, the highest inflation rate has recently been observed with year 2022 being the worst year. The basket containing vegetables (8kg) is R179, fruits (6kg) R147, milk (10l) R187, bread (10 loaves) R168, rice (1.5kg) R39, Eggs (20pcs) R61, cheese (1kg) R127, meat (6kg) R595 food costs R1 503, while the minimum wage in South Africa is R4 353 (Business Day, 2024). Unfortunately, being disadvantaged and unemployed does not only limit access to resources but also affects the health of an individual.

CHAPTER 6. CONCLUSION, LIMITATIONS AND RECOMMENDATIONS

Majority of women in the study population were within the obese side of the BMI and waist circumference spectrum and women were more hypertensive compared to men. Overall, there is an alarming percentage of those with hypertension in the study for both genders. Correlation measurement revealed an association between unemployment, adiposity and hypertension in SOWETO. Those that were unemployed were seen to have an increased adiposity and high levels of blood pressure which may be associated with stress, unhealthy diets and sedentary lifestyle. Social issues such as unemployment affect the health status of an individual and can cause non-communicable diseases such as cardiovascular disease. Challenges in the economy can create health issues for the population which will lead to the need for a functional health system in the country to prevent deaths and epidemics. Moreover, businesses need to contribute to the well-being of communities.

The study had limitations which included lack of information on physical activities. Assessment of lifestyle behavior only includes consumption of alcohol and smoking habits; it is recommended that future studies should consider adding measurements of physical activities such as self-report questionnaires. Additionally, lack of income groups in monetary value prevented explicitly differentiating socio economic status among participants. Future studies can include the salaries of participants to class

according to their living standard measure (LSM). Classing LSM will measure if affordability has an influence on the type of food people consume and the type of lifestyle they live. It will be beneficial to find out if the environment and the culture of South African township is influenced by socio economic status or it is people's choices whether they afford or not. This future research can also provide a clear picture of inequality, and its effects on people's health. Moreover, the study did not categorize education level in terms of high school leavers, college and tertiary graduates to evaluate the effect of education. Future studies can evaluate how the level of education has an effect of lifestyle choices. Again, future research will be necessary to understand if being educated makes one choose certain lifestyle choices because they are well informed of the benefits and consequences, or education level does not play a role in lifestyle choices.

It will be interesting to know the statistics of individuals that possess a university degree, belong to a high LSM and still reside in SOWETO. Future research can focus on why people leave the township after they are financially stable and accomplished a certain level of education or why they are not leaving, if they still reside in SOWETO. Based on the conducted study data presentation, analysis and conclusion, the following recommendations are suggested.

Healthy lifestyle awareness: Efforts to encourage healthy lifestyles through awareness and building sports/wellness centres as well as increasing community vegetable gardens is a need in communities to reduce obesity and hypertension. Making the community aware of the danger of sedentary lifestyle through drives and community radio stations talks, posters in public spaces can assist in encouraging people to be active. There should be visibility of health professionals on a regular basis in communities such as malls, churches, community centres and schools. Health professionals should conduct regular health screenings to check for adiposity, glucose levels and high blood pressure for early detection and awareness. Psychologists and counsellors should be easily accessible by the communities so they can have professionals that can assist them manage their stress and share their problems.

Businesses should extend their awareness programs where they provide free health screenings to the communities where their employees live to benefit employees' family members. Thus, reducing the number of days employees take to take care of sick family members.

Collaboration: The government should look at partnering with universities and gyms to build sport centres and form sport clubs in communities and walking groups for mature adults. Sponsors can be obtained through sport competitions (communities competing against each other) and allowing university sport science students, dieticians and other sport professionals to do their internship there to assist the community. This will encourage the community to stay fit, keep busy and stay out of the street. For those who are already overweight and hypertensive, there should be support groups that consist of those living with the condition to share experiences, as well as the health professionals that will assist with managing their condition. As part of corporate social responsibility, companies should be encouraged to be involved in sponsoring health initiatives such as donating equipment in community clinics and planting mobile clinics in communities.

Communal gardens: Community vegetable gardens are necessary in Soweto Township to embolden healthy eating. There is a culture of consuming fast food in the township as it is considered a quick meal, cheap and stays long in the stomach. If community vegetable gardens can be in hospitals, schools, churches and community centres where everyone is given a responsibility to work in the garden, own their vegetable so they can take it home and sell it to others as a source of income. This will boost healthy eating as well as encourage self-employment. The vegetable garden program can include scientists across universities and research institutions to bring in their expertise and funding. There can be greenhouses that these vegetables can be planted in so they can grow all year round by utilizing a tissue culture laboratory to supply plantlets all year round.

Skills development program: There is a need to skill the community so they can be self-employed to sustain the economy. Skilling the community can be done through skill development and training programs from the department of agriculture land reform and rural development (Vegetable farming) in partnership with the department of science, technology and innovation as well as private companies to teach/mentor entrepreneurs and those who want to be entrepreneurs and encourage entrepreneurship through innovation.

Tax incentives: For those who are already entrepreneurs, there is a necessity for the government intervention to keep their businesses afloat and to avoid liquidation which is often to black businesses in this current economy. The government can support by providing tax incentives to township entrepreneurs and make funding accessible for

entrepreneurs so they can hire community members. Entrepreneurs need all the support they can get to not be liquidated and to survive in the harsh business environments. The government can provide extra tax incentives for those that are selling healthy foods, have gyms, provide gym equipment and clothing.

There is a need for the practice of ethical leadership and best practice of management of funds in the government sector for the government to work on improving the crumbling health system. Lifestyle audits and conflict of interest should be a normal practice for every government employee responsible for managing funds. Accountability such as jail time should be implemented on those individuals implicated or practicing corruption and mismanagement of funds for models such as The Beveridge model to work.

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