TRAUMA AND POSTTRAUMATIC STRESS DISORDER IN SOUTH AFRICA

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Declaration

I, Dr Lukoye Atwoli, hereby declare that the work on which this thesis is based is my original work (except where acknowledgements indicate otherwise) and that neither the whole work nor any part of it has been, is being, or is to be submitted for another degree in this or any other university. I authorize the University to reproduce for the purpose of research either the whole or any portion of the contents in any manner whatsoever.

Signed by candidate

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ABBREVIATIONS

CIDI- Composite International Diagnostic Interview

HIV/AIDS- Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome

MDD- Major Depressive Disorder

OR- Odds Ratio

PTSD- Posttraumatic stress disorder

SASH- South African Stress and Health Study

SE- Standard Error

TB- Tuberculosis

TE- Traumatic Event

WHO- World Health Organisation

WMHS- World Mental Health Surveys

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PREFACE

My interest in trauma and PTSD dates back to 2003 when I enrolled for the MMed Psychiatry degree at the University of Nairobi. For my research proposal, I chose to study PTSD among survivors of the Mau Mau concentration camps in Kenya, and this work launched me into an appreciation of the impact of trauma and PTSD in the human life course. My work with the old men and women associated with Kenya's freedom struggle heightened my sense that if the impact of trauma is not documented across the African continent, we will continue living in a vicious cycle in which trauma begets more trauma without any hope of escape.

After graduation as a psychiatrist I continued seeking opportunities to study trauma and PTSD, and when I started working at Moi University I joined a local research group and participated in a grant tracking the physical and mental health of orphans and separated children in Eldoret, western Kenya. The amount of trauma and PTSD we documented convinced me that more needed to be done in this area.

I met Prof Dan Stein for the first time in August 2011 at a conference organised by the Kenya Psychiatric Association and the African Association of Psychiatrists and Allied Professionals. Over dinner, we discussed the state of research in Africa, and on learning of my interest in trauma and PTSD he offered to help me conduct more research in the area.

Later he accepted my application for a PHD at the University of Cape Town, and helped me navigate the regulations for registration and commencement of my studies. He also introduced me to a research consortium spanning dozens of countries across the world, the World Mental Health Surveys Consortium. Through this group I have met the most dedicated and resourceful people in my entire life, and I have learnt more than I would have learnt had I not taken up the opportunity offered by Prof Stein.

I am grateful for the role UCT has played in my professional life, and will always treasure the experience I have gained working on this PHD project.

ABSTRACT

Objective: The main aim of this thesis is to analyze data from the South African Stress and Health (SASH) study and, for the first time, generate information on the epidemiology of traumatic events (TEs) and posttraumatic stress disorder (PTSD), and on the association of TEs with other psychopathological and physical health outcomes.

Methods: A literature review was done to provide information current knowledge in the field. Cross-tabulations, Chi-squared tests and logistic regression analyses were then conducted SASH data to determine the prevalence of the different types of trauma and PTSD and the associations between the sociodemographic variables and TEs and PTSD on the one hand, and TEs and PTSD, other psychopathology and chronic physical conditions on the other.

Results: The most common traumatic events were the unexpected death of a loved one and witnessing trauma. Lifetime prevalence of PTSD was 2.3%, and the conditional prevalence of PTSD after trauma exposure was 3.5%. PTSD conditional risk and burden were both highest for witnessing trauma. Witnessing trauma was commonest among males and those with low-average education. There was statistically significant association between witnessing and PTSD, mood, and anxiety disorders. Exposure to any TE significantly increased the odds of all the physical conditions, and the odds of having a physical condition were directly related to the number of lifetime traumatic events. Sexual violence and unexpected death of a loved one significantly increased the odds of all the physical conditions assessed, while war events were only associated with respiratory conditions. Apart from war events, accidents and witnessing trauma were associated with the fewest physical conditions.

Conclusions: Consistent with the literature, trauma and PTSD in South Africa are not distributed according to the socio-demographic factors or trauma types observed in other countries. Witnessing trauma is common in South Africa and increases the risk of mood and anxiety disorders. Finally, TE exposure is associated with chronic physical conditions in a dose-response manner. Trauma interventions must therefore focus also on those not directly affected, and routine evaluation for chronic physical conditions is recommended for survivors of all trauma.

EXECUTIVE SUMMARY

Background

Although mental disorders are amongst the 10 leading causes of disease burden and disability in low and middle-income countries, relatively few epidemiologic studies of population representative samples exist. Specifically, little is known about the community prevalence of trauma exposure and posttraumatic stress disorder in these settings. Previous studies have focused on specific traumatic events, or on general outcomes of trauma exposure such as nonspecific psychological distress. Further, little research has been conducted on other psychopathological and physical health outcomes of traumatic exposures in Africa and other low and middle-income settings.

The South African Stress and Health Study (SASH) was the first nationally representative study in Africa to describe psychiatric morbidity and associated factors. Information collected during this study includes exposure to traumatic events (TEs), and the occurrence of PTSD and other psychiatric and general medical conditions after trauma exposure. This thesis analysed SASH data to provide new information on the prevalence and distribution of TE exposure and PTSD, the relationship between witnessing trauma (the TE responsible for the greatest risk for and burden of PTSD In South Africa) and psychopathology other than PTSD, and the relationship between TE exposure and chronic physical conditions.

Objective

The main aim of this thesis is to analyze the SASH data and generate information on the prevalence and determinants of TEs and PTSD, as well as other psychopathological and physical health outcomes of trauma exposure.

Specific objectives

1. To review the literature on trauma and PTSD relevant to South Africa, examining specifically for predictors and outcomes of trauma exposure, including general psychiatric morbidity and different aspects of PTSD.

2. To establish the epidemiology of trauma exposure and PTSD in the SASH. This analysis included identification of the traumatic events that account for the greatest proportion of the public health burden of PTSD in South Africa.

3. To examine the relationship between trauma exposure and other mental disorders, in order to establish whether the traumatic events that account for the greatest burden of PTSD in South Africa increase the risk of other mental disorders.

4. To determine the relationship between trauma, PTSD and physical health. This analysis examined whether traumatic events are associated with greater risk of specific physical health complaints as well as a larger burden of physical health problems overall and whether this association is mediated by PTSD.

Methodology

A literature review was conducted to establish the state of knowledge on community prevalence of trauma exposure and PTSD, covering also the risk factors for both TEs and PTSD and psychopathological and physical health outcomes of trauma exposure (Specific objective 1). This review was updated to include a comparison of the paper published pursuant to Specific Objective 2 with other studies from elsewhere.

Data on TE exposure, PTSD, other psychiatric morbidity and general medical conditions were extracted from the SASH dataset for purposes of analyses. The World Health Organization (WHO) Composite International Diagnostic Interview (CIDI) was used in the SASH to generate psychiatric diagnoses based on the Diagnostic and Statistical Manual of Mental Disorders (DSM IV) and chronic physical conditions.

Cross-tabulations were used to examine the prevalence TEs and conditional prevalence of PTSD given TE exposure. A series of logistic regression models were generated to assess the predictors of lifetime and 12-month PTSD (Specific Objective 2). Chi-squared analyses were used to determine the association between witnessing and sociodemographic variables as well as lifetime mood, anxiety and substance use disorders. Logistic regression models were generated to establish odds of the psychiatric disorders given witnessing status (Specific Objective 3). Finally, Rao-Scott Chi-square tests were used to assess the relationship between sociodemographic variables and TEs as well as physical conditions, and logistic regression models generated to examine the odds of developing physical conditions given TE exposure (Specific Objective 4).

Results

The review of literature revealed that recent community studies have indicated that trauma and PTSD risk factors are distributed differently in South Africa compared to high-income countries. Unlike in the latter where sexual and physical violence play a bigger role in PTSD risk, in South Africa witnessing trauma is associated with significant morbidity and a particularly high conditional risk of PTSD. Association with socio-demographic factors is less prominent in South Africa.

In the first analysis, the most common traumatic events were the unexpected death of a loved one and witnessing trauma occurring to others. Lifetime and 12-month prevalence rates of PTSD were 2.3% and 0.7% respectively, while the conditional prevalence of PTSD after trauma exposure was 3.5%. PTSD conditional risk and burden were both highest for witnessing trauma. Socio-demographic factors such as sex, age and education were largely unrelated to PTSD risk.

Further analysis examined the association between witnessing traumatic events and psychopathology. In this analysis, witnessing was more commonly reported among males and those with low-average education. Witnessing was associated with posttraumatic stress disorder, mood, and anxiety disorders as well as with a higher number of traumatic events when compared to other types of traumatic events.

The final analysis focused on the impact of trauma and posttraumatic stress disorder on physical health, specifically on arthritis, cardiovascular disease, respiratory disease, chronic pain and other conditions not included in these categories. Exposure to any TE significantly increased the odds of all the physical conditions, and the odds of having a physical condition were directly related to the number of lifetime traumatic events. Sexual violence and unexpected death of a loved one significantly increased the odds of all the physical conditions assessed, while physical violence was associated with all physical conditions except arthritis. Network events (involving people in one's social network) were associated with all conditions except respiratory conditions, while war events were only associated with respiratory conditions. Apart from war events, accidents and witnessing trauma were associated with the fewest physical conditions.

Conclusions

Consistent with literature suggesting variations in TE and PTSD distribution, the occurrence of trauma and PTSD in South Africa is not distributed according to the socio-demographic factors or trauma types observed in other countries. Further, witnessing trauma is common in the South African population and results in increased risk of mood and anxiety disorders. Finally, TE exposure is associated with chronic physical conditions in a dose-response manner, with sexual violence and unexpected death of a loved one being associated with all the physical conditions assessed.

Based on these findings, it is recommended that interventions aimed at reducing the burden of trauma and its outcomes must also focus on bystanders and other observers, rather than just focusing on those directly affected. Further, it is important to evaluate routinely physical health outcomes among survivors of TEs in the population.

1.0 INTRODUCTION

This section provides a background on the subject matter of this thesis. It provides an introduction on current research on trauma exposure and PTSD in South Africa (Sections 1.1), trauma and other psychopathology (Section 1.2) as well as physical conditions that arise after trauma exposure (Section 1.3). Section 1.4 discusses the methodological novelty of the SASH study while Section 1.5, presents the specific objectives of this thesis. This chapter closes with a description of the organization of the entire thesis (Section 1.6).

1.1 Trauma exposure and PTSD in South Africa

South Africa's history is unique in the sense that the country was in the past governed under a system of constitutional racial segregation and exploitation in the form of *apartheid*. The system was gradually dismantled towards the end of the 20th Century, giving way to a non-racial democracy in 1994 (1). This transition was achieved through a protracted liberation struggle, characterized by political violence and state-sponsored oppression. After *apartheid*, high levels of often criminal interpersonal violence continued, fuelled by rapid urbanization and ongoing socioeconomic disparities, that resulted in a high level of trauma exposure (1-6).

Violence and injuries are reported to be the second leading cause of death and lost disability-adjusted life years in South Africa, with an overall injury death rate of 157.8 per 100,000 population, nearly twice the global average (7). The rate of homicide of women by intimate partners has further been cited to be six times the global average (7).

Norman et al (1) reported that in the year 2000, interpersonal violence dominated the South African injury profile with age-standardized mortality rates at seven times the

global rate. The same study reported that injuries were the second-leading cause of loss of healthy life, accounting for 14.3% of all DALYs in South Africa in 2000. Similarly, a study in a primary care setting (2) reported a trauma exposure prevalence of 94%, with a mean TE exposure of 3.8 events. Emotional, physical and sexual abuse within the context of intimate relationships has also been reported to be relatively widespread in South African communities (3, 8), with physical violence rates as high as 28.4%. Trauma exposure among children and adolescents is also widespread, increasing the risk of psychiatric morbidity and further traumatization in later life (5, 6).

Despite the relative ubiquity of TEs in South Africa, very little research has been reported on posttraumatic psychiatric morbidity in the country. Two previous reports using national data reported only on nonspecific psychological distress associated with exposure to TEs (9) and the risk of PTSD associated with only one category of TEs, interpersonal violence (10).

Williams et al (9) found that trauma was positively related to high psychological distress, and individuals with the largest number of TE exposures also had the greatest distress. In this study, men were more likely to experience criminal victimization, political traumas, threats to their lives, and witnessing trauma, while women were more likely to report partner violence victimization, sexual assault, and trauma of close others (9).

Studying interpersonal violence in the same dataset, Kaminer et al (10) identified political detention and torture among men, and rape among women, were the forms of violence most strongly associated with PTSD. The forms of interpersonal violence associated with the greatest number of PTSD cases in the population were criminal assault and childhood abuse for men, and intimate partner violence among women.

No other studies have examined population-level factors associated with TE exposure and PTSD. However, studies among population subsets have reported relatively high prevalence rates of PTSD in South Africa. A primary care study reported that 19.9% of the respondents met criteria for PTSD (2), while Seedat et al found that 22.2% of South African school children had current PTSD (5). Perpetration of Human rights violations has also been strongly associated with PTSD (11), as have sociodemographic factors such as gender and age. These figures do not represent the actual burden of TE exposure and PTSD in South Africa, and work is needed in this area in order to inform policy and practice in the field of trauma and PTSD.

There are no previous reports documenting the prevalence and factors associated with the full range of TEs and PTSD in the community in South Africa, and this thesis presents the first effort in this regard.

1.2 Trauma and other psychopathology in South Africa

Among the few small studies available in South Africa, Burns et al (12) found a possible association between previous trauma and positive and affective symptoms of psychosis in a sample of 54 first episode psychosis patients. Others have reported an association between trauma and alcohol use behavior among South African women who patronized alcohol-selling venues, which is largely mediated by PTSD symptoms (13). Ward (6) reported that among high school students, PTSD, depression and anxiety disorders were also associated with violence exposure, demonstrating that PTSD is not the only outcome of TE exposure in this population.

No population surveys have examined the association between any TE exposure and psychopathology other than PTSD in South Africa. This thesis takes witnessing trauma as the prototype TE in South Africa due to its high contribution to the burden of PTSD,

and examines what other psychopathological outcomes are associated with it. It is the first report of its kind from South Africa, and indeed from any African country.

1.3 Trauma and physical health in South Africa

A review of the literature shows a serious dearth of information in South Africa on the occurrence of general medical conditions after exposure to TEs. The present thesis presents the first set of detailed information on this, based on the understanding that exposure to trauma will probably lead to more outcomes than just PTSD and other psychopathology.

1.4 Methodological novelty and significance

As indicated earlier in this chapter, a couple of reports on trauma and PTSD using the SASH data have been published in the past (9, 10). These reports either focused only on nonspecific psychological distress (9) rather than posttraumatic stress disorder, or on interpersonal violence (10) rather than the entire range of TEs.

The significance of the work presented in this thesis is that firstly, it is the first study to report on the full range of TE exposure in the South African general population, presenting the most accurate data on the community occurrence of TEs and the factors associated with them. Secondly, this thesis is unique in determining the conditional risk of PTSD associated with each TE in the community, providing for the first time the most accurate estimates of PTSD in South Africa. Thirdly, another key first is the presentation of data on the association of a particularly malignant TE with psychopathology other than PTSD, filling a gap in the knowledge that has existed for a long time in this country. Finally, for the first time data is presented on the association between TE exposure and chronic physical conditions that contribute significantly to the burden of disease in South

Africa and increasingly in many low and middle-income countries. None of these studies have been attempted before, and this thesis therefore contributes to the body of knowledge on various outcomes of TE exposure in the South African general population.

