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The relationship between household asset index (HAI), food insecurity and post-traumatic stress disorder (PTSD) among adults in rural, South Africa:2021-2022

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The relationship between household asset index (HAI), food insecurity and post-traumatic stress disorder (PTSD) among adults in rural, South Africa:2021-2022

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of the requirements for the

Master of Science in Epidemiology (Epidemiology and Biostatistics)

by

Matilda De Freitas

October 2025

Supervised by Prof Sumaya Mall

Co-supervised by Prof Molly Rosenberg

PLAGIARISM DECLARATION

SCHOOL OF PUBLIC HEALTH

STUDENT DECLARATION

PLAGIARISM

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ABSTRACT

Introduction: South Africa has a history of violence and traumatic events (TEs) both during the previous apartheid and emergent democracy eras. Despite the country's history of TE, the documented prevalence of post-traumatic stress disorder (PTSD), the only mental disorder dependent on a TE is low. Further limited data has examined the relationship between PTSD, poverty and deprivation, contexts which are ubiquitous in South Africa. Therefore, this study aims to fill the gap by addressing several key objectives: a) to estimate the prevalence of probable PTSD at the third of four Waves of an adult cohort in rural South Africa b) to examine the relationship between different TEs, cumulative TE and PTSD in the said cohort, c) to examine the relationship between household asset index (HAI), and food insecurity, among individuals with probable PTSD.

Methods: I conducted a secondary analysis of a primary cohort study, the Health and Aging in Africa: Longitudinal Studies in South Africa (HAALSI), set in rural Agincourt, Mpumalanga. The analytical sample was derived from the third Wave of data collected between 2021-2022. Screening tools employed for TE and probable PTSD were the life history questions from the English Longitudinal Studies of Ageing (ELSA) and the seven-item Short Screening Scale for PTSD respectively. Explanatory variables include exposure to TEs and cumulative TE, HAI and food insecurity. Data analysis included calculating descriptive statistics, univariate and multivariate logistic regression, and backward stepwise selection ($p<0.05$).

Results: Out of 3 332 HAALSI Wave 3 participants, 2.44% reported symptoms suggesting the prevalence of probable PTSD. Experiencing at least one TE nearly doubled the risk of probable PTSD (aOR:1.96, CI:0.94–4.09, p=0.074). Evidence of a dose-response relationship between TE and probable PTSD was reflected, with participants reporting five or more TEs scoring higher on the probable PTSD screener (aOR:3.07, CI:1.64–5.77, $p<0.001$). The

highest HAI quintile participants were nearly twice as likely to be at risk of probable PTSD (aOR: 1.91, CI:1.10–4.66, p=0.027). Moderate food insecurity increased likelihood five-fold (aOR:4.91, CI: 3.04–7.94, p<0.001), while severe food insecurity increased likelihood nineteen-fold (aOR:18.85, CI: 8.96–39.64, p<0.001).

Conclusion: This study confirms PTSD prevalence in rural Mpumalanga aligns with national estimates. TEs, cumulative TE and food insecurity significantly increase probable PTSD risk. Older adults in higher HAI quintiles, who are still affected by poverty and inequality, suggest greater vulnerability. Findings emphasise the need for targeted mental health interventions addressing poverty, TE exposure, and structural inequalities to improve psychological well-being and reduce the prevalence of probable PTSD in vulnerable, low-income populations. Results highlight the need for longitudinal research examining bidirectional relationships between HAI, food insecurity and PTSD. This should be complemented by qualitative research to further explore experiences of HAI and food insecurity.

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LIST OF ABBREVIATIONS

ACS	American Community Survey
aOR	Adjusted odds ratio
CI	Confidence interval
DAG	Directed acyclic graph
DALYs	Disability-adjusted life years
DSM-5	Diagnostic and Statistical Manual of Mental Disorders edition 5
GHS	General Household Survey
HAALSI	Health and Aging Africa: A Longitudinal Study of an INDEPTH Community in South Africa
HAI	Household Asset Index
HDSS	Agincourt Health and Demographic Surveillance System
HFIAS	Household Food Insecurity Access Scale
HFSSM	Household Food Security Survey Module
HIV	Human immunodeficiency virus
MDD	Major depressive disorder
OR	Odds ratio
PCL-C	Posttraumatic Stress Disorder Checklist-Civilian Version
PTSD	Post-Traumatic Stress Disorder
SA-NIDS	South African National Income Dynamics Study
SASH	South Africa Stress and Health Study
SDG	Sustainable Development Goal
Stats SA	Statistics South Africa
TE	Traumatic event
UN	United Nations
USA	United States of America
WHO	World Health Organization
WMH	World Mental Health
YLDs	Years lived with disability

CHAPTER ONE: INTRODUCTION

This chapter presents: 1.1 Background, 1.1.1 PTSD and TEs, 1.1.1.1 Global PTSD, 1.1.1.2 PTSD in South Africa, 1.1.2 Mental Disorders and PTSD in South Africa, 1.1.3 Inequality and Poverty, 1.1.3.1 Household Asset Index, 1.1.3.2 Food Insecurity, 1.2 Literature Review, 1.2.1 Global studies of prevalence of PTSD and TEs, 1.2.2 Global studies of PTSD and cumulative TEs, 1.2.3 Global studies of inequality and poverty, 1.2.3.1 The relationship between HAI and PTSD, 1.2.3.2 The relationship between food insecurity and PTSD, 1.2.4 Comorbidities of PTSD, 1.2.4.1 Comorbid Physical Disorders, 1.2.4.2 Comorbid Mental Disorders, 1.2.5 Conceptual Framework, 1.3 Problem Statement, 1.4 Justification, 1.5 Research Question, 1.6 Aim and 1.7 Objectives.

1.1 Background

The World Health Organization (WHO) defines mental health as a state of well-being that allows an individual to comprehend life's stressors, realise their abilities, study and work productively and contribute to his or her community (1). Both common and severe mental disorders add to the global disease burden. The former refers to post-traumatic stress disorder (PTSD), depression, substance use, and anxiety (2). Examples of severe mental disorders are bipolar disorder and schizophrenia (2).

The 2019 global burden of disease survey considered: depressive, anxiety disorders, serious mental disorders including, bipolar disorder, schizophrenia, autism spectrum disorder, conduct disorder, attention-deficit hyperactivity disorder (ADHD), eating disorders (anorexia nervosa and bulimia nervosa) and idiopathic developmental, intellectual disability (3). In doing so, estimates of the above-mentioned disorders were correlated with disability-adjusted life years (DALYs), years lived with disability (YLDs), and years of life lost for mental disorders (3). The results of the 1990-2019 survey suggested that the worldwide count of

DALYs caused by mental health disorders grew significantly, from 80.8 million to 125.3 million (3). Worldwide DALYs linked to mental health disorders increased from 3.1% (1990) to 4.9% (2019)(3). The age-standardised DALY estimates saw little change, with rates at 1 581.2 DALYs per 100 000 people in 1990, compared to 1 566.2 DALYs per 100 000 people in 2019 (3). Mental disorder burden could be correlated with YLDs, totalling 125.3 million YLDs, which accounted for 14.6% of all global YLDs in 2019 (3). The age-standardised DALY rate for mental disorders was 1 426.5 per 100 000 population for males and 1 703.3 per 100 000 population for females (3). The regions with the greatest age-standardised DALY rates for mental disorders were Tropical Latin America, Australasia, and upper-income North America (3). The above global burden of disease estimates presents the relationship between mental disorders and DALYs (3). Several data from nationally representative studies in high- and low- to mid-income nations have further examined the relationship between traumatic events (TE) and the emergence of mental disorders, notably schizophrenia, bipolar disorder, depression and anxiety (4-6).

PTSD is the only mental disorder where the necessary and fundamental cause is a TE (7-12). PTSD can be debilitating and be associated with poor quality of life (13). Poor quality of life may manifest in difficult personal and professional relationships, difficulties in raising children, finances, jobs, and socialisation (13). Individuals with PTSD are frequently unable to participate in therapy. The therapy may focus on their TE with unpleasant recollections of their experience overwhelming them, which is one cause of treatment resistance (14). PTSD is linked to an elevated risk of chronic, physical illness, hastened ageing and early mortality (15, 16). According to a study in the United States of America (USA), PTSD has an impact on occupational and interpersonal activities and leads to approximately 3.6 days of loss of productivity each month (17).

Symptoms of PTSD include intrusive thoughts, reoccurring experiences of the index TE, consistent avoidance of any stimuli connected to the TE (after the TE), changes in cognition and emotions, and hyperarousal and autonomic hyperactivity (18). PTSD can be associated with comorbid physical disorders (e.g. cardiovascular disease). To substantiate the odds of comorbid physical disorders in PTSD, a nationally representative survey of 2 732 American veterans from the National Health and Resilience in Veterans Study was investigated (19). The study examined the risk of physical comorbidities in those who had comorbid MDD and PTSD compared to MDD alone (19). Adjusting for confounding variables including drug use and socio-demographic variables (age, male sex, non-Caucasian, level of education, marriage status and annual household income), veterans with MDD and PTSD were found to be at risk of migraine, cardiovascular disease, rheumatoid arthritis, and fibromyalgia when related to MDD alone (19). Data also suggests that PTSD can be comorbid with mental disorders, e.g. depression, anxiety, drug abuse, self-harm and suicide attempts (16).

1.1.1 PTSD and TEs

TE, defined by the Diagnostic and Statistical Manual of Mental Disorders, fifth edition (DSM-5) includes: direct or indirect exposure, to death, serious injury or sexual violence, knowing that someone close has been subjected to a TE, unintentional threats or violence, repeated or dose-response exposure or occupational TE as a first responder (7).

Since the 1990s, research in high-income nations, including the USA, has found between 28% and 90% of civilians have experienced at least one TE over their life course (20-25). Frequently experienced TEs are abrupt loss of someone close, car wrecks or robbery (20-25). A more indirect TE could be witnessing violence in combat or as a civilian, hearing of a loved one's TE or a dose-response TE in an occupational setting (e.g. paramedics or first responders responding to a crime or accident scene)(26).

Moving to the African continent, Kowbah and associates investigated the psychometric features of the Life events list of requirements in Kenya (27). Their study, a case-control study of TE in psychosis, suggests that both cases and controls experienced potentially traumatic events (PTE) (27). Over 60% of participants reported experiencing a PTE (27). Concerning data from South Africa, a relevant study by Byansi and associates suggested a mean score of 3.21 for childhood adverse experiences as measured by the Adverse Childhood Experiences questionnaire (ACEs) (28). The sample they recruited consisted of psychiatric outpatients in two public sector hospitals (28). These African-based studies have recruited psychiatric patients, but the findings still suggest that PTE are high on the continent (28). Further studies of nationally representative samples would be worthwhile.

1.1.1.1 Global PTSD

Such TE, once off or over a period of time, would be a prerequisite for the onset of PTSD (29-34). Global data suggests that approximately 70% of individuals globally will encounter a possible TE at a point in their lives (9). However, only 5.6% of these individuals who experience TE will experience PTSD (15).

According to prevalence estimates, the worldwide population has had 3.9% of PTSD at historical point in their life (15). The risk of having PTSD differs relative to the kind of TE encountered. For instance, compared to the global mean prevalence, populations who have been affected by violent conflict or warfare have an average of 15.3% prevalence of PTSD (8). Experiencing sexual violence also leads to a high rate of PTSD (9). Conditional risk of PTSD is correlated to rape (19.0%), physical violence caused by a romantic partner (11.7%), and sexual assault other than rape (10.5%) (9). As much as 40% of individuals suffering from PTSD recover within one year (9). Despite the fact that there are multiple effective treatments for PTSD, only 1 out of every 4 people suffering from PTSD gets treatment in nations with low- or mid-incomes (15). Little knowledge that PTSD is curable, restricted accessibility to

mental health therapies, social prejudice, and a scarcity of qualified mental health care practitioners are all obstacles to therapy (15).

1.1.1.2 PTSD in South Africa

Domestic abuse, sexual assault, and violent criminality are all extremely prevalent in South Africa today. Data suggests that South Africa features among the world's highest incidences of rape, intimate relationship abuse, and violent crime (35-37). This widespread crime could be a consequence of the county's socio-political history of ruthless repression during the apartheid regime, linked with continued socioeconomic inequality and deprivation (38). According to a research article, more than one-third of South Africans have experienced violence in some capacity (39). The kinds of violence most significantly linked to a lifelong diagnosis of PTSD in men were political imprisonment and torment; among women, the highest link was seen with rape (39). Intimate relationship abuse was linked to the highest amount of incidents of PTSD in females, whereas violent crimes and childhood TE were linked to the highest amount of incidents of PTSD in males overall (39).

1.1.2 Mental Disorders and PTSD in South Africa

South Africa is a developing nation that has a history shaped by apartheid, a legally enforced system of racial segregation and exploitation that was abolished in 1994, giving way to a non-racial independent democracy (40). Today, it remains one of the most unequal societies globally (40). Even though apartheid ended 30 years ago, material inequities persist alongside ethnic inequality (41, 42).

The South Africa Stress and Health Study (SASH) was the initial study in Africa with a nationwide representation of mental disorders commissioned by the World Health Organization's World Mental Health (WMH) 2000 initiative (43). The WMH commissions questionnaires in several different nations to estimate the common mental disorders

prevalence, e.g. substance use, PTSD, anxiety and depression, among adults (43-45). In addition to prevalence estimates, the WMH survey initiative collects population-based statistics concerning the prevalence and seriousness of psychiatric conditions, their socio-demographic and psychosocial links, and mental health treatment utilisation rates.

The WMH is also focused on income differences and how they might be related to mental disorders, as well as how race functions as a social determinant of mental disorders (46). Several data suggest that race and income are important proxies for health disparities (47-50). For example, a study of USA-based veterans who were in combat in Iraq and Afghanistan wars suggests that African Americans were less likely to experience PTSD symptom remission (51). Further, a body of evidence also from the USA suggests that race, ethnicity, income and sex may influence the onset of PTSD (52).

Furthermore, the SASH study compiled data on the prevalence of physical and mental torment exposure in the country in order to evaluate the association between these TEs, relevant to South African history and mental disorders (43). Additionally, it evaluates a wide variety of risk variables and resources that could affect the relationship between encounters with violations of human rights and psychiatric health (43).

The lifetime prevalence of PTSD is 2.3% in South Africa's population (15). Even though the SASH study suggests this seemingly low prevalence estimate, there are subsequent studies that yield higher estimates. Using data from the same Health and Ageing in Africa: A Longitudinal Study of an INDEPTH Community in South Africa (HAALSI) cohort suggests a 5% prevalence estimate of PTSD in 2015, Wave 1 was yielded (53).

Further, the Drakenstein Child Health Study, a research project focused on birth outcomes in South Africa, suggests a current or lifetime PTSD is 19%, higher than the SASH study prevalence (54). It is estimated that the lifetime prevalence of PTSD increases with increasing

age groups in the SASH study (46). Results suggest ages 18-34 years old have a 1.8% PTSD prevalence, ages 35-49 years old have a 2.4% PTSD prevalence, ages 50-64 years old have a 2.7% PTSD prevalence and ages ≥ 65 years old have a 4.4% PTSD prevalence (46). This is strong evidence of lifetime PTSD prevalence being higher in adults, as adults have a greater potential exposure to trauma, causing PTSD, due to more years lived (46). This study intends to add to an improved understanding of the PTSD burden among adults in rural South Africa.

A study applying WMH data suggests that in countries of low- to mid-income, including South Africa, only 28.7% of PTSD-diagnosed individuals are undergoing therapy (15). This is related to a shortage of mental health interventions, which is exacerbated by issues such as the substantial prevalence of Human immunodeficiency virus (HIV), low socioeconomic status, immigrant status, and domestic violence, which are all correlated with poor mental health among rural South African communities (55, 56). The Agincourt sub-district is among people who come from houses with low infrastructure and poverty, with the majority relying on government social grants and having no stable income. This study assesses the significance of factors relating to inequality and poverty concerning the risk of PTSD.

1.1.3 Inequality and Poverty

The United Nations' (UN) Sustainable Development Goals (SDGs) and the World Bank Group's goals for 2030 aim to eradicate extreme poverty and promote equitable wealth in all nations in a sustainable way to reduce inequality (57). Comparing the two, inequality is a broader term than poverty. It refers to the whole population rather than simply those who fall below the specified poverty level (57). Most inequality measurements are not based on the distribution's average. Income distribution is assessed by the percentage of revenue or consumption received by various groups among the population, ordered by income or consumption levels (57). Whereas the Gini coefficient, which is based on the Lorenz curve, is a common measure of inequality (58).

Poverty is described and evaluated variously across the globe. The national poverty line for any nation is usually a monetary level below which an individual's fundamental necessities cannot be satisfied, taking into consideration of the nation's financial and social circumstances (57). The UN defines poverty as "…a condition characterised by severe deprivation of basic human needs, including food, safe drinking water, sanitation facilities, health, shelter, education and information. It depends not only on income but also on access to social services"(59). Individuals in poverty are more exposed to violence and the repercussions of climate change (57). Thus, it can be stated that income and food insecurity are factors of poverty and affected individuals, are vulnerable to experiencing TEs. Understanding poverty is critical for understanding how civilisations might improve.

The WHO states that "health inequalities are disparities in health outcomes or in the allocation of health resources across various population groups that result from socioeconomic circumstances under which individuals are born raised, live, work and age" (60).

Rural South Africa experiences significant levels of poverty (61). As a result of historical legacies which have profoundly distorted the nation's economic status and population demographics, income inequality in rural South Africa has widened despite continuous gross domestic product (GDP) growth since the 1994 post-apartheid regime (61). Statistics South Africa (Stats SA) stated that its cost of living remains inconsistent across the nation and has coincided with growing inequality (62). According to studies, labour market income accounts for 85% of income inequality, with unemployment serving as the primary driver of inequality (42). As South Africa is known to suffer from inequalities and poverty with factors of income and food insecurity, there has long been the implementation of complex networks of government-supported social grants, in the manner of money transfers among low-income populations (63).

According to figures published by the Department of Social Development, an average of 18.4 million recipients benefitted from a social grant in April 2021; the four biggest grants in regard to accessibility were the Child Support Grant (13.4 million beneficiaries), the Social Relief of Distress (5.9 million beneficiaries), the old age pension (2.7 million beneficiaries), and the disability grant (997 547 beneficiaries)(64). Without these social grants, it is predicted that poverty in the poorest households of South Africa would have elevated by 5%, as would household income inequality by 1.3% to 6.3% more (65, 66). This proves the importance of how social grants improve household finance and food insecurity, which in turn improves poverty and inequalities within South Africa. This study can give insight into developing systems to demolish the cycle of inequalities, poverty, income and food insecurity in households.

1.1.3.1 Household Asset Index

Epidemiological theories concerning the link between socioeconomic background and mental health include: 1) social causation hypothesis, which implies that income factors including stress, adverse events in life, poor physical wellness, inadequate medical care accessibility, and prejudice contribute to mental disorders, and 2) the social selection or social drift hypothesis, which implies individuals with mental disorders are supposed to drift to in low-income situations (67, 68). A study suggests that the first theory is seen to be more applicable to depression, whilst the second seems more suitable for schizophrenia (69). This current cross-sectional study is limited in using this theory as the time of onset of PTSD is unknown. Probable PSTD may have occurred prior to or after issues involving the Household Asset Index (HAI) and food insecurity. However, we hypothesise that this study abides by the social causation hypothesis.

The theory acknowledges that mental disorders are rooted in an individual's social demographics. Poverty, unemployment, a lack of schooling, an elevated rate of communal

brutality, and interpersonal TE are all major contributors to poor mental health outcomes (21, 68, 70-73). Furthermore, rather than being 'direct' causes of mental disorders, these variables may reinforce one another (74). Based on a particular study, food insecurity can evoke recollections of earlier acts of violent TEs (75). As a result, while the social causation theory acknowledges biological determinants of mental health disorders, it emphasises that adverse interconnected social demographic variables are significant predictors of poor mental health.

In low and mid-income countries, a compound index listing HAI is a common measure of socioeconomic status (76, 77). The HAI focuses on household asset categories such as tangible goods, dwelling amenities, sanitation, and accessibility to services (78). Agincourt Health and Demographic Surveillance System (HDSS) investigators have extensively used this method of calculating HAI based on socioeconomic resources, which is modelled after the Demographic and Health Surveys (DHS) index designed for use in low and middle-income settings (78-80). Furthermore, in low and middle-income locations household assets are more accurate indicators for a household's wealth over time in comparison to earnings or expenditure data; reasons include seasonal fluctuations in income, revenue from possible various and broad informal occupations, a significant proportion of entrepreneurship, recollection bias, and inaccurate reporting (78).

1.1.3.2 Food Insecurity

Food insecurity is the limited or unpredictable accessibility to sufficient, secure foods, or a failure to obtain individually proper nourishment in socially acceptable conduct (81). Food insecurity encompasses inadequate number, quality, or variation of accessible foods; experiences of starvation, stress, or limited options regarding the quantity or kind of available foods; and being forced to participate in methods of procurement involving begging, relying on donations, theft, or sex work to acquire food (82, 83).

The ultimate goal of SDG 2 is to eliminate hunger, conquer food insecurity, and promote a balanced and nutritious diet, although this goal continues to encounter barriers on a global scale (84). In 2018, approximately one-quarter of South African households recorded fully depleted finances for food in the previous year (85). The nutritional status of children is particularly concerning, with 27% of children under five years old classified as stunted in 2016, marginally surpassing the developing country average of 25% (85). The consequences of Childhood malnutrition can have long-term implications that impact adults, affecting cognitive development, raising the risk for infections, and having long-term economic implications by limiting future earning potential (86-88).

1.2 Literature Review

1.2.1 Global studies of prevalence of PTSD and TEs

Several studies have examined exposure to TE and the pathway to PTSD in both high and low to middle-income countries (7-12). However, most studies have focused on TEs such as war and political violence, and there is a significant relationship between these TEs and PTSD (89-94). Studies below illuminate the relationship of such TE in different contexts.

In a Ukrainian study that examined conflict-related TEs, a household stratified multiple-phased random sampling of the public in two metropolises was recruited (95). The following TEs were measured and are related to the war context in Ukraine: witnessing an injury or death to an individual other, and/or of a friend or relative, and any personal exposure to injury (95). Once in-person interviews were conducted, the sample was categorised as either an urban dwelling person (N=1 247) or an internally displaced person (N=300) due to the Donbas war (95). Demographic characteristics of respondents collected included employment status, marital status or ethnicity as both categories are largely Ukrainians (95).

Results suggested that 65% of internally displaced participants experienced a TE, and this group had greater exposure for all three TEs than the urban dwelling person group, with 23% of participants experiencing a TE. Using the DSM-5 PTSD Screening Score, the study found that 26.3% of internally displaced participants were at risk of PTSD and 8.3% of the urban-dwelling participants (95). The logistic regression analysis suggested that Ukrainian ethnicity was the socio-demographic variable that was significantly linked with probable PTSD among urban dwelling participants (aOR=8.433; CI:2.990–1.060)(95). The models excluded participants who were not of Ukrainian or Russian ethnicity (N=51) to reduce confounding (95).

Cross-sectional research, modified by asking about past exposure to TE, demonstrates that PTSD can linger for many years after TE e.g. exposure to civil war. This is evident in Austrian studies following the elderly exposure to World War II in 1946 and Rwanda following the exposed victims of the 1994 genocide (89, 96). Glück and associates conducted a study investigating the current mental state of the elderly in Austria post-World War II-related TE and PTSD prevalence (96). As the sample population (N=316) included the elderly aged 65 and older, recall bias was accounted for, as instead of lifetime PTSD being assessed, only 1 month of PTSD is evaluated. Bombing (79.1%) was the highest war-related TE, and the highest non-war-related TE was the unexpected passing of a someone close (42.2%) and experiencing a natural disaster (41.3%)(96).

The Posttraumatic Stress Disorder Checklist-Civilian Version (PCL-C)(97) is used to measure PTSD symptoms, which abides by the DSM-IV criteria. Respondents in the study were asked to evaluate five recurrent symptoms, seven avoiding symptoms, and five arousing symptoms using a scale of 1 to 5, where scores of 3 or higher indicated clinical relevance. To qualify for a probable full-blown PTSD diagnosis, individuals needed to report one symptom from criterion B, three from criterion C, and two from criterion D (96). For probable

subthreshold PTSD I, one symptom from criterion B and either criterion C or D must be met. In contrast, probable subthreshold PTSD II required at least one symptom from all three criteria (B, C, and D) (96). The study employed both criteria of subthreshold PTSD to enable a comparison between a stricter (subthreshold PTSD I) and a more lenient (subthreshold PTSD II) interpretation of symptoms and their associated distress (96). PTSD subcategories included: full PTSD diagnosis (1.9%), subthreshold PTSD I (8.8%), more strict diagnoses and subthreshold PTSD II (12%), a less strict diagnosis in terms of distress and symptomatology (96).

Observed proportions were compared to the population values with *z*-tests (96). Findings suggest that participants with full PTSD were diagnosed with higher war-related TEs compared to other subgroups (CI:26.48–2.05*; z*=2.09; p=0.031), however alike results for the non-war-related TEs (*z*=1.06; p=0.595). Cognitive performance was significantly decreased in individuals with full PTSD (CI:26.48–2.05; *z*=-2.01; p=0.022; d=-0.23) (96). Patients diagnosed with full PTSD and subthreshold PTSD I suggested a greater likelihood of current clinically significant psychopathological symptoms, with the greatest risk of having interpersonal sensitivity (OR=9.17), depression (OR=9.13), anxiety (OR=10.89), psychoticism (OR=12.42), and global distress (OR=25.51)(all p< 0.001)(96).

