Master's Thesis of Se Young An

Depressive Symptoms Among People with Direct Exposure to Natural Disasters in Ethiopia: Focused on the Moderating Effects of Health Insurance

에티오피아의 자연재난 경험이 우울증상에 미치는 영향: 건강보험의 조절효과 중심으로

August 2023

Graduate School of Public Health
Seoul National University
Health Policy and Management Major

Se Young An

Depressive Symptoms Among People with Direct Exposure to Natural Disasters in Ethiopia: Focused on the Moderating Effects of Health Insurance

지도 교수 김 선 영

이 논문을 보건학석사 학위논문으로 제출함

2023년 5월

서울대학교 보건대학원

보건학과 보건정책관리학전공

안 세 영

안세영의 석사 학위논문을 인준함

2023년 6월

위 원 장 유명순 (인)

부위원장 이태진 (인)

위 원 김선영 (인)

Abstract

Background: Disasters are categorized as either natural or manmade and the cause of disaster defines the type of disaster. Natural disasters are caused by natural phenomena and, recently, the occurrence of natural disaster has been on the rise due to climate change and the damage is substantial. Exposure to natural disasters not only jeopardizes the physical health but also the mental health of the affected population. Globally, psychological distress has been reported following natural disasters, irrespective of the magnitude of disasters or countries' income levels. Nevertheless, the impact of natural disasters disproportionately affects low-and-middle income countries (LMICs), and particularly vulnerable populations who lack the necessary resources to alleviate the psychological distress caused by the shocks. This disparity often results in untreated mental health conditions and can have a disproportionate impact on the mental health of directly affected individuals.

Ethiopia is particularly vulnerable to various natural disasters with frequent occurrences of droughts and floods. When exposed to these various natural disasters, people suffer from various psychological disorders and of all the disorders, depression is widely reported as a common mental disorder. In fact, the prevalence of depression in Ethiopia is 9.1%, which is the highest prevalence among the psychological disorders within the country. This study primarily focuses on depressive symptoms of adult population in the aftermath of natural disasters in Ethiopia. Cognizant of such serious national health issue, the government of Ethiopia has responded actively to mental health problems by integrating mental health care services into primary care since 2012, making these services accessible and affordable. In order to improve accessibility to mental health services, it is critical that more Ethiopians have health insurance, yet only one-third of the population has health insurance.

Despite the significant prevalence of mental health problems in Ethiopia, empirical evidence on the relationship between mental

health, health insurance, and natural disasters is scarce. Furthermore, the topic of mental health remains largely unfamiliar within the country, and stigma and discrimination towards people with psychological disorders continue to persist. As a result, there is an urgent need to generate empirical evidence on whether health insurance protects the mental health of the population directly affected by natural disasters in Ethiopia with the aim of eliciting policy implications for Ethiopia and other developing countries. Therefore, this study aims to estimate the effects of natural disasters on mental health and moderating effects of health insurance on depressive symptoms among Ethiopians directly exposed to natural disasters.

Methodology: The present study used the Disaster Poverty Household Survey (DPHS) data collected in Addis Ababa and Dire Dawa by the World Bank in May and June 2017 to examine the impact of natural disasters on mental health and the potential moderating effects of health insurance. The DPHS data captured critical information on household characteristics, living conditions, coping strategies, and disaster experiences, which provided a comprehensive assessment of poverty-related disaster risks. In the analysis, the study conducted OLS regression to estimate depressive symptoms as a continuous variable and multiple regression model using both probit and linear probability model to estimate depressive symptoms as a binary variable. Also, the analysis was carried out using three models: model 1 for exposure to natural disasters, model 2 for possession of health insurance and model 3 for the interaction term between exposure to natural disasters and health insurance. For control variables, age, sex, education attainment, marital status, religion, asset ownership, labor participation, social (financial) support, illness, and access to health facility were selected. To ensure a rigorous comparison of disaster exposure, propensity score matching (PSM) methodology was performed. The study first estimated the effects of direct exposure to natural disasters on depressive symptoms measured using the 10-item Center for the

Epidemiological Studies of Depression Short Form (CES-D-10). Second, the effects of health insurance on depressive symptoms among those directly exposed to natural disasters were explored.

Result: The findings of this study demonstrated a positive association between direct exposure to natural disasters and depressive symptoms and statistically significant at 1% level, while the negative association between health insurance and depressive symptoms among the affected population was not statistically significant. Furthermore, the results demonstrated that being married or in a consensual union, owning a refrigerator as an asset, and social (financial) support were negatively associated with depressive symptoms and the effects were statistically significant ($p<0.1$, $p<0.1$ and $p<0.01$, respectively).

Conclusion: Direct exposure to natural disasters in Ethiopia poses a significant risk to the depressive symptoms of affected individuals. Additionally, several sociodemographic factors such as marital status, asset ownership, and social (financial) support had a significant association with reduced depressive symptoms. However, health insurance was not found to have a statistically significant effect on reducing depressive symptoms among those who experienced natural disasters. Such results are likely due to various factors such as small number of insured populations, stigma towards mental illness, and inadequate resources for mental health services. Further, the results demonstrate that in order for health insurance to properly work simultaneous efforts to raise awareness of mental health issues and treatment are required. This study underscores the importance of emotional and social (financial) support in the aftermath of a natural disaster, and emphasizes the access to mental health services as a part of disaster management strategies in developing countries. The evidence derived from this study will support the development of policies and interventions aimed at improving mental health outcomes for disaster-affected populations in Ethiopia and other LMICs, ultimately contributing to the progress

of achieving the SDGs 11.5 and 3.8.

Keyword : Natural disaster, Depression, Health insurance, Ethiopia, Disaster Management
Student Number : 2021-24467

Table of Contents

List of Figures

List of Tables

Chapter 1. Introduction

1.1. Study Background

The adverse effects of natural disasters are emphasized as the impact of natural disasters on one's life is devastating. While the immediate effects of these disasters can be disruptive, their long-term effects are far more complex and intricate (Deryugina, 2022). According to a 2018 report by World Bank, disasters result in an estimated annual cost of $520 billion to the global economy, forcing 26 million people into poverty (United Nations, 2018). Furthermore, these impacts from natural disasters are intangible, especially in terms of personal distress, making it more challenging to thoroughly comprehend the lasting ramifications of natural disasters.

According to United Nations Office for Disaster Risk Reduction (UNDRR), the losses that can be measured directly after a disaster are known as direct losses (2015). These include quantifiable factors such as the death toll, physical harm to structures, infrastructure, and natural resources (Komendantova et al., 2014). Indirect losses from natural disasters, on the other hand, are not easily measurable and are difficult to value. Examples of the indirect losses are loss of a life or biodiversity and destruction of cultural heritage sites and such loss of intangible values may lead to negative effects on individuals' well-being that are severe and long-lasting. The resulting effects of these losses extend beyond individual experiences and have far-reaching impact on the economy and society as a whole.

The experience of direct and indirect losses resulting from natural disasters can have a profound impact on individuals' psychological well-being (Hirth et al., 2013). A focus group discussion (FGD) conducted after the 2000 floods in northeast England found that the damage caused to property and the losses incurred from the flood were widespread (Tapsell et al., 2002). Of particular significance were the losses of irreplaceable personal items and memorabilia, which carried a great deal of personal and emotional value, leading to

heightened levels of stress among those affected. In a more challenging context, the loss of a family member due to traumatic events like severe natural disasters can significantly increase the likelihood of developing post-traumatic stress disorder (PTSD), depression, and other psychological disorders. Research has shown that people who have been exposed to traumatic disasters are likely to experience a range of common psychological disorders, including acute stress disorder, generalized anxiety disorder, adjustment disorder, substance abuse, major depression, psychosomatic disorders, and PTSD (Tural et al., 2004). A narrative review about the impact of natural disasters on mental health has demonstrated that individuals are likely to experience emotional instability, stress reactions, anxiety, trauma, and other psychological symptoms in the aftermath of such events (Makwana, 2019). Makwana (2019) further concluded the common psychological disorders such as PTSD, anxiety and depression in the aftermath of a disaster tend to comorbid with feelings of unnecessary fear, hopelessness, worthlessness and helplessness, which are emotional states that deteriorate the quality of life.

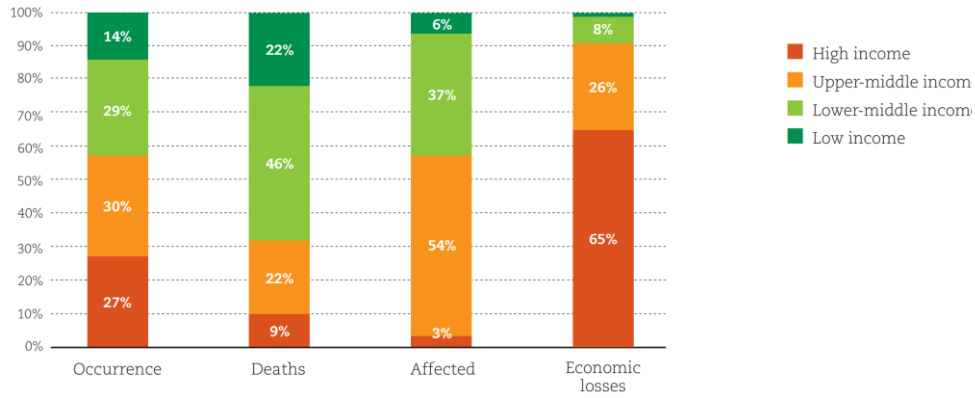
Among natural disaster survivors, depressive symptoms are widely reported as one of the biggest mental health consequences of such events. Exposure to natural disasters leading to depressive symptoms has been examined through major historical events. Studies have documented the increased risk of depression following historical natural disasters such as the 1993 Midwest Floods, the 2004 Tsunami in Sri Lanka, the Indian Ocean tsunami in 2004, the Hurricane Katrina in 2005, the Canterbury earthquakes in New Zealand in 2010 to 2011, the 2011 Flood in Thailand, the Great East Japan Earthquake in 2011, the Hurricane Sandy in 2012 (Ginexi et al., 2000; Goldmann & Galea, 2014; Jenkins & Meltzer, 2012; Kopala-Sibley et al., 2016; Ranasinghe et al., 2023; Sastry & VanLandingham, 2009; Yoda et al., 2017; Yuda & Lee, 2022). It is noteworthy that the scope of disaster studies examining the impact on mental health has been largely limited to developed countries. Research conducted in developing countries has been relatively limited, and as a result, our understanding of the mental

health consequences of disasters in these vulnerable regions is still incomplete.

The risk factors associated with disasters are magnified when they occur in developing countries despite having lower percentage of GDP attributed to total damage costs from natural disasters (Naoaj, 2023). As depicted in Figure 1, there was an unequal distribution of mortality due to natural disaster among developing countries from 1998 to 2017. Based on a report released by UNDRR, which examined natural disasters over the past two decades, LMICs experienced 43% of all disasters occurred around the world, yet comprised the largest portion (68%) of fatalities (Wallemacq & House, 2018). Thus, disasters disproportionately affect developing countries and their most vulnerable populations including elderly, women and children (Bush, 1985; Kousky, 2016).