An important methodological innovation in this thesis is the use of the random event method to describe the full range of TE exposure and PTSD in the South African general population. In most community surveys, respondents usually report lifetime exposure to a very large number of TEs, making it impossible to carry out a separate assessment of PTSD for each TE experienced by every respondent. This problem is typically addressed in community epidemiologic surveys by asking respondents to nominate the worst TE they ever had in their lifetime and using that one TE as the focus of PTSD assessment. This approach often overestimates conditional risk of PTSD because worst traumas are atypical and presumably have a higher risk of PTSD compared with more typical traumas (14-16).

In the present thesis, this problem is resolved by assessing PTSD for two TEs: the one nominated by the respondent as their worst lifetime TE and another TE randomly selected from among the respondent's other lifetime TEs. Both the worst lifetime TE and the randomly selected TE are then assessed for PTSD symptoms, generating a dataset that accurately reflected the occurrence of TEs in the sample population.

This thesis therefore provides important population-wide information reflecting the actual prevalence of TEs and PTSD in South Africa, as well factors associated with both trauma exposure and PTSD. The importance of this accurate information is that it will guide policy makers in developing interventions for reduction of TEs and PTSD in the general population, providing better evidence for such interventions. Current

interventions may not be in tandem with the evidence base, reducing the probability of their success.

1.5 Thesis Objectives

1.5.1 Broad Objective

The main objective of this study was to determine the prevalence and determinants of TEs and PTSD, as well as other outcomes of these conditions, including general medical conditions and other psychiatric morbidity in the South African general population using data from the South African Stress and Health Study (SASH).

1.5.2 Specific objectives

1. To review the literature on trauma and PTSD relevant to South Africa, examining specifically for predictors and outcomes of trauma exposure, including general psychiatric morbidity and different aspects of PTSD.

2. To establish the epidemiology of trauma exposure and PTSD in the SASH. This analysis included identification of the traumatic events that account for the greatest proportion of the public health burden of PTSD in South Africa.

3. To examine the relationship between trauma exposure and other mental disorders, in order to establish whether the traumatic events that account for the greatest burden of PTSD in South Africa increase the risk of other mental disorders.

4. To determine the relationship between trauma, PTSD and physical health. This analysis examined whether traumatic events are associated with greater risk of specific physical health complaints as well as a larger burden of physical health

problems overall and whether this association is mediated by PTSD.

1.6 Organisation of the Thesis

Pursuant to Specific Objective #1, Chapter 2 presents a review of the current global literature on Trauma and PTSD, focusing on community surveys similar to the SASH and providing a review of the state of the knowledge on the subject. It reviews data on distribution of TEs and PTSD, focuses on witnessing trauma and psychopathology, and trauma and physical health. Chapter 3 (Methodology) provides the detailed analytical approaches employed in this thesis in order to meet each of the specific objectives, as well as the ethical considerations involved in handling secondary data.

Chapter 4 (Results) provides the results of the analyses, beginning by discussing generally the occurrence and distribution traumatic events and PTSD in the SASH (Section 4.1), and probes further into the role of witnessing trauma on later onset of psychopathology Section 4.2). Finally, Section 4.3 of this chapter provides evidence of the physical health outcomes of trauma exposure and PTSD.

Chapter 5 presents a discussion of the results, comparing what the analyses of the SASH revealed with what was found in other studies. In this chapter, the significance of the findings in each section of the results is discussed, and opportunities for future research are identified. Chapter 6 (Conclusions) summarises the key findings in each of the analyses and recommends further actions to address these issues.

The references are presented at the end of this thesis.

2.0 LITERATURE REVIEW

This Chapter addresses Specific Objective 1: To review the literature on trauma and PTSD relevant to South Africa, examining specifically for predictors and outcomes of trauma exposure, including general psychiatric morbidity and different aspects of PTSD.

The intention of this chapter is to provide a review of the current state of research on TE exposure and PTSD, demonstrating gaps that the analyses in this thesis will then seek to fill. In Chapter 1, the obvious lack of accurate information on the epidemiology of TE exposure and PTSD was described, and this chapter provides data from other studies against which to compare the subsequent analyses in this thesis. Some of the preliminary work from the analyses in this thesis was published before the thesis was completed (17), and the findings from this publication are included in this literature review. It is the only published work of its kind from Africa, and provides an opportunity to compare the situation in an African country with that in other regions.

The chapter begins with a brief introduction (Section 2.1) on earlier work on trauma and PTSD, and discusses the importance of methodological changes in trauma and PTSD research that enable more accurate estimates of TE exposure and PTSD risk to be made in population settings. Subsequently, the chapter is organized into sections reflecting the specific objectives presented in Chapter 1.0. Section 2.2 presents current literature on TE exposure and PTSD (Specific objective 2), while section 2.3 examines other psychopathological outcomes of TE exposure (Specific objective 3) in global research. Section 2.4 discusses the association between TE exposure and physical conditions (Specific objective 4), while section 2.5 concludes the chapter with a synthesis of the key points in this review and their implications for future work n this area.

2.1 Introduction

Early work on the epidemiology of PTSD established that this disorder is highly prevalent in high-income countries, and is associated with significant comorbidity and morbidity (14, 15, 18, 19). In recent years, the literature on the epidemiology of trauma and PTSD has expanded to include a few rigorous studies from around the world including low and middle-income countries (LMICs), expanding our understanding of the nature of this condition. Here we focus on recent findings from the World Mental Health (WMH) surveys, and compare these with previous work.

In most community surveys, respondents report lifetime exposure to a large number of traumas, making it difficult to carry out a separate assessment of PTSD for each TE experienced by every respondent (17). Previous studies often asked respondents to nominate the worst traumatic event they had ever experienced, and used it to assess for PTSD. Because worst traumas are not also the most prevalent in populations, and presumably have a higher risk of PTSD than typical traumas, this approach overestimates conditional risk of PTSD (14-16).

In the WMH studies, this problem was resolved by assessing PTSD for both the event nominated by the respondent as their worst lifetime trauma, and another event randomly selected from among the respondent's other lifetime traumas. The subsequently generated appropriately weighted dataset has been argued to accurately reflect the occurrence of traumatic events in the sample population (17).

2.2 Trauma and PTSD

2.2.1 Traumatic event distribution

There are many different ways of classifying traumatic events, and this often causes difficulties in comparing the distribution of TEs in different settings. The WMH surveys used the WHO Composite International Diagnostic Inventory (CIDI) to identify up to 29 different types of TEs, including two nonspecific TEs in the 'Other' category- Private events and Other TEs (20). A standard classification was then employed to facilitate easier analysis and comparison across countries. In most WMH studies, TEs were categorized into 8 classes as indicated in the introduction to this thesis (17).

While these recent studies have confirmed the fact that trauma exposure is highly prevalent in all regions of the world, they have also uncovered significant differences in the prevalence and distribution of TEs. The South African Stress and Health Survey was the only African arm of the WMH surveys to report on trauma and PTSD distribution in the community. This study reported a lifetime TE prevalence rate of 73.8%, which was much higher than other countries in Europe and Japan where the rate was in the range of 54-64% [5]. At 54%, Spain has the lowest reported prevalence of trauma exposures (21), followed by Italy's 56.1% (22) and Japan's 60% (23). Northern Ireland's rate of 60.6% was the highest in the National surveys in Europe (24) although previous work in several European countries (25) found a higher prevalence rate of TE exposure (63.6%).

The different rates of trauma exposure seem to reflect local peculiarities in the different regions of the world. South Africa's history of state-sanctioned discrimination and political violence, coupled with rising rates of criminal assault in public spaces may contribute to the higher rates of trauma exposure compared to Europe and Japan (10). Similarly, Northern Ireland had a long history of civil conflict which contributed

significantly to the high prevalence of traumatic events (24). Indeed, an examination of the distribution and burden of the TEs reported in these national surveys demonstrates these differences more clearly.

In South Africa, physical violence and witnessing trauma contributed the largest proportion of all lifetime TEs (17), while in Europe accidents and unexpected death of a loved one were the biggest contributors to the burden of trauma (21, 22, 25). Additionally, network events and witnessing trauma contributed significantly to the trauma burden in Italy (22) and in the cross-national European survey (25). Northern Ireland presents a slightly different picture, with war events playing a huge role in trauma in addition to network events and accidents (24).

A pattern similar to that observed in most European countries was observed in Japan, where network events, unexpected death of a loved one and accidents contributed the greatest proportion of TEs (23). However, up to 10% of the Japanese respondents reported experiencing “Private Events” for which they did not have to describe content, perhaps reflecting the role of culture in determination of which traumatic events may be reported and which may not (23).

South Africans (17) also reported the highest frequency of trauma exposures (4.3), while the average in Europe was reported to be 1.5 (25). In Italy and Northern Ireland, the frequency of exposure (about four lifetime events per respondent) was closer to the South African one, while in Spain the exposure frequency was 2.8 (21, 22, 24). The frequency of exposure to TEs in Japan was 3.5, which was lower than South Africa’s but higher than the cross-national European survey (23).

Regional differences are therefore apparent in the distribution of the TE burden across the world, and these differences may be attributed to the varying socio-cultural and

political environments in each of these regions. LMICs like South Africa have more TE exposure and a pattern of events that differs from Europe and Japan due to the unique historical and cultural contexts prevalent in these regions.

2.2.2 Risk factors for trauma exposure

Factors associated with trauma exposure also appear to vary across different regions of the world. While in South Africa only employment status was associated with risk of trauma exposure, with homemakers being at significantly lower risk of TE exposure compared to those who were employed (17), the pattern is different in other parts of the world.

Female gender was associated with reduced risk of trauma exposure in the European national surveys (21, 22, 24). In addition, low to low average education in Spain and Italy (21, 22), and low income in Northern Ireland (24) were also associated with reduced TE exposure risk. In Italy, those who were never married and those aged 18-44 years had lower risk of TE exposure (22).

Previous marriage in the Spain survey and other employment status in the Northern Ireland study were associated with increased risk of TE exposure (21, 24). The same factors were also associated with increased risk of TE exposure in Japan (23).

The reduced role for socio-demographic factors in the risk of TE exposure once again reflects differences in social and political contexts, where in South Africa the *apartheid* system institutionalized certain types of traumatic events that happened so commonly in public spaces that they obliterated any role other factors may have played. Lower prevalence rates of TE exposure in Europe and Japan probably provided an opportunity for the role of the socio-demographic factors as risk factors to become more apparent.

2.2.3 Cross-national differences in the Prevalence of PTSD

Lifetime prevalence of PTSD also varies quite widely across the WMH surveys. In South Africa (2.3%), Spain (2.2%) and Italy (2.4%) the rates were in the same range (17, 21, 22) while in Japan (23) the rate was significantly lower (1.3%). Northern Ireland reported the highest lifetime PTSD prevalence of 8.8% (24).

In general, however, the lifetime prevalence rates in the WMH surveys are lower than those found in previous studies that employed a different method of selecting the TEs for which a PTSD assessment would be done. The manner in which subtle methodological shifts give rise to different PTSD prevalence estimates in epidemiological studies is emphasized in the work by Beals et al (26). In their study of two Native American reservation communities, using the 'single worst trauma' method, lifetime PTSD prevalence rates ranged from 5.9% to 14.8%, while using questions asking about the 'three worst traumas' yielded higher PTSD prevalence rates of 8.9% to 19.5%. In a similar fashion to the WMH studies, this work suggests the importance of capturing a broad range of potentially traumatic events in community surveys of PTSD in order to generate more accurate information for interventions.

2.2.4 Risk factors for PTSD

Conditional prevalence (or risk) of PTSD refers to the prevalence of PTSD among those that had been exposed to TEs, as opposed to the prevalence of PTSD in the total sample that includes those that were not exposed to any TE (17). It therefore represents the overall risk of developing PTSD due to any TE exposure. This review reveals that apart from Northern Ireland where the conditional prevalence was 17.6%, the other WMH surveys found very low conditional prevalence rates of PTSD in all countries that measured it (24). In the South African survey the PTSD conditional prevalence was

3.5% (17), quite similar to the 3.3% prevalence in Spain (21) and slightly higher than the 2.5% rate in Italy (22).In the South African survey, PTSD conditional risk after trauma exposure was highest for witnessing traumatic events, consistent with high rates of public violence in South Africa (17). This differed from findings in the European surveys and in Japan where sexual and physical violence, unexpected death of a loved one and events categorized as other carried the highest conditional risk of PTSD (21-24).

The unique role of witnessing trauma in causing PTSD in South Africa has been attributed to the previously discussed fact that political and criminal violence often occurs in public settings in South Africa (10). Findings in the other WMH surveys corroborate the role of socio-cultural context in PTSD. In Japan and in the European surveys, events categorized as 'other' had a very high PTSD conditional risk. It has been suggested that this category, which includes 'private' events and 'other' events not on the TE list, may comprise of particularly severe and more stigmatized events that would naturally have a higher PTSD conditional risk than the named events (23). Indeed, in Japan, 'private' events were associated with the highest conditional risk for PTSD, suggesting that they caused more severe and longer-lasting symptoms than the other reported trauma types (23).

TE contribution to the burden of PTSD was measured in all the WMH surveys, and the South African survey differed in important ways from the rest of the surveys. Witnessing trauma contributed to the vast majority of PTSD cases in South Africa, while in European countries the unexpected death of a loved one, network events and sexual and physical violence were the biggest contributors (17, 21, 22, 24). In Japan, perhaps due to the cultural influences discussed previously, 'Other' events and physical violence contributed to the largest proportion of lifetime PTSD cases (23).

Unexpected death of a loved was especially traumatic in the European surveys, and was associated with a higher PTSD conditional risk as well as being responsible for a large proportion of all PTSD cases. Changes in PTSD criterion A in the DSM 5 requiring that 'in cases of actual or threatened death of a family member or friend, the event(s) must have been violent or accidental' will have an impact on the PTSD conditional risk associated with unexpected death of a loved one (27). In the past, any unexpected death of a loved, even due to illness, would have qualified as a TE. The new criterion is more restrictive and will reduce the probability of a PTSD assessment being made in some cases not involving violence or accidental deaths.

Concerning socio-demographic risk factors for PTSD, the South African survey once again differs significantly from the Japanese and European surveys. Female gender was associated with increased PTSD risk in all the countries surveyed except South Africa where socio-demographic factors showed very little association with PTSD risk (17, 21-24). Additionally, low education in Italy (22), and age under 65 years, being married, being retired and having 'other' employment status (which included unemployment) in Northern Ireland (24) were associated with increased PTSD risk.

The lack of association between socio-demographic factors and PTSD risk has been attributed to the unique history of trauma exposure in South Africa, where institutionalized violence and traumatization were common features during the apartheid regime, with almost the entire population being exposed at some point (1).

2.2.5 Chronicity of symptoms

PTSD is associated with serious consequences that may lead to poor quality of life and increased use of health and other social services. Duration of PTSD symptoms may therefore serve as an indicator of the impact of the condition on an individual's life. The

WMH surveys assessed the duration of symptoms and identified the TES responsible for the longest duration of symptoms.

Once again, the South African WMHS study demonstrated that chronicity of PTSD symptoms was greatest for witnessing traumatic events (17) while in the European surveys sexual and physical violence and war events were associated with the longest duration of symptoms (21, 22, 24). In Japan, on the other hand, network events and 'other' events were associated with the longest duration of symptoms (23).

These differences highlight the role of culture in determining mental health outcomes of trauma exposure. For instance, as argued in Atwoli et al (17), the prominence of witnessing events for PTSD burden in South Africa may be related to the cultural philosophy of *Ubuntu* which has been described as an African world-view that emphasizes "group solidarity, conformity, compassion, respect, human dignity, humanistic orientation and collective unity" (28). Previous research on the aversive effects of watching the infliction of pain on others, and studies on PTSD in high-risk groups such as war journalists and rescue workers support the notion that witnessing trauma can be just as 'toxic, or even more 'toxic' than direct experience of trauma (29, 30).