A similar cross-sectional survey albeit in a different context, Rwanda, by Rieder and Elbert, followed victims of the 1994 genocide of the Tutsi. TEs were assessed using the Rwandan-adjusted Event Scale (98), capturing exposure across various timelines (before, during, and after the genocide)(99). The total sample size of 360 included survivors and people imprisoned in the genocide and adding, descendants born before and after 1994. PTSD diagnosis utilised the PTSD Symptom Scale Interview (100), assessing 17 DSM-IV symptoms and created a PTSD severity score (99). PTSD prevalence was reported at 81% for the total sample, with the survivor group having the highest PTSD prevalence of 25% (99).

Depression and anxiety symptoms were evaluated with the Hopkins Symptom Checklist (HSCL-25) (101), with scores analysed for clinical relevance (99).

On average, eight TE types were experienced by respondents (99). Using the Mann-Whitney test, it was revealed that within the survivor group, females recorded a greater TE load during the genocide ($U=2446.0$; $p<0.0001$), while males recorded a greater TE load in subsequent years ($U=1880.0$; $p<0.0001$)(99). The survivor subgroup and their descendants described the majority of TEs, including being caught or kidnapped, seeing a slaughter, and sexual assault (99). Conversely, 65% of past inmates stated that they were physically attacked, mostly during their detention (99). A negative binomial regression analysis of the PTSD symptom severity score suggested that substandard physical wellness ($SE=0.20$; $p=0.010$), poor socialisation ($SE=0.08$; $p=0.026$), and TEs exposure ($SE=0.03$; $p<0.001$), were statistically significant PTSD symptom severity predictors among the parent subgroups ($N=176$)(99). Socio-demographic factors, including age, gender, and socioeconomic position, did not significantly predict PTSD symptoms (99). These studies add to the current study, highlighting the importance of research on post-TE eras and how, even though these periods may have occurred years ago they add to the understanding of the long-term effects of TEs, and the onset of PTSD.

Cardoso and associates examined the relationship between a range of self-reported TEs, the potential relationship of these TEs to PTSD, as well as the role of socio-demographic characteristics, e.g. sex, age, education level, employment and marital status (102). Analyses examined if these socio-demographic factors were acting as confounders or interaction variables among adults in a nationally representative sample in Portugal (102).

Their findings, despite a low response rate of 57.3%, suggest that 69% ($N=1548$) of the participants reported experiencing at least one TE, of which the highest is accident-related

(102). They reported the conditional risk of these TE to PTSD with an overall risk of 6.9%, and sexual violence, including rape and spousal abuse, presented the highest risk of the onset PTSD (19.6%; S.E.=5.7) (102).

The multivariate logistic regression suggested that females were 0.6 times less likely to report experiencing any TE (OR=0.6; 95%CI: 0.48–0.80)(102). When controlling for the type of TEs, the model found that women were more likely than males to be at risk of lifetime PTSD (OR=2.7; 95%CI:1.47–4.96)(102). Students reported less likely at risk of lifetime PTSD compared to the working category (OR=0.13; 95%CI:0.03–0.65)(102). A third model controlled for TE types and lifetime PTSD and was among prior exposed PTSD and TEs respondents. Never-been-married participants were 3.57 times more likely to report 12-month PTSD than married participants suggesting marriage is a proxy for social connection or support (OR=3.57; 95%CI:1.03–12.31) (102). They found that the results of PTSD prevalence align with findings from other countries (102). While women reported lower exposure to TEs, they experienced a higher lifetime PTSD prevalence, suggesting that factors, in addition to the type of TE, such as gender-based vulnerability, serves an integral part in the onset of PTSD (102).

Traumatic social policies from the South African apartheid era have possibly moulded public connections and mental health experiences of elder South Africans, resulting in some PTSD symptoms being relatively prominent compared to other nations (103). Thus, these potential TEs linked to the nation's hardships necessitate more research into the assessment and incidence of PTSD in ageing Black South Africans. A national population study using SASH data comprised 4 315 persons, of whom 58.6% were female, 79.7% were Black, 50% were married, 69.2% were jobless, 62.7% had schooling of less than 12 years, and 59.7% resided in urban areas (104).

The WHO Composite International Diagnostic Interview (CIDI) DSM-IV PTSD module was used to examine participants' lifetime exposure to 27 TEs. 73.8% (SE=1.15) of participators experienced at least one TE and 13 700 TEs were exposed to the sample (104). The average lifetime TE incidence was estimated to be four, with the following TEs being the most commonly reported: sudden passing of someone close (39.2%), physical assault (37.6%), car wrecks (31.9%), and observing TEs (29.5%). 3.5% (SE=1.9) is the average conditional prevalence of PTSD, accounting for about 480 lifetime PTSD events among respondents (104). The overall prevalence of reported lifetime PTSD was 2.3% (SE=0.3), while the 12-month prevalence of PTSD was 0.7% (SE=0.2) (104). The largest conditional risk of PTSD was associated with witnessing TEs (8.3%; SE=4.9), whereas the lowest was associated with PTEs to a loved one (1.4%; SE=0.8) (104). High risks were specifically related to: intentionally harming, assaulting, or murdering another (32.9%), witnessing atrocities (31.5%), rape (13.2%), and potentially fatal incidents, including vehicle wrecks (5.5%) and others (9.6%)(104).

The total mean duration of the PTSD events was 42.3 months (SE=12.3), with significant differences according to the kind of TE (104). Notably, PTSD linked to witnessing TEs had a higher average duration of 55.1 months than other subgroups (104). Witnessing TEs carried the highest association, representing over half of the population’s PTSD burden. Few socio-demographic factors significantly predicted exposure to TE and PTSD in the logistic regression models (104). Homemakers were less likely at risk of PTSD than employees (OR=0.65; CI:0.49–0.86)(104). Regarding lifetime PTSD, when examined by racial group, Indians suggested considerably decreased odds (OR=0.02, CI: 0.00 – 0.09), while retired individuals had an elevated risk of PTSD (OR=9.18, CI: 2.62 – 32.20)(104). For 12-month PTSD, respondents formerly in a marriage had a reduced risk (OR=0.02, CI: 0.00 – 0.31) than presently married persons, while never been married participants had a significantly

increased risk of PTSD (OR=37.64; CI:2.22–639.50)(104). Low-average education was associated with an increased risk of 12-month PTSD compared to a higher level of education (OR=29.45, CI:2.62–330.50)(104).

1.2.2 Global studies of PTSD and cumulative TEs

As mentioned, several studies in different settings have examined the relationship of TEs and the diagnosis of PTSD (9, 105-109), our study adds to the limited studies on the relationship of cumulative TE on the risk of PTSD (110-112). Cumulative TE refers to the experience of various types of TEs and has been operationalised in two ways: one considers the accumulation of different types of exclusively interpersonal TE (113-116), and the other considers all types of TEs, including non-interpersonal TE (44, 117-119). In this current study, cumulative TE is measured as one category for the types of TE. However, a study using two archival datasets further categorised cumulative TE as cumulative interpersonal or non-interpersonal TE (118).

The Detailed Assessment of Posttraumatic Stress (DAPS)(120) standardisation study and research on TE and post-traumatic effects among convicts and others in Canada have been examined. According to the DAPS, 19 individuals (3.9%) met DSM-IV criteria for PTSD at the point of the research (118). Multivariate regression analyses found an association between cumulative TE and PTSD (p=0.004; OR=1.37; 95%CI:1.11 – 1.70) (118). Subcomponent analyses yielded similar findings, except for interpersonal being significant (Wald=8.11; p=0.004) but non-interpersonal not (Wald=0.02; p=nonsignificant) (118).

Further, a post hoc X^2 analysis revealed substantial impacts of both sexual and cumulative TE (118). Persons exposed to sexual TE were more likely to have PTSD (11%; X^2=14.78; p=0.001) (118). Individuals who had two or more cumulative TEs had a higher likelihood of developing PTSD (X^2=13.14; p-value=0.004) (118). Participants who endured a single form

of TE had a 0% chance of developing PTSD, whilst individuals who experienced six or more TEs had a 12.0% chance (118).

The latter study found 46 individuals (47.9%) presenting with PTSD according to DSM- IV criteria (118). Similar results for logistic analyses were reported in research 2. PTSD has been associated with exposure to sexual TE as well as cumulative TE after adjusting for sexual TE (118). When cumulative interpersonal and non-interpersonal TE replaced the overall cumulative TE, the former was a significant predictor (Wald=4.35; p-value=0.037), whereas the latter was not (Wald=1.63, p-value=nonsignificant) (118).

Post-hoc X^2 analysis revealed that victims of sexual TE were more likely to have present PTSD (63.5%; X^2=16.05; p-value<0.001) (118). There is a significant association between the risk of PTSD and two or more cumulative TE (X^2=18.83; p-value=0.001) (118). In the prison sample, those who had experienced one form of TE had a 16.7% chance of developing PTSD, whereas those who experienced six or more TEs had a 63.9% chance (118). A takeaway from the overall study's results is that cumulative interpersonal TE may be related to PTSD, whereas cumulative non-interpersonal TE did not seem to have a significant relationship (118).

Research suggests that PTSD is more likely among those who have experienced several TEs (121, 122). A study using data from the WMH Surveys, which comprised 20 countries, including South Africa, examined PTSD symptoms for the month following each 29-lifetime TE type (44). Using DSM-IV and CIDI criteria, the total sample 12-month PTSD prevalence was reported to be 1.1%, with the largest prevalence estimate in Northern Ireland at 3.8% and the lowest being in Colombia and Mexico at 0.3% (44). South Africa was also on the lower side of the total 12-month PTSD prevalence scale at 0.4% (44).

This study examines the relationship between TEs and PTSD highlighting how the number and type of exposures can significantly shape outcomes. Karam and colleagues found that around 19.8% of those suffering from 12-month PTSD attribute their disorder to the effects of multiple TEs (44). Reported results include that, of the 12-month PTSD-diagnosed patients, 42% experienced severe functional impairment (44). In comparison to individuals with 12-month PTSD linked to one type of TE, those with PTSD correlated with 4 or more TE types exhibited increased odds of severe functional impairments, e.g. work (OR=5.2), global overall (OR=6.0) and close relationships (OR=7.6) had the highest risk associations ($p<0.05$)(44). Higher odds of presenting with 4 or more TE and 12-month PTSD were found among individuals who were not married or cohabitating (OR=2.5) and those unemployed (OR=2.5)(44).

Further analyses deepen this understanding by comparing the prevalence and characteristics of PTSD across varying levels of trauma exposure. The comparative analysis found that 9 of the 15 TE types were significantly ($p<0.05$) more prevalent in respondents with 4 or more TEs and 12-month PTSD than those with 3 or less TEs and 12-month PTSD (44). Common events among the 4 or more TEs and 12-month PTSD group included physical abuse and, in contrast, among 3 or less TEs and 12-month PTSD witnessing violent events during childhood (44). The median age of onset for those with 4 or more TEs and 12-month PTSD was 11 years, compared to 29 years for the 3 or less TEs and 12-month PTSD group (44). Respondents with 4 or more TEs and 12-month PTSD reported a significantly higher mean amount of lifetime PTSD symptoms, particularly in the hyperarousal cluster, which correlated with elevated odds of severe PTSD (OR=1.5; 95%CI:1.1–2.1)(44).

An African sample from South Ethiopia examined PTSD and TE among internally displaced persons who were affected by inter-communal violence, which resulted in substantial relocation, lives lost, and destruction of property (123). This community-based study has a

sample size of 625 respondents. The rate of PTSD among the internally displaced was estimated by PCL–5 at 58.4% (95%CI: 55–61.9), with a higher prevalence noted among women (60.8%)(123). The most frequently reported TEs included personal property destruction (67.52%), inadequate food and water (61.12%), and had experienced the murder of relatives or friends (55.68%)(123).

Multivariable logistic regression analysis revealed significant associations between PTSD and several independent variables: women were 2.35 times likely to develop PTSD than men (95%CI:1.61–3.44)(123). Experiencing the murder of a relative or friend doubled the odds of PTSD (aOR=2.1; 95%CI:1.08–4.08)(123). Participants previously with depression were 2.6 times likely to develop PTSD (95%CI:1.18–3.78)(123). Those displaced more than once had 3.69 times higher odds of PTSD compared to non-displaced participants (95%CI:2.35–5.82)(123).

The research highlights a strong dose–response relationship between the number of TEs experienced and the likelihood of developing PTSD. Respondents in the study who reported having experienced four or more out of a total of 16 distinct TEs were 1.9 times likely to develop PTSD in comparison to those whom experienced zero to three TEs (95%CI:1.1–3.4)(123). Those who experienced between eight to eleven TEs faced an even higher risk, with an adjusted odds ratio (aOR) indicating they were 2.9 times more likely to have PTSD (95%CI:2.3–4.1)(123). Among respondents who had endured twelve or more TEs, the likelihood of the onset of PTSD surged to 4 times greater (aOR=4.1; 95%CI:1.7 –9.7)(123). Research confirms the premise that cumulative TEs, both in regard to harm and risk, is significantly more predictive and effective in guiding therapeutic practice than evaluating individual adversities and TEs in isolation (124-126).

These multiple or extended environmental stressors can have additive effects, which can further lead to a more serious situation, in this case, PTSD severity (127). People with a history of TEs seldom encounter a single TE but are likely to have encountered numerous incidents of TE exposure (17). Endured, repeated, or multiple childhood TEs can lead to a complex symptom presentation which involves not solely PTSD symptoms but also challenges with affective and interpersonal self-organisation, such as anxiousness, anger, dissociation, aggression and social avoidant behaviours (114, 128, 129).

Rink and Lipinska conducted a cross-sectional analysis at an academic institution in South Africa, including 576 students, with the majority being female (84.55%) of an average age of 20.46 years (130). Of the participants, 42.19% reported exposure to a TE occurred within the past year, with others reporting TEs occurring 1–5 years (31.42%), 5–10 years (14.76%), or over 10 years ago (11.63%)(130). The International Trauma Questionnaire (ITQ)(131) and the Latent Class Analysis (LCA)(132) were employed to assess construct validity and differentiate between PTSD and complex PTSD classes (130). Among the participants, 14.93% (N=86) fulfilled the criteria for PTSD, while 11.46% (N=66) met the criteria for complex PTSD (130). Participants first identify their most distressing TE and then respond to questions assessing PTSD symptoms (recurring experience, avoiding, perception of threat) and disruptions in self-regulation symptoms (affective dysfunction, poor self-worth, relationship problems)(130). Emotional neglect was the most reported form of childhood TE (mean=1.95; SD = 0.84), followed by psychological assault (mean=1.90; SD=0.87)(130). Most participants indicated low endorsement of childhood TE (59.55%; N=343), while smaller proportions endorsed one (18.58%; N=107) or more TE subscales (130).

Models from 2 to 6 classes were fitted by applying robust maximum likelihood methods. LCA fit indices analysis revealed that only the four-level solution was workable(130). The class proportions were as follows: PTSD class (32.81%; N=189), complex PTSD class

(23.96%; N=138), disturbances in self-organisation symptoms class (16.49%; N=95), and low endorsement probability for all symptoms classes (26.74%; N=154)(130). Chi-squared tests determined variations between classes in rates of PTSD(130). The PTSD class suggests a higher diagnosis rate compared to the complex PTSD class (χ^2(1, N=327)=20.82; p<0.001)(130). Diagnosis of complex PTSD was more common in the complex PTSD class (χ^2(1, N=327)=113.25; p<0.001)(130). Both PTSD and complex PTSD classes demonstrated significantly elevated rates of PTSD symptom endorsements in comparison to the disturbances in self-organisation symptoms and low endorsement probabilities for all symptom classes (130).

The Mann–Whitney *U* post hoc tests found that the complex PTSD class had higher scores than the PTSD class for both assault and neglect (U=14 881.50; p=0.005 and U=14 781; p =0.008), with the low endorsement probability for all symptoms classes suggests the lowest scores overall (130). The Childhood Trauma Questionnaire (CTQ)(133) subscale scores for emotional abuse (*U*=15 069; *z*=3.562; p=0.002) and emotional neglect (*U*=15 069; *z*=3.562; p=0.002) were significantly elevated in the complex PTSD compared to the PTSD class, indicating distinct childhood TE experiences related to class membership (130). The complex PTSD class had less individuals who did not endorse any subscales in comparison to the PTSD class (χ^2(1, *N* = 316)=7.72; p=0.033), while the low endorsement probability for all symptoms classes consistently endorsed fewer TE types than the other classes, exhibiting meaningful differences across TE endorsement rates (130).

1.2.3 Global studies on inequality and poverty

A research study assessed mental health inequalities among a representative sample of South African teenagers in the Western Cape province (134). Students reported on household conditions, including access to basic utilities and the number of people per room, which indicated overcrowding (134). These factors were used to create an asset index through

Principal Components Analysis (PCA)(135, 136) to measure wealth, particularly in contexts lacking income data (134). This measure of household wealth is similarly used in this current study. Participants assessed their ability to afford essential items such as meals, hygiene products, and clothing (134). This information contributed to an overall scale measuring the ability to afford basic necessities (134).

Chi-squared analysis suggests that Black students experienced greater levels of disadvantage across most indicators, particularly regarding their ability to purchase basic items (134). For instance, a significantly larger percentage of Black students reported being unable to purchase essential items like soap (15%; χ^2=69.65; p=0.04) and shoes (27.4%; χ^2=112.63; p=0.04) compared to their counterparts (134). Students not aged appropriately for their grade (ages 13-15 years) were categorised as educationally underprivileged, following the methodology established by the South African Index of Multiple Deprivation (137). The Multi-Dimensional Scale of Perceived Social Support (MSPSS)(138) was employed to measure perceived community social support from relatives, friends, and partners. Additionally, students reported instances of racially-motivated bullying, with responses dichotomised based on frequency (134). A subscale from the Self Esteem Questionnaire (SEQ)(139) assessed self-worth, validating its applicability in South African adolescents (134). The Harvard Trauma Questionnaire (140) was adapted to assess violence experiences and symptoms of PTSD based on DSM-IIIR criteria, reflecting South African contexts (134).

The overall prevalence of PTSD across the sample (N=1034) was found to be 21%, among the ethnicities include, 34% in Black students (N=612; 61%), 19% in Coloured students (N=101; 10%) and 13.6% in White students (N=268; 27%)(134).[1]Of the students with

[1] During the apartheid period, the government introduced numerous legislations based on racial classification. The South African population were classified into the following racial groups: Whites, Natives (Blacks), Indians and Coloured (mixed race).

probable PTSD, 30.9% of Black students, 23.4% of Coloured students and 16.4% of White students were within the fifth (poorest) quintile of the asset index (134). 33.5% of Black students, 17.2% of Coloured students, and 12.1% of White students were unable to afford all basic items and had probable PTSD (134). A strong correlation was found between ethnicity and experiences of assault and ethnically based bullying. Coloured children had the highest exposure to violence (88%; p=0.004). Adverse mediators (lower interpersonal support and poor esteem for oneself) increased linearly with higher material struggles and decreased accessibility to assets (134).

After adjusting for gender Black children were more than twice as likely to have PTSD as White children, and Coloured children were 1.73 times more probable (95% CI: 1.11 – 2.70)(134). The dose-response relationship observed a positive trend for the ability to purchase basic items, which resulted in a per unit increase in unaffordability. There is a 1.23 times elevation in the risk of a child having PTSD (95% CI: 1.06 – 1.42; p=0.02)(134). As the asset index quintiles increased, so did the rate of relative risk for being diagnosed with PTSD (134). Children in the fifth (poorest) quintile had 2.72 times greater chance of having PTSD (95% CI: 1.92 – 3.85)(134). The results indicated a clear pattern of increasing PTSD prevalence with greater material disadvantage.

Living in a place with high poverty rates or experiencing neighbourhood poverty is one factor that may raise the risk of PTSD (141). South Africa’s inequalities and rural poverty can be compared to the USA’s neighbourhood inequalities poverty. The potential impact of neighbourhood poverty on PTSD symptoms six months following a TE was investigated in a study carried out in Atlanta, Georgia (142). Neighbourhood poverty rates were the socioeconomic measure, which was calculated by the American Community Survey (ACS)

Post-apartheid era, South Africa's four official racial groups are White, Black, Indian/Asian, and Coloured. The word "Coloured" is not regarded as derogatory or insulting in South Africa.

and represented the proportion of the population in a person's zip code living under the line of poverty (142). Every year, the United States Census Bureau conducts the ACS survey, which evaluates the socio-demographic characteristics of various USA regions (142).

Of the final 252 participant sample, 75% were Black, followed by 15.9% White, 4.4% mixed, 1.6% Asian, and those identifying as other races 3.2% (142). Household income resulted in 6.5% reporting a monthly household revenue of below $250; another 6.5% had incomes ranging between $250-$499, 14.3% income within the $500-$999, 21.8% had incomes between $1000-$1999 and nearly half (48.8%) of the participants reported earning over $2000 monthly (142).

Education levels included did not complete high school (13.5%), secondary graduates (24.6%), attended college or technical school (40.1%), obtained a college degree (21.8%), reported attending a postgraduate program (7.9%), and held a postgraduate degree (7.5%)(142). Over half of the sample (52.8%) were employed on a full-time basis. Participants had faced an average of 2.78 different types of TEs prior to enrolment (142). Severity ratings of the TEs indicated that 11.5% were evaluated as mildly severe, 34.1% were rated as somewhat severe, 35.3% experienced severe TEs, and 17.1% faced very severe TEs (142). The mean PTSD symptom score at baseline among respondents was 8.60. The average poverty rate in the neighbourhoods of participants was 22.9% (SD=9.76)(142).

Correlations evaluated neighbourhood poverty conversely associated with household income ($r=-0.236$; $p<0.001$) and with education levels ($r=-0.254$; $p<0.001$)(142). A positive correlation was found between neighbourhood poverty and higher PTSD symptoms at baseline ($r=0.181$; $p=0.004$) as well as PTSD symptoms at the six-month mark ($r=0.163$; $p=0.009$)(142). PTSD symptoms measured six months post-TE were linked with poor education ($r=-0.137$; $p=0.03$), less revenue ($r=-0.155$; $p=0.015$), and more severe clinician-

rated TE (r=0.234; p<0.001)(142). Furthermore, there was a positive correlation between both baseline TE experiences (r=0.156; p=0.013) and PTSD symptoms at baseline (r=0.507; p<0.001)(142).

In the regression analysis, the model analysed the effect of neighbourhood poverty on PTSD symptoms at the six-month post-TE mark while adjusting for baseline TE history, clinician-rated TE severity, and participants' income status (142). This model explained 9.9% of the variance in PTSD symptoms (F=6.80; p<0.001)(142). Neighbourhood poverty significantly predicted increased PTSD symptoms (B=0.15; SE=0.07; p=0.04)(142). Results have suggested the defining differences in inequalities between high and low-income countries, which suggests the importance of independent research in both types of nations. Similarly to the measure applied in the above study, in South Africa data from Stats SA's annual General Household Survey (GHS) may be utilised to measure income status however, in this current study, the HAI is used.

1.2.3.1 The relationship between HAI and PTSD

A study using the current study's HAALSI dataset, Wave 1 investigated the importance of using HAI as a socioeconomic measure for research on health inequalities in the elderly (79). Three health indices were used to assess the health status of the participants; this included general health status (e.g. self-wellness, discomfort, mental processes, social activities, emotions, and eyesight)(143-148), disability status (149) and Poterba, Venti and Wise (PVW) Health Status (various self-reported health indicators, including mobility and healthcare utilisation metrics)(150). Socioeconomic status was measured using three indicators: an asset-based wealth index, household consumption per capita, and household equivalent consumption (79). The wealth index was constructed through, analysing household variables like ownership of assets and housing characteristics (151), similar to the HAI measure. The household consumption metric was derived from a detailed questionnaire regarding various

goods consumed, encompassing both production and purchases (79). This measure was preferred over household income, which had significant missing data (152).

Riumallo-Herl, Canning and Kabudula's regressions results indicate that both the wealth index and equivalent consumption are positively associated with better status of health (79). However, the gradient is steeper for equivalent consumption (79). Specifically, individuals in the top quintile of comparable consumption are 89.1% more likely to be in good health compared to those in the poorest quintile, whereas the wealth index suggests a lesser gradient with only a 34.6% greater probability of good health in the highest quintile (79). There were similar patterns of results for disability status and PVW Health Status however, the association with wealth index quintiles lost significance (79). This paper concludes that the choice of socioeconomic measure significantly influences the assessment of health gradients among the elderly in South Africa (79). The findings reveal that health inequalities are notably more pronounced when using equivalent consumption as opposed to the wealth index (79). The household consumption measures may be considered as an addition to future research in this current study's topic.

In rural Ethiopia, a similar study evaluates the socioeconomic status of households with individuals suffering from severe mental disorders or depression compared to those without (153). A population-based comparative cross-sectional study was executed and targeted households with individuals diagnosed with severe mental disorders (comprising bipolar disorder and schizophrenia) or depression and included matched comparison households without these disorders (153). The primary outcome, household socioeconomic status was measured with three interties household income (e.g. wages, trade, savings, grants, family/community transfers), household consumption (e.g. food, daily use non-food items, consumer durables, healthcare goods) and an asset-based index on grounds of the 35 item multiple correspondence analyses (154), similar to the current study HAI measure (153). In

addition, the Organization of Economic Co-operation and Development (OECD)-modified scale (155) was used to adjust socioeconomic status measurements for the size and consumption of the household (153).