Disasters in developing countries create formidable challenges and their impact on mental health is more pronounced in resource-restricted countries than in developed countries. Wijkman and Timberlak mentioned such unbalanced impact as "natural disasters are failures in interactions between vulnerable people and a vulnerable environment" (2021), attributing the risks not solely on natural factors but also the vulnerability of individuals and environment that can withstand the disaster. Despite the belief that natural disasters are less severe than manmade disasters, this is not the case in developing countries, where natural disasters often have more severe consequences (U.S. Department of Veterans Affairs, 2021). Hence, more research is needed to understand mental health after natural disasters in developing countries and, there is an urgent need to expand our research efforts in order to better understand and address the mental health challenges faced by disaster-affected populations in these regions.

Figure 1. Climate-related and Geophysical Disasters 1998-2017



Source: original data from Wallemacq and House (2018)

Ethiopia faces significant risks from natural disasters as the country is exposed to recurrent natural hazards including droughts, floods, volcanoes and earthquakes (The World Bank Group, 2020). There have been several natural disasters that struck the nation throughout history, including the 1983-1985 drought, 2006 floods, 2006 drought, and 2011-2012 drought (The World Bank Group, 2019). A report from the World Bank further emphasized that droughts and floods frequently occur in Ethiopia, and it is estimated that seven million people are at risk of food insecurity due to these natural disasters and extreme drought conditions can result in a significant reduction in farm production, with crop yields shrinking by as much as 90% (2019). Ethiopia is exposed to a myriad of challenges that hinder its ability to effectively cope with the consequences arising from natural disasters. These challenges include heavy reliance on rain-fed agriculture, limited capacity to mitigate climate changes, rapid population growth, low health service coverage, limited economic development, inadequate road infrastructure, weak institutional structures, under-developed water resources, and lack of awareness (United Nations Development Programme, 2012). The presence of aforementioned challenges disrupts Ethiopia's capacity and resilience to deal with the aftermath of natural disasters, placing a heavy burden on the country.

Many scholars pointed out the need of protective factors in order

to comprehend the underlying causal mechanisms that prevent the development of mental health issues following a disaster (Platania et al., 2020). Health insurance can be used as a means of risk management to alleviate mental illnesses after natural shocks (Patel et al., 2021). In fact, previous studies exhibited a protective effect of health insurance for those with psychological distress (Alang et al., 2014; Baicker et al., 2018; Fry & Sommers, 2018; Tian et al., 2012). Furthermore, health insurance is also known as a protective factor for suicidal behavior, which is highly linked to being diagnosed to depression, as noted in studies by Belete et al. (2021) and Lin et al. (2017). As the international community focuses more and more emphasis on disaster prevention, there is a growing interest in the possibility of insurance as a component of an efficient risk-management (Linnerooth-Bayer et al., 2005).

Ethiopia's efforts towards achieving Universal Health Coverage (UHC) involve the implementation of Community-Based Health Insurance (CBHI) with five specific aims: (1) improving financial access to health care, (2) enhancing the quality of health care, (3) mobilizing resources in the health sector, (4) strengthening community participation in the health sector and (5) enhancing national capacity for policy development and expanding the security of the population (Lee et al., 2018).

While the intended objectives of CBHI in Ethiopia are designed to improve the well-being of Ethiopians, if they are not effectively implemented and accessible to the population, the existence of health insurance becomes futile. According to recent research, less than one-third of the Ethiopian population is currently covered by health insurance (Merga et al., 2022). On a global scale, health insurance coverage varies widely. Only 7.9% of individuals in low-income countries, while 27.3% in lower middle-income countries, and 52.5% in higher middle-income countries are covered by health insurance on average (Hooley et al., 2022). To establish the impact of health insurance on promoting mental well-being in the aftermath of natural disasters, it is essential to examine whether health insurance can act as a moderating factor on the psychological distress arising from such

events.

The present study aims to address a significant empirical gap in the existing literature regarding the impact of health insurance on the depressive symptoms among individuals residing in urban regions of Ethiopia, who have been exposed to a natural disaster. Prior studies investigating mental health in the aftermath of natural disasters were primarily conducted in developed countries and focused on major events, leaving a dearth of research in the context of developing countries. Given Ethiopia's vulnerability to natural hazards, it is crucial to examine the impact of health insurance on the mental health of individuals exposed to natural disasters, particularly in the context of a developing country striving to achieve universal health coverage. Hence, the primary objective of this research is to address the existing knowledge gap regarding the association between natural disasters, health insurance, and mental health within the urban population impacted by such disasters in Ethiopia, where the government is actively striving to expand health insurance coverage to accomplish universal health coverage (UHC).

1.2. Purpose of Research

The primary objective of this research is to evaluate the impact of both natural disasters and health insurance on depressive symptoms among adults living in urban areas in Ethiopia. This study seeks to address the existing gap in empirical research on the role of health insurance in mental health within developing countries. Consequently, the findings of this study will provide insights into the benefits of possessing health insurance and inform interventions aimed at enhancing the mental well-being of individuals who were directly exposed to natural disasters. Furthermore, the research results will contribute to the achievement of SDGs 11.5 and 3.8 in LMICs.

1.3. Study questions

The main question of the study is as below:

1. Did natural disasters affect the depressive symptoms of people in urban area of Ethiopia?
2. Is the relationship between natural disasters and depressive symptoms moderated by health insurance?

Chapter 2. Theoretical Background and Literature Review

2.1. Natural disaster and health

2.1.1 Definition of natural disaster

There is no universally accepted definition for the term, disaster. The variation in the definition of disaster can be attributed to cultural differences and varying perceptions of loss among different communities. From the 1980s, this lack of consensus has prompted scholars to call for an agreed definition, which is necessary for advancing scientific research and international guidance on disaster management (Al-Madhari & Keller, 1997; Quarantelli, 1985). Mayner and Arbon established consensus of the term after reviewing and collating 110 glossaries and the definition presented was: "the widespread disruption and damage to a community that exceeds its ability to cope and overwhelms its resources" (2015). In line with this definition, UNDRR defines disaster as "a serious disruption of the functioning of a community or a society at any scale due to hazardous events interacting with conditions of exposure, vulnerability and capacity, leading to one or more of the following: human, material, economic and environmental losses and impacts" (Mysiak et al., n.d.). Further, the Sendai Framework for Disaster Risk Reduction 2015-2030 by the United Nations defines disasters based on the magnitude of scale. From small-scale disaster to a sudden-onset disaster, hazardous events can be defined and divided by the impact of a disaster, return period, amount of aid and frequency (United Nations, 2015).

For the purpose of this paper, the scope of disaster is limited to natural disasters. There have been four widespread definitions of the term, natural disaster. Natural disaster is defined as: (1) a naturally occurring or man-made geologic condition or phenomenon that presents a risk or is a potential danger to life or property (American

Geological Institute, 1984); (2) an interaction of people and nature governed by the co-existent state of adjustment of the human use system and the state of nature in the natural events system (White, 1974); (3) those elements in the physical environment harmful to man and cause by forces extraneous to him (Burton & Kates, 1963); (4) the probability of occurrence within a specified period of time and within a given area of a potentially damaging phenomenon (Varnes, 1984). These four definitions are in common that natural disasters involve an external force that makes on impact and influences human beings and the environment. Alexander (2018) offers a concise and efficient definition of natural disaster as an event that involves a sudden, immediate, or significant influence of the natural environment on the socio-economic system.

Recognizing such immense impact of the losses from natural disasters, the United Nations Member States have adopted one of the Sustainable Development Goals (SDGs), SDG 11.5, [①] aiming to reduce the adverse effects of natural disasters by 2030. By prioritizing this objective, the international community is dedicated to minimizing the adverse social, economic, and environmental consequences associated with natural disasters, promoting a more sustainable and resilient disaster management strategies for the future.

2.1.2 Relationship between natural disaster and health

Experiencing a natural disaster poses the obvious risk of physical injury. The impact of a disaster extends beyond the immediate physical dangers, as it can have lasting effects on the psychological and physical well-being of those affected. After natural disasters, many report experiencing physical symptoms related to muscles, joints, breathing, and/or neurological problems (Keskinen-Rosenqvist et al.,

[①] SDG 11.5 states "By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations."

2011). Moreover, recent studies on trauma have indicated that there is an elevated risk of developing migraines, back problems, musculoskeletal pain, heart and circulatory diseases, gastrointestinal issues, and immune system disruptions among survivors of disasters (Boscarino, 2004; Green et al., 2006; Kubzansky et al., 2009; Ouden et al., 2005; Spitzer et al., 2009; Yabe et al., 2019; Zacher et al., 2021).

The aforementioned physical symptoms appear with psychological symptoms. A study carried out with a population sample who experienced and survived the 2004 Indian Ocean Tsunami explained that the pain due to the physical injuries sustained during the disaster itself, the rescue phase, and the rehabilitation phase can act as a significant stressor, thereby increasing the risk of experiencing subsequent symptoms (Keskinen-Rosenqvist et al., 2011). Ein et al. (2023) conducted a systematic review that examined the difficulties encountered by military, medical, and public safety personnel who served as relief workers during and after natural disasters. The study reported structural and resource-related issues, psychological burdens, physical health concerns, and social obstacles as various challenges. Among the psychological burden, self-reported or clinically diagnosed PTSD, depressive disorders, anxiety disorders, sleep-wake disorders, and substance-related and addictive disorders were frequently observed. Additionally, physical symptoms such as acute ailments/injuries (such as cuts, scrapes, nausea, fatigue), infectious diseases, risk of death, environmental irritants (like smoke inhalation), and chronic ailments/injuries (such as physical disability, asthma, cancer) emerged as the fourth prevalent challenge. Since relief workers tend to work in unsafe environment, they are vulnerable to numerous physical challenges, however, the notable outcome of the review was that psychological challenges were more commonly reported (Ein et al., 2023).

Moreover, emerging symptoms after natural disasters, whether they are physical or psychological, are interrelated. The comorbidity of physical and psychological distress in the aftermath of disasters is common and the occurrences can be bidirectional, where physical health impairments may trigger the onset of mental health illness, and

vice-versa (Freedy & Simpson Jr, 2007). For example, in specific cases, chronic diseases such as diabetes or congestive heart failure (CHF) can be exacerbated by the effects of disasters, potentially leading to the emergence or intensification of depressive symptoms. Also, in a study of 126 patients who experienced a tornado, significant associations were identified between disaster exposure, generalized distress and PTSD and physical health complaints (Polusny et al., 2008). The findings suggest that the psychological and emotional impact of experiencing a natural disaster, such as a tornado in this case, can manifest in physical health symptoms and highlight the interconnectedness of mental and physical well-being in the aftermath of a natural disaster.