In Japan, on the other hand, the contribution of network events to more chronic symptoms has been attributed to the Japanese culture that emphasizes firm adherence of Japanese couples to their role as parents, as well as a closer relationship between parents, especially mothers, and their children (23).

The long duration of PTSD symptoms is likely to be associated with significant impairment in social and occupational function, consequently leading to reduced productivity and increased use of health services.

2.3 Trauma and other psychopathology

Development of psychiatric comorbidity is an important consequence of trauma exposure and PTSD. Polysedative use for treatment of co-occurring conditions such as pain, insomnia, brain injury and other mental disorders (31) and substance use disorders with increased risk for intimate partner violence (32) are common in PTSD and are associated with increased mortality (33). An association has been shown between PTSD and cannabis dependence among military veterans (34) with PTSD increasing the risk of use of cannabis to cope, severity of cannabis withdrawal and increased craving. The latter two symptoms independently predict continued cannabis use, therefore creating a 'pernicious feedback loop' between PTSD symptomatology and cannabis use (34).

PTSD has further been shown to increase the risk of suicide among those with major depressive disorder as well as those with other mental illnesses (35, 36). Various mechanisms have been postulated to lead to the worsening of prognosis for patients with both PTSD and MDD. Firstly, Gomez-Perez and colleagues found that trauma-exposed individuals evaluate pain in a more negative way (37) which may lead to more negative decision-making during crises, including making the decision to attempt suicide. Secondly, Panagioti et al, in findings from their study among individuals diagnosed with current or lifetime PTSD, argue in favor of a model whereby perceptions of defeat and entrapment mediate the relationship between PTSD symptom severity and suicidal behavior (38). Finally, Stevens et al found that among patients with recurrent MDD, PTSD acted as a vulnerability marker of maladaptive responses to traumatic events and an independent risk factor for attempted suicide (35). It is clear, therefore, that the co-occurrence of PTSD and MDD, which are both independent predictors of increased

suicide risk, significantly elevates suicide risk and complicates the prognosis for both conditions.

An important consequence of trauma and PTSD concerns family functioning and its impact on offspring. Recent data confirms that children of mothers with PTSD are exposed to more traumatic events including increased risk of child maltreatment (39). Indeed, trauma exposure on its own has been shown to cause problems in family functioning (40) and PTSD interferes with intimacy behaviors, especially among men (41). With impaired family functioning and difficulties in parent-child relationships, a vicious cycle may be set up resulting in the maintenance of trauma exposure and increased risk of PTSD both in the parental and the child generations.

In summary, PTSD has wide-ranging consequences that affect individual functioning as well as having wider family and social functioning implications. Prevention and early management of this condition would therefore be expected to have benefits not only to the individual, but also to the society as a whole.

2.4 Trauma and Physical Health

Trauma exposure such as childhood abuse, interpersonal violence, and combat has an adverse effects physical health over the life course (42-45). Previously, this association has been linked to posttraumatic stress disorder and other outcomes of trauma exposure (46-49) leading to the assumption that addressing posttraumatic conditions would reduce the risk of chronic physical conditions (50). However, recent epidemiologic studies in adults in urban Detroit and the World Mental Health Surveys concluded that the effect of trauma on physical health is independent of posttraumatic stress disorder (PTSD) and other mental disorders (43, 51, 52).

Many studies have argued for the moderating influence of PTSD on occurrence of chronic physical conditions after exposure to trauma (53, 54). Wachen et al (54) assessed a sample of 317 U.S. Gulf war veterans for warzone exposure, posttraumatic stress symptomatology, and physical health symptoms 10 years after deployment. In this study, it was reported that posttraumatic stress symptomatology severity mediated the relationship between warzone exposure and post-deployment symptoms in all physical health domains by a factor of up to 75%.

However, other studies suggested that the association transcended the occurrence of PTSD or other post-trauma psychopathology, and was a direct consequence of trauma exposure itself (45, 52, 55-57). Baker et al (45) demonstrated that PTSD mediated the relationship between only certain selected traumas such as childhood sexual violence in women and specific physical conditions, suggesting that in some other cases the trauma exposure itself was responsible for increased onset of physical conditions in later life. Others have shown that trauma exposure predicts earlier onset of physical conditions, and that the higher the number of traumatic events the greater the risk of developing chronic physical conditions and the earlier their onset (52, 53).

Scott et al (51) have recently demonstrated in a large cross-national WMH study that trauma exposure itself has downstream effects on physical health independent of PTSD effects. The effect was linked to the number of TEs an individual was exposed to, with exposure to four or more TEs being associated with a wide range of chronic physical conditions including arthritis, back and neck pain, frequent or severe headaches, heart disease, high blood pressure, asthma, peptic ulcers, chronic lung disease and stroke.

These findings are corroborated by a number of studies outside of the WMH surveys showing that certain chronic general medical conditions that have been shown in to be

leading causes of morbidity and mortality in their own right also occur with a very high frequency among people with PTSD. Thus, metabolic syndrome (58), coronary heart disease (59), Alzheimer's disease (60) sexual dysfunction (61) and Type 2 diabetes mellitus (62) have been linked to PTSD in various studies. Together with major depressive disorder (MDD), PTSD has also been found to increase HIV risk behavior (63).

2.5 Conclusion

In this literature review, several key issues have emerged from recent work on trauma and PTSD.

Firstly, while TE prevalence rates are higher in countries emerging from conflict, the distribution of TE types varies significantly by region. The impact of the socio-political environment on the distribution of TEs is apparent from these findings.

Secondly, lifetime prevalence of PTSD in most community surveys using the 'random event' method is lower than in previous studies that used the 'worst event' method of assessing PTSD. The importance of capturing a broad range of TEs in a community survey has thus been demonstrated, providing the justification for continued use of the 'random event' method in future community surveys of trauma and PTSD.

Thirdly, female gender and several other socio-demographic factors are associated with TEs and PTSD in high-income settings, but in not in South Africa. While the risk factors in the non-LMIC settings reflect existing knowledge on PTSD risk factors, the high rate of TE exposure across all socio-demographic groups in South Africa precludes a comparison between the different risk factors.

Finally, in this review, has been shown that trauma exposure and PTSD have wide-ranging consequences that affect mental and physical health, as well as having wider family and social functioning implications.

3.0 METHODOLOGY

This thesis is based on secondary analysis of previously collected data in the SASH, and the methodology therefore presents both the methods used in the SASH to collect the data, and the analysis methods used in this thesis in order to address the specific objectives.

The first section of this chapter (3.1) therefore describes the SASH methodology, which has been published before (64) and is therefore mostly in summarized form here. The ethical considerations, study population and sampling procedures are described in the first part of the section (3.1.1) followed by a detailed description of the specific measures for the variables in the various analyses (3.1.2).

Section 3.2 presents the analysis methods aimed at achieving the specific objectives of this thesis, and is organised by the respective specific objectives. Analyses for the epidemiology of TEs and PTSD are described in the first part of the section (3.2.1), followed by witnessing and psychopathology (3.2.2) and finally TE exposure and physical conditions (3.2.3).

3.1 SASH Methods

In this section, the data collection methods in the SASH are described, providing an overview of the source of the data used in the analyses in this Thesis. The study area and population for the survey, and the measures used in the survey are described in detail, and the section closes with a discussion of the methodological novelty and significance in the SASH.

3.1.1 Study description and study population

The South African Stress and Health (SASH) study (64) was carried out between January 2002 and June 2004 as part of the WHO World Mental Health Surveys (65). The aim of the survey was to determine the prevalence and identify risk factors for mental disorders in South Africa. The rationale and survey methods have been described in previous publications (9, 64). A summary of the methods is provided here to provide a background of the secondary analyses that were conducted as part of this thesis.

The SASH protocol was reviewed and approved by the Human Subjects Research Ethics Committees of the University of Michigan, Harvard Medical School and the Medical University of South Africa (MEDUNSA) (64). The University of Cape Town Human Research Ethics Committee (HREC) also reviewed and approved the study for the purpose of secondary data analyses such as that undertaken here. Informed consent was obtained from all participants before conducting interviews. In the secondary analyses described in Section 3.2, only anonymised data was used, and the study investigators were involved in the data extraction, including the supervisors, Prof Dan Stein (SASH) and Prof Karestan Koenen (WMH Surveys).

The study population comprised adult South Africans residing both in households and hostels, and excluded those living in institutions such as hospitals, prisons, mental health institutions and military bases. Respondents were selected using a multi-stage area probability sample design. In the first stage, a stratified probability sample of primary sampling areas was selected based on the 2001 South African Census of Enumeration Areas (EAs). The EAs were sampled with probabilities proportionate to their population size. In the second stage, a random sample of 5 households was selected within each EA. The third stage consisted of a random selection of a single adult respondent in each selected household.

Up to three attempts were made to contact each selected respondent, and the study achieved an overall response rate of 85%. The demographic characteristics of the sample have been described previously (9). The total sample of 4,315 adults had a higher proportion of women (58.6%) and Blacks (79.7%), although other racial groups were represented (10.4% Colored, 7.2% White, and 2.7% Indian/Asian). The classification of *Colored* in South Africa represents a heterogeneous racial group of mixed ancestry as discussed elsewhere (66). Use of these groups in this thesis is done not with the intention of reifying them, but rather with an awareness of the ongoing disparities that remain across these groups even post-apartheid, and their possible differential impact on the experience of trauma and PTSD [9]. Further, one half was married, most were unemployed (69.2%), had less than 12 years of education (62.7%), and lived in urban areas (59.7%).

3.1.2 SASH Measures

3.1.2.1 Trauma exposure

The SASH assessed lifetime occurrence of the 27 TEs included in the WHO composite International Diagnostic Interview (CIDI) DSM-IV PTSD module (20). TEs were categorized into 8 classes as follows: war events (combat, relief worker in a war zone, civilian in a war zone, civilian in a region of terror, refugee and purposely injured, tortured or killed someone), physical violence (physical abuse by caregiver, physical assault by spouse or romantic partner, physical assault by someone else, mugged or threatened with a weapon, and kidnapped), sexual violence (raped, sexually assaulted and stalked), accidents (toxic chemical exposure, automobile accident, other life-threatening accident, natural disaster, man-made disaster, and a life-threatening illness), unexpected death of a loved one, network events involving others (having a child with a

serious illness, traumatic event occurring to a loved one, and accidentally causing serious injury or death) and witnessing (witnessing a death, seeing a dead body or someone seriously hurt, seeing atrocities, and witnessing domestic violence). The final category of other included an additional question inquired about other TEs not included in the CIDI list and a final open-ended question obtained information about qualifying TEs that respondents did not report because of embarrassment (coded as 'Private events').

For each of the trauma items, the possible responses were 'Yes', 'No', 'Don't Know' and 'Refuse to Answer. Additionally, for each TE occurrence, the respondents indicated how old they were when the event occurred, and how long it lasted.

3.1.2.2 PTSD assessment

DSM-IV requires PTSD to be assessed in relation to exposure to a qualifying TE. However, just like in other community surveys of trauma and PTSD, most SASH respondents reported lifetime exposure to multiple TEs and some respondents reported exposure to a very large number of TEs. The random event method was therefore used, whereby apart from the TE nominated by the respondent as the worst, another TE was randomly selected from the endorsed list of lifetime TEs and assessed for PTSD. Additionally, the data on symptoms associated with the latter TEs was weighted by the number of lifetime TEs each respondent reported having. A weighted TE-level dataset was therefore created that accurately represented all TEs that ever occurred to all respondents. Unlike datasets based only on information about worst TEs, this weighted dataset of randomly selected TEs can be used to obtain unbiased estimates of PTSD conditional prevalence and distribution across all TEs in the population.

DSM IV PTSD Criterion A2 (Response) was considered met if the respondent endorsed any of three questions about whether, at the time of TE exposure, he/she felt terrified or very frightened, helpless, shocked, or horrified. This was followed with structured questions about re-experiencing (criterion B), avoidance-numbing (criterion C), arousal (criterion D), duration (criterion E), and clinically significant distress or impairment (criterion F).

For each DSM IV PTSD symptom cluster (B, C and D) the respondent was asked how soon after the event the symptoms started, how many days, weeks, months or years the symptoms continued and how often the symptoms occurred per month when they were at their most frequent or intense.

3.1.2.3 Mental and Substance Use Disorders

The CIDI was also used to assess lifetime history of DSM IV mental disorders. For this analysis, history of mood disorders (Major Depressive Episode, Minor Depressive Disorder, Dysthymia, Major Depressive Disorder, Recurrent Brief Depression Disorder), Anxiety disorders (Agoraphobia without Panic Disorder, Agoraphobia, Generalized Anxiety Disorder, Panic Attack, Panic Disorder, Social Phobia), and Substance Use Disorders (Alcohol Abuse, Alcohol Dependence, Drug Abuse, Drug Dependence) were considered as separate outcomes. PTSD, based on the WHO CIDI scale of 26 TEs, as was included as a covariate in order to control for comorbidity between it and other mental disorders.

3.1.2.4 Physical Health

Physical health outcomes were queried for 20 conditions using a dichotomous self-report module for previous year incidence. The conditions were then aggregated by type in

order to maintain adequate statistical power. There were five final categories: Cardiovascular disease (Heart disease, High blood pressure, Stroke, Heart attack), Arthritis, Respiratory conditions (Asthma, Other chronic lung disease, Seasonal allergies), Chronic pain (Chronic back or neck problems, Frequent/ severe headaches, other chronic pain), and Other conditions (TB, Malaria, Diabetes, Ulcer, Thyroid, Neurological conditions, HIV/AIDS, Epilepsy, Cancer). An additional variable was created to represent any previous year physical condition. Self-report modules of this type have shown good reliability [18, 19] and fair validity [20].

3.1.2.5 Socio-demographic correlates:

Six socio-demographic variables were included in the analysis: gender, age, marital status, education, employment status and race. Age consisted of four categories (in years): 18–29, 30–44, 45–59, and 60 or older. Marital status was categorized into three groups: married, previously married and never married. Education was classified depending on number of years of formal schooling into four categories: Low (0-1 year), low-average (2-7 years), high-average (8-12 years) and high (13 or more years). Employment status consisted of four categories: employed, homemaker, retired and other (including unemployed and students). Race consisted of the four standard categories in South Africa: Black, White, Indian/Asian, and Colored. Socio-demographic variables with multiple categories were dummy coded for analytic purposes (reference groups include age 60+, Married, High education, Employed and White race).

3.2 Analyses conducted in this thesis

This section presents the analytical methods used in this thesis, and is organised according to the three specific objectives that required analysis of the SASH data (Specific objectives 2, 3 and 4).

3.2.1 Traumatic events and PTSD

Prevalence of TE exposure and conditional prevalence of PTSD were examined using cross-tabulations. A series of four logistic regression models (67) were then used to examine the predictors of lifetime and 12-month PTSD.

For lifetime PTSD, the first model examined its socio-demographic predictors in the population. The second model examined the socio-demographic predictors of exposure to any traumatic event in the total sample while the third model examined predictors of lifetime PTSD among those with exposure to at least one event. The final model was similar to the third, but additionally controlled for the type of TEs and prior exposure to TEs.

For 12-month PTSD, the first model also examined the socio-demographic predictors in the total population, while the second one examined predictors of 12-month PTSD among those with TE exposure. The third model was similar to the second but additionally controlled for type of TEs and prior exposure to TEs. The final model examined the predictors of 12-month PTSD among those with lifetime PTSD, controlling for both TE exposure and prior TEs.

The logistic regression coefficients and their standard errors were exponentiated and are reported here as odds-ratios (ORs) with 95% confidence intervals. To adjust for the weighting and clustering of the SASH data, standard errors (SE) were estimated using the Taylor series method (68) implemented in the SUDAAN software system (69). Multivariate significance was evaluated with Wald $\chi 2$ tests based on design-corrected coefficient variance-covariance matrices. Statistical significance was consistently evaluated using .05 level two-sided tests.