A total of 836 households were surveyed, comprising 290 households with individuals with severe mental disorders, 128 households with depression, and corresponding comparison groups. Households with severe mental disorders suggest lower rates of marriage, formal education, lower home ownership and access to improved sanitation facilities, indicating poor living conditions compared to the control group (153). A notable portion of households with individuals experiencing severe mental disorders reported no income and had significantly lower annual incomes compared to those without mental disorders (6.8%; 95%CI:3.7–12.3; p=0.011). Households with severe mental disorders and depression reported 10.6% (β=-0.106; $p>0.05$) and 12.2% (β=-0.122; $p<0.05$) lower levels of consumption expenditure, signifying economic hardship (153).

A significant difference in asset possession was observed, with households of persons with severe mental disorders lacking ownership of basic assets compared to the control group: owned a cellular phone (41.2% vs. 57%; p=0.006), radio (35.8% vs. 53.2%; p=0.001), television (4.7% vs. 11.7%; p=0.043), livestock (76.5% vs. 88.5%; p=0.002)(153). The poorest asset quintile had a higher number of homes with severe mental disorders (24.8% vs. 14.5%) than the control group. In contrast, homes with severe mental disorders had a lower share (17%; p=0.007) in the top asset quintiles in comparison to homes with no members with a mental disorder (26.3%)(153). This trend was similar for households affected by depression, although the differences were less pronounced. Households with depression were 9% (p=0.019) more likely to be in the lowest assets quintile than those without depression. Regression analysis confirmed that households with severe mental disorders consistently experienced less assets, with a mean difference of beta is − 0.630. (p=0.001)(153). There was

a clear trend where greater disability was associated with deeper socioeconomic disadvantage. This study aligns with theoretical expectations that households with individuals suffering from severe mental disorders or depression experience significant socioeconomic disadvantages. Their inability to secure essential resources exacerbates their living conditions. The current study will add to this study as PTSD would be the primary mental health disorder assessed to the association with HAI.

The unequal distribution of socio-economic status among ethnic groups has been repeatedly connected to ethnic differences in mental health, according to studies conducted in general populations in the USA (156). Nillni and colleagues concluded this statement in a study that used data from the Longitudinal Investigation of Gender, Health, and Trauma (LIGHT) study, which focuses on how ongoing exposure to TE and violence affects veterans' mental health, functioning, and reproductive health (156). The measure of household income was an estimation of the participant household's annual gross income, ranging from "no income" to "$150,000 or more per year" (156). The investigation addressed reported daily discrimination (measured by the Everyday Discrimination Scale (157)) and income as parallel mediators of the relationship between ethnicity and PTSD, depression, and anxiety symptoms in a sample of Black, White, and Hispanic/Latin veterans (N=3 060) divided by sex and from high-crime areas (156).

Significant differences were observed in mental health symptoms, with both Black (probable PTSD:35.36%) and Hispanic/Latin veterans (probable PTSD:27.85%) reporting higher degrees of PTSD, depression, and anxiety in comparison to White equivalents (probable PTSD:21.88%) (156). Black veteran percentages decreased with increasing income categories, which is conversely with White veterans and with Hispanic/Latin veterans, there were higher percentages in the middle-income categories decreasing to the lowest and highest income categories (156). Low-income has specifically been associated with increased

probabilities of having an anxiety disorder, depression, and PTSD prevalence (156). Mediation analysis found a total of 8 significant mediation models confirming daily discrimination and income acted as mediators between ethnicity and all three mental health outcomes for Black vs. White veterans (PTSD: R^2=0.19; CI:2.21–5.19)(156). Rounding back to the theme of inequality, this study highlights underlying associations and mediators of PTSD in a population with high inequalities of racial incomes. This may be comparable to the high inequities in income and discrimination experienced by historically marginalised populations in South Africa.

1.2.3.2 The relationship between food insecurity and PTSD

A study investigated the relationship between poverty and mental health and how food insecurity mediates in Singapore (158). The mean age of the sample of 419 participants is 52.6 years of which ethnic composition comprised 61.6% Chinese, 24.6% Malays, 10% Indians, and 3.8% from other ethnicities (158). The Household Food Security Survey Module (HFSSM) was applied to evaluate the status of food security over a year (158). The HFSSM consists of 18 questions that capture both adult and child food experiences, categorising households as food secure, moderate insecurity, or severe insecurity based on affirmative answers (159). An overall food insecurity score was computed, ranging from 7 (denoting low food insecurity) to 21 (denoting high food insecurity)(158). Due to incomplete income data, type of housing served as a poverty proxy for socioeconomic status (158). Higher scores on this measure indicated residence in smaller, lower-income flats, while lower scores corresponded to larger or more upscale living arrangements (160, 161).

An unspecific psychological distress scale known as the Kessler six-item was employed to assess psychological well-being (162). Participants rated the frequency of specific feelings encountered in the last 30 days on a five-point Likert scale (158). A strong correlation (r=0.61; p=0.01) was found between adult food insecurity and psychological distress, with no

multicollinearity issues detected (158). Poverty and psychological suffering resulted in a weak correlation (r=0.23; p=0.01)(158), this may be due to the choice of poverty proxy or the socioeconomic measures used. Poverty has a significant indirect influence on psychological suffering through food insecurity, which was revealed with a mediated effect (calculated as a × b, 1.30 × 0.37) yielded 0.49 (95% CI:0.0042–0.2584)(158). Notably, the direct influence of poverty on psychological suffering when adjusting for food insecurity was not statistically significant, confirming full mediation by food insecurity (158). Independent sample t-test findings indicated that those experiencing food insecurity reported significantly higher psychological suffering in comparison to their food-secure counterparts (t=-16.57; p=0.01; d=1.61)(158). The results give insight into the possibility of the relationship that food insecurity may have with the mental health disorder PTSD.

The results of a cohort study among women in the USA who are HIV-positive or at risk; used a dataset from the Women's Interagency HIV Study (WIHS), a longitudinal study examining HIV-positive women along with similar HIV-negative women across multiple centres (163). Food security was also assessed using the HFSSM with high, marginal, low, or very low categories. The PCL-C was utilised to evaluate PTSD symptoms, consisting of 17 items regarding experiences over the past month (163).

The final sample included 2 553 participants, predominantly African American/Black (71.6%), with a median age of 47 years (163). A significant majority (70.6%) were HIV-positive, and over half (51.9%) had an annual income below $12,000 (163). Approximately 44.4% of respondents reported varying degrees of food insecurity (marginal, low, or very low) during baseline assessments (163). At baseline, 12.5% of respondents positively screened for PTSD (163). Those with low and very low food security had significantly greater PCL-C scores and odds of PTSD (163). In regression models, low and very low food security correlated with PCL-C scores of 4.70 (SE=1.18; p< 0.01) and 6.46 (SE=1.31;

p<0.001), respectively, suggesting increased PTSD severity (163). Very low food security was linked with a 1.93 times greater likelihood of screening positive for PTSD (95%CI:1.15–3.24)(163).

Another study conducted among Syrian refugee mothers in the low-income nation of Lebanon investigates food insecurity and poor mental health (164). Mini International Neuropsychiatric Interview (MINI)(165) was applied to measure PTSD and other mental health issues. Food insecurity was measured via the Food Insecurity Experience Scale, with two indicators: moderate or severe (166). The overall prevalence of moderate food insecurity among 433 total participants was reported at 34.4%, with severe food insecurity affecting 12.5% of the mothers (164). Among participants, PTSD was present in 13.2% of mothers (164). Additionally, 27.1% suffered from either PTSD or moderate to severe depression (164). Depression scores were strongly correlated with food insecurity (r=0.353; p<0.000), indicating that poor mental health exacerbates food insecurity conditions (164). Even though there was a significant correlation between PTSD and food insecurity, the coefficient suggests a weak correlation of 0.214 (p<0.000)(164).

In a systematic review of 62 observational research studies analysed, only one study identified no link between food insecurity and poor mental health (167). This article by Sweetland and colleagues investigated 1 142 people from rural communities in Nigeria, Uganda, and Ghana. Psychological suffering was also assessed utilising the Kessler-six scale. Food insecurity was assessed by respondents indicating the number of months in the preceding year their families could not eat two square meals a day. The average duration of food insecurity in the past year was reported as 0.48 months for Nigeria, 1.80 months for Uganda, and 0.75 months for Ghana. Moderate or severe mental distress was reported by 35.5% of responders in Nigeria, 30.8% in Uganda, and 30.4% in Ghana.

The logistic regression concluded that food insecurity is not a risk factor for mental distress in all locations (Ghana: β=-0.120; p=0.085, Uganda: β=0.133; p=0.498, Nigeria: β=0.177; p=0.074) (168). The contrasting findings may result from the inadequate measure of food insecurity, as the number of months in the year prior when the participant's household reported being unable to consume two square meals each day (168). This measure of food insecurity is prone to be inaccurate due to recall bias and an inadequate number of questions or scales were used to have a more reliable measure.

Van der Berg, Patel and Bridgman state that hunger and malnutrition are common factors or consequences of poverty (e.g., imbalanced, carbohydrate-rich meals)(64). Their article evaluates food insecurity in South Africa using Wave 5 of the South African National Income Dynamics Study – Coronavirus Rapid Mobile Survey (SA-NIDS-CRAM) database, conducted in May 2021(169).

Reports observed household hunger at 16%, the proportion of households with child hunger was 15%, and the overall proportion of households reported having fully depleted finance for food was 36% (64, 170). The article reports an increasing trend of adults reporting hunger compared to children in households, suggesting adults may be shielding children from experiencing hunger (64). Women (28%) reported higher levels of food insecurity (vs. 23% of men), which may be attributed to their lower control over household finances when households are male-headed (64). Malnutrition is still an everyday problem for many South African homes, and this suggests that food insecurity is prevalent within South Africa during this time period.

Studies within the African and South African settings examining the relationship between food insecurity and mental disorders are commonly depression-focused and not many on PTSD (167, 171-177). However, here is a study most similar to the current study evaluating

the longitudinal unidirectional and bidirectional correlation of PTSD and food insecurity (53). All three longitudinal Waves (2015, 2019, and 2021/2022) of the HAALSI were utilised in the analysis. This is the same dataset as the present study from Agincourt, Mpumalanga South Africa. The final sample consisted of 3 707 participants (53).

In Wave 1, food insecurity was assessed through three questions regarding lack of food due to financial constraints (53). In Waves 2 and 3, it was defined by three or more positive responses from five questions encompassing recent experiences of hunger and meal-skipping (53). Thus, food insecurity was a binary variable (53). PTSD symptoms were defined using a 7-item symptom scale, with a threshold of score ≥ 4 for probable PTSD (21). Household wealth status is an asset-based measure like the HAI. Rates of food insecurity were 20.2% in 2015, 24.1% in 2019, and dropped slightly to 18.4% in 2021/2022 (53). PTSD was not recorded in Wave 2 thus, the prevalence of probable PTSD was 5% in 2015 and 2.4% in 2021/2022 (53).

The logistic regression analysis revealed that there is an overall correlation of food insecurity and PTSD (unadjusted OR = 2.28; 95%CI: 1.72 – 3.02)(53). When adjusting for age, schooling level, sex, status of marriage, size of household, wealth status, poor self-rated health status, country of origin, Activities of Daily Living limitations, and study Wave, the association was notably strong for PTSD and food insecurity, evidencing a bidirectional relationship (aOR=2.49; 95%CI:1.81–3.44)(53). Individuals experiencing food insecurity in one or more Waves were likely to develop new instances of the cited mental health issues over time (53). Respondents with probable PTSD were 1.46 more likely to report a new occurrence of food insecurity (95%CI:1.02–2.10)(53).

This study is the most comparable with the current study, which was published in April 2024 and issued in early 2025, overlapping the write-up process of this present study. Even though

the two papers are similar research is scarce on this specific topic. The current study adds to this research paper by evaluating the association between TE, cumulative TE, HAI and PTSD. The current study is still valid and adds to the research as there is an importance of addressing food insecurity as well as HAI as a potential avenue for improving mental health outcomes in ageing populations. Literature has proven the necessity for enhanced screening for food insecurity, particularly within mental health support frameworks in South Africa. Addressing food insecurity could serve as an intervention strategy to mitigate mental health problems such as PTSD and other mental health disorders.

1.2.4 Comorbidities of PTSD

1.2.4.1 Comorbid Physical Disorders

PTSD is linked to inadequate self-reported physical health and several comorbidities, including cardiovascular, respiratory, gastrointestinal, inflammatory, and autoimmune illnesses (178-180). A retrospective cohort study of 666 269 Iraq war veterans found that participants who suffered from PTSD had a double increased risk of autoimmune diseases in comparison to those without PTSD (95%CI:1.91–2.09)(181). The connection with the neuroendocrine and immunological systems in PTSD can lead to immune dysfunction and hasten the onset of autoimmune or inflammatory illnesses, exacerbating the burden of disease (182).

In the South African setting, a study evaluated a more severe comorbidity for PTSD and found cardiovascular disease risk was linked with experience of cumulative TE in PTSD patients (OR=1.94), with a 94% increased risk for each raise in standard deviation in TE exposure (112). The cumulative TE exposure explained 14% of the variance in cardiovascular disease risk. TEs can activate allostasis, the body's ability to maintain stability during stress (183, 184). Overactivation of physiological systems, such as the hypothalamic-

pituitary-adrenal (HPA) axis, can lead to allostatic load, resulting in biological dysregulation often associated with PTSD (112). Allostatic load scores suggested a significant positive association with cumulative TE in PTSD patients (112).

1.2.4.2 Comorbid Mental Disorders

A paper observed psychiatric comorbidities of PTSD among 387 refugees in Uganda (185). Among those with PTSD (PTSD prevalence=67%), 70% had also experienced MDD, 82% had a generalised anxiety, and 30% had substance use (185). The presence of substance use disorders increased the odds of having PTSD by 5.13 times ($p<0.0001$)(185). Generalised anxiety disorder increased the odds of having PTSD 3.27 times ($p<0.0001$), and MDD elevated the odds of having PTSD 4.04 times ($p<0.0001$)(185). Perception of distress was significantly associated with PTSD, with those perceiving distress having an eighteen-fold increase in odds (OR=18.10; $p<0.0001$)(185). Other associated factors included healthcare issues, adequacy of aid, and housing security (185).

The findings suggest an association between PTSD and comorbid psychiatric disorders, emphasising the necessity of understanding the multifaceted nature of mental health disorders (185). Key perceived needs contributing to PTSD, such as distress and safety concerns that when unmet, significantly contribute to mental health disorder outcomes (185). A study with a similar sample group of Somali exiles in Kenya suggested that increased TE exposure was positively associated with PTSD (OR=1.280; $p<0.01$)(186).

A paper analyses the relationship between historical TE, current TEs, PTSD symptoms, and suicidal behaviours within a community sample of 447 American Indian adults (187). The PTSD prevalence was 24.8% of participants. 51% of participants reported no suicidal thoughts or actions, 19.5% encountered suicidal thoughts, and 13.6% reported suicidal actions, and verified fatalities (187). The historical loss measure did not correlate

significantly with suicidal thoughts or actions; however, historical loss-associated symptoms were significantly linked to suicidal actions (χ^2=7.5; p<0.006)(187). Among those who experienced assaultive TE (70%), there was a significant link with suicidal thoughts (χ^2=4.6; p<0.03) and actions (χ^2=7.7; p<0.005)(187). Participants with a PTSD had a elevated likelihood of both suicidal thoughts (χ^2=9.2; p<0.002) and suicidal action (χ^2=11.9; p<0.001)(187).

A logistic regression model indicated that individuals with PTSD were more likely to report suicidal thoughts (OR=2.04; p<0.01) and actions (OR=2.3; p<0.008)(187). No association was found between suicidal behaviours, historical loss and female gender(187). Historically relevant TEs have been linked to persistent psychological distress; however, the study revealed that thoughts about historical TE influenced users' psychological symptoms but were not directly associated with suicidal thoughts (187). Conversely, experience with current TE and PTSD diagnosis were significantly predictive of suicidal behaviours (187). This gives insight into potential comorbidities that may affect South African adults who have historical TEs of the apartheid era.

According to worldwide studies, people with PTSD are more likely to be exposed to TEs (188, 189), have higher alcohol consumption (190, 191), have poorer educational levels (192), encounter more food insecurity (10, 193), and have higher disability (e.g. impaired focus) (194, 195). PTSD frequently co-occurs with these substance use disorders and is often linked with severely poor psychological, social, and physical functioning state (196-200). The link between PTSD and alcohol or drug use disorders is complicated and while TE, particularly from childhood, is frequently a precursor to both conditions, discerning their temporal dynamics remains challenging (201-204). Various research studies have revealed persons with PTSD symptoms may lead individuals to use drugs as an alternative form of self-treatment to reduce their anguish (205, 206). Alcohol and substance use disorders pose

an enormous challenges for people and society, accounting for substantial mortality and morbidity, including in South Africa (207-209).

A study conducted in the USA investigated the link between childhood TE, prevalent PTSD symptoms, and troublesome alcohol and drug use within a sample of African-American adults in low-income context (210). Of the 2 887 participants, about 15.69% of individuals reported only alcohol or drug use disorder with no PTSD, while 19.26% reported PTSD only, and 12.02% reported a comorbidity of both (210). PTSD symptoms significantly mediated the association between childhood TE and troublesome use of alcohol, with an indirect effect size considered small to medium (β=0.036; 95%CI:0.028–0.044)(210). The direct effect of childhood TE on problematic alcohol use was significant (β=0.022; 95%CI:0.007–0.037), suggesting that while PTSD plays a mediating role, childhood TE also directly influences alcohol and substance use (210). Gender moderated the effect of PTSD; men suggested a stronger link between PTSD and substance use issues compared to women (210). These results may be generalised in the South African setting and add to the study's importance, as there is a strong likelihood of PTSD comorbidity with substance use disorders being prevalent in the current study sample.

A study from a South African sample in Durban assessed co-morbid PTSD and depression, among 677 women in informal settlements aged 18-30 years (74). The prevalence of PTSD was found at 21.0% and a combination of 18.6% of the sample exhibited both depression and PTSD (74). Of the women with PTSD and depression, 12.7% had little or no food insecurity, 49.2% had moderate food insecurity and 38.1% had severe food insecurity (Chi-squared test: $p<0.001$)(74). Other risk factors depicted elevated levels among women with PTSD and depression, including severe disability (50.8%), high stress relating to lack of income and work (50.8%), past year sexual violence of non-partner (52.4%), past year intimate partner violence (76.2%)(all Chi-squared test: $p<0.001$)(74).

Multinomial logistic regression presented individuals with co-morbid PTSD and depression, were less likely to be a part of a social group (β=-0.73; p=0.008) and experiencing higher levels of childhood TEs (β=0.19; p<0.001), distress relating to low-income and (β=1.13; p=0.009), severe impairment (β=0.99; p=0.002), greater alcohol use (β=0.05; p=0.036) and lifetime TEs (β=1.32; p<0.001) compared to women having neither mental disorders (74). Women experiencing only depression were more likely to report severe food insecurity (β=0.97; p=0.001), with comorbid combination results were not significant (74). Women with comorbid depression-PTSD exhibited more likelihood for moderate and severe disabilities (aOR=2.33; p=0.034 and aOR=2.20; p=0.013), greater childhood TEs (aOR=1.13; p<0.001) and lifetime TEs (aOR=2.44; p=0.012) compared to those with depression alone in results of logistic regression (74). The high prevalence rates of depression and PTSD among women in informal settlements are significantly elevated compared to South Africa's national averages. High levels of TE exposure, disability, substance use, and poverty support the framework of social causation for mental health disorders.

The strong associations between PTSD and various comorbidities underscore the complicated interaction between TE, physical health, and mental health. Evidence suggests that PTSD not only predisposes individuals to chronic illnesses but also increases the likelihood of psychiatric disorders and substance use, leading to profound social and economic implications. In the South African settings, factors such as historical TEs, food insecurity, and socioeconomic stressors further compound these risks. Recognising the broad health consequences of PTSD reinforces the need for comprehensive interventions that addresses both psychological and physiological outcomes, particularly in high-risk populations.

1.2.5 Conceptual Framework

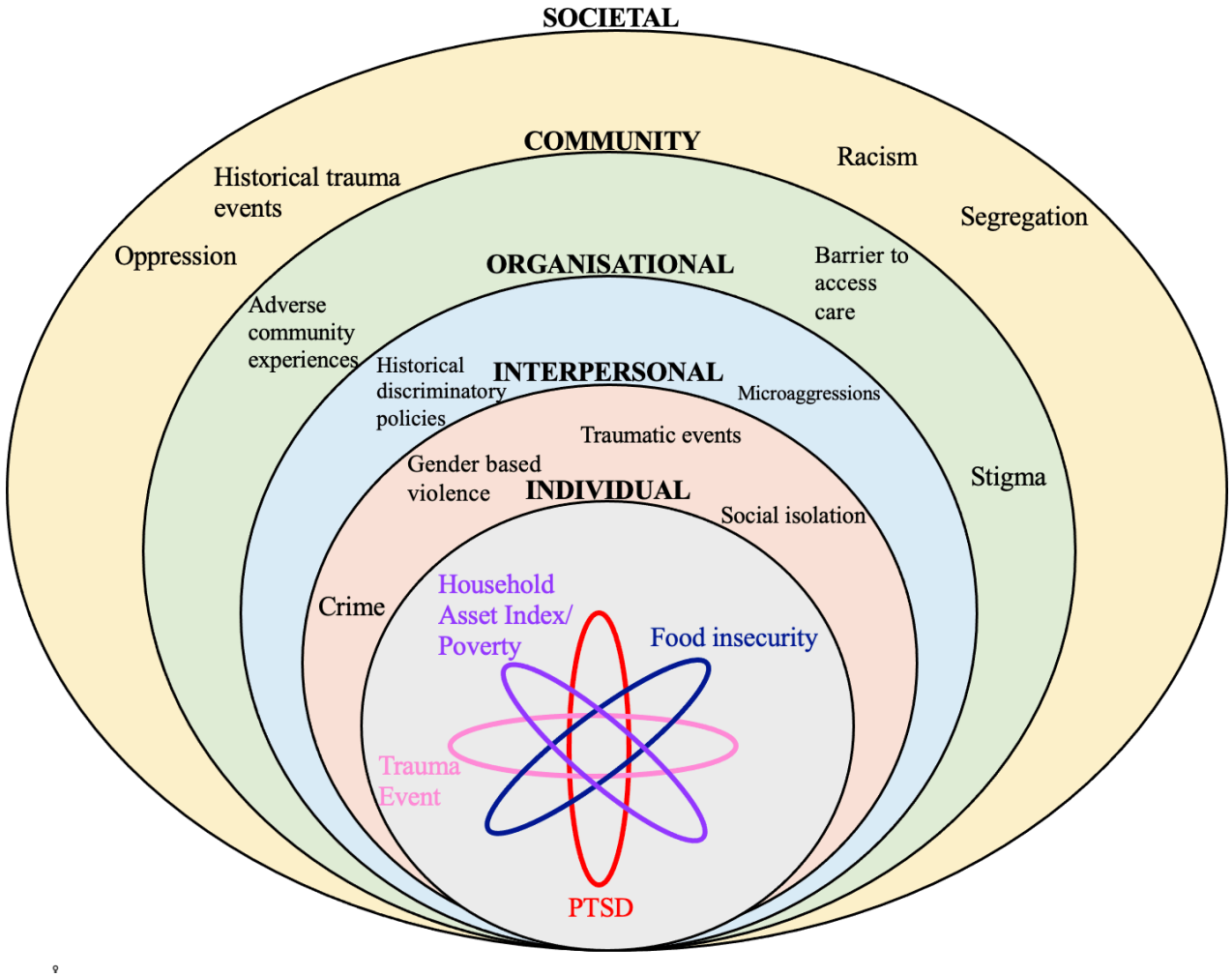
This study is informed by intersectionality theory which was first explained by Crenshaw (211) and then applied to health inequalities by Hankivsky and Christoffersen (212). Intersectionality theory examines the interactions between mutually reinforcing systemic discrimination on the basis of socioeconomic status, gender, race, and health among other factors (213). The theory initially focused on the intersections of racism and sexism faced by Black women and has since grown to encompass other identities and experiences related to oppression and privilege (214, 215). In this concept, we observe both socioeconomic status (measured by HAI) and food insecurity as axes of social power or inequalities of apartheid oppression consequences that overlap in the lives of individuals in poverty. We aim to understand the experiences that may arise at this intersection, specifically as they relate to mental health, namely PTSD.

Social-ecological models suggest that people are integrated into greater social systems and define interacting attributes of individuals and surroundings that underlie health outcomes (216, 217). Figure 1 is a modified social ecological model that suggests how injustices at the societal, community, organisational, interpersonal, and individual levels overlap with TE and reinforce inequalities. According to our study, at the societal level, the study sample is affected by consequences of oppression, historical TE, racism and segregation due to the apartheid era. Community-level participants may experience adverse community experiences including the stigma of having a mental health illness contributing to a barrier to accessing care. At an organisational level, individuals are affected by microaggressions and the effect of historically discriminatory policies. Interpersonally includes TEs related to violence such as gender-based violence, which could lead to symptoms of social isolation. Lastly, the individual level is where the intersectionality framework of this study is present. At this level,

individuals who live in poverty (as all individuals within the community will have a low HAI compared to other urban communities in South Africa), food insecurity and TE may lead to the onset of PTSD.