2.1.3 Natural disaster and depressive symptoms

As mentioned above, depressive symptoms are easily observed among natural disaster survivors regardless of varying demographic characteristics but the association was more pronounced among vulnerable populations in LMICs (Futterman et al., 2023). Empirically, a scoping review that explored the relationship between exposure to climate-related disaster and mental disorder in LMICs showed a positive exposure-outcome association (Sharpe & Davison, 2021). When compared to high-income countries, LMICs reported greater negative impact such as casualties, building collapses and mental health conditions after natural disasters (Rentschler, 2013). The higher levels of exposure experienced by the population and the inefficient interventions provided by the local governments result in a severe risk for PTSD, major depressive disorder and substance-use disorder, representing the most common type of psychopathology reported in the general population (Goldmann & Galea, 2014). Depression was frequently reported across different types of climate-related disasters including droughts, extreme temperature, floods, storms throughout the UN subregion (Briere & Elliott, 2000). ②

② UN subregion includes South Asia, Southeast Asia, East Asia and Latin America and the Caribbean.

Even in LMICs, the most affected populations were vulnerable populations. The depressive symptoms were statistically associated with: older age, female gender, uneducated female, endorsing suicidal ideation, death in one's family, having a life-threatening illness, being divorced after the 2010 earthquake in Haiti; younger age, no education, no children, and having physically injured among village women in Bangladeshi living in disaster-prone areas; especially among girls, witnessing one's home and other homes being damaged, having belongings damaged, being forced to evacuate, having a family, friend, or neighbor experience injury or die, or fearing death or injury of self among Puerto Rican youths after the 2017 Hurricane Maria; suicidality and current suicidal ideation among children who experienced the 2004 Tsunami in Sri Lanka (Catani et al., 2008; Mamun et al., 2019; Wagenaar et al., 2012).

2.1.4 Negative life events

In numerous disaster studies, the Conservation of Resources (COR) theory has widely been applied to understand how individuals and communities respond to the challenges and stresses posed by natural disasters. First introduced by Hobfoll, the COR stress model suggests that resource loss plays a central role in predicting psychological distress (Ehrlich et al., 2010; Freedy et al., 1994; Hobfoll, 1989). Furthermore, according to the COR theory, individuals who are already deficient in resources are more susceptible to the negative impact of loss spirals, while those who possess abundant resources are more likely to have opportunities for gaining resource back (Hobfoll & Schumm, 2009). This points out that natural disasters affect LMICs and vulnerable population at a greater level, leaving already-lacking population less likely to be resilient against external threats.

Given that this study primarily focuses on mental well-being, it is more appropriate to view the objective of this study with negative life events (NLEs) as an element of the present study's conceptual framework, with natural disasters serving as a specific example of NLEs. Negative life events refer to stressful life occurrences that are

unpleasant and uncontrollable, presenting considerable obstacles to one's capacity to cope with distress (Armstrong et al., 2011). Previous research has shown that NLEs can lead to negative psychological outcomes such as anxiety, depression, and PTSD (Joseph et al., 2000; Kraaij et al., 2002; Phillips et al., 2015; Zou et al., 2018). Moreover, contrary to positive life events, NLEs tend to have a stronger influence on individuals as Baumeister et al. (2001) concisely described, "Bad is Stronger Than Good," often disrupting emotional stability and leading to psychological distress. Research in the field of disaster studies has consistently shown that natural disasters can have a profound impact on the mental well-being of individuals affected by them using natural disaster as NLEs (Jeney-Gammon et al., 1993; Martin et al., 2016; Nishikawa et al., 2018; Wickrama & Ketring, 2012). As such, NLEs provide a useful framework for examining the impact of natural disasters on individuals' mental well-being.

Miller et al. suggested in the review on the mechanisms linking psychological factors and health that negative life events are more prevalent in disadvantaged neighborhoods (2009). Such findings demonstrate health disparities that exist on a global scale. The presence of negative life events can intensify the negative health outcomes that are already associated with living in developing countries, thus creating a vicious cycle that lead to health disparities.

2.2. Health insurance and health

2.2.1 Health insurance

Health insurance can be defined as a means of sharing and distributing the financial risk related to the fluctuation of individuals' healthcare expenses and such risk can be managed by pooling costs over time through pre-payment and spreading risks across a larger population through risk pooling (Colombo & Tapay, 2004). World Health Organization (WHO) has pointed out the importance of health insurance since it grants access to healthcare services that may otherwise be financially out of reach for many people so they can improve their health and well-being (2010). A systematic review on

social inclusion of health insurance in LMICs reported health insurance's role of preventing catastrophic expenditures on health and such role was most evident among chronically ill, followed by older adults, individuals with disabilities, female-headed households, ethnic minorities and displaced populations (van Hees et al., 2019). SDG 3.8[③], which emphasizes the achievement of Universal Health Coverage (UHC), is an indicator specifically focused on improving access to essential health services for all individuals without causing any financial burden on them. As global health strives towards achieving UHC and sustainable development goals (SDGs) that prioritize healthy lives, health insurance can serve as a valuable tool to enhance UHC by ensuring adequate access to healthcare resources.

Expanding health insurance coverage has been identified as a critical strategy for achieving UHC and improving access to quality and affordable healthcare, particularly in LMICs. Enrollment in health insurance in LMICs has a positive impact on reducing out-of-pocket spending and increasing utilization of health services, as demonstrated in a systematic review of the impact of health insurance in Asia and Africa (Spaan et al., 2012).

2.2.2 Health insurance and health in the context of natural disasters

Disaster insurance serves as a mechanism for compensating losses resulting from catastrophic events and reducing their significant financial burden on individuals and communities. The financial resources made available through insurance assist in reducing the impact of disasters on food security, health, education and livelihood assets (Morduch, 2005). One potential advantage of insurance for developing countries is its ability to enhance resilience by providing social safety nets, risk sharing or pooling programs and insurance tools against unexpected losses, which can help to maintain social

③ SDG 3.8 indicates "achieve universal health coverage, including financial risk protection, access to quality essential health-care services and access to safe, effective, quality and affordable essential medicines and vaccines for all."

stability and reduce vulnerability to shocks. In addition, insurance can provide timely financial resources to facilitate post-disaster recovery, which is especially crucial in resource-restricted countries. By promoting risk reduction and facilitating post-disaster recovery, insurance can help to uphold sustainable development and reduce poverty in developing countries (Warner et al., 2009).

According to the framework of the relationship between insurance and disaster risk mitigation by Patel et al. (2021), benefits are divided into three levels: at the direct beneficiary level, at the insurance company level and at the state or government level. Insurance coverage can lead to immediate outcomes such as improvements in disaster risk awareness, post-disaster management, protection against disasters, and reducing out-of-pocket expenditures. Furthermore, it provides protection against loss of life, health, and property, thereby promoting overall wellbeing. Despite the wealth of existing research on insurance coverage and its impacts in the aftermath of natural disasters, limited attention has been devoted to exploring the potential effects of insurance on mental health outcomes in the context of natural hazard events. This gap in the literature requires further investigation, as the interplay between insurance coverage and mental health in the aftermath of natural disasters may have significant implications for disaster survivors' well-being and their recovery process.

2.2.3 Health insurance and its effects on mental health

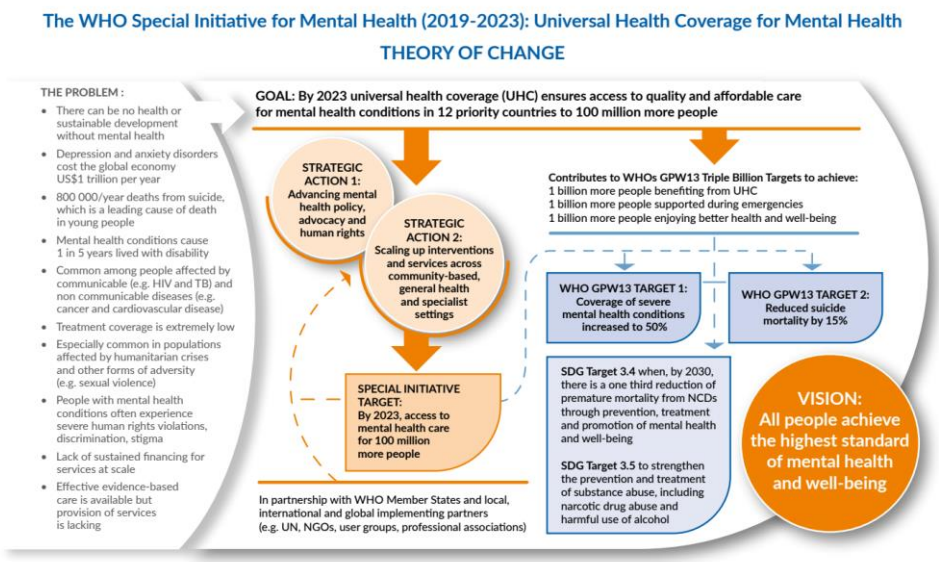
Regardless of the types of health insurance, there have been numerous studies that exhibited the positive effects of health insurance on health outcomes (Bagnoli, 2019; Guindon, 2014; Hadley & Waidmann, 2006; Pan et al., 2016; Sood et al., 2014). The Director-General of WHO, Dr. Tedros Adhanom Ghebreyesus, once mentioned, “the world is accepting the concept of universal health coverage. Mental health must be an integral part of UHC. Nobody should be denied access to mental health care because she or he is poor or lives in a remote place,” drawing attention to health insurance as a means

to improve access to mental health services (World Health Organization, 2019).

Figure 2 indicates the WHO Special Initiative for Mental Health (2019-2023) to accelerate implementation of the 13th general Programme of Work (GPW13) and SDGs. The initiative is aimed at achieving UHC for mental health with health insurance coverage as a key element (World Health Organization, 2019). Here, ensuring better access to quality and affordable care for mental health in 12 priority countries to 100 million more people by 2030 is the overarching goal of the initiative. Mental health is an essential component of overall health and wellbeing, and lack of access to quality care can have significant negative impacts on individuals, families, and communities. Therefore, improving access to mental health care through initiatives like this is crucial in promoting healthy lives and SDGs.

Notably, the initiative demonstrates the financial burden of the global economy due to depression and anxiety disorders is US $1 trillion per year. Thus, it is important to focus on the psychological distress after natural disasters and preventive measures such as health insurance.

Figure 2 The WHO Special Initiative for Mental Health Theory of Change



Source: WHO (2019)

Studies have consistently shown the positive effects of health insurance on depression, with insurance as a moderating factor that is associated with decreased depressive symptoms (Fry & Sommers, 2018; Li et al., 2023; Tian et al., 2012). Research conducted in Oregon, US shows that medical coverage reduced the prevalence of undiagnosed depression by almost 50% and untreated depression by more than 60% (Baicker et al., 2018). Harman et al., found that in contrast to insured individuals, those without insurance were less likely to initiate treatment for depression (2004). In the US, effective depression treatments are available, however, individuals lacking insurance are less likely to receive such treatments. Moreover, a study evaluating the impact of mental health insurance laws on state suicide rates discovered the suicide rate was decreased by 5% following the enactment of legislation mandating insurance coverage for mental health benefits equivalent to those for physical health (Lang, 2013). These findings underscore the important role of health insurance in promoting mental well-being and emphasize the need for comprehensive health coverage that includes mental health services to tackle the global burden of depression.