3.2.2 Witnessing and psychopathology

Chi-squared tests were used to determine the association between witnessing and socio-demographic groups. As well as lifetime diagnosis of mood, anxiety, or substance use disorders. To ensure correct temporal order, the sample was restricted to only individuals who reported their witnessing experience prior to a diagnosis of any mental disorder, and not the other way around (97.79% of the sample).

Chi-squared analysis was also used to test the proportion of respondents who reported experiencing each TE group according to whether or not they had also reported witnessing. A two-sample t-test assuming equal variances was used to test if the number of total TEs reported were statistically significantly different among those who witnessed and those who had not. Because the minimum number of TEs possible for each group was not equal, the mean scores that were tested and reported did not include the witnessing TE.

The odds of mood, anxiety, or substance use disorders were tested for those who reported witnessing or not using logistic regression modeling. Final models were adjusted for all significant demographic variables. Similar models also adjusted for PTSD diagnosis that preceded any other mental disorder, as well as the experience of any other TEs. Once again, only witnessing that preceded the diagnosis of a mental disorder was included. All tests were completed in STATA using weighted regression analysis with exponentiated coefficients reported as Odds Ratios (ORs) with corresponding 95% Confidence Intervals (95% CIs).

A discrete-time survival analysis was used to examine if witnessing was associated with earlier onset of mental disorders other than PTSD. In the regression model, person-years were the unit of analysis to model the time to first onset of a mood, anxiety, or

substance use disorder, starting from age one (70). If an individual has no reported mental disorder diagnosis, this unit was equivalent to their age at the interview. Logistic regression was used to test the odds of disorders among respondents who reported witnessing violence than those who did not, adjusted for the number of years lived without a diagnosis. Given that exposure to witnessing traumatic events and experiencing psychiatric consequences of those events may differ among men and women (71), adjusted models were tested for interaction by sex and each mental disorder outcomes.

3.2.3 Trauma and Physical Conditions

Rao-Scott chi-square tests were used to determine the association between socio-demographic groups and the number of cumulative reported TEs, as well as the frequency of previous year physical conditions. The analysis examined both the association between physical health and each TE group, as well as physical health and the number of cumulative lifetime TEs.

The odds of reporting a current physical condition were tested among respondents who reported each type and cumulative number of TEs using logistic regression modeling. To accurately capture the association of interest, only individuals who reported TEs prior to the onset of any physical condition were included. Final models were adjusted for sex, age, education, employment, marital status, race/ethnicity, and any mood, anxiety, or substance use disorder, and PTSD. All tests were completed in STATA using weighted analysis as described in the study population description (72).

4.0 RESULTS

The Results are organized into three sections. Section 4.1 addresses specific objective 2, and presents findings of the analysis of SASH epidemiological data for TE exposure and PTSD.

Section 4.2 addresses specific objective 3 and builds on section 4.1, presenting results relating to the association of witnessing trauma and psychopathology other than PTSD. Finally, section 4.3 deals with specific objective 4, presenting data on the relationship between TE exposure and chronic physical conditions.

4.1 Trauma and PTSD

This Section addresses Specific Objective 2: To establish the epidemiology of trauma exposure and PTSD in the SASH. This analysis includes identification of the traumatic events that account for the greatest proportion of the public health burden of PTSD in South Africa, as well as those that carry the greatest conditional risk for PTSD.

The results presented in this section, addressing specific objective 2, have been published before in the Journal BMC Psychiatry:

Atwoli, L., Stein, D. J., Williams, D. R., McLaughlin, K. A. Petukhova, M., Kessler, R. C., and Koenen, K. C. Trauma and posttraumatic stress disorder in South Africa: analysis from the South African Stress and Health Study. BMC Psychiatry 2013; 13:182 doi:10.1186/1471-244X-13-182

This section is divided into three parts. The first part (4.1.1) presents results on the distribution of TE exposures in the study population, while the second part presents results on the prevalence and conditional risk of PTSD. The final part of this section

deals with the socio-demographic predictors of TE exposure and PTSD in this analysis.

4.1.1 Traumatic Event Exposure

In this analysis, the prevalence (standard error) of exposure to at least one lifetime TE was 73.8% (1.15), and on average, a person exposed to any lifetime TE reported an average of 4.3 occurrences (Table 1). The TE class reported by the highest proportion of respondents was unexpected death of a loved one (39.2%) followed by physical violence (37.6%), accidents (31.9%), and witnessing (29.5%).

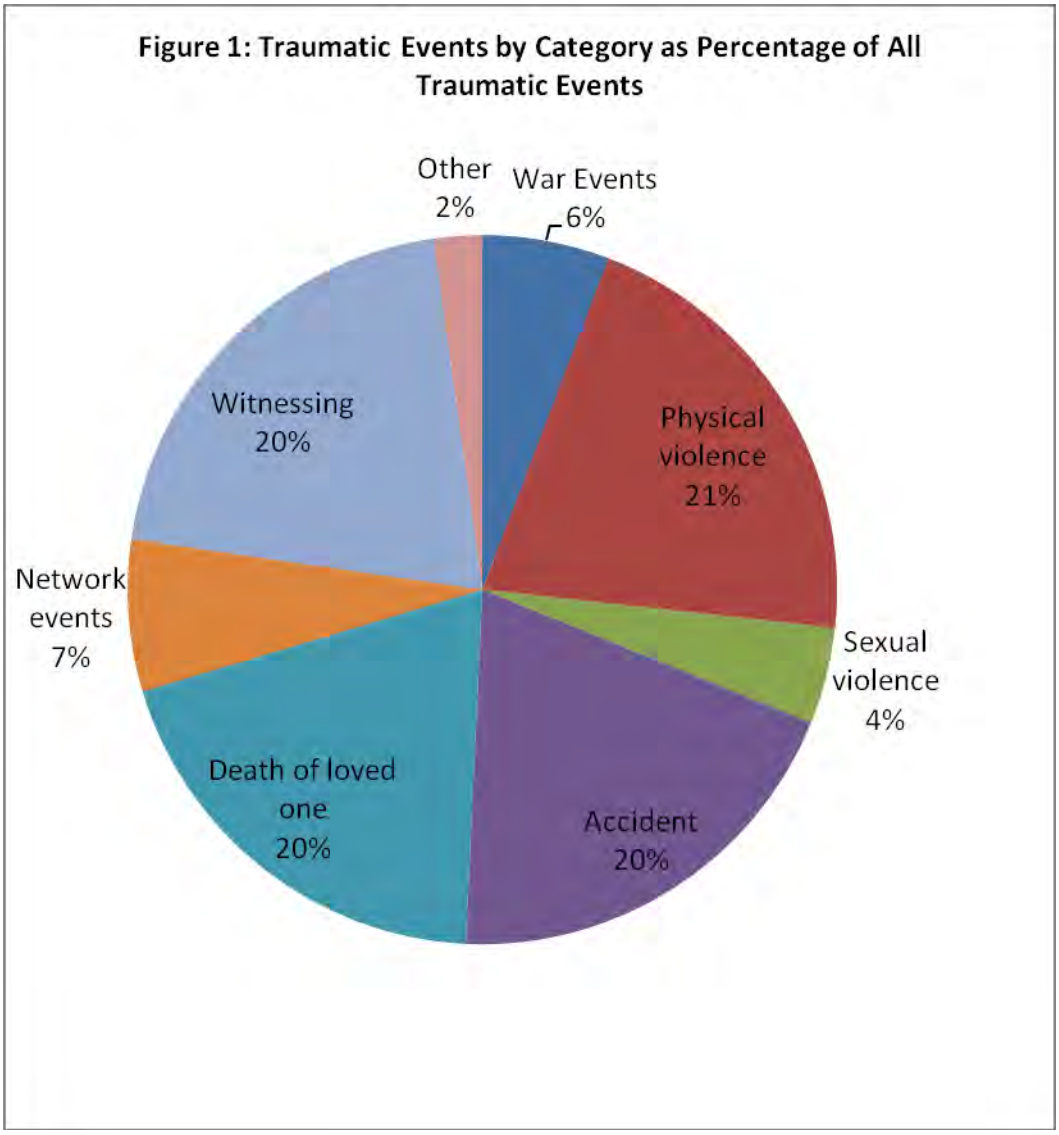
The mean number of occurrences varied significantly across TE classes (χ_7=549.1, p<.001), and the highest proportion of all lifetime events was associated with physical violence (20.9%) followed by witnessing (20.5%), accidents (19.6%) and unexpected death of a loved one (19.6%) (Figure 1).

Table 1: Prevalence of trauma exposure (N=4315)

Event type	Prevalence %	SE	Mean no. of occurrences[a]	SE	Proportion of traumas in population[b]	SE
War Events	**12.2**	**0.87**	**1.5**	**0.06**	**5.8**	**0.54**
Combat	2.6	0.35	1	0	0.8	0.1
Relief worker	2.1	0.33	1	0	0.7	0.1
Civilian in war zone	3.6	0.67	1	0	1.1	0.21
Civilian in region of terror	7.1	0.73	1	0	2.2	0.23
Refugee	1.6	0.28	1	0	0.5	0.09
Purposely injured, tortured, or killed someone	0.9	0.17	1.5	0.16	0.5	0.09
Physical Violence	**37.6**	**0.98**	**1.8**	**0.04**	**20.9**	**0.60**
Beaten up by caregiver	12	0.82	1	0	3.8	0.26
Beaten up by partner	7.9	0.48	1	0	2.5	0.14
Beaten up by someone else	12.4	0.61	1.5	0.06	5.9	0.34

Mugged or threatened with a weapon	18.3	0.79	1.4	0.04	8.4	0.36
Kidnapped	1.2	0.21	1	0	0.4	0.07
Sexual Violence	**7.6**	**0.56**	**1.8**	**0.08**	**4.4**	**0.34**
Raped	2.1	0.27	1.3	0.07	0.9	0.13
Sexually assaulted	1.6	0.24	1.8	0.17	0.9	0.17
Stalked	4.5	0.43	1.9	0.11	2.7	0.25
Accidents	**31.9**	**1.06**	**1.9**	**0.05**	**19.6**	**0.57**
Toxic chemical exposure	3.2	0.40	2.3	0.19	2.3	0.38
Automobile accident	13.2	0.64	1.2	0.03	5.1	0.24
Other life threatening accident	5.6	0.42	1.4	0.07	2.5	0.25
Natural disaster	4.1	0.51	1.3	0.06	1.7	0.21
Man-made disaster	2.8	0.27	1.3	0.12	1.2	0.15
Life-threatening illness	13.2	0.76	1.6	0.05	6.8	0.36
Unexpected death of loved one	**39.2**	**1.22**	**1.6**	**0.04**	**19.6**	**0.57**
Network events	**14.1**	**0.74**	**1.6**	**0.07**	**6.9**	**0.47**
Child with serious illness	8.1	0.51	1.4	0.05	3.5	0.27
Traumatic event to loved one	5.8	0.41	1.4	0.09	2.5	0.25
Accidentally caused serious injury or death	1.9	0.28	1.6	0.26	1	0.22
Witnessing	**29.5**	**1.29**	**2.2**	**0.09**	**20.5**	**0.96**
Witnessed death/dead body, saw someone hurt	28.5	1.29	2.0	0.07	18.1	0.89
Saw atrocities	3.9	0.51	1.9	0.15	2.4	0.37
Others	**6.4**	**0.52**	**1.1**	**0.02**	**2.2**	**0.18**
Some other event	3.0	0.37	1	0	0.9	0.12
Private event	3.9	0.40	1	0	1.2	0.13
Total with any event	**73.8**	**1.15**	**4.3**	**0.11**	**100**	**0**

[a] Mean number of occurrences among respondents with any TE vary significantly across the eight TE classes (χ_5=489.8, p<.001 as well as across the 28 individual TE types (χ_{18}=1698, p<.001). [b] Events in this class as percentage of all traumatic events



4.1.2 Prevalence and conditional risk of PTSD

Conditional prevalence of PTSD refers to the prevalence of PTSD among those that had been exposed to TEs, as opposed to the prevalence of PTSD in the total sample that includes those that were not exposed to any TE. In this sample, the PTSD conditional prevalence was 3.5% (1.9) across all TEs, for a total of approximately 480 lifetime episodes of PTSD (i.e., 3.5% of approximately 13,700 TE occurrences).

The proportion of the study population that reported at least one lifetime episode of PTSD was 2.3% (0.3). In comparison the prevalence estimate of 12-month PTSD was 0.7% (0.2). (Table 2)

Table 2: Conditional risk of PTSD, mean symptom duration and relative PTSD burden associated with specific TEs and TE classes (n=4315)

Event type	Conditional PTSD risk [a]	SE	Number of lifetime to date PTSD episodes [b]	SE	Mean PTSD Duration (Months)[c]	SE	% Relative PTSD burden[d]	SE
War Events	**2.9**	**2.80**	**0.5**	**0.52**	**70.7**	**10.77**	**8.1**	**7.53**
Combat	2.3	2.19	0.1	0.08	60.0	0.00	0.8	0.89
Relief worker	0.0	0.00	--	--	--	--	--	--
Civilian in war zone	0.0	0.00	--	--	--	--	--	--
Civilian in terror	0.0	0.00	--	--	--	--	--	--
Refugee	0.0	0.00	--	--	--	--	--	--
Purposely injured, tortured, or killed someone	32.9	28.73	0.5	0.18	72.0	0.00	4.3	1.68
Physical Violence	**1.8**	**0.65**	**1.2**	**0.42**	**27.5**	**16.14**	**6.9**	**5.92**
Beaten up by caregiver	1.2	0.71	0.1	0.09	14.5	6.12	0.5	0.38
Beaten up by partner	5.4	2.69	0.4	0.22	59.0	44.20	5.3	5.34
Beaten up by someone else	0.9	0.82	0.2	0.15	2.0	0.00	0.10	0.12
Mugged or threatened with a weapon	1.7	0.98	0.4	0.26	11.1	6.06	1.1	0.84
Kidnapped								
Sexual Violence	**2.6**	**1.70**	**0.4**	**0.24**	**15.2**	**12.39**	**1.2**	**1.21**
Raped	13.4	8.36	0.4	0.24	15.2	9.59	1.2	1.21
Sexually assaulted	0.0	0.00	--	--	--	--	--	--
Stalked	0.0	0.00	--	--	--	--	--	--
Accidents	**3.3**	**1.23**	**2.1**	**0.78**	**39.1**	**17.23**	**17.2**	**10.55**
Toxic chemical exposure	0.0	0.00	--	--	--	--	--	--

Automobile accident	5.5	3.57	0.9	0.60	33.7	14.88	6.3	4.39
Other life threatening accident	9.6	5.31	0.8	0.40	20.1	9.91	3.2	2.00
Natural disaster	0.7	0.73	0.0	0.02	7.0	0.00	0.1	0.03
Man-made disaster	0.5	0.65	0.0	0.06	72.0	0.00	0.3	0.89
Life-threatening illness	1.8	0.87	0.4	0.19	91.8	55.35	7.3	6.01
Unexpected death of loved one	**3.3**	**1.32**	**2.0**	**0.84**	**27.5**	**8.10**	**11.8**	**7.83**
Network events	**1.4**	**0.83**	**0.3**	**0.18**	**53.1**	**34.72**	**3.6**	**3.43**
Child with serious illness	1.9	1.36	0.2	0.15	68.8	21.45	3.0	3.26
Traumatic event to loved one	0.1	0.11	0.0	0.01	24.0	0.00	0.0	0.05
Accidentally caused serious injury or death	3.4	3.65	0.1	0.11	24.0	0.00	0.5	0.59
Witnessing	**8.3**	**4.91**	**4.5**	**2.46**	**55.1**	**4.38**	**50.5**	**15.38**
Witnessed death/dead body, saw someone hurt	3.7	2.67	2.1	1.54	44.1	9.51	19.8	13.92
Saw atrocities	31.5	18.34	2.4	1.37	61.6	1.42	30.7	10.82
Others	**2.5**	**1.91**	**0.2**	**0.14**	**21.4**	**8.19**	**0.8**	**0.61**
Some other event	0.9	0.91	0.0	0.01	48.0	0.00	0.3	0.15
Private event	1.2	0.13	4.1	3.77	1.4	1.28	0.5	0.48
Total with any event	**3.5**	**1.91**	**11.2**	**6.29**	**42.3**	**12.27**	**100.0**	**0.00**

[a] Conditional risk for PTSD varies significantly across broad TE classes (χ_7=134.2 p<.001) and even more across specific TEs (χ_{17}=356, p<.001). Some classes of events are not included in the comparison because their number of mean occurrences is equal to zero. [b] Number of lifetime-to-date episodes of PTSD associated with this class of TEs and individual TE per 100 respondents. [c] Mean duration of PTSD episode (or residual symptoms, in months) for episodes associated with TE in this class (χ_7=134.2, p<.001) and individual TE types(χ_{11}=416.1, p<.001). [d]Percent of all years (or months) with PTSD episode (or residual symptoms) in the population due to episodes associated with this class of events

The PTSD conditional risk associated with TE classes varied from a high of 8.3% (4.9) associated with witnessing TEs to a low of 1.4% (0.8) associated with network TEs (i.e., TEs that occurred to loved ones) but did not vary significantly across broad TE classes (χ_7=0.60, p=.75). There was greater variation across specific TEs, with the highest value by far being associated with purposely injuring, torturing or killing someone (32.9%) and

witnessing atrocities (31.5%). This variation was however not statistically significant (χ_{27}=1.00, p=.44). The next highest conditional PTSD risks were associated with rape (13.2%) and life-threatening accidents (5.5% for auto accidents; 9.6% for other accidents). Conditional risks associated with the other 22 traumatic events were much lower (0.0-5.4%).