As described it can be justified that at societal and community levels, inequality is reinforced, and TE is produced at organisational, interpersonal and individual levels, reflecting poor health. In contrast, this diagram can be useful to reflect on how to approach each level to promote healing, resilience, and equity, which is useful for recommendations in further studies and policy-making (218).

Figure 1: A diagram depicting the intersectionality theory within a modified social ecological model with relevant TE, inequity and PTSD intersections.



1.3 Problem Statement

When compared to individuals without mental illness, it has been found that people with mental disorders are more likely to reside in leased and low-quality housing (219), have lower levels of education (220, 221), are more in debt (222, 223), experience more food insecurity (224, 225), have less savings (226), and live in poverty (227). Literature has suggested that factors of inequality and poverty such as food insecurity, unemployment, low HAI, a lack of education, elevated communal violence, and exposure to interpersonal TE, are all major contributors to poor mental health outcomes. However, many variables cluster together, making determining the specific influence of each factor especially difficult. Additionally, to being direct causes of mental disorders, these variables may reinforce and influence each other. This relationship between these factors and PTSD is still unclear, particularly in poverty settings among a population with low PTSD prevalence.

Population-based studies of mental disorders in South Africa have suggested evidence that the health and socio-demographic indicators of PTSD symptoms may not follow global trends (103). This is due to numerous findings related to PTSD and risk factors; however, most of the available research focuses on TEs of war and civil political warfare. These results may not be generalisable to South Africa as there are differences in TE exposure, racial groups and socioeconomic status.

Particularly with PTSD studies conducted in middle to high-economic nations, socioeconomic status is assessed by income, which is not a useful measure in the current study setting where unemployment is high. Furthermore, numerous available studies in South Africa address samples in urban settings or among adolescents (228-230). Hence, conducting this research in rural South Africa adds to the research as it focuses on low-socioeconomic, primarily Black individuals, whereby food insecurity is a common experience for many people within the study sample and other developing countries.

1.4 Justification

This current study will add an update of data to the field, providing more knowledge on PTSD in today's South Africa. The public health significance is that individuals with PTSD within a low-income household will have an impact on their quality of life. As life expectancy has grown internationally, so has the population of older people and age-related comorbidities (231). Limited international studies have found correlations between comorbid PTSD and other chronic illnesses, including mental disorders, and substance use (227, 232, 233). As a result, further research is needed to understand how socio-demographics and risk factors affect mental performance in ageing populations. Social determinants, non-medical variables that affect health outcomes, are indicators of cognitive health in old age (231).

While poverty is a widely recognised issue, inequality encompasses broader socioeconomic disparities affecting entire populations. South Africa, one of the most unequal societies globally, continues to experience significant material disparities despite post-apartheid economic growth. Poverty and inequality contribute to increased vulnerability to TEs, food insecurity, and income instability, which in turn elevates the risk of the onset of PTSD. This study highlights the urgent need to examine PTSD concerning economic and social inequalities, as well as the role of social support and self-esteem as potential mediating factors.

In both low- and high-income countries of wide inequalities, economic disadvantage is consistently associated with increased PTSD risk, highlighting the need for context-specific research. Therefore, this study aims to fill the gap by addressing the key objective of examining if a household with a member who is at risk of PTSD is more likely to be food insecure and have less assets. South Africa's unique socioeconomic landscape, including its reliance on government-supported social grants, presents an opportunity to explore how financial assistance impacts PTSD outcomes.

This study will contribute to the existing body of research by employing a HAI to assess material disadvantage and its impact on PTSD risk. By analysing how socioeconomic status, food insecurity, and inequality shape mental health outcomes, the findings will provide valuable insights for policymakers and mental health professionals. Addressing PTSD in marginalised communities can inform interventions aimed at disrupting the cycle of poverty, inequality, and TE in South Africa.

1.5 Research Question

What are the relationships between each of low HAI and food insecurity, and PTSD among men and women aged older than 40 years in the Agincourt sub-district, Mpumalanga, South Africa?

1.6 Aim

To estimate the relationship between each of low HAI and food insecurity, and PTSD among individuals aged older than 40 years in Mpumalanga, South Africa.

1.7 Objectives

1. To estimate the prevalence of probable PTSD among the study population.
2. To estimate the relationship of different TEs and cumulative TE with the prevalence of probable PTSD.
3. To estimate the relationship of HAI and food insecurity with the prevalence of probable PTSD.

CHAPTER TWO: METHODS

2.1 Primary Study

The primary study is a community population-based observational cohort study known as "Health and Aging Africa: A Longitudinal Study of an INDEPTH Community in South Africa" (HAALSI) (234). HAALSI has a longitudinal follow-up at 3-year intervals. This cohort was conceptualised to observe and investigate morbidity, mortality and etiological factors influenced by epidemiological transition by an ageing global population (234).

2.1.1 Study Site

The HAALSI cohort is based in the Agincourt sub-district in Mpumalanga Province, in rural North-Eastern South Africa. This is where the MRC/Wits Rural Public Health and Health Transitions Research Unit has been running the Agincourt HDSS since 1992 (234). The research site consists of 31 villages where, through random selection, 6 281 individuals were invited to participate in HAALSI (234).

During the apartheid era which was from 1948 to 1994, this area was forcefully designated as a rural "homeland" for xiTsonga-speaking Black South Africans due to segregation laws; where Black Africans were moved to the periphery and had difficulty accessing any basic services, including health and education (235). Mozambique is bordering with Mpumalanga province and therefore former Mozambican refugees are part of the cohort sample. Some of these individuals may have fled to South Africa to escape the Mozambican civil war which occurred from 1983 to 1992 (235).

South African homeland regions had limited resources and poor quality of health care, education, few employment opportunities and members were exposed to abuse and violence (235). Although Agincourt's economic situation has improved since apartheid ended, there are still gaps in the provision of essential services including transport, healthcare, and

sanitary facilities (235). Furthermore, South Africa continues to have a consistently high incidence of theft, sexual assault, and violent crime in general (235).

2.1.2 Study Population

Males and females aged older than 40 years who took part in the third Wave of HAALSI PTSD-related questions conducted in Agincourt sub-district in Mpumalanga, South Africa (234). Wave 3 was conducted in July 2021 to April 2022 among 3 707 men and women (236, 237). Inclusion Criteria: All individuals who have answered the PTSD questions with corresponding questions on social determinants and TEs experienced in Wave 3 of the HAALSI cohort from 2021 to 2023. These participants have all been granted ethical consent to partake in this cohort study. All participants are men and women aged older than 40 years who have experienced a TE. Participants included in the study either have PTSD or not. Exclusion Criteria: Individuals who did not answer Wave 3 PTSD-related surveys conducted from 2021 to 2022.

2.1.3 Data Collection

In the primary study, participants took part in waves of surveying which were administered by local field workers in respective mother tongue languages, Shangaan/xiTsonga or in English to ensure reliability (234). These questionnaires were administered via computer-assisted personal interviews in the participants' households (237). Appendix 1 suggests tables of what data variables were collected in HAALSI cohort household surveys (234). Secondary data was used in this study from this HAALSI cohort.

The HDSS applied a standardised survey that measured the HAI variable, including household construction materials, toilet facility type, water and power sources, and ownership of modern assets and livestock (78). The primary study evaluated the household's physical assets utilising an absolute index that reflected the possession or existence of resources at

the dwelling. The index collected a range of variables from five areas of household materials: 1) the primary housing structure's building materials, 2) power sources for cooking and lighting, 3) access to water and kind of sanitation amenities, 4) livestock ownership, and 5) technology conveniences consisting of fridge, television, telephone, and automobile (238). Variables within each category were weighted, with greater scores indicating greater socioeconomic position. The category-specific scores were added to provide a total household physical assets value ranging from 0 to 5 at that time point (78).

2.2 Secondary Study

2.2.1 Study Design

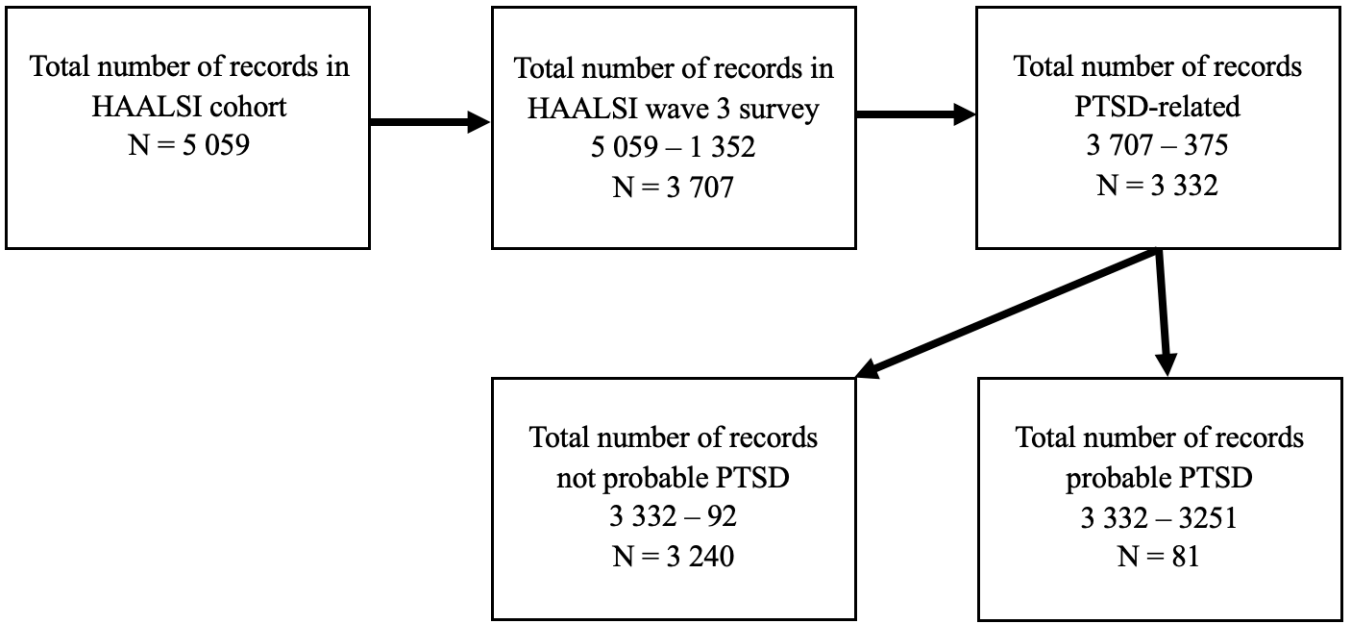
An analytical cross-sectional study using secondary data from Wave 3 of the HAALSI cohort household survey.

2.2.2 Sampling

All 3 332 records of participants who answered the HAALSI Wave 3 survey including the PTSD-related questions were used in the analysis.

Figure 2 below presents the selection process of these records of participants. Using this study's proportions of risk of PTSD groups power was calculated at an alpha of 0.05. This resulted in the power of the study being 100%.

Figure 2: A Flowchart outlining final sample size



2.3 Data Management

The dataset from the cohort was received already cleaned accounting for missing values, outliers, and any non-plausibility. All additional statistical management and analysis were completed using Stata version 18 software. Childhood environment TE questions were extracted from Laboratory Baseline and Wave 2 HAALSI surveys because it is unavailable in Wave 3 survey. This is a non-issue as childhood environment TE are most likely not possible to change over time among adult participants. The rest of the data variables were used from Wave 3 records. Appendix 2 visually represents the relationships between the study variables, emphasising the key exposures investigated in each directed acyclic graph (DAG) model created in DAGitty.

Variable definitions:

Outcome variable

The prevalence of probable PTSD is the primary outcome variable of this study. This binary variable was labelled and categorised as "PTSD" (0 = Not probable PTSD, 1 = Probable PTSD). PTSD was measured using a seven-item Short Screening Scale for DSM-IV criteria

PTSD, a score of four or more PTSD symptoms an individual was categorised as probable PTSD and a score of zero to three was classified as not probable PTSD (239). PTSD symptoms were detailed in descriptive Table 1 in the third chapter.

Explanatory variables

The primary exposure of interest was the experience of at least 1 TE. In this study, the TE variable is categorised as a binary variable (0 = No, 1 = Yes). Yes, means that an individual has experienced at least 1 TE, and no implies that an individual has not experienced at least 1 TE. TE was measured using life history questions from the English Longitudinal Studies of Ageing (ELSA)(240). There were 16 types of TEs which are divided into 5 larger categories childhood environment, community violence, illness/accident/disaster, social/family environment, and war violence (235). Types of TE categories are detailed in Table 2 in the third chapter.

From the TE variable, the cumulative TE variable was developed. Cumulative TE was measured using the 16 types of TEs and their larger categories. Cumulative TE is categorised in terms of the occurrence of different TEs a participant reported which is 2 TEs and 3 or more TEs. Further, the cumulative TE variable has other categories observing an overall number of cumulative TEs which are classified as 2 TEs, 3 TEs, 4 TEs and 5 or more TEs an individual has experienced. This measure of cumulative TE was based on measures from the WMH surveys (44, 241).

The covariates are the social determinants including age, sex, nationality, marital status and education level (19). Age was categorised into 9–year intervals the first group will be 40 – 49 years continuing up to 70 – 79 years old then ending with an 80–year and more category (235). Male and female were the two categories for sex. Nationality was categorised by South African and Mozambican or other. Marital status was categorised as single,

separated/divorced, widowed or married/cohabitating. Education levels were categorised as no formal education, primary (1 – 7 years), secondary (8 – 11 years) or tertiary (12+ years) levels of education (235).

The following includes key investigated exposures, HAI and food insecurity.

The HAI variable was categorised into quintiles the first quintile being the lowest household asset level and the fifth quintile being the highest household asset level.

The food insecurity variable was measured by the Household Food Insecurity Access Scale (HFIAS), ranging from 5 to 15 questions through rating five food insecurity-related questions between 1 to 3 (242). Food insecurity was categorised as food secure with a score from 13 to 15, moderate food insecurity with a score from 8 to 12 and severe food insecurity with a score from 5 to 7. For the following statistical analysis the food secure category was used as a referent group in the analysis of food insecurity associations with the prevalence of probable PTSD. The HFIAS measure is validated within the South African context and has been used by Stats SA GHS (243).

2.4 Statistical Analysis

Descriptive statistics were calculated, identifying the categorical variables and comparing frequencies with statistical tests to assess their independent relationship with the prevalence of probable PTSD.

The frequencies and associations of PTSD and all covariates were calculated by a univariate analysis calculating the unadjusted odds ratios (ORs) and corresponding p-values and 95% confidence intervals (CIs).

Then aORs were calculated using multivariate logistic regression where all analysed p-values less than 0.05 were considered statistically significant. The models for the multivariate

logistic regression to find the relationship between TEs, cumulative TE, HAI and food insecurity and prevalence of probable PTSD and adjusted for socio-demographic variables age, sex, nationality, marital status and education level. The models eliminated the non-contributory risk factors of PTSD, accounting for any possible interaction, variable modification, or variable adjustments using the backward stepwise selection method, where the cut-off p-value was set to 0.1.

2.5 Ethical Considerations

This cross-sectional research question was answered using secondary data information collected by the HAALSI cohort study, which conducts longitudinal population-based community surveys. This primary study received ethical approvals from the University of the Witwatersrand Human Research Ethics Committee (ref. M141159) (234). The University of Witwatersrand Human Research Ethics Committee (Medical) approved this sub-study, in the student's name: Matilda De Freitas, and ethical approval number: M240667 (Appendix 3). The HAALSI dataset received from Harvard Dataverse was deidentified and stored on a password-protected computer and hard drive copy, only accessed by the primary investigator of this study and supervisors.

CHAPTER THREE: RESULTS

3.1 Description of the study population

3.1.1 Socio-demographic characteristics and their effects on probable PTSD

The secondary study has a total of 3 332 participants, 57.48% female, who answered PTSD-related questions in Wave 3 of the HAALSI survey from July 2021 to April 2022. Of these participants, the prevalence of probable PTSD is 81 (2.44%) participants.

Table 1 presents the socio-demographic characteristics of the sample, illustrating specific frequencies and percentages for the independent associations between socio-demographic variables and probable PTSD. Furthermore, a Chi-square test determined significance between these independent associations, as shown by the p-values. The 60 – 69 years age group has the highest number of individuals prevalent with probable PTSD which was 29 (35.80 %) participants. The prevalence of probable PTSD among males and females suggests that 46.91% and 53.09% may have PTSD.

As the setting of the study sample was in South Africa, there were more South Africans than Mozambicans or other nationalities in the study group. Individuals who were at risk of probable PTSD included 60 (74.07%) South Africans and 21 (25.93%) Mozambicans or other nationalities.

Examination of marital status suggests that widowed and married or cohabitating groups had the highest prevalence of probable PTSD which were 32 (39.51%) widowed and 33 (40.74%) married or cohabitating participants.

Having up to a primary education level had the highest group of individuals prevalent with probable PTSD summing to 37 (45.68%) of persons. Overall, the independent associations of these socio-demographic variables including age, sex, nationality, marital status, education

level, PTSD symptoms and the primary outcome variable, probable PTSD, had p-values greater than the set 5% significance level.

Of all seven PTSD symptoms, individuals who experienced avoiding certain places suggested the highest frequency of 176 (5.28%) participants, and those who experienced jumpy or easily startled feelings had the lowest frequency of 85 (2.55%) participants. Reported PTSD symptoms of loss of interest in an activity once found enjoyable, feeling of isolation, and feeling of difficulty to love had the highest frequency of contributing to the prevalence of probable PTSD, which has 61 (75.31%) participants in each category. All PTSD symptoms had a p-value of 0.001 suggesting that the relationship between the probable PTSD and PTSD symptoms is significant. Table 1 socio-demographic variables reported no missing variables relative to having or not having probable PTSD.

Table 1: Socio-demographic characteristics and their effects on probable PTSD of the sample

Variable	Category	Total n (%, n = 3332)	Probable PTSD (%, n = 81)	Not probable PTSD (%, n = 3240)	p-Value
Age	40 – 49 years 50 – 59 years 60 – 69 years 70 – 79 years 80+ years	240 (7.23) 837 (25.20) 1 007 (30.32) 758 (22.82) 479 (14.42)	8 (9.88) 15 (18.52) 29 (35.80) 14 (17.28) 15 (18.52)	232 (7.16) 822 (25.37) 978 (30.19) 744 (22.96) 464 (14.32)	0.268
Sex	Male Female	1 412 (42.52) 1 909(57.48)	38 (46.91) 43 (53.09)	1 374 (42.41) 1 866 (57.59)	0.418
Nationality	South African Mozambican or other	2 326 (70.08) 993 (29.92)	60 (74.07) 21 (25.93)	2 266 (69.94) 974 (30.06)	0.427
Marital status	Single Separated/ Divorced Widowed Married/Cohabitating	232 (7.03) 368 (11.15) 1 221 (37.01) 1 478 (44.80)	5 (6.17) 11 (13.58) 32 (39.51) 33 (40.74)	227 (7.05) 357 (11.09) 1 189 (36.95) 1 445 (44.90)	0.808
Education level	No formal education Primary (1 – 7 years) Secondary (8 – 11 years) Secondary or more (12+ years)	1 362 (41.14) 1 208 (36.48) 419 (12.65) 322 (9.73)	26 (32.10) 37 (45.68) 9 (11.11) 9 (11.11)	1 336 (41.36) 1 171 (36.25) 410 (12.69) 313 (9.69)	0.273
PTSD Symptoms					
Avoiding places		176 (5.28)	51 (62.96)	125 (3.86)	0.001
Loss of interest		155 (4.65)	61 (75.31)	94 (2.90)	0.001
Feeling of isolation		131 (3.93)	61 (75.31)	70 (2.16)	0.001
Hard to love		126 (3.78)	61 (75.31)	65 (2.01)	0.001
No point of planning		128 (3.84)	58 (71.60)	70 (2.16)	0.001
Trouble sleeping		112 (3.36)	45 (55.56)	67 (2.07)	0.001
Feeling jumpy		85 (2.55)	36 (44.44)	49 (1.51)	0.001

3.1.2 Characteristics of key exposures and their effects on probable PTSD

Table 2 presents the key exposures of the sample, illustrating specific frequencies, percentages, and p-values of the t-test of independent associations of key exposure variables and probable PTSD. This table presents in detail the types of TE and the larger categories of types of TEs which include childhood environment, social or family environment, illness or accident or disaster, community violence and war violence.

The total number of participants who experienced at least 1 TE was 2 734 (82.05%) and of these participants, 73 (90.12%) were at higher risk of probable PTSD. The type of TE experiencing severe financial hardship was the highest contributor to the risk of probable PTSD, with 53 participants out of all TE types. In the TEs categories, had a life-threatening

illness or accident and were physically abused by parents (age < 16) each both had 20 (24.69%, 21.31%) participants who had risk of probable PTSD. There were 18 (22.22%) participants in both TEs categories; experienced a close family/friend injured or killed from a serious accident or injury and witnessed violent act causing injury/death not in war, with risk of probable PTSD.

Overall, larger TE categories, social or family environment TE contributed the highest risk of probable PTSD, being 57 (78.08%) of participants in the sample. In each larger category of experienced at least 1 TE, all independent associations with probable PTSD were significant. However, only the experienced at least 1 childhood environment TE did not provide enough evidence to prove relationship significance.

The total number of cumulative TEs from all participants is 6 813 TEs, which is equivalent to an average of 2 TEs reported per participant. Of this total number, the illness or accident or disaster cumulative TE category contributes to the highest number of individuals with probable PTSD. This measured 13 (16.05%) participants who experienced 2 TEs and 4 (4.94%) participants who experienced 3 or more TEs. In the overall cumulative TEs category, 17 (20.99%) individuals were classified as experienced 5 or more TEs and contributed to the highest number with probable PTSD in this variable. The cumulative TE variable reported that all categories' independent associations with probable PTSD were significant. However, the childhood environment category did not have enough evidence to prove the relationship's significance.

The relationship between HAI and probable PTSD was significant, with a p-value of 0.049. The fifth HAI quintile had 27 (33.33%) individuals with probable PTSD, which was the highest among the other HAI quintiles.

The relationship between food insecurity and the prevalence of probable PTSD was found to be statistically significant, as the p-value was 0.001. Individuals who reported food secure with probable PTSD included 36 (44.44%), individuals who reported moderate food insecurity with probable PTSD included 34 (41.98%) and individuals who reported severe food insecurity with probable PTSD included 11 (13.58%).

The childhood environment TEs category reported the highest number of missing data, which ranged between 167 and 185. Missing data were found in other TE categories; total missing values for each large TE category included 272 in social or family environment, 7 in illness or accident or disaster, and both community violence and war violence reported 5 missing data. Furthermore, HAI reported 79 missing data, and food insecurity reported 3 missing data.