2.3. Situations in Ethiopia

2.3.1 Disasters and its impact in Ethiopia

Ethiopia is a country that has a high risk of experiencing various natural disasters, including floods, droughts, landslides, volcanoes and earthquakes (Simpson et al., 2019). With an estimated 9.7 million people at risk and in need of food in 2016 due to the 2015-2016 El Niño drought, which also caused flooding and infectious diseases, Ethiopia is one of the most disaster-prone countries in Africa (Disaster Risk Management Technical Working Group, 2016). Additionally, fire is reported to be one of the common natural hazards within the urban areas of Ethiopia, putting the country at risk of losing vital natural resources (Lemessa, 2001). Forest fires frequently occur and they are usually caused by human activities and intensified by prolonged dry

season and severe droughts (Harris et al., 2023; Lemessa, 2001). These factors contribute to the increased vulnerability of the urban environment and emphasize the need for effective disaster management and prevention strategies to protect valuable natural resources.

According to a study by the United Nations Office for the Coordination of Humanitarian Affairs (OCHA), these disasters have had significant social and economic impacts, leading to loss of life, displacement, and destruction of infrastructure like WASH (Water, Sanitation and Hygiene) services (2021). In addition to the immediate impacts, natural disasters in Ethiopia have also resulted in long-term consequences, such as food insecurity and malnutrition, which can further exacerbate poverty and limit the country's development. Recent climate situations are worrisome as Ethiopia is experiencing drought crisis after five consecutive inadequate rainfall. After December 2022, the recurrent drought has led to food insecurity, resulting in 11.8 million people severely food insecure in Ethiopia (The Center for Disaster Philanthropy, 2023).

In Ethiopia, complicated factors ranging from cultural norms and practices, civil wars, adverse natural conditions, and policy challenges, have worsened mental health problems in Ethiopia (Alem et al., 1995). Risk factors include malnutrition, chronic illnesses, separation, migration, natural disasters, unstable social situations, and overpopulation, which are very common. These trigger severe stress responses that demand excessive and prolonged coping efforts from affected individuals and communities (Atkinson et al., 1990). Ethiopia's 2023 Humanitarian Response Plan illustrates the urgent call for disaster prevention, "climatic shocks such as drought and floods are recurring events, but the frequency and duration of droughts is increasing; further intensifying the needs of affected people and causing greater devastation to lives and livelihoods. The situation is further exacerbated by fragile social service systems that are unable to respond to the needs of the population (OCHA, 2023)."

According to the Ethiopian National health survey of 4,925 adults, the prevalence of depression was 9.1% and the pooled prevalence of

depression was 18.3% in 2012 (Hailemariam et al., 2012). Compared to other mental illnesses, depression accounted for the largest proportion of burden in Ethiopia (Abdulahi et al., 2001). However, it is important to note that this number may underestimate the actual burden of depression in the country, as there are underreported, undiagnosed and untreated cases. Notably, in 2012, major depressive disorder ranked as the third leading cause of years of life lost due to disability (YLD). Depression alone puts a heavy burden on the Ethiopian population, with an estimated 2,117 years lost per 100,000 people (World Health Organization, 2017). Such heavy burden of depression highlights the urgent need for improved mental health services and effective interventions to address depression in Ethiopia where there are many risk factors including exposure to natural disasters.

2.3.2 Health insurance in Ethiopia

Aiming for UHC, Ethiopia started to implement Community-Based Health Insurance (CBHI) in 2011 in order to promote health services and expand it to people residing in rural parts of Ethiopia, as mentioned earlier (Atnafu et al., 2018). According to a study that looked at the impact of CBHI on healthcare utilization and cost of care, enrollment in public health facilities has resulted in a significant increase of 30-41% in the utilization of outpatient care, with a notable 45-64% increase in the frequency of visits, along with a considerable decline of at least 56% in the cost per visit (Mebratie et al., 2019). This implies that the Ethiopian CBHI scheme has proven to be relatively successful, with a high uptake rate of almost 50% within two years of its establishment (2019).

Although CBHI in Ethiopia has demonstrated its effectiveness in enhancing healthcare utilization and reducing healthcare costs, questions still remain regarding its feasibility and coverage. In 2019, the health insurance coverage in Ethiopia was 28%, which means less than one-third of the population enrolled in health insurance programs (ICF, 2019; Merga et al., 2022).

Health insurance is expected to fill the gap in the country's health care system and mitigate the shocks caused by natural disasters. Although the existing literature has investigated the relationship between health insurance and mental health in different settings, little attention has been paid to the context of natural disasters affecting mental health and the role of health insurance in Ethiopia.

Chapter 3. Study Methods

3.1. Study Design

This study estimated the effects of natural disasters on the depressive symptoms of Ethiopian adults and the moderating role of health insurance, taking a cross-sectional approach with data collected in urban areas of Ethiopia.

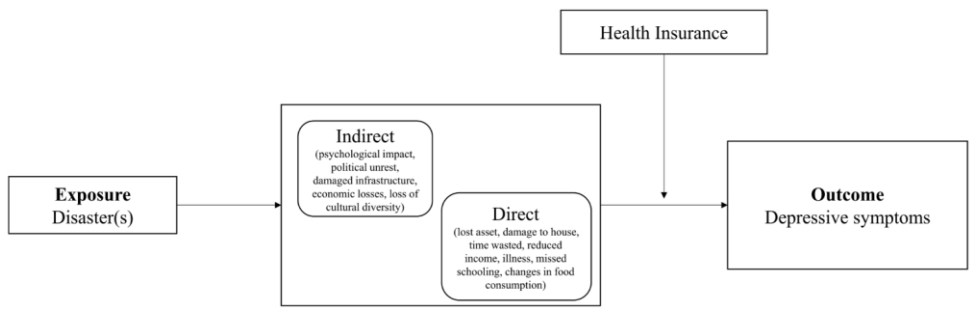
The model of this study is based on the conceptual framework of Hardin et al. (1994) that described the association between negative life events (NLEs) such as a natural disaster and psychological distress including depression, anger and anxiety and the role of insurance in the context of natural disasters demonstrated by Patel et al. (2021). This study tried to yield empirical evidence of the mental health effects of health insurance among adult populations in Ethiopia who were directly exposed to natural disasters, considering NLEs and positive health effects of health insurance.

More specifically, Hardin et al. (1994) shows that the effects of NLEs on depression are pronounced as individuals suffer from psychological distress from experiencing natural disasters coupled with various psychosocial factors such as demographics, family structure and economic support. Unlike other forms of stress, disaster stress is a unique type of major stress, as it is related to threats to survival, property damage and other substantive life changes (Komendantova et al., 2014; Norris et al., 1999; Tapsell et al., 2002). This suggests that the impact of a natural disaster extends beyond the physical realm and can have significant psychological consequences for those affected. Moreover, the model utilized in this study was also built upon Patel et al. (2021)'s study, which highlights the significance of health insurance in mitigating the negative effects of natural disasters on individuals. Patel et al. (2021) demonstrated the crucial role of health insurance in not only minimizing the economic burden of disasters but also safeguarding the psychological well-being of

affected individuals, consequently leading to disaster risk management. By drawing on these established models and theories, this study tried to investigate the psychological impacts of natural disasters and the role of health insurance on individuals affected by natural disasters in Ethiopia.

The conceptual framework depicted in Figure 3 elucidates that the exposure to natural disasters significantly contributes to depressive symptoms via the intermediate mechanisms of direct and indirect losses and impacts following the natural calamities. In this pathway, health insurance intervenes and plays a significant role in ameliorating the negative impacts and psychological distress, potentially moderating this mechanism.

Figure 3. Study model



Source: adapted from Hardin et al. (1994) and Patel et al. (2021) by author

3.2. Data and sample

3.2.1 Data source

This study used Disaster Poverty Household Survey (DPHS) in Addis Ababa and Dire Dawa by the World Bank (The World Bank, 2017). DPHS is a survey that can be used to identify disaster risk including exposure, vulnerability and capacity to recover and poverty in urban environment. The Global Facility for Disaster Reduction and Recovery (GFDRR) is in charge of leading this initiative in close collaboration with the Poverty Global Practice and Urban, Disaster Risk Management, Resilience and Land Global Practice (GPURL) at the World Bank, along with national statistical agencies, Ministries of Finance, local and city governments, disaster risk management

agencies, and selected survey firms. Policy-related research such as urbanization, urban poverty and climate change adaptation can be carried out using the DPHS data.

The survey questionnaire contains information about household size, religion, education, labor, household expenditure, living conditions, housing quality, asset ownership, access to services and jobs, rent and housing costs, tenure arrangements and disaster experiences. With the DPHS data, the question for exposure to natural disasters can be aimed to collect information on various disasters while the 2017 survey mainly focuses on the impacts of urban flooding and other natural hazards in Ethiopia. Additionally, the survey question primarily asks respondents' experience on floods, landslides and fire and is labeled as experience of (natural) shocks, thus focusing on the natural disaster risk and trying to link the relationship between the natural disasters (exposure, vulnerability and capacity to recover) and poverty in the urban setting.

DPHS data has been conducted in three countries: Addis Ababa and Dire Dawa in Ethiopia in May and June of 2017, Dar es Salaam in Tanzania in November and December of 2017 and September of 2018 and Cap-Haïtien in Haiti in October and November of 2018. This study used the DPHS data conducted in Addis Ababa and Dire Dawa, Ethiopia to take a cross-sectional approach.

The Institutional Review Board of Seoul National University approved this study (IRB No. E2303/003-005).

3.2.2 Study population and propensity score matching

All the study samples were surveyed through DPHS in Ethiopia's urban cities (Addis Ababa and Dire Dawa) during May and June 2017. The survey was designed by the World Bank, in collaboration with GFDRR and GPURL. While the total number of participants in the survey was 1,197, we used 1,151 for the analysis after removing the observations with missing values and participants under 18 during May and June, 2017.

Propensity score matching (PSM) is a statistical technique widely

utilized to perform causal inference in situations where randomization is not possible or feasible, as is the case of this study (Guo & Fraser, 2014). In this study, randomly assigning participants to either a directly exposed or non-exposed group to natural disasters was not possible. Therefore, PSM was applied to investigate the potential impact of direct exposure to natural disasters on the level of depressive symptoms among adults residing in urban areas of Ethiopia. This approach provided an insight to compare the levels of depressive symptoms between individuals who directly experienced natural disasters and those who did not, but with a similar probability of experiencing it based on a range of relevant factors such as age, gender, education level, marital status, asset ownership, health status, and level of depression.

By using PSM, the average treatment effect on the treated (directly exposed) group was computed whether exposure to natural disasters was associated with higher levels of depression. A set of variables to generate a propensity score that estimated the likelihood of exposure to natural disasters was measured. This score was then used to match individuals in the exposed and unexposed groups based on their probability of exposure, controlling for potential confounding factors and creating two groups that were as similar as possible, except for their exposure status to natural disasters.

Overall, the use of PSM allowed this study to meticulously assess the relationship between exposure to natural disasters and depressive symptoms among adults, despite the lack of a randomized control group. Potential effects of natural disasters on mental health were drawn.