PTSD symptom duration varied significantly by the TEs responsible for the PTSD (for TE classes: χ_7=134.2, p<.001; for individual TEs: (χ_{11}=416, p<.001). The mean duration (standard error) for all PTSD episodes was 42.3 (12.3) months.

Because the respondents with PTSD associated with several specific TEs were few, little precision could be achieved in studying between-TE variation in mean PTSD symptom duration. Focusing on TE classes with 10 or more respondents, PTSD symptoms attributed to accidents and sudden unexpected death had a shorter than average duration while those associated with witnessing trauma had longer than average duration.

The relative burden of PTSD is the percentage of all the time (months) lived with PTSD symptoms in the population due to episodes associated with each class of events. It is calculated by combining three factors: the prevalence of the TE, the conditional risk of PTSD following the TE and the PTSD symptom duration.

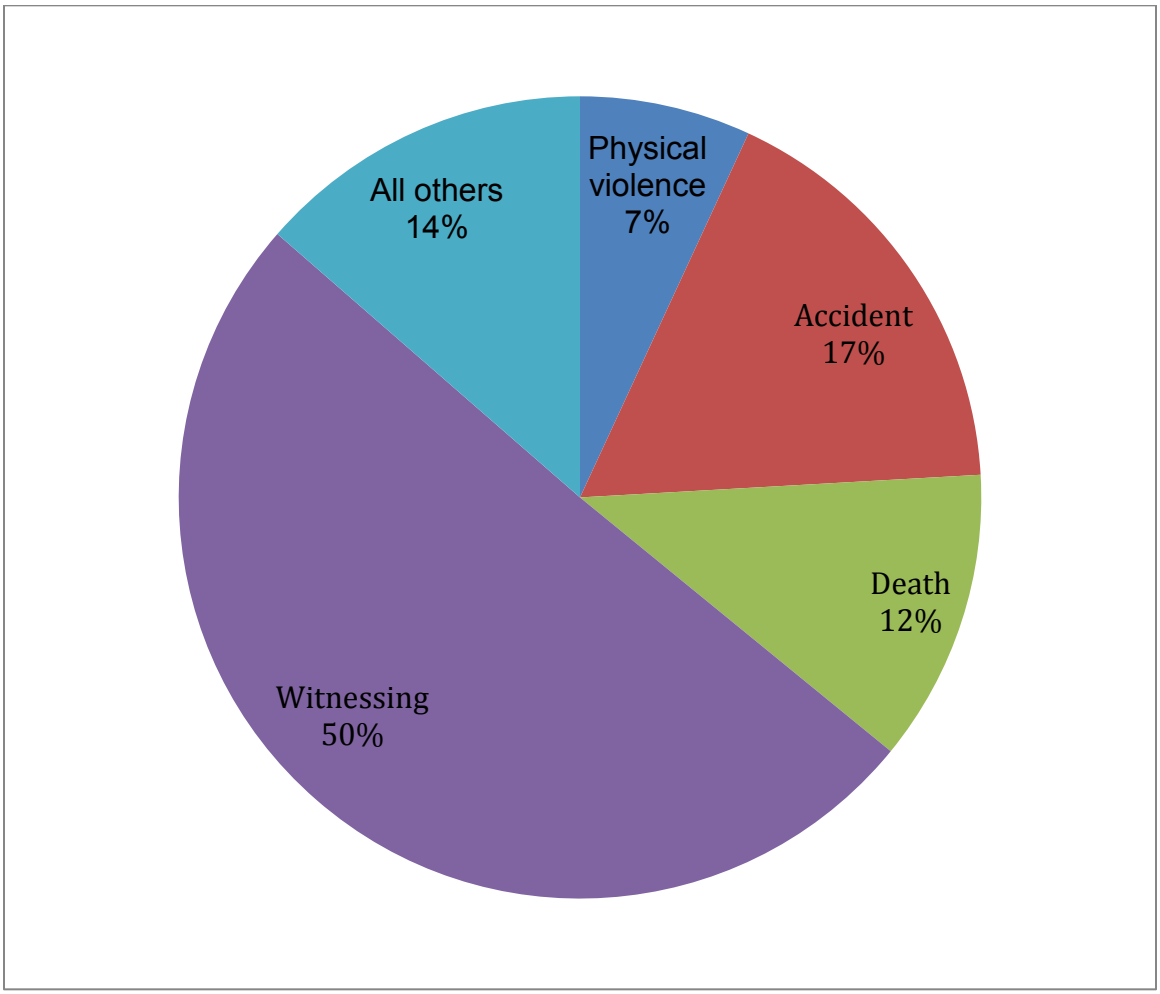
In this analysis, the highest relative burden for individual events was associated with unexpected death of a loved one (11.8%), witnessing death/dead body (19.8%) and seeing atrocities (30.7%). There were different reasons for the high burden for each of these TEs.

For instance, the unexpected death of a loved one was one of the most commonly reported events with 39.2% prevalence. However, the PTSD conditional risk associated with this TE was only 3.3% and the duration of PTSD episodes associated with it was only 27 months. As a result, even despite the low conditional risk of PTSD and relatively short duration of symptoms compared to other events, its contribution to the total burden was high due to the high prevalence rate. Seeing atrocities, on the other hand, was much less common, with a prevalence of only 3.9%. However, the conditional risk of PTSD (31.5%) and duration (60.6 months) associated with this event were very high, resulting in its high contribution to the total PTSD burden of almost a third.

As shown in Table 2, the TE class responsible for the largest relative burden of PTSD was witnessing trauma at 50.5%. This TE class had a longer than average duration of PTSD symptoms, 55.1 months.

Figure 2 illustrates the relative PTSD burden due to the different TE classes.

Figure 2: Relative PTSD burden associated with TE classes



4.1.3 Socio-demographic predictors of trauma exposure, lifetime and 12-month PTSD

Very few sociodemographic factors were associated with trauma exposure and lifetime PTSD (Table 3) and 12-month PTSD (Table 4). Homemakers were at significantly lower risk of exposure to TEs (OR=0.65, CI 0.49-0.86) than employed respondents.

In the case of lifetime PTSD, Indians had reduced odds (OR=0.02, CI 0.00-0.09) and retired persons increased odds (OR=9.18, CI 2.62-32.20) in fully adjusted models. Among those with lifetime PTSD, previously married participants had lower odds of 12-month PTSD (OR=0.02, CI 0.00-0.31) compared to currently married respondents, while the never-married had significantly elevated odds of 12-month PTSD (OR=37.64, CI 2.22-639.50). Compared to those with high education, those with low-average education had significantly increased odds of having 12-month PTSD (OR=29.45, CI 2.62-330.50). However, most of the confidence intervals were very wide for theses categories due to the relatively small numbers of respondents.

Table 3: Associations of socio-demographic factors with lifetime PTSD (N=4315)

Variable	Lifetime Trauma exposure OR (OR Range)	Lifetime PTSD OR (OR Range)		
		Among Total Sample	Among those with Events	Among those with Events, Controlling for events
Gender				
Male	1.00	1.00	1.00	1.00
Female	1.03 (0.84-1.26)	1.24 (0.56-2.76)	0.53 (0.12-2.30)	0.84 (0.34-2.04)
Age				
18 - 29	0.89 (0.64-1.25)	1.24(0.39-3.90)	0.76 (0.14-4.27)	1.70 (0.35-8.26)
30 - 44	1.04 (0.72-1.5)	1.62 (0.60-4.39)	0.59 (0.11-3.08)	0.83 (0.15-4.69)
45 - 59	1.22 (0.89-1.67)	1.69 (0.69-4.15)	0.51 (0.12-2.09	0.91 (0.25-3.36)
60+	1.00	1.00	1.00	1.00
Marital Status				
Married	1.00	1.00	1.00	1.00
Previously married	1.35 (0.85-2.14)	**2.71 (1.16-6.35)***	0.36 (0.09-1.36)	0.47 (0.10-2.28)
Never married	0.85 (0.67-1.08)	0.74 (0.33-1.66)	0.80 (0.30-2.14)	0.66 (0.20-2.16)
Education Level				
Low	0.59 (0.38-0.94)	0.47 (0.18-1.23)	0.71 (0.10-4.92)	0.68 (0.10-4.92)
Low-average	0.72 (0.48-1.06)	0.70 (0.38-1.26)	3.16 (0.66-15.19)	1.92 (0.65-5.66)
High-average	0.85 (0.65-1.12)	0.55 (0.29-1.06)	0.76 (0.22-2.64)	0.31 (0.08-1.23)

High	1.00	1.00	1.00	1.00
Employment				
Employed	1.00	1.00	1.00	1.00
Homemaker	**0.65 (0.49-0.86)***	1.00 (0.40-2.52)	1.15 (0.29-4.58)	0.92 (0.26-3.24)
Retired	0.87 (0.54-1.39)	2.33 (0.89-6.09)	**11.97 (4.00-35.82)***	**9.18 (2.62-32.20)***
Other	0.86 (0.67-1.10)	1.14 (0.70-1.87)	1.23 (0.56-2.72)	1.06 (0.50-2.24)
Race				
White	1.00	1.00	1.00	1.00
Black	1.32 (0.81-2.16)	0.70 (0.29-1.68)	0.36 (0.10-1.28)	0.60 (0.23-1.61)
Colored	0.73 (0.42-1.25)	0.90 (0.50-1.62)	0.76 (0.14-4.01)	0.79 (0.21-3.06)
Indian	1.35 (0.69-2.62)	**0.07 (0.01-0.57)***	**0.01 (0.00-0.09)***	**0.02 (0.00-0.19)***
Other	1.17 (0.51-2.71)	0.95 (0.22-4.09)	0.61 (0.04-9.16)	1.23 (0.18-8.41)
TE Classes				
War events	-	-	-	2.40 (0.32-18.06)
Physical violence	-	-	-	0.68 (0.23-2.00)
Sexual violence	-	-	-	0.74 (0.08-7.32)
Accident	-	-	-	1.43 (0.31-6.55)
Death	-	-	-	1.00
Network events	-	-	-	0.38 (0.06-2.32)
Witnessing	-	-	-	3.56 (0.53-24.03)
Other or private	-	-	-	0.74 (0.09-6.40)
Count of prior TEs				
Prior war events	-	-	-	0.58 (0.29-1.15)
Prior physical violence	-	-	-	1.33 (0.73-2.43)
Prior sexual violence	-	-	-	1.56 (0.91-2.69)
Prior accidents	-	-	-	0.95 (0.73-1.23)
Prior deaths	-	-	-	1.53 (1.16-2.03)
Prior network events	-	-	-	1.10 (0.77-1.57)
Prior witnessing	-	-	-	1.09 (0.93-1.28)
Prior other events	-	-	-	0.14 (0.01-2.92)

*Statistically significant ($p<0.05$); OR= Odds Ratio

Table 4: Associations of socio-demographic factors with 12-Month PTSD (N=4315)

Variable	12-Month PTSD in Total Sample; OR (OR Range)	12-Month PTSD Among Those with Events; OR (OR Range)	12-Month PTSD Among those with events, controlling for events; OR (OR Range)	12-Month PTSD Among those with Lifetime PTSD; OR (OR Range)
Gender				
Male	1.00	1.00	1.00	1.00
Female	1.55 (0.58-4.14)	0.44 (0.06-3.27)	0.45 (0.12-1.68	2.40 (0.32-17.82)
Age				
18 - 29	0.95 (0.10-9.50)	4.60 (0.17-123.08)	2.86 (0.16-50.34)	11.29 (0.17-743.84)
30 - 44	1.43 (0.35-5.86)	3.66 (0.61-21.89)	2.58 (0.43-15.50)	10.57 (0.29-384.73)
45 - 59	1.21 (0.23-6.42)	4.82 (0.47-49.80)	4.81 (0.61-37.88)	21.85 (0.66-722.73)
60+	1.00	1.00	1.00	1.00
Marital Status				
Married	1.00	1.00	1.00	1.00
Previously married	1.34 (0.38-4.71)	0.19 (0.01-2.72)	0.30 (0.06-1.62)	**0.02 (0.00-0.31)***
Never married	0.78 (0.20-3.02)	1.70 (0.49-5.92)	3.76 (0.78-18.15)	**37.64 (2.22-639.50)***
Education Level				
Low	0.14 (0.01-1.42)	0.49 (0.03-9.92)	0.59 (0.03-13.83)	.
Low-average	1.56 (0.38-6.38)	4.56 (0.30-68.37)	5.55 (0.29-106.30)	**29.45 (2.62-330.50)***
High-average	0.53 (0.14-2.01)	**0.17 (0.03-0.91)***	**0.10 (0.01-0.82)***	2.03 (0.18-23.31)
High	1.00	1.00	1.00	1.00
Employment				
Employed	1.00	1.00	1.00	1.00
Homemaker	0.67 (0.25-1.75)	0.24 (0.05-1.29)	0.41 (0.09-1.94)	.
Retired	0.44 (0.06-3.20)	0.14 (0.02-1.14)	0.14 (0.02-1.15)	.
Other	1.17 (0.47-2.92)	0.49 (0.14-1.75)	0.68 (0.22-2.07)	0.15
Race				
White	1.00	1.00	1.00	.
Black	1.05 (0.20-5.54)	13.38 (0.90-	14.97 (0.71-318.08)	.