Table 2: Characteristics of key exposures and their association on probable PTSD of the sample

Variable	Category	Total n (%, n = 3 332)	Probable PTSD (%, n = 81)	Not probable PTSD (%, n = 3 240)	p-Value
Traumatic events (TEs)	**Childhood environment**				
	Parental unemployment (age <16)	487 (18.52)	8 (13.11)	479 (18.73)	0.227
	Missing	175	5	170	
	Parents often argue (age <16)	607 (23.08)	14 (22.95)	593 (23.18)	0.878
	Missing	185	6	179	
	Parents often drink/use drugs (age <16)	587 (14.74)	13 (23.40)	574 (22.44)	0.725
	Missing	175	5	170	
	Physically abused by parents (age <16)	809 (22.32)	20 (21.31)	789 (30.84)	0.947
	Missing	167	4	163	
	Experienced at least 1 childhood environment TE	**1 460 (55.51)**	**32 (52.46)**	**1 428 (55.82)**	**0.483**
	Social/family environment				
	Close family addicted to drugs/alcohol	85 (2.78)	12 (16.44)	73 (2.45)	0.001
	Missing	1	0	1	
	Provided long-term care to disabled friend/relative	115 (3.76)	5 (6.85)	110 (3.70)	0.177
	Missing	0	0	0	
	Experienced severe financial hardship	1 934 (63.20)	53 (72.60)	1 881 (63.21)	0.099
	Missing	271	8	263	
	Experienced at least 1 Social/family environment TE	**1 990 (65.03)**	**57 (78.08)**	**1 933 (64.95)**	**0.020**
	Illness/accident/disaster				
	Had a life-threatening illness or accident	390 (11.73)	20 (24.69)	370 (11.44)	0.001
	Missing	2	0	2	
	Close friend/family injured or killed from serious accident or injury	406 (12.21)	18 (22.22)	388 (12.00)	0.005
	Missing	2	0	2	
	Experienced a major natural disaster	619 (18.62)	15 (18.52)	604 (18.68)	
	Missing	3	0	3	0.974
	Experienced at least 1 illness/accident/disaster TE	**980 (29.47)**	**32 (39.51)**	**948 (29.32)**	**0.047**
	Community violence				
	Victim of serious physical attack	112 (3.37)	8 (9.88)	104 (3.21)	0.001
	Missing	2	0	2	
	Witness violent act causing injury/death not in war	325 (9.77)	18 (22.22)	307 (9.49)	0.001
	Missing	1	0	1	
	Victim of sexual assault	45 (1.35)	3 (3.70)	42 (1.30)	0.064
	Missing	2	0	2	
	Experienced at least 1 community violence TE	**427 (12.83)**	**25 (30.86)**	**402 (12.43)**	**0.001**
	War violence				
	Fired a weapon in combat or been fired upon	41 (1.23)	4 (4.94)	37 (1.14)	0.002
	Missing	2	0	2	
	Witness serious injury/death in combat	115 (3.46)	14 (17.28)	101 (3.12)	0.001
	Missing	1	0	1	
	Lost close friend/relative in war	136 (4.09)	8 (9.88)	128 (3.96)	0.008
	Missing	2	0	2	
	Experienced at least 1 war violence TE	**214 (6.43)**	**19 (23.46)**	**195 (6.03)**	**0.001**
	Experienced at least 1 TE	**2 734 (82.05)**	**73 (90.12)**	**2 661 (82.13)**	**0.062**
	Total Number of TEs Cumulated	**6 813**			
Cumulative TE	**Childhood environment**				
	2 TEs experienced	367 (11.01)	5 (6.17)	362 (11.17)	0.378
	3+ TEs experienced	295 (8.85)	8 (9.88)	287 (8.86)	
	Social/family environment				
	2 TEs experienced	114 (3.42)	13 (16.05)	101 (3.12)	0.001
	3+ TEs experienced	8 (0.24)	0 (0.00)	8 (0.25)	
	Illness/accident/disaster				
	2 TEs experienced	220 (6.60)	13 (16.05)	207 (6.39)	0.002
	3+ TEs experienced	107 (3.21)	4 (4.94)	103 (3.18)	
	Community violence				
	2 TEs experienced	44 (1.32)	4 (4.94)	40 (1.23)	0.015
	3+ TEs experienced	5 (0.15)	0 (0.00)	5 (0.15)	
	War violence				
	2 TEs experienced	50 (1.50)	3 (3.70)	47 (1.45)	0.004
	3+ TEs experienced	14 (0.42)	2 (2.47)	12 (0.37)	
	Overall				
	2 TEs experienced	675 (20.26)	11 (13.58)	664 (20.49)	0.001
	3 TEs experienced	425 (12.76)	14 (17.28)	411 (12.69)	
	4 TEs experienced	275 (8.25)	3 (3.70)	272 (8.40)	
	5+ TEs experienced	297 (8.91)	17 (20.99)	280 (8.64)	
Household Asset Index (HAI)	First (lowest) quintile	628 (19.31)	13 (16.05)	615 (19.46)	0.049
	Second quintile	630 (19.37)	15 (18,52)	615 (19.46)	
	Third quintile	635 (19.52)	9 (11.11)	626 (19.80)	
	Fourth quintile	667 (20.50)	17 (20.99)	650 (20.56)	
	Fifth (highest) quintile	682 (20.97)	27 (33.33)	655 (20.72)	
	Missing	79	0	79	
Food insecurity	Food secure	2 708 (81.35)	36 (44.44)	2 672 (82.55)	0.001
	Moderate food insecurity	553 (16.61)	34 (41.98)	519 (16.03)	
	Severe food insecurity	57 (1.71)	11 (13.58)	46 (1.42)	
	Missing	3	0	3	

3.2 Association of PTSD and covariates in univariate analysis

Table 3 presents all completed univariate analysis results which demonstrate unadjusted ORs of the associations between the prevalence of probable PTSD and explanatory variables. The univariate analyses of socio-demographic variables (age, sex, nationality, marital status, education level) including smaller TEs categories and the primary outcome variable prevalence of probable PTSD are presented in Appendix 4 of extended results findings. These socio-demographic variables were adjusted for the multivariate analysis of the key exposures and prevalence of probable PTSD.

Participants who reported at least 1 TE were nearly two times as likely to report symptoms consistent with probable PTSD (OR:1.99; CI:0.95–4.14; p=0.063). People who reported at least 1 childhood environment TE did not have significantly higher odds of prevalent probable PTSD relative to those without at least 1 childhood TE (OR:0.85; CI:0.53–1.35; p=0.483). People who reported at least 1 war violence TE were nearly five times as likely to report significantly for probable PTSD (OR:4.78 CI:2.80–8.15; p<0.001) relative to those who did not report war violence TEs. This experience of at least 1 war violence TE had the largest point estimate for the prevalence of probable PTSD out of the other categories in the TEs variable.

Similarly, the effect of war violence in the cumulative TE variable has the highest effect where participants reported 3 or more war violence TEs were nearly seven times as likely to report significant prevalence of probable PTSD (OR:6.97; CI:1.53–31.68; p=0.012). The overall cumulative TE category resulted in participants reporting 5 or more TEs were nearly three times as likely to report significantly for probable PTSD (OR: 2.98; CI:1.60–5.54; p<0.001).

Using the first HAI quintile as a baseline in the analysis of all quintiles of HAI associations to risk of PTSD did not have enough evidence to prove significance; however, participants reported in the fifth quintile were nearly two times more likely to report marginally significant prevalence of probable PTSD (OR: 1.95; CI:1.00–3.81; p=0.051).

Participants who reported moderate food insecurity were nearly five times more likely to report significant prevalence of probable PTSD (OR:4.86; CI:3.01–7.84; p<0.001), and participants who reported severe food insecurity were nearly eighteen times more likely to report significant prevalence of probable PTSD (OR:17.75; CI:8.51–37.03; p<0.001).

3.3 Multivariate logistic regression

The multivariate logistic regression analysis results are presented in Table 3 which reports unadjusted ORs and aORs in the final model using the stepwise backward method. Each model analysed the key exposures and adjusted for socio-demographic variables age, sex, nationality, marital status, and education level. Mentioned below are all key exposure models that were significantly associated with the prevalence of probable PTSD. However, TEs and cumulative TE variables in the childhood environment TEs did not report significant results.

People who reported at least 1 social or family environment TE were nearly two times as likely to report the significant prevalence of probable PTSD (aOR:1.92; CI:1.10–3.37; p=0.022). People who reported at least 1 illness or accident or disaster TE were nearly two times more likely to report a marginally significant prevalence of probable PTSD (aOR:1.54; CI:0.98–2.42; p=0.062). People who reported at least 1 community violence TE were three times more likely to report significant risk for probable PTSD (aOR:3.07; CI:1.90–4.99; p<0.001). People who reported at least 1 war violence TE were nearly four times more likely to report significant risk for probable PTSD (aOR:4.79; CI:2.80–8.19; p<0.001). Lastly,

people who reported at least 1 TE were nearly two times more likely to report a marginally significant risk for probable PTSD (aOR:1.96; CI:0.94–4.09; p=0.074).

Of the cumulative TE variable people who reported 2 social or family environment TEs were six times more likely to report significant risk for probable PTSD (aOR:6.16; CI:3.27–11.58; p<0.001). People who reported 2 illness or accident or disaster TEs were nearly three times as likely to report significantly for probable PTSD (aOR:2.90; CI:1.56–5.38; p=0.001). People who reported 2 community violence TEs were four times as likely to report significant prevalence of probable PTSD (aOR:4.34; CI:1.50–12.50; p=0.007). People who reported 2 and 3 or more war violence TEs were nearly three and seven times as likely to report significant prevalence of probable PTSD (aOR:2.92; CI:0.88–9.63; p=0.079) (aOR:6.54; CI:0.88–30.09; p=0.016). Lastly, people who reported 5 or more overall TEs were three times as likely to report significant prevalence of probable PTSD (aOR: 3.07; CI:1.64–5.77; p<0.001).

The HAI variable suggests that people reported in the fifth or highest quintile were nearly two times more likely to report the significant prevalence of probable PTSD (aOR:1.91; CI:1.10–4.66; p=0.027).

The food insecurity variable found participants who reported moderate food insecurity were nearly five times more likely to report significant prevalence of probable PTSD (aOR:4.91; CI:3.04–7.94; p<0.001), and participants who reported severe food insecurity were nearly nineteen times more likely to report significant risk for probable PTSD (aOR:18.85; CI:8.96–39.64; p<0.001).

These key exposure variables are significant predictors of probable PTSD as they contribute to an increased likelihood of prevalent probable PTSD. All aORs varied only slightly from the unadjusted ORs.

Table 3: Univariate and multivariate logistic regression of the relationship between probable PTSD and covariates

Variable	Category	Univariate analysis			Multivariate analysis		
		Unadjusted OR	95% CI	p-Value	Adjusted OR	95% CI	p-Value
Traumatic events (TEs)	Experienced at least 1 childhood environment TE	0.85	0.53 – 1.35	0.483	0.85	0.53 – 1.35	0.491
	Experienced at least 1 social/family environment TE	1.92	1.10 – 3.36	0.022	1.92	1.10 – 3.37	0.022
	Experienced at least 1 illness/accident/disaster TE	1.58	1.00 – 2.48	0.049	1.54	0.98 – 2.42	0.062
	Experienced at least 1 community violence TE	3.15	1.94 – 5.10	0.001	3.07	1.90 – 4.99	0.001
	Experienced at least 1 war violence TE	4.78	2.80 – 8.15	0.001	4.79	2.80 – 8.19	0.001
	Experienced at least 1 TE	**1.99**	**0.95 – 4.14**	**0.068**	**1.96**	**0.94 – 4.09**	**0.074**
Cumulative TE	**Childhood environment**						
	2 TEs experienced	0.54	0.21 – 1.34	0.183	0.52	0.21 – 1.31	0.166
	3+ TEs experienced	1.08	0.51 – 2.28	0.837	1.04	0.49 – 2.21	0.909
	Social/family environment						
	2 TEs experienced	6.15	3.27 – 11.57	0.001	6.16	3.27 – 11.58	0.001
	3+ TEs experienced	*					
	Illness/accident/disaster						
	2 TEs experienced	2.87	1.56 – 5.30	0.001	2.90	1.56 – 5.38	0.001
	3+ TEs experienced	1.77	0.63 – 4.97	0.275	1.75	0.62 – 4.91	0.290
	Community violence						
	2 TEs experienced	4.15	1.45 – 11.87	0.008	4.34	1.50 – 12.50	0.007
	3+ TEs experienced	*					
	War violence						
	2 TEs experienced	2.67	0.81 – 8.77	0.106	2.92	0.88 – 9.63	0.079
	3+ TEs experienced	6.97	1.53 – 31.68	0.012	6.54	1.42 – 30.09	0.016
	Overall						
	2 TEs experienced	0.81	0.40 – 1.65	0.566	0.81	0.40 – 1.65	0.560
	3 TEs experienced	2.67	0.87 – 3.22	0.124	1.68	0.87 – 3.25	0.124
	4 TEs experienced	0.54	0.16 – 1.80	0.316	0.51	0.15 – 1.68	0.266
	5+ TEs experienced	2.98	1.60 – 5.54	0.001	3.07	1.64 – 5.77	0.001
Household Asset Index (HAI)	First (lowest) quintile						
	Second quintile	1.15	0.54 – 2.45	0.709	1.21	0.57 – 2.59	0.618
	Third quintile	0.68	0.29 – 1.60	0.378	0.76	0.32 – 1.82	0.538
	Fourth quintile	1.24	0.60 – 2.57	0.568	1.40	0.66 – 2.97	0.387
	Fifth (highest) quintile	1.95	1.00 – 3.81	0.051	1.91	1.10 – 4.66	0.027
Food insecurity	Food secure						
	Moderate food insecurity	4.86	3.01 – 7.84	0.001	4.91	3.04 – 7.94	0.001
	Severe food insecurity	17.75	8.51 – 37.03	0.001	18.85	8.96 – 39.64	0.001

The models for the multivariate logistic regression to find the relationship between the prevalence of probable PTSD and key exposures including TEs, cumulative TE, household asset index and food insecurity, adjusted for socio-demographic variables including age, sex, nationality, marital status and education level.

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CHAPTER FOUR: DISCUSSION

This study aimed to estimate the relationship between low HAI and food insecurity, and PTSD among individuals aged older than 40 years in Mpumalanga, South Africa and yielded important findings. This chapter compares the findings to previous studies. The present section begins with an evaluation of the results in relation to the research objectives, and it then concludes with a perspective on its limitations and recommendations for future PTSD research.

This current study revealed significant associations between various TEs, socio-demographic factors, and the prevalence of probable PTSD. Individuals who experienced at least one TE in areas such as social or family environment, illness or accidents or disaster, community violence, and war violence had an increased risk of probable PTSD, with a reported higher prevalence of probable PTSD ranging from two to five times more. Additionally, cumulative TE exposure further elevated probable PTSD risk, including all levels of cumulative TE, ranging from two to as high as seven times more likely to report probable PTSD.

Food insecurity also emerged as a strong PTSD predictor, with moderate food insecurity participants nearly five times more likely to be prevalent (aOR:4.91; CI:3.04–7.94; $p<0.001$), and those with severe food insecurity almost nineteen times more likely (aOR:18.85; CI:8.96–39.64; $p<0.001$). The highest quintile in the HAI was associated with nearly double the prevalence of probable PTSD (aOR:1.91; CI:1.10–4.66; $p=0.027$), and was the only quintile with significant results reported. These findings highlight those specific types and frequencies of TE, as well as socioeconomic challenges like food insecurity and HAI, are important predictors of PTSD, underscoring the complex interplay of personal and environmental factors in PTSD risk.

4.1 Prevalence of PTSD

The prevalence of probable PTSD in this study population in Agincourt, Mpumalanga was 2.43%, whereas SASH found a 2.3% PTSD prevalence in South Africa (104). The prevalence is similar to the population prevalence, highlighting the current study's generalisability to the South African population.

In previous research examining the prevalence of PTSD in nations experiencing civilian TE in civil wars and previously served veterans, probable PTSD prevalence ranges between 26.3% and as high as 81% of the sample (95, 99, 123). These results corroborate the present study's findings that the prevalence of PTSD in rural Mpumalanga is considered low. War-related PTSD has a high impact on PTSD prevalence, and the current study has examined a range of other types of TEs that have a different impact on PTSD prevalence.

The results from a previous study using SASH data found that the number of probable PTSD individuals increased with age; however, the age ranged from 18 years and older (46). Though our results may seem to differ from those of previous studies trends as the middle age group (60-69 years) has the highest number of probable PTSD individuals, being 35.80% between the age categories. This may be due to the age category having the highest number of participants (1 007 participants).

Our study's PTSD prevalence lends support to other existing literature conducted in South Africa among adults (44, 53, 104). However, research among South African adolescents has suggested a higher PTSD prevalence of 14.93% and 21% (130, 134) as adolescents and children are more likely to develop PTSD following exposure to TEs (244). Children vary in their vulnerability to the psychological impacts of TE due to a variety of developmental characteristics, such as their degree of cognitive and emotional maturity (244).

4.2 The relationship of TE, cumulative TE and PTSD

There were 2 734 (82.05%) participants who experienced at least one TE. Out of the total 81 participants who reported probable PTSD prevalence, 90.12% of participants had experienced at least 1 TE. Overall, cumulative TE findings did not preclude a stair-step pattern in the significance of reported individuals with probable PTSD risk. The 5 or more TEs experienced have the highest number of 20.99% reported probable PTSD, and 4 TEs experienced have the lowest number of 3.70% reported probable PTSD. A significant three-times risk of probable PTSD was for individuals who reported 5 or more overall TEs.

Comparing these results, the number of reported individuals with probable PTSD who experienced one TE is higher than individuals who experienced cumulative TE. These findings corroborate with findings of research using WMH surveys (44). This is due to the number of individuals who experienced one TE (2 734 participants) being more than double the total number of individuals who experienced cumulative TE (1 672 participants). Thus, our findings still support studies with evidence that cumulative TE is a greater risk factor for PTSD compared to experiencing one TE (44, 118, 121-123).

According to surveys, South Africa has one of the highest rates of rape, intimate partner violence, and armed robbery globally (35-37). The highest types of TEs experienced by over 300 participants were parental unemployment (age <16), parents often arguing (age <16), parents often drinking/using drugs (age <16), physical abuse by parents (age <16), experienced severe financial hardship, had a life-threatening illness or accident, close friend/family injured or killed from serious accident or injury, experienced a major natural disaster and witness violent act causing injury/death not in war. These results reflect South Africa's prevalence of domestic abuse, sexual assault, and violent criminality which is an effect of multiple factors including high unemployment, alcohol availability, financial dependence, and a range of psychological distress (245). This also highlights how certain

types of TEs are more prevalent among people living in poverty in South Africa compared to those in the middle to high income intern raising the issue of inequality.

Cumulative TE exposure and PTSD symptoms in older individuals are an interaction of characteristics that are critical to evaluate together, given the high and increasing incidences of cumulative TE in older adults in the South African setting (246). It can be stated that the reason for there being many individuals who have experienced cumulative TE is because the age group of participants is older than 40 years hence the participants have lived a longer life, and it may differ if this study was conducted among adolescents. A recent study conducted in South Africa found that higher cumulative TE exposure correlated with heightened PTSD stress symptoms in older persons, emphasising the necessity for targeted research on this demographic group (111).

This study's significant results, experiencing at least 1 TE increases the prevalence of probable PTSD by almost two times and having cumulative TE of 5 or more TEs increases the prevalence of probable PTSD by three times. These findings are in line with literature not only from the South African context but also from a global scale where sample populations experienced civil warfare TEs (44, 118). Findings have added to the literature which proves that TE and cumulative TE are predictors of PTSD (247, 248).

4.3 The relationship of HAI and PTSD

Contrary to our hypothesis, that the lowest or poorest HAI quintile will have the most significant likelihood of having a prevalence of probable PTSD, vastly different results have emerged. There is previous research that supports that low socioeconomic status is significantly associated with PTSD (134, 142, 156). The current study results suggest a significant likelihood of having a prevalence of probable PTSD is increased by twice more by being within the highest HAI quintile. Apparent discrepancies between our findings and those

of earlier studies may be due to differences in the study sample. This study is based in a rural area of South Africa, which is associated with a population with low income and low access to household utilities (249). The entire sample is considered to be all from a poor background in a country where unemployment rates are high. Hence, there may not be as much difference between the quintile of the HAI measure thus, analyses reflected such results.

Furthermore, evidence that 1 934 (63.20%) participants, which is more than half of the sample, have experienced the TE of severe financial hardship. Therefore, this research suggests that participants are already born into low-income circumstances and experienced financial hardships leading to the development of probable PTSD. Intern this study stands by the theory of the social causation hypothesis.

Another study used Wave 1 data from HAALSI to evaluate whether socioeconomic measures, including HAI, household consumption per capita, and household equivalent consumption, affects the calculation of health gradients among older adults in South Africa (79, 153). The results revealed that there is no major variation across socioeconomic measures, even though HAI is a reliable socioeconomic status measure used in other surveys in developing countries (79). Consumption data may be valuable in gaining an improved understanding of socioeconomic inequalities in the health of older adults (79). Due to these findings, the present study's decision to use HAI as a measure aims to make the study more comparable to previous publications in low-income countries, where consumption data may not be available due to collection difficulties. Furthermore, this study confirms that food insecurity is a proxy measure for HAI and should be considered in future studies measuring socioeconomic status.

4.4 The relationship of food insecurity and PTSD

2021 was a time when South Africa encountered an array of difficulties, including high unemployment and poverty, alongside a continuous energy shortage and rising living costs (250). These factors had a detrimental influence on South Africa's food insecurity by food becoming expensive and unavailable to many individuals, and households facing food insecurity and hunger (250). This explains the reported 16.61% (N=557) moderate food insecurity participants and 1.71% (N=57) severe food insecurity participants.

Stats SA issued a study using data from the GHS to evaluate the country's food insecurity and hunger in 2021 (250). Results indicate that approximately 15% (N=2.6 million) reported moderate food insecurity, and 6% (N=1.1 million) reported severe food insecurity (250). As the current data suggests similar results to the GHS looking at the entire South African population it adds to the relevance of the study's findings of the relationship between food insecurity on PTSD.

Results included a high prevalence of probable PTSD in participants facing moderate food insecurity five times, and participants with severe food insecurity are sixteen times more likely to develop probable PTSD. This finding is supported by the recent study conducted by Pengpid and Peltzer, using the same HAALSI dataset (53). Even though they measured food insecurity as a binary variable they also had comparable results to the current study (53). These significant findings solidify the relationship between food insecurity being a contributing factor to the prevalence of probable PTSD.

The relationship between HAI, food insecurity, and PTSD emphasises the overlap between adverse living situations and psychological stressors. Households with limited assets and severe food insecurity are exposed to chronic hardship, which not only causes continuing stress but also increases susceptibility to trauma-related disorders. By investigating how

sociodemographic adverse events interact with PTSD, this study emphasises the necessity of acknowledging material deprivation and structural inequality as significant predictors of trauma outcomes in South Africa.

4.5 Study Limitations

The cross-sectional design of this study has a significant disadvantage in that it does not allow for the investigation of the exact time at which the TEs occurred and the onset of PTSD symptoms over time. The study's results should be evaluated with consideration of its limitations.

Firstly, data were collected during the COVID-19 pandemic, a time when individuals were isolated due to government-enforced regulations. Possible problems include HAALSI cohort individuals who may be steered against surveyors coming to their homes to conduct surveys in fear of transmission or spread of COVID-19 disease, resulting in loss of follow-up in the Wave 3 survey. Loss of follow-up is also affected by COVID-19-related mortalities among participants in the HAALSI cohort.

Differential misclassification is the fundamental method by which recall bias distorts regression findings. Recall bias could be a factor whereby participants may have forgotten or had an incorrect recollection of an experienced TE, for instance, recall of childhood environment and war violence TEs, possibly leading to inaccurate data collected. This could result in measurement error, which may result in an overestimation or underestimation of the true relationship between PTSD and covariates, HAI and food insecurity.

Cultural, racial, and gender factors, such as societal views on stigmatised beliefs about mental disorders, may obscure the validity of methods utilised for measuring PTSD symptoms in low-income and traditional African populations (251). Whereas participants may withhold the truth due to mental disorder stigma and the fear of others finding out about any issues.

The seven-item Short Screening Scale for PTSD and the TE measure using ELSA are measurements that have only been used in the published papers within the HAALSI context (53, 235). These measurements have not been validated in South Africa, questioning the study's accuracy; however, it emphasises the need for contextualisation. Measuring HAI and food insecurity is limited in a rural community where the overall population is identified as poor compared to other urban parts of the country. This may be difficult to differentiate between the categories of these variables. Furthermore, the measuring of food insecurity and HAI may not be a true reflection as they are measured by a survey, whereby questions may not give the true reflection of a household over time. Also, food insecurity is not measured by a full scale. Economists may suggest that the study is limited as inequality is not measured in the study.

The number of respondents of 3 or more TEs in the cumulative TE categories of social or family environment and community violence is too small of a quantity in this sample size; therefore, the analysis was not able to be calculated for this group.

4.6 Study Strengths

Comparing this study to research using SASH, the gold standard available source of dataset observing PTSD in South Africa, there is a clear depiction of similarities between this HAALSI dataset and SASH. This adds to the strength of this research report as it is generalisable to the rest of the South African population, and this suggests that there's not a great change in PTSD frequency and patterns in South Africa. Individuals aged older than 40 years were observed; this age group may be more susceptible to the long-term effects of income instability and health problems, in this case PTSD, which provides valuable data on how these variables are associated.

Current literature available in the African context focuses on civilian TEs populations who have been involved in war-related hardships. These studies lack thorough data measures, such as investigating the relationship between PTSD and HAI and food insecurity, which differentiates this current study. Wave 3 time period, 2021-2022, most certainly involves the impacts of the COVID-19 pandemic, which had profound repercussions for society worldwide, including in South Africa. This adds to the study's relevance, as it may have revealed the worsening of HAI and food insecurity during this time frame, as well as the mental health consequences. Furthermore, this study identifies the relationship between HAI and food insecurity, factors of poverty, and PTSD in a field that does not have much research on this specific mental health disorder. This study highlighted important themes of health inequality and comorbidities in South Africa.

CHAPTER FIVE: CONCLUSION

5.1 Study Conclusion

In summary, this study highlights that there is a relationship between the prevalence of probable PTSD with having a low HAI and being food insecure among individuals aged older than 40 years in Mpumalanga, South Africa.

The high levels of food insecurity underscore the profound mental health impact of food insecurity, particularly in a context where economic and environmental factors exacerbate the availability and affordability of food. This study justifies the public health significance that individuals with PTSD within a low-income household will have an impact on their quality of life. In turn, it emphasises the need for targeted mental health interventions for older adults living in rural poverty who have cumulative TE experiences over their lifetimes.

In conclusion, this study suggests that in South Africa, inequality and poverty intensify exposure to TE through violence, food insecurity, low HAI and systemic discrimination, making PTSD more prevalent among adults in lower-income populations.

5.2 Study Recommendations

Our research emphasises how factors of poverty, such as food insecurity and HAI influences the prevalence of probable PTSD. This has direct implications for public health and social services, as PTSD comorbidities may arise, further burdening community health. Study findings underline the importance of mental health interventions to prevent TEs and cumulative TE to promote mental health and PTSD later in life. Practitioners, including psychologists, social workers, and policymakers, can use these insights to develop targeted programs that address both TE and financial instability. For instance, incorporating food security initiatives and financial aid into reinforcing PTSD treatment plans could enhance mental health outcomes in vulnerable populations.

Examples of mental health treatment plans include awareness of structural violence, recognising that these situations are part of larger systems of structural violence, and emphasising the importance of context-responsive, social justice-sensitive psychological therapies (252). Social support reinforcement, which promotes the restoration of trust and social networks is critical for reducing loneliness and improving collective coping techniques (252). Lastly, psychoeducation, validating patients' concerns and feelings while explaining the health consequences of persistent stress can help normalise their emotions and increase involvement in treatment (252).