Additionally, in order to minimize potential confounding bias, control variables were applied. The caliper method was used, and subjects with the smallest differences in total propensity score were paired in a 1:2 ratio. Consequently, unmatched samples were excluded, resulting in a total number of participants (N = 255) allocated after PSM. Based on the estimation of propensity scores, nearest-neighbor matching with a caliper was performed (Cochran and Rubin 1973). Study samples with direct exposure to natural disasters and without

direct exposure to natural disasters were randomly ordered. People with direct exposure to natural disasters were selected and matched with people without direct exposure to natural disasters using the closest propensity score within the region of caliper (Guo and Fraser 2010). In the present study, the caliper size was equal to 0.05 times the standard deviation of the calculated propensity score.

3.3. Variables

3.3.1 Dependent variable

The dependent variable of this study is depressive symptoms. The DPHS survey measured depressive symptoms with the 10-item Center for the Epidemiological Studies of Depression Short Form (CES-D-10). CES-D-10 is a shortened version of the Center for Epidemiologic Studies Depression Scale (CES-D), which is widely used to assess depressive symptoms in general population (Radloff, 1977). Developed by Andresen et al. (1994), CES-D was halved into ten items and it has been acknowledged for its strong reliability, sensitivity and specificity (Irwin et al., 1999). Its effectiveness in screening and identifying depressive symptoms among older adults has been demonstrated in numerous studies, making CES-D-10 a concise and effective tool (Andresen et al., 1994; Han et al., 2019; Perrin et al., 2010; Sunjaya et al., 2022; Yu et al., 2013). It is of critical importance to acknowledge that the CES-D-10 serves as a screening measure specifically designed to identify the presence of depressive symptoms, rather than serving as a diagnostic tool for determining clinical depression. This distinction underscores the primary function of the CES-D-10 as a preliminary assessment tool that aids in the identification and classification of individuals who may potentially exhibit depressive symptoms warranting further evaluation and diagnostic assessment by qualified healthcare professionals.

Respondents were asked ten questions regarding their feelings in the past week: (1) Were you disturbed by things that don't normally bother you? (2) Did you have trouble keeping your mind on what you

were doing? (3) Did you feel depressed? (4) Did you feel that everything you did was a burden? (5) Were you hopeful about the future? (6) Did you feel afraid? (7) Was your sleep restless? (8) Were you happy? (9) Did you feel lonely? (10) Did you feel not “get going (not motivated)”?

The response to each question is coded from 0-7, measuring how frequent respondents experience depressive symptoms during the past 7 days. In this study, the respondents whose total score of the ten questions is 10 or greater were categorized as having high levels of “depressive symptoms (=scored 1).” In other words, if the sum of 10 items is equal to or higher than 10, it is considered depressed (Fu et al., 2022).

3.3.2 Explanatory variable

The explanatory variables are possession of health insurance and direct exposure to disaster(s). Health insurance is measured by asking, “Is [NAME] covered by any health insurance? (like public or organizational or private insurance) and responses are binary (Yes/No). Exposure to disaster(s) is measured by asking, “Have you been directly exposed to FLOOD; LANDSLIDE; or FIRE?”

Being directly exposed to natural disaster(s) is defined into seven different impacts. The definitions are: (1) Lost asset (including assets not in your house, i.e. items located in your shop, items you were transporting), (2) Damages to house or water & sanitation & electricity services affected, (3) Significant time (one day) spent cleaning the house, cleaning in and around the house due to shock, (4) Loss of significant share of income, including one day of work missed or more (due to transportation, illness, work place damages, or forced to stay home with dependents, or other reason), or if you were fined or reprimanded due to late arrival caused by shock, (5) Illness caused by shock, (6) Children missed one day or more of schooling due to shock, (7) Changes in food intake. Those who responded ‘Yes (=scored 1)’ to any of the seven definitions are classified as directly exposed.

3.3.3 Control variable

The analysis controlled demographic characteristics, socio-economic factors and other variables related to health outcomes. Control variables in demographic characteristics are age, age squared, sex, religion, marital status, educational attainment, economic status, assets ownership, social (financial) support, illness and access to health facilities.

In this study, several socio-demographic variables were considered as potential confounding factors, including education, marital status, religion, labor participation, social (financial) support, asset ownership, health insurance, illness, and access to health facility. Age and age squared are continuous variables. Sex is a binary variable (0=male, 1=female). Education was categorized into five groups based on the level of education attained: no education, primary, middle school, high school, and college or post-university degree. Marital status was classified into four groups: never married, married or in a consensual union, separated or divorced, and widowed. Religion was categorized into three groups: Christianity, Muslim, and others. Labor participation was dichotomized into two groups: currently working and not working. Social (financial) support was defined as individuals' financial support and was measured by asking, "In case you needed to borrow 50 Birr in an emergency, would you have ONE PERSON you can turn to that could provide you with a loan?" Respondents who answered yes were assigned a value of 1, while those who answered no were assigned a value of 0. Asset ownership was defined as ownership of a refrigerator and/or car. As an alternative to income, asset ownership is frequently used as a measure of households' economic status especially in developing countries (Howe et al., 2012). In the context of disaster exposure, households with higher income are more likely to have more available resources to cope with the impact of natural hazards. Hence, it is possible that the direct exposure to natural disasters may disproportionately affect households with lower economic status. Health insurance was dichotomized into two groups: those who had

health insurance regardless of its type (public, organizational, or private) were assigned a value of 1, while those who did not have health insurance were assigned a value of 0. Illness was defined as the presence of illness or injury in the past four weeks, and was coded as 1 if a participant had a health issue, and 0 otherwise. Finally, access to health facility was measured in minutes as a continuous variable, reflecting the time it takes for participants to reach the nearest health facility. Table 1 indicates details of all dependent, explanatory, and control variables.

Table 1. List of variables

Category	Variable name	Description	Type
Dependent variable	Depressive symptoms	CESD-10 (score of 10 or above)	Binary (no/yes)
			Continuous (score)
Explanatory variable	Health insurance	Types of insurance (public, organizational, private)	Binary (no/yes)
	Exposure to disaster(s)	Directly exposed to flood, landslide or/and fire	Binary (no/yes)
Control variable	Age	Working age	Continuous (over 18)
	Age squared	Age squared/100	Continuous
	Sex	Sex	Binary (female/male)
	Education	Highest education attained	Category (No education, Primary education, Middle school education, High school education, College/post university degree)
	Marital status	Present marital status	Category (Never married, Married/consensual union, Separated/divorced, Widowed)
	Religion	Religion	Category (Christianity, Muslim, others)
	Asset ownership	Type of assets: Refrigerator and Car	Binary (no/yes)
	Labor participation	Main occupation	Binary (no/yes)
	Social(financial) support	In case you needed to borrow 50 Birr in an emergency, would you have ONE PERSON you can turn to that could provide you with a loan?	Binary (no/yes)
	Illness	Any illness or injury during the past 4 weeks?	Binary (no/yes)
	Access to health facility	In minutes	Continuous

3.4. Method of analysis

In order to estimate the effects of health insurance on depressive symptoms among people with direct exposure to natural disasters, this study utilized following analysis: an OLS model, a probit and a linear probability model (LPM). The OLS model examined depressive symptoms as a continuous variable, while the probit and LPM models assessed depressive symptoms as a binary dependent variable. The LPM was selected as one of the statistical methods, due to its advantage of providing easily interpretable results, as well as its ability to estimate effects in cases where logistic regression may be limited (Deke, 2014).

First, the study conducted OLS regression with cross-sectional data to estimate the depressive symptoms. Second, a logistic regression model was performed to examine the relationship between predictor variables and the probability of experiencing depressive symptoms based on CES-D-10. Each analysis was conducted before and after PSM, yet the main focus of this study was on the statistics obtained after PSM as they were of particular interest in determining the impact of the direct exposure to natural disasters on the depressive symptoms.

One of the main challenges in conducting this study is that assigning direct exposure to natural disasters randomly is not feasible. This creates the risk of biased estimation, as individuals with higher income or education levels may have greater resources to protect themselves from natural disasters and experience fewer losses compared to those with lower socioeconomic status (Muttarak & Lutz, 2014; Padli & Habibullah, 2008; Toya & Skidmore, 2007). To overcome this challenge, we utilized the Propensity Score Matching (PSM) method, which is a valuable statistical tool to address selection bias and balance covariates between the treated and comparison groups in observational studies (Pearl, 1980). By using the PSM technique, we aimed to reduce the potential impact of selection bias on our empirical findings and increase the accuracy of our estimation.

This study conducted descriptive statistical analysis, OLS and logistic regression. This study completed analyses using SAS® version 9.4 statistical software (SAS Institute Inc, Cary, North Carolina).

Analysis model is shown below:

$$Mental\ health_i = \beta_0 + \beta_1 Disasters_i + \beta_2 Health\ insurance_i + \beta_3 Disasters_i \cdot Health\ insurance_i + \beta_4 Covariates_i + \varepsilon_i$$

This equation represents a multiple regression model where the outcome variable is mental health (depressive symptoms). $Mental\ health_i$ represents depressive symptoms of an individual, changes in depressive symptoms depending on disaster exposure is $\beta_1 Disasters_i$, the interaction term between disaster and health insurance and $\beta_2 Covariates_i$ includes all the covariates, and εi is the error term. Overall, this equation is used to estimate the impact of disasters exposure on mental health while controlling for the potential confounding effects of other covariates. The interaction term was added to capture the moderating effect of health insurance on the relationship between disasters and mental health

To see the impact of aforementioned variables on depressive symptoms among those directly affected, PSM was performed and three models were drawn: Model 1 for disaster, Model 2 for health insurance and Model 3 for interaction term. Model 1 was constructed to examine the impact of natural disasters, Model 2 was created to investigate the impact of health insurance, and Model 3 aimed to assess the interaction term between natural disasters and health insurance. These models were analyzed through a probit model and a linear probability model (LPM), two widely used statistical models in social science research for analyzing binary dependent variables (Aldrich & Nelson, 1984; Breen et al., 2018). The use of both models provided a more comprehensive analysis of the impact of natural disasters and health insurance on depressive symptoms. The results of these models provided valuable insights into the effectiveness of health insurance as a protective factor against the negative impact of

natural disasters on mental health.

Chapter 4. Study Results

4.1 Descriptive Statistics

Table 2 provides a comprehensive overview of the demographic characteristics of the exposed and unexposed groups before and after propensity score matching (PSM). Prior to the matching procedure, this study obtained 1,159 samples and a noteworthy imbalance and difference was found in the distribution of relevant sociodemographic and health-related factors between the exposed group (N=85) and the unexposed group (N=1,074). The study samples were characterized by a relatively balanced distribution of males and females in terms of sex ratio, with unexposed 55.40% female and 44.60% male before matching and unexposed 52.35% female and 47.65% male after matching while the exposed female was 55.29% and male 44.71%.