		199.26)		
Colored	1.08 (0.23-5.06)	11.38 (0.75-172.24)	16.86 (0.55-518.03)	.
Indian	0.40 (0.03-4.95)	0.77 (0.03-19.87)	2.37 (0.04-155.10)	.
Other	4.45 (0.33-60.76)	42.19 (0.83-2138.38)	27.14 (0.72-1024.36)	.
TE Classes				
War events, physical or sexual violence	-	-	0.95 (0.20-4.51)	0.33 (0.05-2.29)
Accident	-	-	1.21 (0.19-7.68)	0.73 (0.07-7.91)
Death	-	-	1.00	1.00
Network events	-	-	0.03 (0.00-1.95)	0.13 (0.01-2.04)
Witnessing	-	-	2.04 (0.38-10.75)	0.09 (0.00-2.12)
Other or private	-	-	0.10 (0.00-2.38)	3.39 (0.03-430.50)
Count of prior TEs				
Prior war events	-	-	0.25 (0.03-1.89)	1.12 (0.25-5.06)
Prior physical violence	-	-	1.53 (0.96-2.45)	2.43 (0.98-6.06)
Prior sexual violence	-	-	2.38 (1.21-4.69)	2.97 (0.98-8.99)
Prior accidents	-	-	1.32 (0.99-1.76)	0.87 (0.33-2.33)
Prior deaths	-	-	0.57 (0.23-1.42)	1.08 (0.55-2.11)
Prior network events	-	-	0.12 (0.01-2.08)	0.05 (0.01-0.28)
Prior witnessing	-	-	1.09 (0.88-1.35)	3.38 (1.38-8.27)
Prior other events	-	-	0.40 (0.03-5.69)	89.72 (0.91-8832.05)

*Statistically significant ($p<0.05$); OR= Odds Ratio
Low and low-average education was combined in the model predicting 12-month PTSD among respondents with LT PTSD; Homemaker, retired and other employment categories were combined in the model predicting 12-month PTSD among respondents with LT PTSD

4.2: Traumatic events and other psychopathology: Witnessing trauma

This section addresses Specific Objective 3: To examine the relationship between trauma exposure and other mental disorders, in order to establish **whether the traumatic events that account for the greatest burden of PTSD in South Africa increase the risk of other mental disorders.**

In the previous analysis, (Section 4.1) it has been shown that witnessing trauma contributed to the largest proportion of PTSD cases, and carried the highest conditional risk for PTSD. The greatest burden of PTSD in this population it therefore attributable to witnessing trauma, and the present analysis therefore tackled this objective by assessing the risk of other mental disorders associated with witnessing trauma.

This section is also organized into four parts to deal with separate segments of the specific objective. The first part (4.2.1) presents the socio-demographic factors associated with witnessing trauma, while the second part (4.2.2) deals with the association between witnessing trauma and other TE categories. Section 4.2.3 examines the association between witnessing trauma and lifetime mental disorders and finally section 4.2.4 presents the results of discrete time-survival analyses of the ORs of witnessing and mental disorders, in order to estimate the temporality of the associations.

4.2.1 Socio-demographic factors and witnessing trauma

In this analysis, 1084 (27.6%) respondents reported witnessing trauma. Men reported witnessing traumatic events more frequently than women (33.4% vs. 22.8%, $p<0.0001$). Respondents with low to low-average education had higher rates of witnessing than those with high-average to high education (8 or more years of education). None of the other socio-demographic variables showed any significant association with witnessing

status (**Table 5).**

Table 5: Associations of socio-demographic factors with witnessing trauma (N=4255)[1]

	Witnessing	No Witnessing	Chi-sq	p
Sex (n=4253)				
Female	577 (22.8)	2012 (77.2)	33.52	<.0001
Male	507 (33.4)	1157 (66.6)		
Age (n=4250)				
18-29	428 (28.4)	1173 (71.6)	4.2	0.2393
30-44	385 (28.8)	1067 (71.2)		
45-59	192 (26.0)	611 (74.0)		
60+	77 (23.4)	317 (76.6)		
Marital Status (n=4202)				
Currently married	543 (28.6)	1540 (71.4)	1.7	0.4298
Previously married	82 (28.6)	255 (71.4)		
Never Married	446 (26.5)	1336 (73.5)		
Education (n=4176)				
Low (0-2 yrs)	163 (27.5)	439 (72.5)	8.9	0.0303
Low-avg (3-7 yrs)	636 (29.6)	1717 (70.4)		
High-avg (8-12 yrs)	185 (24.3)	613 (75.7)		
High (13+ yrs)	83 (23.0)	340 (77.0)		
Employment status (n=2524)				
Employed	350 (31.5)	889 (68.5)	7.9	0.0967
Unemployed	241 (33.2)	547 (66.8)		
Homemaker	52 (23.2)	192 (76.8)		
Retired	14 (22.7)	62 (77.3)		
Other	46 (26.9)	131 (73.1)		
Race (n=4255)				
White	82 (29.9)	213 (70.1)	8.1	0.0891
Black	851 (28.6)	2327 (71.4)		
Colored	96 (19.7)	438 (80.3)		
Indian	33 (22.2)	115 (77.8)		
Other	22 (27.6)	78 (72.4)		

[1]Subsamples may not always equal the total sample size due to missing responses

4.2.2 Witnessing trauma and other traumatic events

The mean number of traumatic events, not including witnessing, was significantly higher for those who reported witnessing than for those who did not (2.78 vs. 1.38; p<.0001). Exposure to all other types of traumatic events was statistically significantly higher among those who also reported witnessing (**Table 6)**.

Table 6: Association between witnessing and other traumatic events

	Witnessing N=1084	**No Witnessing N=3171**	**Chi-sq**	**p**
TEs (N= 4255)				
War Events	205 (20.9)	222 (8.7)	65.8	<.0001
Physical Violence	565 (52.8)	932 (30.6)	159.6	<.0001
Accidents	487 (45.9)	750 (25.4)	118.1	<.0001
Sexual Violence	108 (10.5)	186 (6.0)	14.2	0.0002
Unexpected Death	624 (57.2)	988 (31.2)	186.0	<.0001
Network Events	236 (20.7)	346 (11.0)	76.1	<.0001
Other	108 (9.9)	155 (4.9)	32.8	<.0001
Mean number of TEs			**F**	**P**
Mean (SE)	2.78 (0.1)	1.38 (0.04)	1143.4	<.0001

4.2.3 Lifetime mental disorders and witnessing trauma

The differences in prevalence rates of lifetime mental disorder diagnoses by witnessing status were tested. Witnessing trauma was significantly associated with having any

anxiety or mood disorder, but there was no association with substance use disorders (**Table 7).**

Table 7: Association between witnessing and lifetime mental disorders

Disorder	Witnessing (%)	No witnessing (%)	Chi-sq	P
Any Mood Disorder	175 (15.4)	340 (10.4)	17.2	<.0001
Any Anxiety Disorder	306 (26.9)	614 (18.7)	17.9	<.0001
Any Substance Use Disorder	102 (10.0)	309 (11.5)	1.52	0.2183
PTSD	36 (3.3)	50 (1.7)	9.4	0.0022

Table 8, presents the odds ratios of mood, anxiety, and substance use disorders by witnessing status.

Table 8: Logistic regression models of lifetime mental disorders by witnessing

	Model 1[1]		Model 2[2]		Model 3[3]	
Disorder	**OR (95% CI)**	**P**	**OR (95% CI)**	**P**	**OR (95% CI)**	**P**
Mood	1.72 (1.38-2.15)	<.0001	1.69 (1.35-2.13)	<.0001	1.38 (1.1-1.75)	0.0066
Anxiety	1.78 (1.42-2.22)	<.0001	1.76 (1.4-2.21)	<.0001	1.45 (1.17-1.80)	0.0008
Substance use	0.71 (0.57-0.90)	0.0045	0.69 (0.55-0.88)	0.0023	0.55 (0.43-0.70)	<.0001

[1]Adjusted for sex, marital status, level of education, race/ethnicity, and age
[2]Adjusted for all model 1 covariates and prior PTSD
[3]Adjusted for all model 2 covariates and for any other TE

Adjusted models were restricted to complete cases only. However, a large proportion of responses for employment status were missing (n=1731). Because this covariate was non-significant in the regression models, employment status was removed as a covariate in the final models in order to retain the full analytic sample in the adjusted models. When adjusted for sex, marital status, highest level of education, and age (Model 1 on **Table 8**), the odds of developing a mood disorder were 72% higher among respondents reporting witnessing than among those who did not (95% CI=1.38-2.15;

p=<.0001). Likewise, the odds of developing an anxiety disorder were 78% higher (95% CI=1.42-2.22; p<.0001). However, the odds of developing a substance use disorder were 0.71 times lower among those who witnessed than those who did not (95% CI=0.57-0.90; p=.0045).

A similar pattern is seen when further controlling for a prior PTSD diagnosis (Model 2 on **table 8**). The odds of mood disorder are 1.69 times higher in the exposed group (95% CI=1.35-2.13; p=<.0001), the odds of anxiety disorder are 1.76 times higher (95% CI=1.4-2.21; p=<.0001) and the odds of substance use disorder are 0.69 times lower among those who reported witnessing trauma (95% CI=0.55-0.88; p=0.0023) as compared to those who did not.

In order to test the specificity of witnessing versus other traumatic events, another set of models tested the effect of witnessing further adjusted for any other reported TE experienced prior to the mental disorder diagnosis (Model 3 on **table 8**). The effect was similar; among those who reported witnessing, the odds of mood disorder were 1.38 times higher (95% CI: 1.1-1.75; p=0.0066), and the odds of anxiety disorder were 1.45 times higher (95% CI=1.17-1.8; p=0.0008) compared with those who did not report witnessing. The odds of substance use disorder were 0.55 times lower among those who reported witnessing; 95% CI=0.43-0.7; p<0.0001).

4.2.4 Discrete-time survival analysis

Person-years, starting from age one, were added to test the difference in time to diagnosis by witnessing status. Models were also adjusted for respondent's age at diagnosis, as the best available proxy for time to onset of diagnosis. When adjusted for demographic covariates, prior PTSD, person-years to diagnosis and age at diagnosis, the odds of mood disorders were 1.62 times higher (95% CI: 1.2-2.2; p=.0021) and the

odds of anxiety disorders were 1.61 times higher (95% CI: 1.21-2.14; p=.001) compared to those who did not report witnessing. The odds of substance use disorder were not significantly associated with witnessing status (OR=1.11; 95% CI=0.48-2.53; p=0.8128). Models were also best fit by including only covariates that were statistically significant in the full models, but this process caused no appreciable change in the full model estimates. Complete model results can be found in **table 9**.

Table 9: Discrete-time survival analysis of ORs of mental disorders by witnessing

	Full models[1]			**Best-fit models**		
Disorder	**OR**	**95% CI**	**P**	**OR**	**95% CI**	**P**
Mood	1.62	1.2-2.2	0.0021	1.53[2]	1.14-2.04	0.0043
Anxiety	1.61	1.21-2.14	0.001	1.61[3]	1.21-2.13	0.0009
SUD	1.11	0.48-2.53	0.8128	1.12[4]	0.47-2.63	0.8027

[1] Adjusted for person-time to event or end of study, age at diagnosis, sex, marital status, education, race, age, prior PTSD, any other TE
[2] Adjusted for person-time to event or end of study, age at diagnosis, marital status, education, age, prior PTSD, any other TE
[3] Adjusted for person-time to event or end of study, age at diagnosis, sex, education, age, prior PTSD, any other TE
[4] Adjusted for person-time to event or end of study, age at diagnosis, marital status, age, prior PTSD, any other TE

To more fully understand the association between sex and psychiatric outcomes, an interaction term for sex and witnessing was added to the adjusted survival models. The model estimates were non-significant for all outcomes (Mood β=0.018, p=0.840; Anxiety β=0.145, p=0.096; SUD β=0.182, p=0.532), and were not included in the final model estimates.

4.3 Trauma exposure and physical conditions

This analysis addressed Specific Objective 4: To determine the relationship between trauma, PTSD and physical health. Results are presented on whether traumatic events are associated with greater risk of specific physical health complaints as well as a larger burden of physical health problems overall and whether this association is mediated by PTSD.

This section is divided in to five parts. The first part (4.3.1) presents results on the sociodemographic distribution of physical conditions, and is followed by part 4.3.2 examining the distribution of physical condition s by TE type. The third part (4.3.3) examines the association between the cumulative number of TEs and socio-demographic variables, while the fourth part (4.3.4) describes the association between TE exposure and physical conditions. The final part of this section (4.3.5) examines the effect of cumulative lifetime TEs on the odds of physical conditions.

4.3.1 Sociodemographic distribution of physical conditions

The most commonly reported physical condition was chronic pain (46.6%). Up to 60.2% of the sample reported having at least one physical condition. Female respondents reported a higher prevalence of all conditions that was statistically significant in all cases except respiratory conditions. Groups with the highest prevalence of physical conditions were female, age 60+, previously married, highly educated (13+ yrs), and worked as a homemaker. Further, prevalence of mental disorders among those who reported any physical condition ranged from 61.2% for substance use disorders to 93.4% for PTSD, evidence of high comorbidity between lifetime mental disorders and physical conditions. Full results are shown in Table 10 overleaf.

4.3.2 Distribution of physical conditions by TE type

The most commonly reported types of trauma were physical violence (32.9%), sexual violence (28.4%), and unexpected death of a loved one (31.3%). As shown in Table 10, the frequencies of any reported physical condition were elevated among respondents reporting each of the traumatic events, ranging from 64.7% (witnessing) to 79.2% (network trauma). Associations between individual TEs and individual physical conditions are shown in Table 10.

Table 10: Distribution of physical conditions by sociodemographic variables and PTE type (n=4351)

			Type of physical condition											
	Total sample (n, %)		**Arthritis**		**Cardio-vascular**		**Respiratory**		**Chronic pain**		**Other**		**Any physical condition**	
Variable Total (n, %)	4351	100.0	455	10.0	915	19.5	843	19.1	2055	46.6	729	16.5	2656	60.2
Sex														
Female	2616	53.6	353	13.7	702	25.9	520	19.6	1400	53.6	481	18.0	1754	66.8
Male	1733	46.4	100	5.8	212	12.2	323	18.6	654	38.5	248	14.9	901	52.6
Column total n; *p val*	4349		453	*<.0001*	914	*<.0001*	843	*0.434*	2054	*<.0001*	729	*0.009*	2655	*<.0001*
Age														
18-29	1637	39.1	36	2.4	104	5.7	286	17.8	649	38.9	155	9.3	817	49.1
30-44	1491	32.1	125	7.1	257	15.4	292	19.1	709	46.4	257	16.6	904	59.8
45-59	820	20.0	158	19.2	334	37.7	178	20.5	447	54.2	206	24.5	604	72.2
60+	398	8.7	132	33.6	220	55.2	86	22.7	247	64.1	109	29.5	328	83.3
Column total n; *p val*	4346		451	*<.0001*	915	*<.0001*	842	*0.193*	2052	*<.0001*	727	*<.0001*	2653	*<.0001*
Marital Status														
Currently married	2135	50.6	277	13.0	546	25.0	436	20.2	1105	51.6	403	19.4	1393	64.8
Previously married	343	6.5	77	19.7	139	39.2	61	15.6	194	55.1	77	20.3	264	76.6
Never Married	1820	42.9	94	5.2	222	10.3	336	18.7	740	39.8	243	12.7	977	52.7
Column total n; *p val*	4298		448	*<.0001*	907	*<.0001*	833	*0.219*	2039	*<.0001*	723	*<.0001*	2634	*<.0001*
Education														
Low (0-2 yrs)	618	15.2	44	6.9	86	12.0	139	20.9	262	39.8	91	13.4	353	53.4
Low-avg (3-7 yrs)	2410	58.3	186	7.1	378	14.5	444	18.2	1050	43.0	333	13.7	1369	56.5
High-avg (8-12 yrs)	810	17.4	140	18.3	278	34.3	159	20.3	464	59.1	176	23.1	578	73.0
High (13+ yrs)	433	9.1	79	19.2	161	36.8	89	21.0	250	59.0	112	25.2	321	73.6
Column total n; *p val*	4271		449	*<.0001*	903	*<.0001*	831	*0.582*	2026	*<.0001*	712	*<.0001*	2621	*<.0001*
Employment status														
Employed	1276	49.7	90	7.2	223	16.5	247	19.2	550	42.6	185	15.0	746	58.0
Unemployed	812	30.8	113	12.0	181	19.3	169	19.3	434	51.9	163	18.8	536	64.1