The study is limited by its cross-sectional design, potential recall bias, and the challenges of accurately measuring the onset of probable PTSD and key risk factors, HAI and food insecurity. Future research should examine these relationships longitudinally and through a qualitative research approach to assessing HAI and food insecurity. Implementing these approaches would better outline the before or after effects of low HAI and severe food insecurity on the onset of PTSD. This would further explore experiences of HAI and food insecurity among people and broaden the understanding of the social causation hypothesis.

Rural households are most likely to have various levels of household assets throughout time as household members change in provider or consumer ratios (61). Therefore, data from Stats SA's annual GHS is advised to be used accompanied by another dataset to measure HAI. This will allow potential investigators to compare data over time and have precise measures of HAI. To improve understanding of socioeconomic inequalities, household consumption should be considered as a socioeconomic measure in high-poverty populations where unemployment is high (79).

This study uses the HFIAS, a series of 5 to 15 questions, to measure food insecurity. Another study investigating food insecurity used the SA-NIDS, a nationally representative sample

survey, to measure food insecurity (253). This a more thorough measure as it examines a series of food security indicators, including household hunger from the HFIAS, food sufficiency through questioning the household food consumption over the past 12-month period, dietary diversity calculating Household Dietary Diversity Score (HDDS) using the Food and Agriculture Organization (FAO) guidelines, food expenditure which is estimated by dividing monthly food expenses by total household spending and child and adult anthropometry according to WHO growth standards (253). Therefore, future studies assessing food insecurity should consider SA-NIDS measures or conducting a qualitative research approach as it is a more reliable update.

Overall, this study contributes valuable insights into the complex interplay between economic factors and mental health in an older South African population, highlighting the urgent need for integrated social and health policies that address both economic insecurity and mental health challenges. By demonstrating the link between PTSD, food insecurity, and material deprivation, our study underscores the importance of holistic support systems. This knowledge can help non-government organisations, government agencies, and healthcare providers design comprehensive assistance programs that go beyond clinical treatment to include economic relief, job creation, and food distribution efforts.

REFERENCES

1. Mental health: World Health Organization; 2022 [Available from: https://www.who.int/news-room/fact-sheets/detail/mental-health-strengthening-our-response.
2. Patel V, Saxena S, Lund C, Thornicroft G, Baingana F, Bolton P, et al. The Lancet Commission on global mental health and sustainable development. The lancet. 2018;392(10157):1553-98.
3. GBD DALYsHALE Collaborators e. GBD 2015 DALYs and HALE Collaborators. Global, regional, and national disability-adjusted life-years (DALYs) for 315 diseases and injuries and healthy life expectancy (HALE), 1990–2015: a systematic analysis for the Global Burden of Disease Study. Lancet. 2015;388:1603.
4. Nikoonia M, Khosravi M, Islam SMS, Sobhani SR, Dabagh AE, Senobari M-A. Is household food insecurity related to mothers' stress, anxiety and depression in Iran? Preventive medicine reports. 2023;35:102293.
5. Arenas DJ, Thomas A, Wang J, DeLisser HM. A systematic review and meta-analysis of depression, anxiety, and sleep disorders in US adults with food insecurity. Journal of general internal medicine. 2019;34:2874-82.
6. Archibong V, Usman IM, Kasozi KI, Aigbogun Jr EO, Josiah I, Monima AL, et al. Anxiety, anger and depression amongst low-income earners in Southwestern Uganda during the COVID-19 total lockdown. Frontiers in public health. 2021;9:590458.
7. Benjet C, Bromet E, Karam EG, Kessler RC, McLaughlin KA, Ruscio AM, et al. The epidemiology of traumatic event exposure worldwide: results from the World Mental Health Survey Consortium. Psychological medicine. 2016;46(2):327-43.
8. Charlson F, van Ommeren M, Flaxman A, Cornett J, Whiteford H, Saxena S. New WHO prevalence estimates of mental disorders in conflict settings: a systematic review and meta-analysis. The Lancet. 2019;394(10194):240-8.
9. Kessler RC, Aguilar-Gaxiola S, Alonso J, Benjet C, Bromet EJ, Cardoso G, et al. Trauma and PTSD in the WHO world mental health surveys. European journal of psychotraumatology. 2017;8(sup5):1353383.
10. Mugisha J, Muyinda H, Wandiembe P, Kinyanda E. Prevalence and factors associated with posttraumatic stress disorder seven years after the conflict in three districts in northern Uganda (The Wayo-Nero Study). BMC psychiatry. 2015;15:1-12.
11. Canetti D, Galea S, Hall BJ, Johnson RJ, Palmieri PA, Hobfoll SE. Exposure to prolonged socio-political conflict and the risk of PTSD and depression among Palestinians. Psychiatry. 2010;73(3):219-31.
12. De Jong JT, Komproe IH, Van Ommeren M, El Masri M, Araya M, Khaled N, et al. Lifetime events and posttraumatic stress disorder in 4 postconflict settings. Jama. 2001;286(5):555-62.
13. Rodriguez P, Holowka DW, Marx BP. Assessment of posttraumatic stress disorder-related functional impairment: a review. Journal of Rehabilitation Research & Development. 2012;49(5).
14. Zepinic V. Treatment resistant symptoms of complex PTSD caused by torture during war. Canadian Social Science. 2015;11(9):26-32.
15. Koenen K, Ratanatharathorn A, Ng L, McLaughlin K, Bromet E, Stein D, et al. Posttraumatic stress disorder in the world mental health surveys. Psychological medicine. 2017;47(13):2260-74.
16. Sessa B. MDMA and PTSD treatment:"PTSD: from novel pathophysiology to innovative therapeutics". Neuroscience letters. 2017;649:176-80.
17. Kessler RC. Posttraumatic stress disorder: the burden to the individual and to society. Journal of Clinical Psychiatry. 2000;61:4-14.
18. Schrader C, Ross A. A review of PTSD and current treatment strategies. Missouri medicine. 2021;118(6):546.
19. Nichter B, Haller M, Norman S, Pietrzak RH. Risk and protective factors associated with comorbid PTSD and depression in US military veterans: Results from the National Health and Resilience in Veterans Study. Journal of psychiatric research. 2020;121:56-61.

20. Norris FH. Epidemiology of trauma: frequency and impact of different potentially traumatic events on different demographic groups. Journal of consulting and clinical psychology. 1992;60(3):409.
21. Breslau N, Kessler RC, Chilcoat HD, Schultz LR, Davis GC, Andreski P. Trauma and posttraumatic stress disorder in the community: the 1996 Detroit Area Survey of Trauma. Archives of general psychiatry. 1998;55(7):626-32.
22. Hepp U, Gamma A, Milos G, Eich D, Ajdacic–Gross V, Rössler W, et al. Prevalence of exposure to potentially traumatic events and PTSD: The Zurich Cohort Study. European archives of psychiatry and clinical neuroscience. 2006;256:151-8.
23. Storr CL, Schaeffer CM, Petras H, Ialongo NS, Breslau N. Early childhood behavior trajectories and the likelihood of experiencing a traumatic event and PTSD by young adulthood. Social psychiatry and psychiatric epidemiology. 2009;44:398-406.
24. Roberts AL, Gilman SE, Breslau J, Breslau N, Koenen KC. Race/ethnic differences in exposure to traumatic events, development of post-traumatic stress disorder, and treatment-seeking for post-traumatic stress disorder in the United States. Psychological medicine. 2011;41(1):71-83.
25. Ogle CM, Rubin DC, Siegler IC. Cumulative exposure to traumatic events in older adults. Aging & mental health. 2014;18(3):316-25.
26. Association AP. Diagnostic and Statistical Manual of Mental Disorders, 5th edn. American Psychiatric Publishing: Washington, DC. 2013.
27. Kwobah EK, Misra S, Ametaj AA, Stevenson A, Stroud RE, Koenen KC, et al. Traumatic experiences assessed with the life events checklist for Kenyan adults. Journal of affective disorders. 2022;303:161-7.
28. Byansi W, Galvin M, Chiwaye L, Luvuno Z, Kim AW, Sundararajan R, et al. Adverse childhood experiences, traumatic events, and mental health among adults at two outpatient psychiatric facilities in Johannesburg, South Africa: a cross-sectional analysis. BMC psychiatry. 2023;23(1):581.
29. Turner RJ, Lloyd DA. Lifetime traumas and mental health: The significance of cumulative adversity. Journal of health and social behavior. 1995:360-76.
30. Norman SB, Means-Christensen AJ, Craske MG, Sherbourne CD, Roy-Byrne PP, Stein MB. Associations between psychological trauma and physical illness in primary care. Journal of Traumatic Stress: Official Publication of The International Society for Traumatic Stress Studies. 2006;19(4):461-70.
31. Galea S, Brewin CR, Gruber M, Jones RT, King DW, King LA, et al. Exposure to hurricane-related stressors and mental illness after Hurricane Katrina. Archives of general psychiatry. 2007;64(12):1427-34.
32. Spitzer C, Barnow S, Völzke H, John U, Freyberger HJ, Grabe HJ. Trauma, posttraumatic stress disorder, and physical illness: findings from the general population. Psychosomatic medicine. 2009;71(9):1012-7.
33. Keyes KM, McLaughlin KA, Demmer RT, Cerdá M, Koenen KC, Uddin M, et al. Potentially traumatic events and the risk of six physical health conditions in a population-based sample. Depression and anxiety. 2013;30(5):451-60.
34. Scott KM, Koenen KC, Aguilar-Gaxiola S, Alonso J, Angermeyer MC, Benjet C, et al. Associations between lifetime traumatic events and subsequent chronic physical conditions: a cross-national, cross-sectional study. PloS one. 2013;8(11):e80573.
35. Stultz NM. Crime and Policing in Post-Apartheid South Africa: Transforming under Fire. JSTOR; 2002.
36. Bollen S, Artz L, Vetten L, Louw A. Violence against women in metropolitan South Africa: A study on impact and service delivery: Institute for Security Studies Pretoria, South Africa; 1999.
37. Abrahams N, Jewkes R, Laubscher R, Hoffman M. Intimate partner violence: Prevalence and risk factors for men in Cape Town, South Africa. Violence and victims. 2006;21(2):247-64.
38. Fajnzylber P, Lederman D, Loayza N. Inequality and violent crime. The journal of Law and Economics. 2002;45(1):1-39.
39. Kaminer D, Grimsrud A, Myer L, Stein DJ, Williams DR. Risk for post-traumatic stress disorder associated with different forms of interpersonal violence in South Africa. Social science & medicine. 2008;67(10):1589-95.

40. Norman R, Matzopoulos R, Groenewald P, Bradshaw D. The high burden of injuries in South Africa. Bulletin of the World Health Organization. 2007;85:695-702.
41. Leibbrandt M, Woolard I, Woolard C. Poverty and inequality dynamics in South Africa: Post-apartheid developments in the light of the long-run legacy. South African economic policy under democracy. 2009;10:270-300.
42. Leibbrandt M, Finn A, Woolard I. Describing and decomposing post-apartheid income inequality in South Africa. Development Southern Africa. 2012;29(1):19-34.
43. Williams DR, Herman A, Kessler RC, Sonnega J, Seedat S, Stein DJ, et al. The South Africa stress and health study: rationale and design. Metabolic brain disease. 2004;19:135-47.
44. Karam EG, Friedman MJ, Hill ED, Kessler RC, McLaughlin KA, Petukhova M, et al. Cumulative traumas and risk thresholds: 12-month PTSD in the World Mental Health (WMH) surveys. Depression and anxiety. 2014;31(2):130-42.
45. Kessler RC, Sampson NA, Berglund P, Gruber M, Al-Hamzawi A, Andrade L, et al. Anxious and non-anxious major depressive disorder in the World Health Organization World Mental Health Surveys. Epidemiology and psychiatric sciences. 2015;24(3):210-26.
46. Herman AA, Stein DJ, Seedat S, Heeringa SG, Moomal H, Williams DR. The South African Stress and Health (SASH) study: 12-month and lifetime prevalence of common mental disorders. South African medical journal. 2009;99(5).
47. Zare H, Fugal A, Azadi M, Gaskin DJ, editors. How income inequality and race concentrate depression in low-income women in the US; 2005–2016. Healthcare; 2022: MDPI.
48. Jones Harden B, Slopen N. Inequitable experiences and outcomes in young children: Addressing racial and social-economic disparities in physical and mental health. Annual Review of Developmental Psychology. 2022;4(1):133-59.
49. Douglas RD, Alvis LM, Rooney EE, Busby DR, Kaplow JB. Racial, ethnic, and neighborhood income disparities in childhood posttraumatic stress and grief: Exploring indirect effects through trauma exposure and bereavement. Journal of Traumatic Stress. 2021;34(5):929-42.
50. Cruz-Gonzalez M, Alegría M, Palmieri PA, Spain DA, Barlow MR, Shieh L, et al. Racial/ethnic differences in acute and longer-term posttraumatic symptoms following traumatic injury or illness. Psychological medicine. 2023;53(11):5099-108.
51. Maguen S, Batten A, Hubbard A, Holder N, Burkman K, Cottonham D, et al. Advancing health equity by understanding race disparities and other factors associated with PTSD symptom improvement following evidence-based psychotherapy. Journal of Anxiety Disorders. 2023;98:102747.
52. Eitle D, Turner RJ. Exposure to community violence and young adult crime: The effects of witnessing violence, traumatic victimization, and other stressful life events. Journal of research in Crime and Delinquency. 2002;39(2):214-37.
53. Pengpid S, Peltzer K. Longitudinal associations between food insecurity and mental health in aging adults in South Africa. Clinical Gerontologist. 2024:1-9.
54. Koen N, Brittain K, Donald KA, Barnett W, Koopowitz S, Maré K, et al. Psychological trauma and posttraumatic stress disorder: risk factors and associations with birth outcomes in the Drakenstein Child Health Study. European journal of psychotraumatology. 2016;7(1):28720.
55. Gómez-Olivé FX, Angotti N, Houle B, Klipstein-Grobusch K, Kabudula C, Menken J, et al. Prevalence of HIV among those 15 and older in rural South Africa. AIDS care. 2013;25(9):1122-8.
56. Stoner MC, Edwards JK, Westreich D, Kilburn K, Ahern J, Lippman SA, et al. Modeling cash plus other psychosocial and structural interventions to prevent HIV among adolescent girls and young women in South Africa (HPTN 068). AIDS and Behavior. 2021:1-11.
57. Poverty and Inequality: World Bank Group; [Available from: https://datatopics.worldbank.org/world-development-indicators/themes/poverty-and-inequality.html#:~:text=by%20country%20briefs.-,Inequality%20and%20shared%20prosperity,the%20mean%20of%20the%20distribution.
58. Haughton J, Khandker SR. Handbook on poverty+ inequality: World Bank Publications; 2009.
59. Rao DB. World Summit for Social Development: Discovery Publishing House; 1998.
60. Health inequities and their causes: World Health Organization; 2018 [Available from: https://www.who.int/news-room/facts-in-pictures/detail/health-inequities-and-their-causes.

61. Sartorius K, Sartorius B, Tollman S, Schatz E, Kirsten J, Collinson M. Rural poverty dynamics and refugee communities in South Africa: A spatial–temporal model. Population, Space and Place. 2013;19(1):103-23.
62. Africa S. Poverty trends in South Africa an examination of absolute poverty between 2006 and 2015. Pretoria: Statistics South Africa Pretoria: Government Printers. 2017.
63. Bank W. South Africa poverty and inequality assessment 2018. Overcoming Poverty and Inequality in South Africa: Drivers, constraints and opportunities. Washington, DC.: World Bank; 2018.
64. Van der Berg S, Patel L, Bridgman G. Food insecurity in South Africa: Evidence from NIDS-CRAM wave 5. Development Southern Africa. 2022;39(5):722-37.
65. Bhorat H, Köhler T. Social assistance during South Africa's national lockdown: Examining the COVID-19 grant, changes to the Child Support Grant, and post-October policy options. 2020.
66. Köhler T, Hill R. The distribution and dynamics of South Africa's TERS policy. 2021.
67. Dohrenwend BP, Levav I, Shrout PE, Schwartz S, Naveh G, Link BG, et al. Socioeconomic status and psychiatric disorders: the causation-selection issue. Science. 1992;255(5047):946-52.
68. Lund C, Breen A, Flisher AJ, Kakuma R, Corrigall J, Joska JA, et al. Poverty and common mental disorders in low and middle income countries: A systematic review. Social science & medicine. 2010;71(3):517-28.
69. Saraceno B, Levav I, Kohn R. The public mental health significance of research on socio-economic factors in schizophrenia and major depression. World psychiatry. 2005;4(3):181.
70. Cuadros DF, Tomita A, Vandormael A, Slotow R, Burns JK, Tanser F. Spatial structure of depression in South Africa: A longitudinal panel survey of a nationally representative sample of households. Scientific reports. 2019;9(1):979.
71. Dohrenwend BP. The role of adversity and stress in psychopathology: Some evidence and its implications for theory and research. Journal of health and social behavior. 2000:1-19.
72. Laugharne J, Lillee A, Janca A. Role of psychological trauma in the cause and treatment of anxiety and depressive disorders. Current Opinion in Psychiatry. 2010;23(1):25-9.
73. Ndungu JW, Ndetei DM, Cronje J, van Rooyen K. Attribution style and post-traumatic stress severity in the Central Region of Kenya: Influences of dwelling location. Journal of Psychology in Africa. 2018;28(5):355-9.
74. Ndungu J, Ramsoomar L, Willan S, Washington L, Ngcobo-Sithole M, Gibbs A. Depression, posttraumatic stress disorder (PTSD) and their comorbidity: implications of adversity amongst young women living in informal settlements in Durban, South Africa. Journal of affective disorders reports. 2020;1:100022.
75. Chilton M, Booth S. Hunger of the body and hunger of the mind: African American women's perceptions of food insecurity, health and violence. Journal of nutrition education and behavior. 2007;39(3):116-25.
76. Ataguba JE, Akazili J, McIntyre D. Socioeconomic-related health inequality in South Africa: evidence from General Household Surveys. International journal for equity in health. 2011;10:1-10.
77. Barros FC, Victora CG, Scherpbier R, Gwatkin D. Socioeconomic inequities in the health and nutrition of children in low/middle income countries. Revista de Saúde Pública. 2010;44:1-16.
78. Kabudula CW, Houle B, Collinson MA, Kahn K, Tollman S, Clark S. Assessing changes in household socioeconomic status in rural South Africa, 2001–2013: a distributional analysis using household asset indicators. Social indicators research. 2017;133:1047-73.
79. Riumallo-Herl C, Canning D, Kabudula C. Health inequalities in the South African elderly: The importance of the measure of social-economic status. The Journal of the Economics of Ageing. 2019;14:100191.
80. Thorogood M, Clark B, Kahn K, Tollman S. Assessing health and well-being among older people in rural South Africa. Global Health Action. 2010;3.
81. Weiser SD, Palar K, Hatcher AM, Young S, Frongillo EA, Laraia B. Food insecurity and health: a conceptual framework. Food insecurity and public health: CRC Press; 2015. p. 23-50.
82. Whittle HJ, Palar K, Napoles T, Hufstedler LL, Ching I, Hecht FM, et al. Experiences with food insecurity and risky sex among low-income people living with HIV/AIDS in a resource-rich setting. African Journal of Reproduction and Gynaecological Endoscopy. 2015;18(1).

83. Whittle HJ, Palar K, Hufstedler LL, Seligman HK, Frongillo EA, Weiser SD. Food insecurity, chronic illness, and gentrification in the San Francisco Bay Area: An example of structural violence in United States public policy. Social science & medicine. 2015;143:154-61.
84. Fonseca LM, Domingues JP, Dima AM. Mapping the sustainable development goals relationships. Sustainability. 2020;12(8):3359.
85. General Household Survey: Global Nutrition Report 2019: Statistics South Africa; 2018.
86. Richter LM, Desmond C. Targeting AIDS orphans and child-headed households? A perspective from national surveys in South Africa, 1995–2005. AIDS care. 2008;20(9):1019-28.
87. Ampaabeng SK, Tan CM. The long-term cognitive consequences of early childhood malnutrition: the case of famine in Ghana. Journal of health economics. 2013;32(6):1013-27.
88. Hoddinott J, Behrman JR, Maluccio JA, Melgar P, Quisumbing AR, Ramirez-Zea M, et al. Adult consequences of growth failure in early childhood123. The American journal of clinical nutrition. 2013;98(5):1170-8.
89. Kuwert P, Spitzer C, Träder A, Freyberger HJ, Ermann M. Sixty years later: post-traumatic stress symptoms and current psychopathology in former German children of World War II. International Psychogeriatrics. 2007;19(5):955-61.
90. Mobbs MC, Bonanno GA. Beyond war and PTSD: The crucial role of transition stress in the lives of military veterans. Clinical psychology review. 2018;59:137-44.
91. Magruder KM, Yeager DE. The prevalence of PTSD across war eras and the effect of deployment on PTSD: A systematic review and meta-analysis. Psychiatric Annals. 2009;39(8).
92. Jordan AH, Eisen E, Bolton E, Nash WP, Litz BT. Distinguishing war-related PTSD resulting from perpetration-and betrayal-based morally injurious events. Psychological Trauma: Theory, Research, Practice, and Policy. 2017;9(6):627.
93. Thabet AM, Thabet SS, Vostanis P. The relationship between war trauma, PTSD, depression, and anxiety among Palestinian children in the Gaza Strip. Health Science Journal. 2016;10(5):1.
94. Hoppen TH, Priebe S, Vetter I, Morina N. Global burden of post-traumatic stress disorder and major depression in countries affected by war between 1989 and 2019: a systematic review and meta-analysis. BMJ global health. 2021;6(7):e006303.
95. Johnson RJ, Antonaccio O, Botchkovar E, Hobfoll SE. War trauma and PTSD in Ukraine's civilian population: comparing urban-dwelling to internally displaced persons. Social psychiatry and psychiatric epidemiology. 2022:1-10.
96. M. Glück T, S. Tran U, Lueger-Schuster B. PTSD and trauma in Austria's elderly: Influence of wartime experiences, postwar zone of occupation, and life time traumatization on today's mental health status—An interdisciplinary approach. European Journal of Psychotraumatology. 2012;3(1):17263.
97. Weathers FW, Litz BT, Herman DS, Huska JA, Keane TM, editors. The PTSD Checklist (PCL): Reliability, validity, and diagnostic utility. annual convention of the international society for traumatic stress studies, San Antonio, TX; 1993: San Antonio, TX.
98. Schaal S, Elbert T. Ten years after the genocide: Trauma confrontation and posttraumatic stress in Rwandan adolescents. Journal of traumatic stress. 2006;19(1):95-105.
99. Rieder H, Elbert T. Rwanda–lasting imprints of a genocide: trauma, mental health and psychosocial conditions in survivors, former prisoners and their children. Conflict and health. 2013;7:1-13.
100. Foa EB, Tolin DF. Comparison of the PTSD symptom scale–interview version and the clinician-administered PTSD scale. Journal of Traumatic Stress: Official Publication of the International Society for Traumatic Stress Studies. 2000;13(2):181-91.
101. Derogatis LR, Lipman RS, Rickels K, Uhlenhuth EH, Covi L. The Hopkins Symptom Checklist (HSCL): A self-report symptom inventory. Behavioral science. 1974;19(1):1-15.
102. Cardoso G, Antunes A, Silva M, Azeredo-Lopes S, Xavier M, Koenen K, et al. Trauma exposure and ptsd in Portugal: findings from the world mental health survey initiative. Psychiatry research. 2020;284:112644.
103. Adams LB, Farrell M, Mall S, Mahlalela N, Berkman L. Dimensionality and differential item endorsement of depressive symptoms among aging Black populations in South Africa: Findings from the HAALSI study. Journal of affective disorders. 2020;277:850-6.