After the aforementioned PSM procedure, the exposed group (N=85) demonstrated highly similar characteristics in relation to the sociodemographic and health-related factors, as compared to the control group (N=170). After applying propensity score weights, all mean differences except for some values of variables like sex, religion and highest education attainment in baseline covariates diminished substantially. For example, the percentage of households without a refrigerator and car was significantly higher in the after matching group compared to the before matching group. Specifically, the difference between unexposed and exposed group for not owning a refrigerator appeared to be significant (p=0.002). However, statistically significant differences disappeared after propensity score matching (p=0.858), indicating that the directly exposed group to natural disaster and unexposed group were actually not significantly different after matching. The use of PSM technique in this study is thus justified with such outcome, indicating disparity has existed regardless of experiencing natural disasters. In other words, the observed differences before matching, such as the percentage for

owning a refrigerator between the exposed and unexposed groups, were found to be not statistically significant after applying propensity score matching (PSM). This implies that PSM effectively reduced the differences in baseline characteristics between the two groups, specifically those related to the exposure to natural disasters. As a result, the groups became more comparable, allowing for a more accurate evaluation of the effect of natural disasters.

After PSM treatment, more than half of study samples were married or in consensual union followed by never married, widowed and separated or divorced. Majority of people, 79.41% in unexposed and 77.65% in exposed were Christians followed by Muslim and others. The labor participation was very similar with being employed slightly higher. As for prevalence of depression, 50.59% of people who were directly exposed to natural disasters had depressive symptoms while 30.35% who were not exposed to natural disasters had depressive symptoms ($p=0.0001$) before matching. After PSM, statistical significance still remained with 32.94% of unexposed group and 50.59% of exposed group elicited depressive symptoms ($p=0.006$).

Table 2 Characteristics of sample before PSM and after PSM by exposed and unexposed group

Variables	Before Propensity Score Matching (N=1,159)			After Propensity Score Matching (N=255)		
	Unexposed to natural disaster (N=1,074)	Exposed to natural disaster (N=85)	*p*	Unexposed to natural disaster (N=170)	Exposed to natural disaster (N=85)	*p*
Age						
Mean	42.88±14.49	42.12±15.46	0.661	42.36±15.00	42.12±15.46	0.904
Sex						
Female	55.40%	55.29%	0.985	52.35%	55.29%	0.657
Male	44.60%	44.71%		47.65%	44.71%	
Marriage						
Never married	14.90%	25.88%	0.039	26.47%	25.88%	0.971
Married/consensual union	64.15%	51.76%		50.59%	51.76%	
Separated/divorced	7.45%	9.41%		8.24%	9.41%	
Widowed	13.50%	12.94%		14.71%	12.94%	
Religion						
Christianity	68.81%	77.65%	0.065	79.41%	77.65%	0.563
Muslim	23.84%	21.18%		17.65%	21.18%	
Others	7.36%	1.18%		2.94%	1.18%	
Labor participation						
No	47.77%	49.41%	0.770	48.24%	49.41%	0.859
Yes	52.23%	50.59%		51.76%	50.59%	
Social (financial) support						
No	26.35%	40.00%	0.007	35.29%	40.00%	0.463
Yes	73.65%	60.00%		64.71%	60.00%	
Asset ownership						
Refrigerator						
No	39.11%	56.47%	0.002	57.65%	56.47%	0.858
Yes	60.89%	43.53%		42.35%	43.53%	
Car						
No	90.22%	96.47%	0.057	97.65%	96.47%	0.588
Yes	9.78%	3.53%		2.35%	3.53%	
Education						
No education	22.20%	27.06%	0.573	30.59%	27.06%	0.656
Primary education	13.71%	15.29%		14.71%	15.29%	
Middle school education	26.87%	20.00%		12.94%	20.00%	
High school education	16.42%	14.12%		17.06%	14.12%	
College/post university degree	20.80%	23.53%		24.71%	23.53%	
Health insurance						
No	93.16%	89.41%	0.195	89.41%	89.41%	1.000
Yes	6.84%	10.59%		10.59%	10.59%	
Depression						
Yes	30.35%	50.59%	0.0001	32.94%	50.59%	0.0064
No	69.65%	49.41%		67.06%	49.41%	

4.2 Regression results

Table 3 presents the results of a regression analysis for depressive symptoms. There are three categorizations and the columns of the table 3 are by different models, looking to see depressive symptoms by specific explanatory variables: disaster, health insurance and the interaction term (disaster * health insurance). The purpose of this analysis was to investigate the depressive symptoms with predictor variables, while controlling for various socio-demographic factors. Model 1 shows the effects of being directly exposed to natural disasters. Model 2 shows the effects of possessing health insurance. Model 3 shows the effects of the interaction term between health insurance and being directly exposed to natural disasters.

Table 3 Regression results for depressive symptoms by models

Variables	Model 1 (1)	Model 2 (2)	Model 3 (3)
Exposure to natural disasters (ref: unexposed)			
Directly exposed	6.123 (1.332)***	6.118 (1.335)***	6.112 (1.429)***
Health insurance (ref: no health insurance)			
Health insurance	-	-0.515 (2.101)	-0.532 (2.593)
Disaster × Health insurance	-	-	0.051 (4.459)
Age	0.442 (0.294)	0.446 (0.295)	0.446 (0.295)
Age squared	-0.004 (0.003)	-0.004 (0.003)	-0.004 (0.003)
Sex (ref: male)			
Female	-0.335 (1.571)	-0.300 (1.581)	-0.299(1.587)
Education (ref: no education)			
Primary education	-3.866 (2.042)*	-3.831 (2.051)*	-3.831 (2.055)*
Middle school education	-3.609 (2.246)	-3.535 (2.271)	-3.531 (2.301)
High school education	-1.088 (2.145)	-0.995 (2.194)	-0.995 (2.199)
College/post university	-1.755 (2.243)	-1.704 (2.257)	-1.703 (2.262)
Marriage (ref: never married)			
Married/consensual union	-2.451 (1.936)	-2.428 (1.942)	-2.428 (1.946)
Separated/divorced	5.048 (2.986)*	5.002 (2.998)*	5.002 (3.005)*
Widowed	-2.716 (3.004)	-2.731 (3.011)	-2.733 (3.019)
Religion (ref: Christianity)			
Muslim	-1.173 (1.683)	-1.173 (1.686)	-1.172 (1.691)
Others	-4.656 (4.261)	-4.691 (4.272)	-4.692 (4.281)
Labor participation (ref: not working)			
Yes	-2.050 (1.509)	-2.045 (1.512)	-2.046 (1.521)
Social (financial) support (ref: no social-financial support)			
Yes	-5.210 (1.390)***	-5.252 (1.402)***	-5.253 (1.409)***
Recent Illness (ref: no illness)			
Yes	0.630 (1.812)	0.657 (1.819)	0.655 (1.829)
Asset Ownership (ref: not owned)			
Refrigerator	-3.775 (1.524)*	-3.794 (1.529)**	-3.793 (1.536)**
Car	-0.860 (3.971)	-0.885 (3.981)	-0.885 (3.989)
Access to hospital	0.050 (0.050)	0.051 (0.050)	0.051 (0.051)
Intercept	6.011 (6.506)	5.921 (6.530)	5.921 (6.544)

Standard error in parentheses

*** p<0.01, ** p<0.05, * p<0.1

The findings from the three models consistently revealed a significant positive association between direct exposure to natural disasters and depressive symptoms ($p<0.01$). The results of the OLS regression analysis indicate that individuals with the direct exposure to natural disasters had CES-D-10 scores that were 6 points higher in comparison to those with no exposure to natural disasters, suggesting a significant difference in the prevalence of depressive symptoms between the two groups.

Column (2) shows the impact of health insurance on depressive symptoms. The effect of having health insurance in Model 2 is also in the expected direction -lower depressive symptoms among those with health insurance-but the effect is not statistically significant ($p=0.807$). Even though the finding shows people with health insurance were less likely to have depressive symptoms compared to those without health insurance, the negative relationship was not statistically significant.

One of the primary interests of this study was whether health insurance plays a moderating role on depressive symptoms among those directly affected by natural disasters, shown in column (3). The interaction term between disaster and health insurance was not statistically significant ($p=0.897$), indicating that the effect of disaster on depressive symptoms does not differ significantly between those with and without health insurance.

For socioeconomic characteristics, education attainment emerged as a significant factor in reducing depressive symptoms across all three models. Specifically, having attained primary education significantly decreased CES-D-10 scores by more than 3 points compared to those who reported no education ($p<0.1$). This indicates that primary education compared to no education was associated with lower levels of depressive symptoms. Notably, individuals who attained their education up to the primary education had a statistically significant negative association with depressive symptoms ($p<0.1$), while the associations between depressive symptoms and education levels beyond primary education were not significant. Although the coefficients for middle school, high school, and college/post-university education were negative, demonstrating education was

associated with lower levels of depressive symptoms at other education levels, none except for primary education were statistically significant. Therefore, the results suggest that attaining at least primary education may be a salient factor in reducing depressive symptoms among individuals affected by natural disasters.

As for marital status, those who were separated or divorced reported higher depressive symptoms compared to those who were never married. The results of the OLS regression analysis indicate that individuals who are separated or divorced had CES-D-10 scores that are 5 points higher compared to those who have never married, suggesting a significant difference in the prevalence of depressive symptoms between the two groups ($p<0.1$). Being married or in consensual union and widowed were negatively associated with depressive symptoms but failed to find statistical significance.

Social (financial) support was found to be significantly associated with decreased depressive symptoms in all models. Specifically, individuals who perceived that they could receive financial help from another person compared to those who reported no financial support around them exhibited lower CES-D-10 scores by more than 5 points (-5.210 in Model 1, -5.252 in Model 2, and -5.253 in Model 3), with all estimates being statistically significant ($p<0.01$). These findings suggest that social (financial) support may play an important role in mitigating the negative psychological impact of natural disasters. It is noteworthy that these results are consistent across all models, even after controlling for other potential confounding variables such as disaster exposure and health insurance status. Overall, the results of this study highlight the importance of social (financial) support in disaster management and recovery efforts.

In terms of asset ownership, having a refrigerator was statistically associated with reduced depressive symptoms ($p<0.1$ in Model 1, $p<0.05$ in Model 2 and 3). Compared to not owning a refrigerator, owning a refrigerator as an asset was found to be statistically significant and the score for depressive symptom was lowered by 3 points.

By contrast, the other variables were not associated with eliciting

depressive symptoms: age, age squared, sex, attainment to middle school, high school, college/post university education, being married or in consensual union, widowed, religion, labor participation, recent illness, access to hospital were not significantly associated with depressive symptoms.

To further examine the association between the explanatory variables and the likelihood of experiencing high levels of depressive symptoms, a probit model and a linear probability model (LPM) were performed in the analysis as presented in Table 4. Both models used the same set of independent variables across all models. In Table 4, probit model and LPM are presented, where the dependent variable is a dummy variable that is equal to one for high depressive symptoms according to cutoff point of 10 or above as indicated in Fu et al. (2022), and is equal to zero otherwise (1=high depressive symptoms, 0=low depressive symptoms). The results of both models are presented in Table 4.