Homemaker	246	9.8	88	34.2	142	55.5	53	22.4	165	66.6	73	31.1	215	86.4
Retired	78	2.6	22	31.5	39	57.1	20	28.2	46	65.3	19	26.6	60	81.5
Other	185	7.1	27	14.7	47	20.2	36	20.7	82	42.2	31	14.8	111	56.6
Column total n; *p val*	2597		340	*<.0001*	632	*<.0001*	525	*0.561*	1277	*<.0001*	471	*<.0001*	1668	*<.0001*
Race														
White	300	9.4	38	12.4	66	18.9	72	20.6	119	36.6	59	17.4	189	56.6
Black	3252	75.0	323	9.6	679	19.9	617	18.8	1590	48.6	561	16.9	2002	61.0
Colored	549	10.2	70	11.5	124	19.5	105	19.4	231	43.1	71	13.4	317	57.8
Indian	148	3.1	15	9.8	27	15.9	34	25.3	77	48.2	22	17.0	97	66.1
Other	102	2.3	7	9.3	19	15.8	15	13.6	38	34.9	16	14.9	51	49.2
Column total n; *p val*	4351		453	*0.631*	915	*0.802*	843	*0.577*	2055	*0.010*	729	*0.604*	2656	*0.255*
Type of PTE														
War	407	11.2	43	10.4	90	21.5	130	31.9	212	50.0	91	21.5	273	65.6
p val				*0.795*		*0.382*		*<.0001*		*0.276*		*0.009*		*0.073*
Physical violence	1376	32.9	153	10.6	320	21.7	335	24.3	777	55.6	299	20.6	942	67.8
p val				*0.360*		*0.029*		*<.0001*		*<.0001*		*0.0003*		*<.0001*
Sexual violence	1148	28.4	169	14.1	335	26.8	321	27.9	717	60.1	305	25.0	862	72.8
p val				*<.0001*		*<.0001*		*<.0001*		*<.0001*		*<.0001*		*<.0001*
Accident	257	6.3	23	7.9	65	22.3	72	28.5	146	56.2	76	28.0	177	69.0
p val				*0.332*		*0.226*		*0.002*		*0.015*		*<.0001*		*0.012*
Unexpected death	1340	31.3	193	14.1	364	26.4	324	24.6	765	56.0	281	21.5	949	70.0
total n; *p val*				*<.0001*		*<.0001*		*<.0001*		*<.0001*		*0.0003*		*<.0001*
Network trauma	484	11.3	93	19.2	177	35.0	113	22.2	320	65.6	133	26.4	384	79.2
total n; *p val*				*<.0001*		*<.0001*		*0.128*		*<.0001*		*<.0001*		*<.0001*
Witness	924	23.3	104	10.7	202	20.7	232	24.5	502	53.6	200	22.1	611	64.7
total n; *p val*				*0.539*		*0.357*		*<.0001*		*0.0003*		*<.0001*		*0.015*
Any trauma	2810	66.8	342	11.6	670	22.4	643	22.8	1502	52.3	557	19.5	1886	66.0
total n; *p val*				*<.0001*		*<.0001*		*<.0001*		*<.0001*		*<.0001*		*<.0001*

4.3.3 Number of Traumatic Events (TEs) by demographic groups

Respondents reporting no lifetime TEs with the greatest frequency were mostly female, aged 18-29, never married, highly educated (13+ yrs), employed as a homemaker, and 'colored'. Conversely, groups reporting the highest frequency of 5+ TEs were mostly male, aged 30-44, with low (0-1 years) education, other employment status, and other race. (Table 11 overleaf)

4.3.4 Odds ratios of TE type and previous year physical condition

As shown in Table 12, among respondents who reported any type of trauma, the odds of developing a physical condition were between 1.48 (95% CI: 1.06-2.07 for arthritis) and 2.07 (95% CI: 1.57-2.73 for respiratory conditions) times higher than the reference group. Similarly, the odds of developing any type of physical condition were statistically significantly higher for individuals who reported experiencing any TE, except for war event or accidents. Increased odds ranged from 1.41 (95% CI: 1.02-1.93) among those who witnessed violence, and 2.48 (95% CI: 1.72-3.58) among those who experienced network events involving others. The odds of developing any of the included physical conditions were significantly elevated among individuals who experienced sexual violence or unexpected death of a loved one.

Table 11: Distribution of Number of Lifetime Traumatic Events (TEs) by sociodemographic variables (n= 4351)

	n, % with cumulative lifetime TEs [1]												Any PTE			% with PTSD		
	0		1		2		3		4		5+		p			p	n	%	p
Total	1309	27.8	1005	23.1	917	21.6	591	14.3	328	8.1	199	5.1	<.0001	3040	72.2	<.0001	91	2.2	<.0001
Sex																			
Female	802	27.7	642	23.6	569	21.7	332	14.6	179	8.3	92	4.0	<.0001	1814	52.6	0.098	62	2.5	0.3
Male	507	25.4	363	19.8	348	21.4	259	15.3	149	10.7	107	7.4		1226	47.4		29	1.9	
Age																			
18-29	533	31.1	386	23.5	329	19.6	210	14.3	110	6.9	69	4.7	0.092	1104	68.9	0.008	24	1.4	0.2
30-44	413	25.6	335	21.8	317	22.8	226	15.3	122	8.5	78	6.0		1078	74.4		33	2.4	
45-59	234	24.1	189	23.7	178	23.1	109	13.9	70	9.9	40	5.4		586	75.9		23	3.2	
60+	131	29.8	93	23.4	91	23.6	45	11.6	26	8.1	12	3.5		267	70.2		11	3.1	
Marital Status																			
Currently married	615	26.1	478	22.0	473	23.1	290	14.2	175	9.2	104	5.4	0.009	1520	73.9	0.013	50	2.4	0.0
Previously married	82	21.0	91	27.2	63	17.4	67	19.4	26	10.2	14	4.8		261	79.0		19	6.9	
Never Married	597	30.8	422	23.5	371	20.6	230	13.8	122	6.4	78	4.8		1223	69.2		21	1.3	
Education																			
Low (0-2 yrs)	155	23.2	155	23.8	134	23.4	90	15.2	50	8.6	34	5.8	0.459	463	76.8	0.069	15	3.2	0.2
Low-avg (3-7 yrs)	728	27.9	551	22.8	514	21.4	323	14.3	179	8.1	115	5.5		1682	72.1		42	1.8	
High-avg (8-12 yrs)	261	30.3	178	21.7	176	23.1	106	13.2	55	7.4	34	4.4		549	69.7		19	2.5	
High (13+ yrs)	142	29.7	103	25.3	78	18.4	62	15.2	37	8.6	11	2.9		291	70.3		13	2.8	
Employment status																			
Employed	357	23.2	274	21.3	275	23.5	190	16.0	116	10.1	64	5.9	0.492	919	76.8	0.246	25	2.4	0.2
Unemployed	183	21.7	190	23.0	182	22.1	125	16.3	76	9.4	56	7.6		629	78.3		21	2.2	
Homemaker	67	27.1	51	20.2	67	27.4	31	11.9	21	10.3	9	3.2		179	72.9		12	5.2	
Retired	28	25.6	19	25.0	16	24.6	8	13.5	2	4.2	5	6.9		50	74.4		2	6.5	
Other	39	17.6	45	26.9	35	17.5	39	19.3	16	9.2	11	9.5		146	82.4		3	1.7	
Race																			
White	87	26.6	78	23.2	61	23.4	31	11.7	29	10.8	14	4.3	0.1	213	73.4	0.155	8	3.8	0.1

Black	945	27.1	725	22.7	709	22.0	468	15.0	245	7.7	160	5.5	2307	72.9	64	2.0
Colored	213	35.0	136	24.4	90	17.3	64	13.0	34	7.7	12	2.6	336	65.0	16	3.1
Indian	35	24.3	40	26.6	41	28.9	17	10.9	8	4.7	7	4.5	113	75.7	1	0.2
Other	31	26.1	26	25.0	16	12.9	11	12.3	12	15.2	6	8.5	71	73.9	2	2.9

[1] Does not include the PTE 'life-threatening illness'

[2] PTSD analyzed separately

Table 12: Multivariable odds ratios between each type of TE and previous year physical conditions (n=4351)

	Type of physical condition (OR, 95% CI)					
PTE Type	**Arthritis**	**Cardio-vascular**	**Respiratory**	**Chronic pain**	**Other**	**Any physical condition**
None	*1*	*1*	*1*	*1*	*1*	*1*
War	1.33	1.38	2.27	1.40	1.27	1.37
	(0.86-2.05)	(0.95-2.0)	(1.55-3.31)	(0.97-2.02)	(0.82-1.96)	(0.96-1.95)
Physical violence	1.32	1.56	1.50	1.69	1.73	1.61
	(0.99-1.76)	(1.25-1.96)	(1.18-1.89)	(1.39-2.07)	(1.34-2.24)	(1.25-2.08)
Sexual violence	1.56	1.52	1.76	2.06	1.71	1.97
	(1.19-2.05)	(1.12-2.04)	(1.36-2.29)	(1.64-2.58)	(1.35-2.17)	(1.57-2.48)
Accident	0.97	1.06	1.58	1.31	2.08	1.29
	(0.56-1.71)	(0.66-1.7)	(1.03-2.43)	(0.76-2.25)	(1.44-3.0)	(0.73-2.27)
Unexpected death	1.49	1.57	1.56	1.49	1.40	1.51
	(1.14-1.94)	(1.22-2.02)	(1.25-1.94)	(1.22-1.81)	(1.04-1.89)	(1.2-1.9)
Network trauma	1.71	1.84	1.18	2.27	1.89	2.48
	(1.16-2.53)	(1.36-2.5)	(0.86-1.61)	(1.7-3.04)	(1.3-2.75)	(1.72-3.58)
Witness	1.09	1.33	1.62	1.60	1.57	1.41
	(0.72-1.64)	(0.98-1.8)	(1.28-2.07)	(1.2-2.14)	(1.13-2.19)	(1.02-1.93)
Any trauma	1.48	1.71	2.07	1.74	1.76	1.67
	(1.06-2.07)	(1.22-2.41)	(1.57-2.73)	(1.37-2.21)	(1.32-2.36)	(1.34-2.09)

Model is adjusted for sex, age, education, employment, marital status, race/ethnicity, and any mood, anxiety, or substance use disorder

4.3.5 Odds ratios of physical conditions by cumulative lifetime TEs

Compared to those who reported no lifetime PTEs, the odds of physical conditions generally increased with each accumulated traumatic experience. Among individuals who reported one trauma, the odds of developing a respiratory condition were 62% higher than the reference (95% CI: 1.17-2.25). Among individuals with two or more PTEs, the odds of developing cardiovascular, respiratory, chronic pain, other, or any physical health condition were significantly higher than the reference group. The odds of

developing arthritis were significantly elevated among those who experienced 4 or more PTEs. The odds of developing any physical condition among those with 4 or more traumatic experiences were all statistically significantly higher than those with none. (Table 13)

Table 13: Multivariable odds ratios between the number of lifetime TEs and previous year physical conditions (n=4351)

Cumulative lifetime PTEs	Type of physical condition (OR, 95% CI)					
	Arthritis	Cardio-vascular	Respiratory	Chronic pain	Other	Any physical condition
0	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
1	1.12 (0.71-1.77)	1.271 (0.86-1.89)	1.624 (1.17-2.25)	1.056 (0.77-1.45)	0.956 (0.65-1.4)	1.104 (0.84-1.44)
2	1.26 (0.82-1.93)	1.987 (1.35-2.92)	2.53 (1.73-3.69)	1.588 (1.15-2.2)	1.512 (1.06-2.17)	1.68 (1.26-2.24)
3	0.95 (0.63-1.42)	1.469 (0.91-2.36)	2.189 (1.54-3.11)	1.948 (1.4-2.72)	2.299 (1.63-3.25)	1.975 (1.4-2.79)
4	2.99 (1.86-4.8)	2.49 (1.67-3.71)	3.957 (2.57-6.11)	3.591 (2.41-5.35)	3.046 (1.91-4.85)	3.763 (2.48-5.7)
5+	3.17 (1.75-5.72)	4.0 (2.25-7.11)	4.596 (2.7-7.84)	4.8 (2.97-7.71)	3.043 (1.76-5.27)	3.5 (2.17-5.67)

Model is adjusted for sex, age, education, employment, marital status, race/ethnicity, and any mood, anxiety, or substance use disorder

5.0 DISCUSSION

5.1 Trauma and PTSD

The present analysis expands the body of knowledge on Trauma and PTSD in South Africa in a number of important ways. Firstly, this is the first national estimate of TE prevalence across the full range of TEs as captured in the WHO CIDI PTSD module. About three out of every four respondents was exposed to at least one TE, a prevalence rate in the same range as that in two urban US epidemiologic samples using the random event method where rates of 89.6% and 87.2% respectively were reported (14, 73). As discussed in the literature review (Chapter 2), recent studies from a number of European countries employing a methodology similar to this study have reported lower prevalence rates than South Africa, with Spain reporting the lowest rates at 54% (21). The rate in Italy was 56.1% (22) while in Northern Ireland it was 60.6% (24). A national study in Japan also reported a lifetime TE prevalence rate of 60% (23). The reasons for the differences in TE exposure rates have been discussed earlier in this thesis, but local peculiarities in the social and political context play a significant role. State-sanctioned violence and trauma exposure in South Africa, high rates of violent crime in the US and the recent history of civil conflict in Northern Ireland appear to explain in large part the higher rates of TE exposure compared to the relatively more tranquil parts of the world.

Secondly, the high burden of witnessing trauma and unexpected death of a loved one, accounting for over 40% of all reported TEs, was a particularly novel finding in view of previous work that has suggested that interpersonal violence is more common and pervasive in South Africa (8, 74). However, these previous studies did not assess the full range of TEs in the community, and probably under-estimated the importance of traumas related to unexpected death and witnessing. Accidents and war events

contributed the greatest proportion of TEs in Europe, while in Japan network events and 'Other' events had the higher contribution to the TE burden (21-24).

Thirdly, the lifetime PTSD prevalence in this study was 2.3%, significantly lower than rates found in contemporary European (7.4%) and North American (6.8%) studies (19, 75). The PTSD conditional risk of 3.5% is also significantly lower than that found in previous work using the random event method, where Breslau et al described a PTSD conditional risk of 9.2% (14). Subsequently, studies carried in Europe and Asia using the same methodology as the SASH have reported similarly low rates. With the exception of Northern Ireland where the PTSD lifetime prevalence was 8.8% (24), all the other studies report rates in the range of 1.3% in Japan (23) through 2.2% in Spain (21) to 2.4% in Italy (22). PTSD conditional prevalence rates similarly range from 2.5% in Italy to 3.3% in Spain, quite similar to the findings in this thesis (21, 22). There are multiple explanations for the cross-national differences in PTSD prevalence rates. The most obvious explanation would be methodological. Studies focusing on a narrow range of TEs might overestimate the conditional risk of PTSD, since they often focus on incident traumas or 'worst' traumas reported by the respondents (14-16). Another plausible explanation is the requirement of the avoidance of traumatic reminders in the PTSD diagnostic criteria. The fact that many South Africans have been exposed to public political and criminal violence may make avoidance difficult, thereby reducing the chance of getting a PTSD diagnosis to that extent. The avoidance criterion has previously been criticized as being too stringent in certain cases, leaving our 'subthreshold' cases that still cause as much functional impairment as full PTSD (76). Studies using less restrictive criteria have reported high rates of clinically significant sub-threshold PTSD (77, 78).