104. Atwoli L, Stein DJ, Williams DR, Mclaughlin KA, Petukhova M, Kessler RC, et al. Trauma and posttraumatic stress disorder in South Africa: analysis from the South African Stress and Health Study. BMC psychiatry. 2013;13:1-12.
105. Wilson JP, Friedman MJ, Lindy JD. Treating psychological trauma and PTSD: Guilford Press; 2012.
106. Lowe SR, Walsh K, Uddin M, Galea S, Koenen KC. Bidirectional relationships between trauma exposure and posttraumatic stress: a longitudinal study of Detroit residents. Journal of Abnormal Psychology. 2014;123(3):533.
107. Smith HL, Summers BJ, Dillon KH, Cougle JR. Is worst-event trauma type related to PTSD symptom presentation and associated features? Journal of anxiety disorders. 2016;38:55-61.
108. Pham PN, Weinstein HM, Longman T. Trauma and PTSD symptoms in Rwanda: implications for attitudes toward justice and reconciliation. Jama. 2004;292(5):602-12.
109. Schoeman R, Carey P, Seedat S. Trauma and posttraumatic stress disorder in South African adolescents: A case-control study of cognitive deficits. The Journal of nervous and mental disease. 2009;197(4):244-50.
110. Suliman S, Mkabile SG, Fincham DS, Ahmed R, Stein DJ, Seedat S. Cumulative effect of multiple trauma on symptoms of posttraumatic stress disorder, anxiety, and depression in adolescents. Comprehensive psychiatry. 2009;50(2):121-7.
111. Matamela NA, Wyatt G, Oduntan Y, Johnson CD. Cumulative Trauma Exposure and Post-Traumatic Stress Symptoms Among Older Adults in South Africa: Does Post-Traumatic Growth Moderate This Link? Journal of Aggression, Maltreatment & Trauma. 2024:1-16.
112. van Vuren EJ, van den Heuvel LL, Hemmings SM, Seedat S. Cardiovascular risk and allostatic load in PTSD: The role of cumulative trauma and resilience in affected and trauma-exposed adults. Journal of Psychiatric Research. 2025.
113. Briere J, Hodges M, Godbout N. Traumatic stress, affect dysregulation, and dysfunctional avoidance: A structural equation model. Journal of traumatic Stress. 2010;23(6):767-74.
114. Cloitre M, Stolbach BC, Herman JL, Kolk Bvd, Pynoos R, Wang J, et al. A developmental approach to complex PTSD: Childhood and adult cumulative trauma as predictors of symptom complexity. Journal of traumatic stress. 2009;22(5):399-408.
115. Follette VM, Polusny MA, Bechtle AE, Naugle AE. Cumulative trauma: The impact of child sexual abuse, adult sexual assault, and spouse abuse. Journal of traumatic stress. 1996;9(1):25-35.
116. Vranceanu A-M, Hobfoll SE, Johnson RJ. Child multi-type maltreatment and associated depression and PTSD symptoms: The role of social support and stress. Child abuse & neglect. 2007;31(1):71-84.
117. Briere J, Kaltman S, Green BL. Accumulated childhood trauma and symptom complexity. Journal of Traumatic Stress: Official Publication of The International Society for Traumatic Stress Studies. 2008;21(2):223-6.
118. Briere J, Agee E, Dietrich A. Cumulative trauma and current posttraumatic stress disorder status in general population and inmate samples. Psychological trauma: Theory, research, practice, and policy. 2016;8(4):439.
119. Grasso DJ, Ford JD, Briggs-Gowan MJ. Early life trauma exposure and stress sensitivity in young children. Journal of pediatric psychology. 2013;38(1):94-103.
120. Briere J. DAPS: Setailed Assessment of Postraumatic Stress: Psychological Assessment Resources (PAR); 2001.
121. Breslau N, Chilcoat HD, Kessler RC, Davis GC. Previous exposure to trauma and PTSD effects of subsequent trauma: results from the Detroit Area Survey of Trauma. American journal of Psychiatry. 1999;156(6):902-7.
122. Kilpatrick DG, Resnick HS, Milanak ME, Miller MW, Keyes KM, Friedman MJ. National estimates of exposure to traumatic events and PTSD prevalence using DSM-IV and DSM-5 criteria. Journal of traumatic stress. 2013;26(5):537-47.
123. Madoro D, Kerebih H, Habtamu Y, G/tsadik M, Mokona H, Molla A, et al. Post-traumatic stress disorder and associated factors among internally displaced people in South Ethiopia: a cross-sectional study. Neuropsychiatric Disease and Treatment. 2020:2317-26.

124. MacKenzie MJ, Kotch JB, Lee L-C, Augsberger A, Hutto N. A cumulative ecological–transactional risk model of child maltreatment and behavioral outcomes: Reconceptualizing early maltreatment report as risk factor. Children and Youth Services Review. 2011;33(11):2392-8.
125. MacKenzie MJ, Kotch JB, Lee L-C. Toward a cumulative ecological risk model for the etiology of child maltreatment. Children and youth services review. 2011;33(9):1638-47.
126. Appleyard K, Egeland B, van Dulmen MH, Alan Sroufe L. When more is not better: The role of cumulative risk in child behavior outcomes. Journal of child psychology and psychiatry. 2005;46(3):235-45.
127. Kira IA, Lewandowski L, Templin T, Ramaswamy V, Ozkan B, Mohanesh J. Measuring cumulative trauma dose, types, and profiles using a development-based taxonomy of traumas. Traumatology. 2008;14(2):62-87.
128. Haselgruber A, Knefel M, Sölva K, Lueger-Schuster B. Foster children's complex psychopathology in the context of cumulative childhood trauma: the interplay of ICD-11 complex PTSD, dissociation, depression, and emotion regulation. Journal of affective disorders. 2021;282:372-80.
129. Maercker A, Cloitre M, Bachem R, Schlumpf YR, Khoury B, Hitchcock C, et al. Complex post-traumatic stress disorder. The lancet. 2022;400(10345):60-72.
130. Rink J, Lipinska G. Evidence of distinct profiles of ICD-11 post-traumatic stress disorder (PTSD) and complex PTSD in a South African sample. European journal of psychotraumatology. 2020;11(1):1818965.
131. Cloitre M, Shevlin M, Brewin CR, Bisson JI, Roberts NP, Maercker A, et al. The International Trauma Questionnaire: Development of a self-report measure of ICD-11 PTSD and complex PTSD. Acta Psychiatrica Scandinavica. 2018;138(6):536-46.
132. Robertson J, Kaptein M. Modern statistical methods for HCI: Springer; 2016.
133. Bernstein DP, Stein JA, Newcomb MD, Walker E, Pogge D, Ahluvalia T, et al. Development and validation of a brief screening version of the Childhood Trauma Questionnaire. Child abuse & neglect. 2003;27(2):169-90.
134. Das-Munshi J, Lund C, Mathews C, Clark C, Rothon C, Stansfeld S. Mental health inequalities in adolescents growing up in post-apartheid South Africa: Cross-sectional survey, SHaW study. PloS one. 2016;11(5):e0154478.
135. Vyas S, Kumaranayake L. Constructing socio-economic status indices: how to use principal components analysis. Health policy and planning. 2006;21(6):459-68.
136. Filmer D, Pritchett LH. Estimating wealth effects without expenditure data—or tears: an application to educational enrollments in states of India. Demography. 2001;38:115-32.
137. Barnes H, Wright G, Noble M, Dawes A. The South African index of multiple deprivation for children: Census 2001. The Human Sciences Research Council. 2007.
138. Zimet GD, Dahlem NW, Zimet SG, Farley GK. The multidimensional scale of perceived social support. Journal of personality assessment. 1988;52(1):30-41.
139. DuBois DL, Felner RD, Brand S, Phillips RS, Lease AM. Early adolescent self-esteem: A developmental-ecological framework and assessment strategy. Journal of research on adolescence. 1996;6(4):543-79.
140. Mollica RF, Caspi-Yavin Y, Bollini P, Truong T, Tor S, Lavelle J. The Harvard Trauma Questionnaire: Validating a cross-cultural instrument for measuring torture, trauma, and posttraumatic stress disorder in Indochinese refugees. The Journal of nervous and mental disease. 1992;180(2):111-6.
141. Council NR, Behavioral Do, Sciences S, Policy CoNU. Inner-city poverty in the United States: National Academies Press; 1990.
142. Ravi M, Powers A, Rothbaum BO, Stevens JS, Michopoulos V. Neighborhood poverty prospectively predicts PTSD symptoms six-months following trauma exposure. Mental Health Science. 2023;1(4):213-21.
143. Debpuur C, Welaga P, Wak G, Hodgson A. Self-reported health and functional limitations among older people in the Kassena-Nankana District, Ghana. Global health action. 2010;3(1):2151.
144. Hirve S, Juvekar S, Lele P, Agarwal D. Social gradients in self-reported health and well-being among adults aged 50 years and over in Pune District, India. Global Health Action. 2010;3(1):2128.

145. Kyobutungi C, Egondi T, Ezeh A. The health and well-being of older people in Nairobi's slums. Global health action. 2010;3(1):2138.
146. Mwanyangala M, Mayombana C, Urassa H, Charles J, Mahutanga C, Abdullah S, et al. Health status and quality of life among older adults in rural Tanzania. Global health action. 2010;3(1):2142.
147. Ng N, Hakimi M, Byass P, Wilopo S, Wall S. Health and quality of life among older rural people in Purworejo District, Indonesia. Global health action. 2010;3(1):2125.
148. Razzaque A, Nahar L, Akter Khanam M, Kim Streatfield P. Socio-demographic differentials of adult health indicators in Matlab, Bangladesh: self-rated health, health state, quality of life and disability level. Global health action. 2010;3(1):4618.
149. Üstün TB. Measuring health and disability: Manual for WHO disability assessment schedule WHODAS 2.0: World Health Organization; 2010.
150. Poterba JM, Venti SF, Wise DA. Family status transitions, latent health, and the post-retirement evolution of assets. National Bureau of Economic Research; 2010.
151. Rutstein SO. The DHS wealth index. (No Title). 2004.
152. Deaton A, Grosh M. Designing household survey questionnaires for developing countries lessons from ten years of LSMS experience, chapter 17: Consumption. 1998.
153. Hailemichael Y, Hanlon C, Tirfessa K, Docrat S, Alem A, Medhin G, et al. Mental health problems and socioeconomic disadvantage: a controlled household study in rural Ethiopia. International journal for equity in health. 2019;18:1-12.
154. Booysen F, Van Der Berg S, Burger R, Von Maltitz M, Du Rand G. Using an asset index to assess trends in poverty in seven Sub-Saharan African countries. World Development. 2008;36(6):1113-30.
155. Hagenaars AJ, De Vos K, Asghar Zaidi M. Poverty statistics in the late 1980s: Research based on micro-data. 1994.
156. Nillni YI, Horenstein A, McClendon J, Duke CC, Sawdy M, Galovski TE. The impact of perceived everyday discrimination and income on racial and ethnic disparities in PTSD, depression, and anxiety among veterans. Plos one. 2023;18(9):e0291965.
157. Williams DR, Yu Y, Jackson JS, Anderson NB. Racial differences in physical and mental health: Socio-economic status, stress and discrimination. Journal of health psychology. 1997;2(3):335-51.
158. Nagpaul T, Sidhu D, Chen J. Food insecurity mediates the relationship between poverty and mental health. Journal of poverty. 2022;26(3):233-49.
159. Collins L. The impact of food insecurity on women's mental health: how it negatively affects children's health and development. Journal of the Motherhood Initiative for Research and Community Involvement. 2009.
160. Lwin MO, Malik S, Kang VBT, Chen GP. Disparities in the impact of a community hypertension education programme across age, gender, race and housing type. Health Education Journal. 2018;77(5):555-70.
161. Ng C, Tan WS, Gunapal P, Wong LY, Heng BH. Association of socioeconomic status (SES) and social support with depressive symptoms among the elderly in Singapore. Ann Acad Med Singap. 2014;43(12):576-87.
162. Kessler RC, Andrews G, Colpe LJ, Hiripi E, Mroczek DK, Normand S-L, et al. Short screening scales to monitor population prevalences and trends in non-specific psychological distress. Psychological medicine. 2002;32(6):959-76.
163. Whittle HJ, Sheira LA, Wolfe WR, Frongillo EA, Palar K, Merenstein D, et al. Food insecurity is associated with anxiety, stress, and symptoms of posttraumatic stress disorder in a cohort of women with or at risk of HIV in the United States. The Journal of nutrition. 2019;149(8):1393-403.
164. Abou-Rizk J, Jeremias T, Cocuz G, Nasreddine L, Jomaa L, Hwalla N, et al. Food insecurity, low dietary diversity and poor mental health among Syrian refugee mothers living in vulnerable areas of Greater Beirut, Lebanon. British Journal of Nutrition. 2022;128(9):1832-47.
165. Kadri N, Agoub M, El Gnaoui S, Alami KM, Hergueta T, Moussaoui D. Moroccan colloquial Arabic version of the Mini International Neuropsychiatric Interview (MINI): qualitative and quantitative validation. European psychiatry. 2005;20(2):193-5.
166. IT F. SDG Indicator 2.1. 2-Using the Food Insecurity Experience Scale (FIES).

167. Trudell JP, Burnet ML, Ziegler BR, Luginaah I. The impact of food insecurity on mental health in Africa: A systematic review. Social science & medicine. 2021;278:113953.
168. Sweetland AC, Norcini Pala A, Mootz J, Kao JC-W, Carlson C, Oquendo MA, et al. Food insecurity, mental distress and suicidal ideation in rural Africa: evidence from Nigeria, Uganda and Ghana. International Journal of Social Psychiatry. 2019;65(1):20-7.
169. Ingle K, Brophy T, Daniels R. National Income Dynamics Study–Coronavirus Rapid Mobile Survey (NIDS-CRAM) panel user manual. Technical Note Version. 2020;1.
170. Ingle K, Brophy T, Daniels R. National Income Dynamics Study–Coronavirus Rapid Mobile Survey (NIDS-CRAM) 2020-2021 Panel User Manual. Release July. 2021.
171. Sorsdahl K, Slopen N, Siefert K, Seedat S, Stein DJ, Williams DR. Household food insufficiency and mental health in South Africa. Journal of Epidemiology & Community Health. 2011;65(5):426-31.
172. Dewing S, Tomlinson M, Le Roux IM, Chopra M, Tsai AC. Food insecurity and its association with co-occurring postnatal depression, hazardous drinking, and suicidality among women in peri-urban South Africa. Journal of affective disorders. 2013;150(2):460-5.
173. Abrahams Z, Lund C, Field S, Honikman S. Factors associated with household food insecurity and depression in pregnant South African women from a low socio-economic setting: a cross-sectional study. Social psychiatry and psychiatric epidemiology. 2018;53:363-72.
174. Hadley C, Tegegn A, Tessema F, Cowan JA, Asefa M, Galea S. Food insecurity, stressful life events and symptoms of anxiety and depression in east Africa: evidence from the Gilgel Gibe growth and development study. Journal of Epidemiology & Community Health. 2008;62(11):980-6.
175. Maharaj V, Tomita A, Thela L, Mhlongo M, Burns JK. Food insecurity and risk of depression among refugees and immigrants in South Africa. Journal of immigrant and minority health. 2017;19:631-7.
176. Jesson J, Dietrich J, Beksinska M, Closson K, Nduna M, Smit J, et al. Food insecurity and depression: a cross-sectional study of a multi-site urban youth cohort in Durban and Soweto, South Africa. Tropical Medicine & International Health. 2021;26(6):687-700.
177. Smith L, Il Shin J, McDermott D, Jacob L, Barnett Y, López-Sánchez GF, et al. Association between food insecurity and depression among older adults from low-and middle-income countries. Depression and anxiety. 2021;38(4):439-46.
178. Boscarino JA. Posttraumatic stress disorder and physical illness: results from clinical and epidemiologic studies. Annals of the New York Academy of sciences. 2004;1032(1):141-53.
179. Kubzansky LD, Koenen KC. Is posttraumatic stress disorder related to development of heart disease? An update. Cleveland Clinic journal of medicine. 2009;76(Suppl 2):S60.
180. Cavalcanti-Ribeiro P, Andrade-Nascimento M, Morais-de-Jesus M, De Medeiros GM, Daltro-Oliveira R, Conceicao JO, et al. Post-traumatic stress disorder as a comorbidity: impact on disease outcomes. Expert review of neurotherapeutics. 2012;12(8):1023-37.
181. O'Donovan A, Cohen BE, Seal KH, Bertenthal D, Margaretten M, Nishimi K, et al. Elevated risk for autoimmune disorders in Iraq and Afghanistan veterans with posttraumatic stress disorder. Biological psychiatry. 2015;77(4):365-74.
182. Neigh GN, Ali FF. Co-morbidity of PTSD and immune system dysfunction: opportunities for treatment. Current opinion in pharmacology. 2016;29:104-10.
183. Karatsoreos IN, McEwen BS. Psychobiological allostasis: resistance, resilience and vulnerability. Trends in cognitive sciences. 2011;15(12):576-84.
184. McEwen BS. Stress, adaptation, and disease: Allostasis and allostatic load. Annals of the New York academy of sciences. 1998;840(1):33-44.
185. Bapolisi AM, Song SJ, Kesande C, Rukundo GZ, Ashaba S. Post-traumatic stress disorder, psychiatric comorbidities and associated factors among refugees in Nakivale camp in southwestern Uganda. BMC psychiatry. 2020;20:1-10.
186. Im H, Swan LE, Warsame AH, Isse MM. Risk and protective factors for comorbidity of PTSD, depression, and anxiety among Somali refugees in Kenya. International journal of social psychiatry. 2022;68(1):134-46.
187. Ehlers CL, Yehuda R, Gilder DA, Bernert R, Karriker-Jaffe KJ. Trauma, historical trauma, PTSD and suicide in an American Indian community sample. Journal of psychiatric research. 2022;156:214-20.

188. Cougle JR, Resnick H, Kilpatrick DG. A prospective examination of PTSD symptoms as risk factors for subsequent exposure to potentially traumatic events among women. Journal of abnormal psychology. 2009;118(2):405.
189. Ng LC, Medhin G, Hanlon C, Fekadu A. Trauma exposure, depression, suicidal ideation, and alcohol use in people with severe mental disorder in Ethiopia. Social psychiatry and psychiatric epidemiology. 2019;54:835-42.
190. Berg MK, Hobkirk AL, Joska JA, Meade CS. The role of substance use coping in the relation between childhood sexual abuse and depression among methamphetamine users in South Africa. Psychological trauma: theory, research, practice, and policy. 2017;9(4):493.
191. Possemato K, Maisto SA, Wade M, Barrie K, Johnson EM, Ouimette PC. Natural course of co-occurring PTSD and alcohol use disorder among recent combat veterans. Journal of Traumatic Stress. 2017;30(3):279-87.
192. Porche MV, Costello DM, Rosen-Reynoso M. Adverse family experiences, child mental health, and educational outcomes for a national sample of students. School Mental Health. 2016;8:44-60.
193. Chu T, Keller AS, Rasmussen A. Effects of post-migration factors on PTSD outcomes among immigrant survivors of political violence. Journal of immigrant and minority health. 2013;15:890-7.
194. Andersen TE, Elklit A, Vase L. The relationship between chronic whiplash-associated disorder and post-traumatic stress: attachment-anxiety may be a vulnerability factor. European Journal of Psychotraumatology. 2011;2(1):5633.
195. McDermott MJ, Fulwiler JC, Smitherman TA, Gratz KL, Connolly KM, Tull MT. The relation of PTSD symptoms to migraine and headache-related disability among substance dependent inpatients. Journal of behavioral medicine. 2016;39:300-9.
196. Swendsen J, Conway KP, Degenhardt L, Glantz M, Jin R, Merikangas KR, et al. Mental disorders as risk factors for substance use, abuse and dependence: results from the 10-year follow-up of the National Comorbidity Survey. Addiction. 2010;105(6):1117-28.
197. Boarts JM, Sledjeski EM, Bogart LM, Delahanty DL. The differential impact of PTSD and depression on HIV disease markers and adherence to HAART in people living with HIV. AIDS and Behavior. 2006;10:253-61.
198. Drescher KD, Rosen CS, Burling TA, Foy DW. Causes of death among male veterans who received residential treatment for PTSD. Journal of Traumatic Stress: Official Publication of The International Society for Traumatic Stress Studies. 2003;16(6):535-43.
199. North CS, Smith EM. Posttraumatic stress disorder among homeless men and women. Psychiatric Services. 1992;43(10):1010-6.
200. Taft CT, Pless AP, Stalans LJ, Koenen KC, King LA, King DW. Risk factors for partner violence among a national sample of combat veterans. Journal of consulting and clinical psychology. 2005;73(1):151.
201. Dutton CE, Adams T, Bujarski S, Badour CL, Feldner MT. Posttraumatic stress disorder and alcohol dependence: Individual and combined associations with social network problems. Journal of anxiety disorders. 2014;28(1):67-74.
202. Mericle AA, Park VMT, Holck P, Arria AM. Prevalence, patterns, and correlates of co-occurring substance use and mental disorders in the United States: Variations by race/ethnicity. Comprehensive Psychiatry. 2012;53(6):657-65.
203. Anda RF, Felitti VJ, Bremner JD, Walker JD, Whitfield C, Perry BD, et al. The enduring effects of abuse and related adverse experiences in childhood: A convergence of evidence from neurobiology and epidemiology. European archives of psychiatry and clinical neuroscience. 2006;256:174-86.
204. Molnar BE, Buka SL, Kessler RC. Child sexual abuse and subsequent psychopathology: results from the National Comorbidity Survey. American journal of public health. 2001;91(5):753.
205. Cameron C, Watson D, Robinson J. Use of a synthetic cannabinoid in a correctional population for posttraumatic stress disorder–related insomnia and nightmares, chronic pain, harm reduction, and other indications: a retrospective evaluation. Journal of clinical psychopharmacology. 2014;34(5):559-64.

206. Davis TA, Jovanovic T, Norrholm SD, Glover EM, Swanson M, Spann S, et al. Substance use attenuates physiological responses associated with PTSD among individuals with co-morbid PTSD and SUDs. Journal of psychology & psychotherapy. 2013:006.
207. Weich L, Pienaar W. Occurrence of comorbid substance use disorders among acute psychiatric inpatients at Stikland Hospital in the Western Cape, South Africa. African journal of psychiatry. 2009;12(3):213-7.
208. Pasche S, Myers B. Substance misuse trends in South Africa. Human Psychopharmacology: Clinical and Experimental. 2012;27(3):338-41.
209. Seedat S, Williams DR, Herman AA, Moomal H, Williams SL, Jackson PB, et al. Mental health service use among South Africans for mood, anxiety and substance use disorders: mental health. South African Medical Journal. 2009;99(5):346-52.
210. Cross D, Crow T, Powers A, Bradley B. Childhood trauma, PTSD, and problematic alcohol and substance use in low-income, African-American men and women. Child abuse & neglect. 2015;44:26-35.
211. Crenshaw K. Demarginalizing the intersection of race and sex: A black feminist critique of antidiscrimination doctrine, feminist theory and antiracist politics. Feminist legal theories: Routledge; 2013. p. 23-51.
212. Hankivsky O, Christoffersen A. Intersectionality and the determinants of health: a Canadian perspective. Critical Public Health. 2008;18(3):271-83.
213. Collins PH. Black feminist thought: Knowledge, consciousness, and the politics of empowerment: routledge; 2022.
214. Veenstra G. Race, gender, class, and sexual orientation: intersecting axes of inequality and self-rated health in Canada. International journal for equity in health. 2011;10:1-11.
215. Ross LE, O'Gorman L, MacLeod MA, Bauer GR, MacKay J, Robinson M. Bisexuality, poverty and mental health: A mixed methods analysis. Social Science & Medicine. 2016;156:64-72.
216. Sallis JF, Owen N, Fisher E. Chapter 20: Ecological models of heath behavior. Health behavior and health education: Theory, research and practice. 2008;4.
217. Stokols D. Establishing and maintaining healthy environments: Toward a social ecology of health promotion. American psychologist. 1992;47(1):6.
218. Inequities and Intersectionality: NASTAD; [Available from: https://nastad.org/inequities-and-intersectionality.
219. Lewis G, Bebbington P, Brugha T, Farrell M, Gill B, Jenkins R, et al. Socio-economic status, standard of living, and neurotic disorder. International Review of Psychiatry. 2003;15(1-2):91-6.
220. Araya R, Rojas G, Fritsch R, Acuña J, Lewis G. Common mental disorders in Santiago, Chile: prevalence and socio-demographic correlates. The British Journal of Psychiatry. 2001;178(3):228-33.
221. Kebede D, Alem A. Major mental disorders in Addis Ababa, Ethiopia. I. Schizophrenia, schizoaffective and cognitive disorders. Acta Psychiatrica Scandinavica. 1999;100:11-7.
222. Mahal A, Karan A, Engelgau MM. The economic implications of non-communicable disease for India. 2010.
223. Jenkins R, Bhugra D, Bebbington P, Brugha T, Farrell M, Coid J, et al. Debt, income and mental disorder in the general population. Psychological medicine. 2008;38(10):1485-93.
224. Patel V, Chisholm D, Kirkwood BR, Mabey D. Prioritizing health problems in women in developing countries: comparing the financial burden of reproductive tract infections, anaemia and depressive disorders in a community survey in India. Tropical medicine & international health. 2007;12(1):130-9.
225. Tirfessa K, Lund C, Medhin G, Hailemichael Y, Fekadu A, Hanlon C. Food insecurity among people with severe mental disorder in a rural Ethiopian setting: a comparative, population-based study. Epidemiology and psychiatric sciences. 2019;28(4):397-407.
226. Gresenz CR, Sturm R. New dimensions of economic well-being among people with mental illness: evidence from Healthcare for Communities. Health Services Research. 2000;35(5 Pt 3):32.
227. Trani J-F, Bakhshi P, Kuhlberg J, Narayanan SS, Venkataraman H, Mishra NN, et al. Mental illness, poverty and stigma in India: a case–control study. BMJ open. 2015;5(2):e006355.
228. Kim AW, Said Mohamed R, Norris SA, Naicker S, Richter LM, Kuzawa CW. Childhood adversity during the post-apartheid transition and COVID-19 stress independently predict adult PTSD

risk in urban S outh A frica: A biocultural analysis of the stress sensitization hypothesis. American journal of biological anthropology. 2023;182(4):620-31.
229. Zimmerman A, Halligan S, Skeen S, Morgan B, Fraser A, Fearon P, et al. PTSD symptoms and cortisol stress reactivity in adolescence: Findings from a high adversity cohort in South Africa. Psychoneuroendocrinology. 2020;121:104846.
230. Choi KW, Sikkema KJ, Velloza J, Marais A, Jose C, Stein DJ, et al. Maladaptive coping mediates the influence of childhood trauma on depression and PTSD among pregnant women in South Africa. Archives of women's mental health. 2015;18:731-8.
231. Mutola S, Gómez-Olivé FX, Ng N. The path between socioeconomic inequality and cognitive function: A mediation analysis based on the HAALSI cohort in rural South Africa. Frontiers in Public Health. 2023;11:1011439.
232. Lorant V, Deliège D, Eaton W, Robert A, Philippot P, Ansseau M. Socioeconomic inequalities in depression: a meta-analysis. American journal of epidemiology. 2003;157(2):98-112.
233. Bauer M, Glenn T, Rasgon N, Marsh W, Sagduyu K, Munoz R, et al. Association between median family income and self-reported mood symptoms in bipolar disorder. Comprehensive psychiatry. 2011;52(1):17-25.
234. Gómez-Olivé FX, Montana L, Wagner RG, Kabudula CW, Rohr JK, Kahn K, et al. Cohort Profile: Health and Ageing in Africa: A Longitudinal Study of an INDEPTH Community in South Africa (HAALSI). International Journal of Epidemiology. 2018;47(3):689-90j.
235. Payne CF, Mall S, Kobayashi L, Kahn K, Berkman L. Life-course trauma and later life mental, physical, and cognitive health in a postapartheid South African population: Findings from the HAALSI study. Journal of aging and health. 2020;32(9):1244-57.
236. Harvard Center for Population and Development Studies: HAALSI Wave 1 Dried Blood Spot for C-Reactive Protein. 2019.
237. Harvard Center for Population and Development Studies (Harvard T.H. Chan School of Public Health: HAALSI Wave 3 Survey Harvard Dataverse. 2023.
238. Kahn K, Collinson MA, Gómez-Olivé FX, Mokoena O, Twine R, Mee P, et al. Profile: Agincourt health and socio-demographic surveillance system. International journal of epidemiology. 2012;41(4):988-1001.
239. Breslau N, Peterson EL, Kessler RC, Schultz LR. Short screening scale for DSM-IV posttraumatic stress disorder. American Journal of Psychiatry. 1999;156(6):908-11.
240. Steptoe A, Breeze E, Banks J, Nazroo J. Cohort profile: the English longitudinal study of ageing. International journal of epidemiology. 2013;42(6):1640-8.
241. Heeringa S, Wells J, Hubbard F, Mneimneh Z, Chiu W, Sampson N, et al. Sample designs and sampling procedures In Kessler RC & Üstün TB (Eds.), The WHO world mental health surveys: Global perspectives on the epidemiology of mental disorders. Cambridge, England: Cambridge University Press.[Google Scholar]; 2008.
242. Household Food Insecurity Access Scale (HFIAS): International Dietary Data Expansion Project; [Available from: https://inddex.nutrition.tufts.edu/data4diets/indicator/household-food-insecurity-access-scale-hfias.
243. Maluleke R. Measuring Food Security in South Africa:

Applying the Food Insecurity Experience Scale. 2020. Report No.: 03-00-19.
244. Calitz F, De Jongh N, Horn A, Nel M, Joubert G. Children and adolescents treated for post-traumatic stress disorder at the Free State Psychiatric Complex. South African Journal of Psychiatry. 2014;20(1):15-20.
245. Ndlovu S, Mulondo M, Tsoka-Gwegweni J, Ndirangu J. COVID-19 impact on gender-based violence among women in South Africa during lockdown: A narrative review. African journal of reproductive health. 2022;26(7):59-71.
246. Kotzé C. Elder abuse—The current state of research in South Africa. Frontiers in public health. 2018;6:358.
247. Bromet E, Sonnega A, Kessler RC. Risk factors for DSM-III-R posttraumatic stress disorder: findings from the National Comorbidity Survey. American journal of epidemiology. 1998;147(4):353-61.