Table 4. LPM and probit estimation of depressive symptoms by models

Variables	Model 1		Model 2		Model 3	
	(1) Probit	(2) LPM	(3) Probit	(4) LPM	(5) Probit	(6) LPM
Exposure to natural disasters (ref: unexposed)						
Directly exposed	0.508	0.176	0.507	0.175	0.519	0.177
	(0.181)	(0.064)	(0.181)	(0.064)	(0.194)	(0.069)
	***	***	***	***	***	***
Health insurance (ref: no health insurance)						
Health insurance	-	-	-0.193	-0.083	-0.154	-0.077
			(0.285)	(0.110)	(0.358)	(0.138)
Disaster × Health insurance	-	-	-	-	-0.104	-0.020
					(0.591)	(0.231)
Age	0.058	0.02	0.060	0.022	0.059	0.022
	(0.041)	(0.015)	(0.041)	(0.015)	(0.041)	(0.015)
Age squared	-0.001	-0.000	-0.001	-0.000	-0.001	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sex (ref: male)						
Female	-0.193	-0.071	-0.182	-0.068	-0.184	-0.068
	(0.215)	(0.080)	(0.216)	(0.080)	(0.216)	(0.080)
Education (ref: no education)						
Primary education	-0.070	-0.031	-0.055	-0.027	-0.055	-0.028
	(0.273)	(0.095)	(0.274)	(0.095)	(0.274)	(0.095)
Middle school education	-0.369	-0.120	-0.345	-0.116	-0.353	-0.116
	(0.310)	(0.098)	(0.314)	(0.099)	(0.318)	(0.100)
High school education	-0.087	-0.051	-0.053	-0.039	-0.053	-0.039
	(0.292)	(0.107)	(0.297)	(0.108)	(0.297)	(0.108)
College/post university	-0.259	-0.116	-0.237	-0.109	-0.238	-0.109
	(0.309)	(0.110)	(0.311)	(0.111)	(0.311)	(0.111)
Marriage (ref: never married)						
Married/consensual union	-0.502	-0.175	-0.494	-0.174	-0.495	-0.173
	(0.266)*	(0.106)*	(0.266)*	(0.105)*	(0.266)*	(0.105)*
Separated/divorced	0.489	0.160	-0.477	0.156	0.475	0.156
	(0.409)	(0.155)	(0.411)	(0.153)	(0.410)	(0.154)
Widowed	-0.360	-0.163	-0.366	-0.166	-0.364	-0.165
	(0.410)	(0.161)	(0.410)	(0.160)	(0.410)	(0.160)
Religion (ref: Christianity)						
Muslim	-0.220	-0.067	-0.222	-0.068	-0.223	-0.069
	(0.231)	(0.076)	(0.232)	(0.077)	(0.232)	(0.077)
Others	-0.494	-0.178	-0.508	-0.192	-0.507	-0.190
	(0.591)	(0.272)	(0.591)	(0.269)	(0.591)	(0.269)
Labor participation (ref: not working)						
Yes	-0.302	-0.096	-0.304	-0.097	-0.300	-0.096
	(0.207)	(0.070)	(0.208)	(0.071)	(0.209)	(0.071)
social (financial) support (ref: no social-financial support)						
Yes	-0.509	-0.173	-0.528	-0.188	-0.525	-0.187
	(0.185)	(0.068)	(0.187)	(0.069)	(0.188)	(0.070)
	***	***	***	***	***	***
Recent Illness (ref: no illness)						
Yes	0.287	0.096	0.298	0.107	0.301	0.106
	(0.242)	(0.090)	(0.242)	(0.089)	(0.243)	(0.089)
Asset Ownership (ref: not owned)						
Refrigerator	-0.363	-0.115	-0.369	-0.120	-0.372	-0.120
	(0.208)*	(0.072)	(0.209)*	(0.072)*	(0.209)*	(0.072)*
Car	-0.219	-0.037	-0.221	-0.038	-0.222	-0.037
	(0.625)	(0.175)	(0.624)	(0.173)	(0.127)	(0.173)
Access to hospital	0.007	0.002	0.007	0.002	0.007	0.002
	(0.007)	(0.003)	(0.007)	(0.003)	(0.007)	(0.003)
Intercept	-0.582	0.259	-0.618	0.247	-0.620	0.246
	(0.904)	(0.329)	(0.907)	(0.328)	(0.907)	(0.330)

Standard error in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The results of probit regression showed a positive association between direct exposure to natural disasters and depressive symptoms. The association was notably strong, with p-value less than 0.01. The estimate of LPM model in Column (2) was 0.176 (SE=0.064). This means that individuals who directly experienced a natural disaster have a 17.6% higher probability of exhibiting depressive symptoms compared to those who were not exposed to a natural disaster. The findings from Table 4, which analyze binary outcomes, align with the results from Table 3, which examines continuous variables. Specifically, the results of Table 4 reaffirm that exposure to natural disasters has a significant and deleterious impact on the mental health of individuals affected, as demonstrated by the strong positive association between direct exposure to natural disasters and depressive symptoms. This underscores the crucial need for effective preparedness and response strategies aimed at alleviating the adverse mental health impacts from natural disasters.

The probit result of Model 2 showed the effect of possessing health insurance on depressive symptoms, revealing negative and not statistically significant (p=0.499). The result of LPM represented the probability of exhibiting depressive symptoms for those with health insurance is 8.3% lower relative to those without health insurance, however, the association was statistically insignificant.

Column (5) and (6) examined the interaction term (disaster*health insurance) for depressive symptoms to investigate the potential impact of health insurance on reducing depressive symptoms among individuals who have been directly affected by natural disasters. The probit result of Model 3 showed that the coefficient of the interaction term is negative and not statistically significant (p= 0.860). The result of LPM represented the probability of exhibiting depressive symptoms for those with health insurance in the context of natural disaster is 2% lower compared to those without health insurance, however, the association was statistically insignificant.

Consistent with the findings presented in Table 3, Table 4 demonstrates that the possession of certain assets has a notable

association with depressive symptoms in the context of natural disasters. More specifically, the possession of a refrigerator was significantly related to lower levels of depressive symptoms across all models and both probit and LPM estimations ($p<0.1$), with the exception of LPM in Model 1 ($p=0.109$). For example, in Model 3, the probability of exhibiting depressive symptoms for those with refrigerator is 12% lower compared to those without refrigerator. Additionally, the status of being married or in a consensual union was negatively associated with depressive symptoms ($p<0.1$). These findings suggest that social and material resources may play a protective role in mental health outcomes following natural disasters.

Furthermore, the findings from the probit and LPM models of all three models (Model 1, Model 2, and Model 3) demonstrate a robust and statistically significant relationship between social (financial) support and reduced levels of depressive symptoms. Specifically, individuals who reported that they can get help from someone exhibited significantly lower CES-D-10 scores ($p<0.01$) than those who responded no support from others. The probability of exhibiting depressive symptoms for those with social (financial) support is 17.3%, 18.8% and18.7% lower in Model 1, Model 2 and Model 3, respectively, compared to those who reported no social (financial) support.

Chapter 5. Discussion and Conclusion

5.1. Discussion

This study aimed to estimate the impact of health insurance on depressive symptoms among individuals in urban areas of Ethiopia, as measured by the CES-D-10 scale, using a cross-sectional approach with data from the DPHS. The present study utilizes OLS and multiple regression based on propensity score matching techniques to study the effect of natural disasters on the mental health of adults, thereby providing empirical evidence of the impact of natural disasters and health insurance on mental well-being.

Prior to examining the effect of health insurance on mental health, the study first investigated the impact of natural disasters on depressive symptoms. Specifically, the first research question was whether natural disasters had any effects on the mental health of individuals in urban Ethiopia.

The study found that being directly exposed to natural disasters has a significant impact on the mental health of adult population living in urban areas of Ethiopia. The study findings revealed a positive association between direct exposure to natural disasters and elevated levels of depressive symptoms. The observed relationship was consistent across all OLS, probit, and LPM models used in the analysis, with varying estimates depending on the estimation method employed. Notably, the statistical analysis consistently yielded strong p-values, confirming the robustness of the association between direct exposure to natural disasters and increased depressive symptoms ($p<0.01$). These findings underscore the importance of disaster preparedness and response measures geared towards mitigating the adverse mental health consequences of natural disasters.

Such detrimental effect of natural disasters on depressive symptoms is consistent with other studies (Beaglehole et al., 2018; Newnham et al., 2022; Pennington et al., 2018; Siskind et al., 2015). In

addition to the finding, the use of PSM has shed light on the fact that natural disasters exacerbate the mental state of already vulnerable populations in urban areas of Ethiopia, placing additional burden. The study revealed that the severity of depressive symptoms was more apparent among those who were directly exposed to natural disasters, and even more prominent after PSM, which helped to reduce potential confounding variables and biases in the comparison between the exposed and unexposed groups.

The present study is based on the data collected from DPHS, which was conducted in the aftermath of the catastrophic floods and droughts caused by the El Niño in May and June 2017 (Weldegebriel & Amphune, 2017). Thus, it is plausible to conclude that the results of this study could possibly reflect the impact of 2017 floods and droughts in Ethiopia. The impact of these natural disasters on the people of Ethiopia was massive, with a staggering number of individuals being greatly affected by them. The floods that hit the country in 2016 alone had an impact on approximately 210,600 people in just three months, and the drought that took place the same year was the most severe drought Ethiopia had experienced in three decades, leaving more than 10 million people in dire need of food and water (Godfrey & Hailemichael, 2017; United Nations Office for the Coordination of Humanitarian Affairs (UN-OCHA), 2016). In light of the numerous disaster studies that have demonstrated the different mental health consequences of natural disasters, it is imperative to examine the effects of such catastrophes on the well-being of individuals, considering the differences in the types of disasters.

In Ethiopia, numerous factors contribute to the increased risk of depression. Firstly, as seen in this study, the country's susceptibility to natural disasters increases the likelihood of experiencing traumatic events that can trigger mental health problems like PTSD and depression. In addition to Ethiopia's vulnerability to natural disasters, the country also faces a high burden of neuropsychiatric disorders, including conditions like schizophrenia and depression. The prevalence of depression is particularly worth noting, as it contributes to approximately 6.5% of the overall burden of disease in the country

(Tesera, 2014).

The issue of mental health in Ethiopia is compounded by the pervasiveness of stigma and discrimination towards individuals with psychological disorders (Girma et al., 2022). A notable risk factor of depression in Ethiopia is embedded within the nation's cultural tendency to view mental disorders as a taboo, and such cultural stereotypes and stigma create a significant barrier to the utilization of existing mental health services and resources, further exacerbating the already vulnerable psychological state of the nation. People with mental illness in Ethiopia tend to be erroneously labeled as "insane" or "crazy," and they are sent to religious places like church with the belief that they are "possessed" (Mitiku, 2018).

The stigma attached to mental illness in Ethiopia is deeply ingrained in cultural beliefs and religious practices, which view it as a manifestation of spiritual possession or a divine penalty, rather than a treatable medical condition. This local context perpetuates negative attitudes towards individuals with mental illness and discourages seeking appropriate mental health care. The mental health needs are unmet even more because people with psychological disorders are imprisoned in their own homes, isolated from society and such mental health is not openly discussed, which hinders accessing proper health care (Odom, n.d.). The detrimental effects of such prevailing stigma and discrimination cannot be overstated, as they serve to perpetuate the marginalization and disenfranchisement of individuals with mental health conditions, inhibiting their ability to access the care and support they desperately need. Furthermore, the lack of resources and limited access to mental health services exacerbate their mental health status, making it challenging to address and manage depression at the national level.