Fourthly, witnessing events contributed to more than half of the PTSD burden in South Africa, and were associated with among the most chronic of PTSD symptoms. In other studies, the unexpected death of a loved one (14) and direct interpersonal violence (rape and combat) (15) are associated with the largest proportion of PTSD episodes. These differences continue to be demonstrated even in the latest work using the random event method (21-25). The preponderance of witnessing TEs in PTSD causation in South Africa may be related to the culturally prescribed linkage of one's well-being to the well-being of one's family and community. The philosophy of *Ubuntu* emphasizes "group solidarity, conformity, compassion, respect, human dignity, humanistic orientation and collective unity" (28), and culturally links many South African people to others during difficult times. An alternative explanation is that compared to directly experiencing a traumatic event, witnessing may have differential effects on memory and feelings of helplessness that may be important in PTSD etiology. Hackett argues that "the impact of witnessing trauma is likely to be more distressing for individuals who have experienced multiple traumas. The witnessing experience may have more impact on individuals who are sensitized to trauma through enhancing memory formation; thus, intrusive and vivid recall is more likely" (79). Prior studies on the aversive effects of watching the infliction of pain on others, and in high-risk groups such as war journalists and rescue workers further strengthens this argument (29, 30).

Finally, there was little association between socio-demographic predictors and TEs, lifetime or 12-month PTSD in the South African population. Many epidemiologic studies in other settings have reported that, among other sociodemographic factors, men are at increased risk of trauma exposure while women experience increased risk of lifetime PTSD (15, 21, 22, 24, 80, 81). This was not observed in this analysis, likely due to the unique history of trauma exposure in South Africa as has been previously discussed in

this thesis, where institutionalized violence and traumatization were common features during the *apartheid* regime, with almost the entire population being exposed at some point (1). Typical socio-economic and other demographic associations with PTSD are often not observed where trauma exposure is so pervasive, as demonstrated in work among Hurricane Katrina survivors (82). Utilizing the incident trauma approach, most research from elsewhere in Africa such as South Sudan, Rwanda and Uganda continues to find associations between PTSD and sociodemographic variables such as gender and marital status (83-85). These differences may be largely attributable to methodological variations, and further research is necessary to further elucidate this. The few associations found between sociodemographic characteristics such as education and marital status (with 12-month PTSD) and employment status (with Lifetime PTSD) showed very wide confidence intervals due to the small numbers of respondents in each group.

The main limitation of this analysis is the reliance on retrospective reporting of TEs and symptoms. Often, respondents report TEs associated with significant distress and under-report more common TEs. The possibility of under-reporting stigmatized TEs such as sexual assault can also not be ruled out. Jewkes and other researchers (3, 86-88) have demonstrated the complexity of power relations and sexual transactions in South Africa that affect the experience and reporting of sexual abuse. The use of the comprehensive WHO CIDI trauma checklist, and the incorporation of the random event rather than just using the 'worst event', was aimed at reducing the impact of this problem. Allowing the respondent to report on 'other' and 'private' events was also an attempt to allow them to report on potentially embarrassing TEs that they did not want to discuss with the interviewers. Finally dependence on respondents' respective recall of the temporal link between occurrence of TEs and the subsequent emergence of PTSD

symptoms is a potential pitfall. Retrospective recall of mental disorders, particularly over long intervals, tends to underestimate the true prevalence of these disorders (89, 90). The PTSD prevalence estimates in this analysis are therefore more likely to be conservative than to over-estimate the actual prevalence.

In this analysis, the large contribution of sudden unexpected deaths and witnessing of traumatic events to the trauma burden in South Africa has been reported, and the contribution of especially witnessing trauma to the national PTSD burden is evident. Interventions aimed at reducing the burden of trauma and its outcomes in South Africa must also focus on bystanders and other observers, rather than just focusing on those directly affected.

5.2 Trauma exposure and psychopathology: Witnessing Trauma

The second analysis in this thesis examined he association between TE exposure and psychopathology, focusing on disorders other than PTSD. Four major findings stand out in this analysis.

Firstly, witnessing trauma is more frequent among males and those with low-average education. This perhaps reflects the widespread victimization against males both during the apartheid regime and subsequently after the 1994 democratic elections in South Africa (1). The analysis in the previous section, part of which has been published in a peer-reviewed journal, has demonstrated that these two factors are significantly associated with trauma exposure in general in the South African population (17). The findings in this thesis on the distribution of witnessing trauma fit well into this framework.

Secondly, those reporting witnessing trauma also reported a higher number of traumatic events overall. This finding is hardly surprising given that due to the public nature of

violent victimization in South Africa there is often scant differentiation between the direct victims and bystanders. The result is that apart from witnessing others being maimed or killed during such events, the bystander is often also directly affected in one way or the other (1).

Thirdly, respondents who witnessed trauma were almost twice as likely to develop a mood or an anxiety disorder compared to those who did not report witnessing. This effect remained even after adjusting for prior PTSD diagnosis and any other reported TE, providing robust support for the specific relationship between witnessing and psychiatric illness other than PTSD. Moreover, the effect was consistent for men and women. Adjusting for other PTEs, PTSD diagnosis and demographic covariates, witnessing trauma was associated with reduced risk of substance use. While similar findings have been described elsewhere in relation to risky alcohol use after traumatic injury (91), further investigation of the distinct nature of substance use disorders in this context would be valuable. In this analysis, however, the results must be interpreted with caution due to the relatively small number of respondents who reported both witnessing and substance use disorders in the sample (n=102; 2.77%), thereby reducing the statistical power to obtain a valid effect estimate. Another possible explanation for this unusual finding is that respondents may have under-reported substance abuse behaviors to avoid social or cultural stigma.

Finally, by measuring person-time to diagnosis and age at diagnosis, we were able to show that individuals who witnessed trauma were not only significantly more likely to develop mood and anxiety disorders, they also developed the disorders significantly earlier than those who did not report witnessing. The results for substance use disorders were less conclusive, as the effect of witnessing was not significant in the person-time models. Overall, these findings provide support for prioritizing preventative services to

individuals who have witnessed traumatic events in a time-sensitive manner.

This analysis also had a number of important limitations. First, although we were able to control the temporal order of the exposures and outcomes of interest, the survey design was indeed cross-sectional, and potentially subject to recall bias that might be expected when respondents were asked to remember events that occurred several years prior. Similarly, individuals may choose not to report witnessing highly sensitive traumatic events, such as sexual assault, due to the stigma associated with such events in South Africa (3).

Also, because individuals living in institutions such as hospitals, prisons, and mental health institutions were excluded from the study (64) the true effect of traumatic exposures may have been attenuated in this study. While notable, correcting this source of bias would likely increase the already significant association we have shown. Finally, the DSM-IV/CIDI tools used within the SASH have not yet been clinically validated in the context of South Africa (92), though other validation studies have shown that this is not likely to bias results (93).

These findings however demonstrate the unique and robust association between witnessing a traumatic event and developing not only traumatic stress disorders, but also mood and other anxiety disorders. Future research and services for victims of trauma should consider a broad range of posttraumatic outcomes such as mood, anxiety and substance use disorders (94). Even though results were less consistent for the odds of developing substance use disorders, further research may identify disorder-specific risks in those who have witnessed trauma.

In conclusion, witnessing trauma is common in the South African population and is associated with a unique risk of mood and anxiety disorders. This finding further

strengthens the recommendation in the previous section that interventions for survivors of trauma must broaden their focus to include observers and other bystanders, since these individuals are also at considerable risk of developing other mental illnesses as a result of witnessing trauma. Further, trauma survivors must be evaluated for conditions other than PTSD, such as mood and other anxiety disorders, in order to uncover the full range of psychopathology that may arise after trauma.

5.3 Trauma exposure and physical conditions

This particular analysis examines the association between trauma exposure and chronic physical conditions in an African general population sample including a wide range of traumatic events. For the first, this analysis demonstrates that exposure to any lifetime trauma significantly increases the risk of developing at least one of the assessed chronic physical conditions, and provides further support to the idea that trauma itself, without the mediation of PTSD, plays a role in the aetiology of chronic physical conditions. Apart from this important finding, two other more specific results emerge from this analysis.

First, the odds of chronic physical conditions increased with increasing numbers of traumatic exposures. One lifetime traumatic exposure was associated with only one of the physical conditions (respiratory), while four or more traumatic exposures were associated with all of the physical conditions examined. This is in keeping with previous work that has suggested a dose-response relationship between trauma exposure and occurrence of chronic physical conditions [10, 11]. While Keyes and colleagues described this relationship only in association with arthritic conditions [11], Scott et al [10] found increasing lifetime traumatic events increased the odds of any of the assessed physical conditions.

Second, we demonstrated that some traumas are more strongly associated with chronic

physical conditions than others. Sexual violence and unexpected death of a loved one significantly increased the odds of all the physical conditions assessed, while war events were only associated with respiratory conditions. Physical violence was also associated with all the physical conditions except arthritis, while network events were associated with all conditions except respiratory conditions. Witnessing traumatic events, and accidents, were associated with the fewest physical conditions in this analysis.

In direct contrast to our findings, Keyes et al [11] had earlier suggested that assaultive violence or other threats to physical integrity were associated with elevated risk for arthritic conditions. A subsequent cross-national study reported no variation in physical health outcomes after exposure to the different types of trauma [10]. These differences in 'toxicity' of traumatic events bolster the impression that outcomes of traumatic events in Africa and similar settings may differ from that in other regions [17]. This may have something to do with perceptions and culturally determined coping mechanisms, and it is imperative for future research to focus on these differences in order to generate information that may be used to predict adverse physical health outcomes after trauma exposure, and to inform interventions after such events.

A key question that remains unanswered is whether the perception of severity of a traumatic event plays any role in subsequent physical ill health, and future cross-national surveys may be able to address this. The answer to this question might explain, at least in part, the variance in the distribution and outcomes of trauma and PTSD across the world. Further, it is important to more fully describe other factors that may be mediating physical health outcomes after trauma exposure. Behavioral mediators, in particular, have been suggested as possible pathways to physical ill health after trauma exposure. Substance use and misuse and sleep problems, which are common after trauma exposure, are potential risk factors for chronic physical conditions and may contribute to

explaining the associations found in the present study [28-30]. Other mechanisms through which trauma and PTSD result in physical ill health, such as the physical effects of chronic stress have been described, although findings remain inconclusive [31].

This analysis, like the previous two, also has a number of important limitations. First, we the reliance on retrospective reports of trauma exposures is likely to under-report most traumatic events and perhaps focus only on the more severe ones. The use of a detailed trauma checklist may have somewhat mitigated the likelihood of under-reporting, but this cannot be completely eliminated [17]. Second, medical conditions were assessed based on self-report and not independent measures such as medical records and confirmed diagnoses. While it has been shown that self-reports of these nature are often in agreement with physician or medical record diagnoses [32, 33], the possibility of misclassification and hence false associations with traumatic events cannot be ruled out entirely. Finally, because of the cross-sectional design of this study, causal associations cannot be made from our findings.

This analysis however adds onto an increasing body of research that shows that trauma exposure is a risk factor not only for PTSD, but also for multiple general medical conditions. It is therefore recommended that evaluation of survivors of traumatic events with or without post-traumatic mental disorders must also include physical health assessments and treatment for those found with problems.

6.0 CONCLUSIONS

In concluding this thesis, the Specific Objectives will be restated, and the key findings under each objected presented alongside the relevant recommendations.

6.1 Specific Objective 1: To review the literature on trauma and PTSD relevant to South Africa, examining specifically for predictors and outcomes of trauma exposure, including general psychiatric morbidity and different aspects of PTSD.

In the literature review, several key issues emerged from recent work on trauma and PTSD. Firstly, while TE prevalence rates are higher in countries emerging from conflict, the distribution of TE types varies significantly by region. The impact of the socio-political environment on the distribution of TEs is apparent from these findings.

Secondly, lifetime prevalence of PTSD in most community surveys using the 'random event' method is lower than in previous studies that used the 'worst event' method of assessing PTSD. The importance of capturing a broad range of TEs in a community survey has thus been demonstrated, providing the justification for continued use of the 'random event' method in future community surveys of trauma and PTSD.

Thirdly, female gender and several other socio-demographic factors are associated with TEs and PTSD in high-income settings, but in not in LMICs such as South Africa. While the risk factors in the non-LMIC settings reflect existing knowledge on PTSD risk factors, the high rate of TE exposure across all socio-demographic groups in South Africa precludes a comparison between the different risk factors.

Finally, in this review, it has emerged that trauma and PTSD have wide-ranging consequences that affect mental and physical health, as well as having wider family and social functioning implications.

6.2 Specific Objective 2: To establish the epidemiology of trauma exposure and PTSD in the SASH. This analysis included identification of the traumatic events that account for the greatest proportion of the public health burden of PTSD in South Africa.

The most common traumatic events were the unexpected death of a loved one and witnessing trauma occurring to others. Lifetime and 12-month prevalence rates of PTSD were 2.3% and 0.7% respectively, while the conditional prevalence of PTSD after trauma exposure was 3.5%. PTSD conditional risk after trauma exposure and probability of chronicity after PTSD onset were both highest for witnessing trauma. Socio-demographic factors such as sex, age and education were largely unrelated to PTSD risk.

In this analysis, the large contribution of sudden unexpected deaths and witnessing of traumatic events to the trauma burden in South Africa was reported, and the contribution of especially witnessing trauma to the national PTSD burden was evident.

Based on these findings, it is recommended that interventions aimed at reducing the burden of trauma and its outcomes in South Africa must also focus on bystanders and other observers, rather than just focusing on those directly affected.

6.3 Specific Objecive 3: To examine the relationship between trauma exposure and other mental disorders, in order to establish whether the traumatic events

which account for the greatest burden of PTSD in South Africa increase the risk of other mental disorders.

Witnessing trauma was more commonly reported among males and those with low-average education. Posttraumatic stress disorder, mood, and anxiety disorders varied significantly with witnessing status, and witnessing was associated with exposure to a higher number of traumatic events compared to other types of traumatic events. Respondents reporting witnessing trauma had elevated odds of mood and anxiety disorders, but not substance use disorders.

These findings further strengthen the recommendation for Specific Objective 2 that interventions for survivors of trauma must broaden their focus to include observers and other bystanders, since these individuals are also at considerable risk of developing other mental illnesses as a result of witnessing trauma. Further, trauma survivors must be evaluated for conditions other than PTSD, such as mood and other anxiety disorders, in order to uncover the full range of psychopathology that may arise after trauma.

6.4 Specific Objecitive 4: To determine the relationship between trauma, PTSD and physical health. This analysis examined whether traumatic events are associated with greater risk of specific physical health complaints as well as a larger burden of physical health problems overall and whether this association is mediated by PTSD.

Exposure to any trauma increased the odds of all the physical conditions in this study. Among specific events, sexual violence, physical violence, unexpected death of a loved one, and network events significantly increased the odds of all or nearly all the physical conditions assessed. Accidents and witnessing traumatic events were associated with

the fewest physical conditions. The odds of having a physical condition were directly related to the number of lifetime traumatic events. Those reporting only one traumatic event had significantly increased odds of developing respiratory conditions, while those with four or more events had significantly increased odds of developing all the examined conditions.

This analysis adds onto an increasing body of research that shows that trauma exposure is a risk factor not only for PTSD, but also for multiple general medical conditions. It is recommended that evaluation of survivors of traumatic events with or without post-traumatic mental disorders must also include physical health assessments and treatment for those found with problems.

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