248. Roberts AL, Austin SB, Corliss HL, Vandermorris AK, Koenen KC. Pervasive trauma exposure among US sexual orientation minority adults and risk of posttraumatic stress disorder. American journal of public health. 2010;100(12):2433-41.
249. Mathee A, Moyes J, Mkhencele T, Kleynhans J, Language B, Piketh S, et al. Housing quality in a rural and an urban settlement in South Africa. International journal of environmental research and public health. 2021;18(5):2240.
250. Maluleke R. Assessing food inadequacy and hunger in

South Africa in 2021 using the General

Household Survey (GHS). 2023. Report No.: 03-00-20.
251. Rumble S, Swartz L, Parry C, Zwarenstein M. Prevalence of psychiatric morbidity in the adult population of a rural South African village. Psychological medicine. 1996;26(5):997-1007.
252. Kaminer D, Eagle G, Crawford-Browne S. Continuous traumatic stress as a mental and physical health challenge: Case studies from South Africa. Journal of health psychology. 2018;23(8):1038-49.
253. Harper A, Goudge J, Chirwa E, Rothberg A, Sambu W, Mall S. Dietary diversity, food insecurity and the double burden of malnutrition among children, adolescents and adults in South Africa: findings from a national survey. Frontiers in Public Health. 2022;10:948090.

APPENDICES

Appendix 1

Data variables collected in HAALSI cohort household surveys (234)

Table 1. Data collected during household and individual interviews in the HAALSI study in Agincourt, South Africa

INDIVIDUAL		
Demographics	**Employment**	**Social conditions**
Age	Employment status	Social networks, social support, interactions
Sex	Occupation	Caregiving/care receiving
Education	Wages	**Psychological well-being**
Marital status	Income for unemployment:	Gallup (Well-being)
Religion	Insurance	Center for Epidemiological Studies Depression scale
Nationality	Disability/pensions	Post-traumatic stress disorder
Ethnicity		**Expectations**
		Survival
		HIV infection
Cognition	**Self-reported health**	**Health behaviours**
Orientation	Vision and hearing	Tobacco use
Word recall	Diagnosis and treatment:	Alcohol consumption
Immediate	Hypertension	Diet (fruit, vegetables, bread, soft drinks)
Delayed	Glycaemia	International Physical Activity Questionnaire
Numeracy, number series	HIV	Vigorous, moderate exercise, sedentary activity
Self-rated memory	TB	Sexual behaviour
	Stroke	Morisky Medication Adherence Scale
	Angina	
	Myocardial infarction	
	High cholesterol	
	Kidney disease	
	Male circumcision	
	Brief Pain Inventory	
	Pittsburgh Sleep Quality Index	
	Activities of Daily Living	
Health care utilization	**Physical examinations: function**	**Point of care: blood assays**
Type of health facility used	Blood pressure	Total cholesterol, HDL, LDL, Triglycerides
Number of visits	Pulse	Glucose
	Grip strength	Haemoglobin
	Height and weight	HIV
	Body mass index	Viral load
	Waist and hip circumference,	Antiretroviral therapy (3TC, FTC)
	Waist-hip ratio	High-sensitivity C-reactive protein
	Walk time	
	Balance	
HOUSEHOLD		
Members	**Consumption**	**Income and assets**
Age	Food	Household member employment status
Sex	Communication	Household member wages
Relationship to household head	Transport	Business
Education	Rent, mortgage	Subsidies, pensions
	Consumables	Gifts
	Celebrations, funerals	Rentals
	Education	Durable goods (TV, fridge . . .)
	Health care	Properties (dwelling, land . . .)
	Transfers (including charity)	Livestock

Table 2. Anthropometry, physical performance and point of care measures, procedures for data collection and threshold values

Anthropometry	Equipment	Field procedures	Thresholds: measurements	
Blood pressure[50]	Omron©	Three measurements, 2 min apart, after 5-min rest. Final blood pressure: average of second and third measures	Hypertension: diastolic ≥ 90 OR systolic ≥ 140 OR on hypertension medication	
Waist circumference[51]	SECA© flexible tape	Tape at the navel, waist measured at mid distance between the iliac crest and the lowest rib, on a horizontal plane with participant standing	Men: Women:	Increased: ≥ 94 cm AND < 102 cm; Substantially increased: ≥12 0 cm Increased: ≥80 cm AND < 88 cm; Substantially increased: ≥88 cm
Hip circumference	SECA© flexible tape	Tape at the hip joint, circle around the widest portion of the buttocks on a horizontal plane with participant standing		
Waist/hip ratio[51]		Ratio of the waist and hip measurement	Men: Women:	Increased waist/hip ratio: ≥0.90 Increased waist/hip ratio: ≥0.85
Height	Genesis Growth Management Scale©, Patient Focus Africa	Measured in centimetres with one decimal point, using a height sensor placed on top of participant's head connected via infrared to the weight scale		
Weight	Genesis Growth Management Scale©, Patient Focus Africa	Measured in kilograms with one decimal point		
Body mass index (BMI)[52]		Weight in kilograms / (height in metres)[2]	Underweight < 18.5; normal 18.5–24.9	Overweight 25–29.9; obese > 30.00
Physical Performance				
Walking course	Century digital timer: Jumbo©	Participant walks 2.5 m, and repeats, at their usual speed using any walking aid needed	Mean walk time (5 m/s) = 5/(time 1 + time 2)	
Semi-tandem		Participant stands with the heel of one foot beside the other, touching the toe of the other foot and holds for 10 s		
Tandem		If semi-tandem was completed: participant stands with the heel of one foot touching the toe of the other foot, with feet in one line and holds for 60 s i < 70 years of age, or 30 s if >70 years		
Side by side		If semi-tandem was not completed: participant stands with both feet together, side by side, with the inside of both feet touching, and holds for 10 s		
Grip strength	Smedley© Digital Hand Dynamometer (12–0286)	Participant sits upright with feet flat on the floor, legs uncrossed and elbow at a 90-degree angle with arm close to body and forearm parallel to the floor. Results of grip recorded in kg with one decimal point	Mean of the 2 measures per hand if difference between measures is <10 kg; strongest measure per hand if mean difference >10 kg	
Point of care				
Total cholesterol, LDL, HDL, triglycerides[53,54]	Cardio Chek© PA (Silver version)	Finger prick using PTS Panel #1710 lipid panel test strips	High total cholesterol > 6.21 mmol/L, high LDL > 4.1 mmol/L	Low HDL < 1.19 mmol/L, high triglycerides > 1.7 mmol/L

(continued)

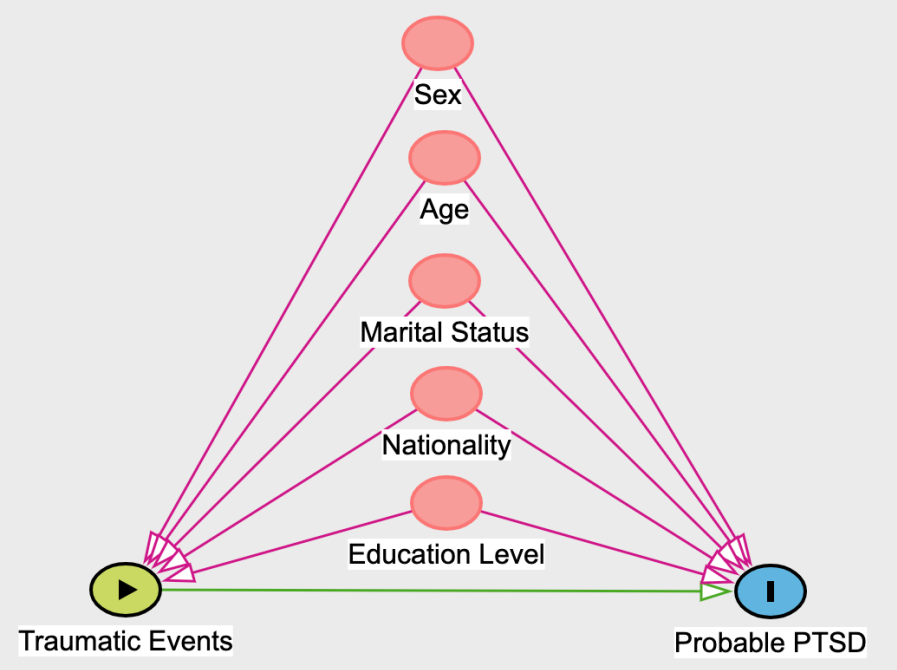
Table 2. Continued

Anthropometry	Equipment	Field procedures	Thresholds: measurements	
Glycaemia[55]	CareSens© N Monitor	CareSens N blood glucose test strips	Diabetes:	Glucose ≥ 11.1 mmol/L no fasting Glucose ≥ 7 mmol/L fasting Glucose < 7 mmol/L on diabetes medication
Haemoglobin[56]	Hemocue© Hb 201 + Analyser	Finger prick using Hemocue Hb 201 + microcuvette	Men:	Normal > 12.9 g/dl; mild anaemia ≤ 12.9 g/dl and ≥11 g/dl, moderate anaemia < 11 g/dl and ≥ 8 g/dl
			Women:	Normal > 11.9 g/dl, mild anaemia ≤ 11.9 g/dl and ≥ 11 g/dl, moderate anaemia < 11 g/dl and ≥8 g/dl, severe anaemia <8 g/dl

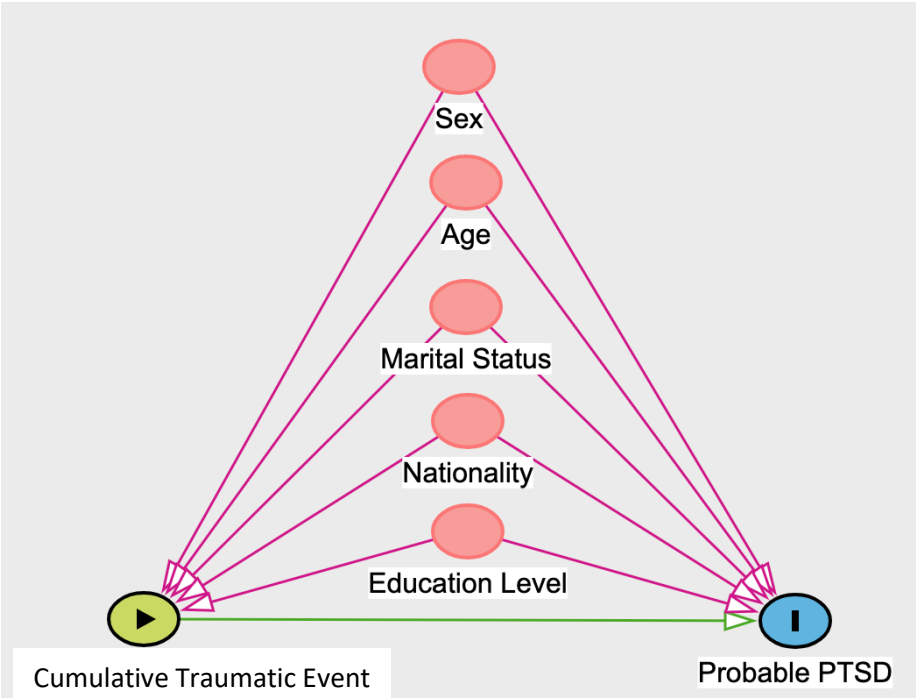
Appendix 2

Directed Acyclic Graphs

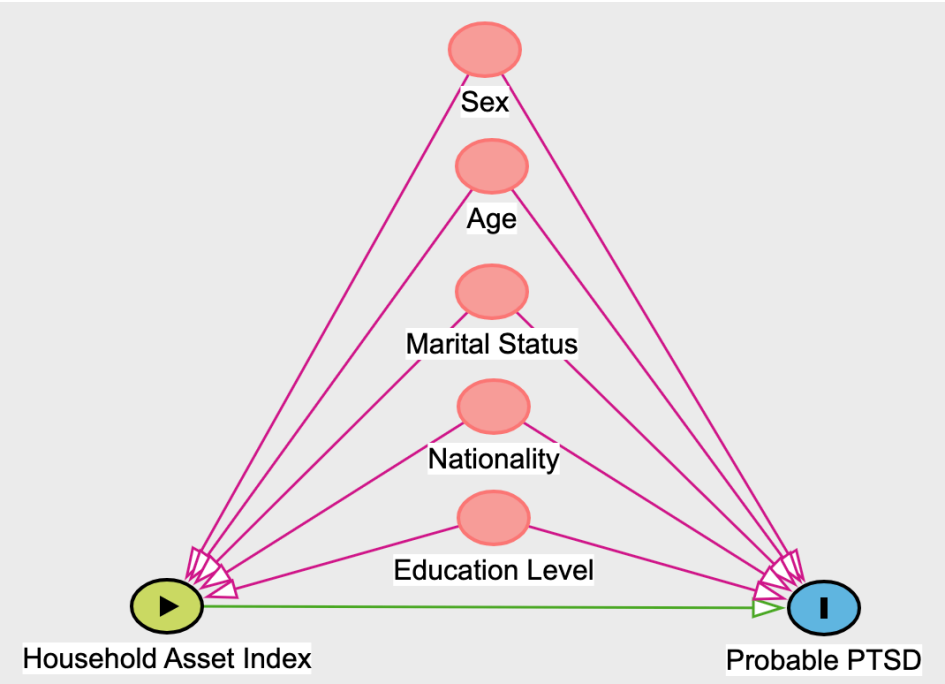
A DAG presenting the relationship between Traumatic Events and PTSD including associations of socio-demographics



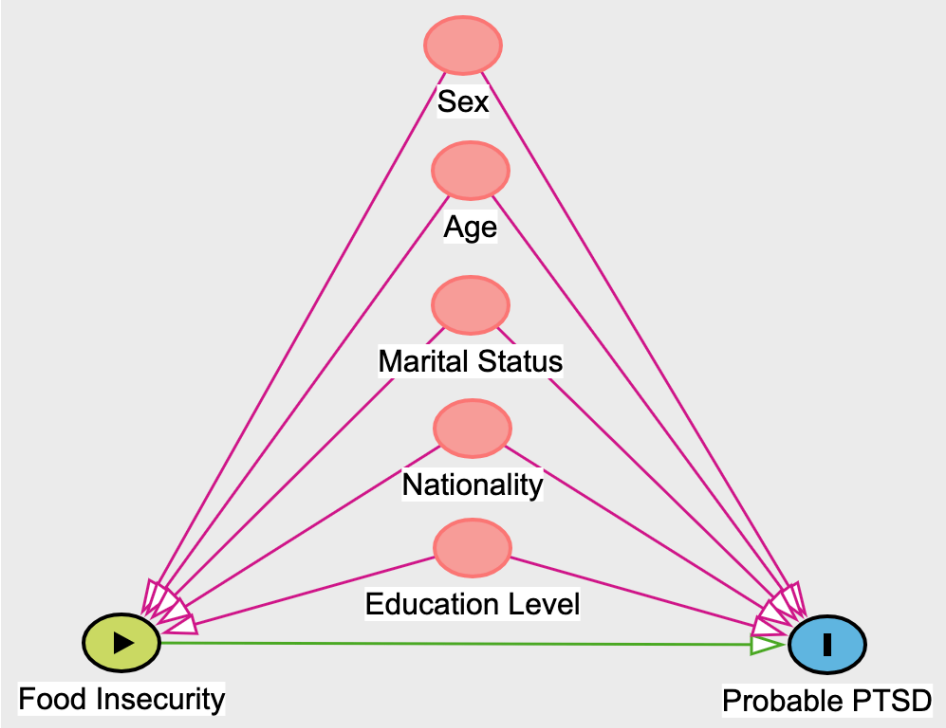
A DAG presenting the relationship between Cumulative Traumatic Event and PTSD including associations of socio-demographics



A DAG presenting the relationship between Household Asset Index and PTSD including associations of socio-demographics



A DAG presenting the relationship between Food Insecurity and PTSD including associations of socio-demographics



Appendix 3

Ethics Approval Form

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG	HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)

Office of the Deputy Vice-Chancellor (Research and Innovation)

TO: Ms M de Freitas
School of Public Health
Division of Epidemiology and Biostatistics
Faculty of Health Sciences

E-mail: 1835922@students.wits.ac.za

CC: Supervisor: Professor S Mall
Sumaya.Mall@wits.ac.za
and <HREC-Medical Research Office@wits.ac.za>

FROM: Mr Iain Burns
Human Research Ethics Committee (Medical)
Tel: 011 717 1252

E-mail: Iain.Burns@wits.ac.za

DATE: 16 July 2024

REF: R14/49

PROTOCOL NO: **M240667** (This is your ethics application reference number. Please quote it in all enquiries, oral or written, relating to this study.)

PROJECT TITLE: *The effect of income and food insecurity on post-traumatic stress disorder amongst adults aged =/> 40 years in Agincourt sub-district, Mpumalanga, South Africa: 2021/22*

Please find attached the Clearance Certificate for the above project. I hope it goes well and that an article in a recognized publication comes out of it. This will reflect well on your professional standing and contribute to Government funding of the University.

MSWorks2000/Iain0007/Clearscan.wps

UNIVERSITY OF THE WITWATERSRAND JOHANNESBURG

R49 Ms M de Freitas

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
CLEARANCE CERTIFICATE NO. M240667

NAME: (Principal Investigator) Ms M de Freitas **DEGREE:** MSc

DEPARTMENT: School of Public Health
Division of Epidemiology and Biostatistics
Faculty of Health Sciences

TITLE: *The effect of income and food insecurity on post-traumatic stress disorder amongst adults aged =/> 40 years in Agincourt sub-district, Mpumalanga, South Africa: 2021/22*

DATE CONSIDERED: Ad hoc

DECISION: Approved unconditionally

CONDITIONS: Sub-study under M21/01/23

NOTE: If contact information regarding student study participants is required, please contact the Registrar's office <Nicoleen.Potgieter@wits.ac.za>

SUPERVISORS: Professor S Mall

APPROVED BY:
Professor P Ruff, Chairperson, HREC (Medical)

DATE OF APPROVAL: 16 July 2024 **EXPIRY DATE:** 15 July 2029

This Clearance Certificate is valid for 5 years from the date of approval. An extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Research Office secretariat on the 3rd floor, Phillip Tobias Building, Parktown, University of the Witwatersrand, Johannesburg.

I/we fully understand the conditions under which I am/we are authorized to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated from the research protocol as approved, I/we undertake to submit details to the Committee. **I agree to submit a yearly progress report** in the format available at https://wits.ac.za/research/researcher-support/research-ethics/ethics-committees/. This report is due annually, for the duration of the Clearance Certificate, beginning on the first anniversary of Date of Approval above. Unreported changes to the study may invalidate the clearance given by the HREC (Medical).

Signature of Principal Investigator Date

Appendix 4

Extended result findings

Univariate analysis of the relationship between socio-demographic and traumatic events and risk of PTSD

Variable	Category	Univariate analysis		
		Unadjusted OR	95% CI	p-Value
Age	40 – 49 years			
	50 – 59 years	0.53	0.22 – 1.26	0.380
	60 – 69 years	0.86	0 .39 – 1.91	0.839
	70 – 79 years	0.55	0.23 – 1.32	0.373
	80+ years	0.02	0.39 – 2.24	0.864
Sex	Male			
	Female	0.83	0.54 – 1.30	0.418
Nationality	South African			
	Mozambican or other	0.82	0.49 – 1.35	0.428
Marital status	Single			
	Separated/ Divorced	1.40	0.48 – 4.08	0.539
	Widowed	1.22	0.47 – 3.17	0.680
	Married/Cohabitating	1.04	0.01– 2.68	0.941
Education level	No formal education			
	Primary (1 – 7 years)	1.62	0.98 – 2.70	0.061
	Secondary (8 – 11 years)	1.13	0.52 – 2.43	0.758
	Secondary or more (12+ years)	1.48	0.69 – 3.18	0.319
Traumatic events (TEs)	**Childhood environment**			
	Parental unemployment (age <16)	0.64	0.30 – 1.33	0.231
	Parents often argue (age <16)	0.96	0.53 – 1.72	0.878
	Parents often drink/use drugs (age <16)	0.90	0.49 – 1.64	0.725
	Physically abused by parents (age <16)	1.02	0.61 – 1.70	0.947
	Experienced at least 1 childhood environment TE	**0.85**	**0.53 – 1.35**	**0.483**
	Social/family environment			
	Close family addicted to drugs/alcohol	7.54	3.92 – 14.53	0.001
	Provided long-term care to disabled friend/relative	1.88	0.74 – 4.72	0.184
	Experienced severe financial hardship	1.54	0.92 – 2.60	0.101
	Experienced at least 1 social/family environment TE	**1.92**	**1.10 – 3.36**	**0.022**
	Illness/accident/disaster			
	Had a life-threatening illness or accident	2.54	1.52 – 4.26	0.001
	Close friend/family injured or killed from serious accident or injury	2.10	1.23 – 3.59	0.007
	Experienced a major natural disaster	1.00	0.56 – 1.75	0.974
	Experienced at least 1 illness/accident/disaster TE	**1.58**	**1.00 – 2.48**	**0.049**
	Community violence			
	Victim of serious physical attack	3.30	1.55 – 7.03	0.002
	Witness violent act causing injury/death not in war	2.73	1.60 – 4.67	0.001
	Victim of sexual assault	2.93	0.89 – 9.65	0.078
	Experienced at least 1 community violence TE	**3.15**	**1.94 – 5.10**	**0.001**
	War violence			
	Fired a weapon in combat or been fired upon	4.50	1.56 – 12.92	0.005
	Witness serious injury/death in combat	6.49	3.53 – 11.94	0.001
	Lost close friend/relative in war	2.66	1.26 – 5.64	0.011
	Experienced at least 1 war violence TE	**4.78**	**2.80 – 8.15**	**0.001**
	Experienced at least 1 TE	**1.99**	**0.95 – 4.14**	**0.068**

Appendix 5

Turnitin Report

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ORIGINALITY REPORT

15%	11%	13%	3%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

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6	hdl.handle.net Internet Source	<1%
7	Jane Ndungu, Leane Ramsoomar, Samantha Willan, Laura Washington, Magnolia Ngcobo-Sithole, Andrew Gibbs. "Depression, posttraumatic stress disorder (PTSD) and their comorbidity: Implications of adversity amongst young women living in informal	<1%