Moreover, in Ethiopia, the financial burden is a significant barrier that prevents many people from accessing the mental health services they need. The cost of mental health care can be prohibitive for many Ethiopians, especially those living in poverty or in rural areas with limited access to resources (Hanlon et al., 2019). As a result, many individuals with mental health conditions go untreated, leading to a

deterioration of their overall health and well-being. This lack of financial coverage has profound implications for the mental health of Ethiopians, as well as for the country's efforts to achieve UHC and address the challenges of natural disasters. In addition to financial barriers, it is crucial to acknowledge other factors that influence enrollment in CBHI in Ethiopia. According to a mixed-method study investigating health service utilization in Ethiopia, household factors including age, education, self-rated health status, perceived quality of health services, household size, knowledge and information (awareness) about CBHI were greatly associated with the enrollment into CBHI (Asmamawu, 2018). This points out the need for concrete and comprehensive strategies and efforts to expand CBHI to strengthen Ethiopians' health.

Often underdiagnosed and ignored, psychological disorders have not received enough attention or priority from the policymakers and service providers. While CBHI aimed for coverage for essential services, mental health has often been deprioritized, leaving those with psychological disorders behind. Therefore, people with mental disorders frequently encounter the financial burden of out-of-pocket payments when seeking mental health services, as social support systems are often lacking or unavailable (Ayano, 2016). Moreover, the National Health Insurance Scheme (NHIS) provides limited coverage for mental health services, further exacerbating the financial challenges. The result of this study, which did not indicate a moderating effect of health insurance could be due to the fact that mental health services were not fully covered in 2016, failing to reach people in need.

As mental health issues are a significant concern in Ethiopia, the country is committed to taking concrete steps to address them and meeting the needs. One of the key strategies has been the integration of mental health care into primary health care and general medical services based on WHO mental health scale up programme: Mental Health Gap Action Program (mhGAP) (Ayano et al., 2016). Since 2012, the government has taken a proactive approach to provide mental health care by non-specialized professionals working at the first and

second levels of facilities, making the resources more accessible and available. In 2019, the Ministry of Health in Ethiopia launched the second-generation health extension program cross the country. Similar to mhGAP, such implementation of the PHC approach relies on health workers, including community health workers (CHWs) (Yitbarek et al., 2021). CHWs, who are selected by community members or organizations, play a vital role in the healthcare system of developing countries (Maes et al., 2018). They act as community health aids and provide basic healthcare services to the local population so the inclusion of CHWs in the health extension program aims to improve access to primary healthcare services, including mental health services, especially in remote and underserved areas (Kane et al., 2016). Despite efforts to integrate mental health care into primary care services, the costs of psychotropic medication, transportation can be expensive, leading many individuals to drop out of care or stop the treatment (Hailemariam et al., 2017). This highlights the urgent need for more comprehensive and affordable health insurance options in Ethiopia, particularly for those who may be more vulnerable to the negative impacts of natural disasters and other environmental shocks.

Nevertheless, the initiative to making mental health services more available and affordable by making it a part of primary care is a step forward in addressing the gap in mental healthcare in Ethiopia and improving the mental health outcomes of the population. The recently published Mental Health Atlas 2020 by the WHO emphasizes a promising development in Ethiopia that people in Ethiopia are fully insured at the point of mental health service use (2022). According to the technical document, those who have insurance are exempt from any financial payments for mental health services and psychotropic medications. The NHIS includes comprehensive coverage for psychological disorders such as psychosis, bipolar disorder and depression, ensuring financial support and minimizing out-of-pocket expenses. Given the comprehensive nature of the NHIS, future research should delve into the effects of service coverage on mental health outcomes, shedding light on the benefits that health insurance can offer in this context.

The second research question of this study aimed to investigate whether health insurance had a moderating effect on the relationship between direct exposure to natural disasters and depressive symptoms. The findings of this study suggest that the possessing health insurance did not have a significant moderating effect on the relationship between direct exposure to natural disasters and the incidence of depressive symptoms. The direction of probit model was negative and not statistically significant and LPM suggests that the probability of depressive symptoms for individuals with health insurance in a natural disaster context is 2% lower than those without, but the association was not statistically significant. Therefore, the results of this study suggest that having health insurance does not have a significant effect on reducing depressive symptoms in individuals who are directly exposed to natural disasters. While the findings do suggest a potential protective effect of health insurance on mental health, it is important to note that this effect was not statistically significant, and further research is needed to explore the relationship between health insurance and mental health outcomes in the context of natural disasters.

This result is inconsistent with previous studies which insisted that providing health insurance benefits to vulnerable population to maintain their mental health, contradicting 'insurance effect' (Pluym et al., 2021; Rondet et al., 2013; Tachibana et al., 2019; Yuda & Lee, 2022). 'Insurance effect,' described by Tachibana et al. (2019), refers to the phenomenon where mere access to a financial cushion or cash income source attenuates mental distress in the aftermath of a disaster, even in the absence of real remittances. The discordant findings of this study from previous studies can be attributed to several factors.

First potential explanation for the contrasting results from previous studies is the relatively small number of individuals in the current study who possessed health insurance regardless of its type. Specifically, only 82 individuals out of the total sample size, comprising 7.10% of the total study sample, reported having health insurance. The small number of individuals with health insurance may have restricted the statistical power of the analysis and weakened the ability to detect

significant differences in the mental health outcomes between those with and without health insurance. Further, it is significant to take a look at the current status of health insurance in Ethiopia. A recent research reported the health insurance coverage in Ethiopia was 28.1% and the place of residence was a significant contributor of the CBHI scheme utilization with rural residents having 1.38 times higher odds being covered by health insurance than urban residents (Merga et al., 2022). Given that Addis Ababa and Dire Dawa, the location where DPHS data collection was conducted, are urban areas, the study samples might have been less likely to be covered by insurance, disguising the relationship between owning health insurance and eliciting depressive symptoms.

Another plausible explanation for the lack of significant association between health insurance and decreased depressive symptoms could be attributed to the supply and demand sides of mental health care services in Ethiopia. Insurance coverage does not necessarily guarantee that individuals will seek or receive mental health care services in Ethiopia. According to a study that investigated mental health service utilization in Ethiopia from health professional perspective, five major barriers were drawn: (1) a tendency to deprioritize psychological disorders in favor of other illnesses, (2) low levels of literacy and knowledge about mental illness, (3) fear of experiencing stigma and discrimination (4) a preference for traditional or religious healers over health facility, and (5) lack of government attention and commitment towards mental health services (Hanlon et al., 2019; Mekonen et al., 2022). Especially, from the supply side, the service coverage for mental health was limited at the time of data collection in 2017 as mentioned above. These factors may limit access to mental health care services even for those with health insurance coverage, thereby potentially reducing the impact of insurance on decreasing depressive symptoms.

Third explanation as to why health insurance could not be a protective factor on depressive symptoms among those directly affected by natural disasters could be due to lack of resources. From the supply side, lack of resources for mental health care may be one

of the leading factors for under-utilization of health service. As for mental health workforce, there are 111 psychiatrists (0.10 per 100,000 population), 595 mental health nurses (0.53 per 100,000 population) 10 social workers (0.009 per 100,000) and 46 psychologists (0.04 per 100,000 population) (WHO, 2022). In total, the number of mental health workers in Ethiopia is merely 0.68 per 100,000 population, which is considerably lower than the ratio in low-income countries (2 per 100,000 population) and high-income countries (60 per 100,000 population) (WHO, 2022). In terms of mental health service availability and uptake in Ethiopia, there is only one mental hospital, one community residential facility and one community based mental health facility. Unfortunately, the number of community-based mental health service has declined from 2014, indicating a decrease in the number of community-based outpatient facilities (e.g. community mental health centres), other outpatient services (e.g. day treatment facilities) and mental health community residential facilities for adults. The significant indicators including number of visits, hospital beds, admissions and mental health promotion and prevention were unavailable and not reported from the Mental Health Atlas 2020 by WHO. Unfortunately, most of the resources for mental health are available only in the large cities, which is a risk factor for health disparity as 80% of Ethiopians reside in rural areas. It is important to note that since 1970s, the WHO has consistently asserted for the inclusion of psychiatry within primary care in order to minimize the treatment gap for mental health disorders, making it available regardless of location (World Health Organization, 2008).

In addition to the main findings, the analysis of covariates yielded intriguing findings that require careful consideration and interpretation. Asset ownership was found to be statistically associated with reduced depressive symptoms. The outcome of the study is aligned with the extant body of literature that underscores the benefit of having resources and belongings to individuals' mental well-being (Lin & Okyere, 2020; Tao et al., 2022). In terms of marital status, the findings of this study are consistent with previous research that has shown that individuals who are divorced or widowed have a higher risk of

experiencing depressive symptoms (Deyessa et al., 2008; Hailemariam et al., 2012). Consistent with previous studies, age, religion, labor participation, education attainment (except for primary education) had no significant association with depressive symptoms (Deribew et al., 2010; Friis & Nanjundappa, 1986; Hailemariam et al., 2012; Wink et al., 2005).

Social (financial) support was statistically associated with reduced depressive symptoms in all OLS, probit and LPM. Social (financial) support was associated with low depressive symptoms and those with social (financial) support scored lower on CES-D-10 than individuals who reported no social (financial) support and the statistical power was very strong with p-value less than 0.001. In summary, those who reported having at least one person they could rely on in case of financial struggles exhibited reduced depressive symptoms, highlighting the importance of social (financial) support for mental health in the context of natural disasters.

These findings are consistent with previous research that has identified social support, especially financial support, as a protective factor for mental health outcomes, particularly in the context of natural disasters and other traumatic events (Aldamman et al., 2019; Brooks et al., 2022; Ehring et al., 2011; Labrague & De los Santos, 2020; Sanchez et al., 1995; Wang et al., 2000). Aligned with the present study that asked specifically about available financial support, Tachibana et al. (2019) discovered that in the aftermath of the 2015 Nepal earthquake, the increase in remittances sent to households reduced depression severity scores. The strong statistical relationship between perceived social (financial) support and lower levels of depressive symptoms highlights the potential effectiveness of interventions aimed at enhancing social (financial) support in reducing the risk of mental health issues, especially among vulnerable population. The notable finding of this research not only emphasizes the importance of social (financial) support, but it also underscores the need for a support network and available resources to help individuals cope with mental health issues in the aftermath of disasters. According to the study by Hirono and Blake (2017) that examined the role of

clerics in the restoration of hope after natural disasters, it found that social (financial) support was considered more significant in facilitating disaster relief compared to the involvement of religious leaders in Japan.

Similar to social (financial) support, the marital status, specifically being married or in a consensual union, is associated with reduced depressive symptoms, which suggests that having a supportive partner or significant other can be a protective factor against mental health challenges in times of crisis. This highlights the value of social connections in promoting resilience and facilitating recovery in the aftermath of natural disasters. Additionally, the importance of access to resources, such as mental health services and counseling, cannot be understated in addressing the mental health needs of disaster-affected individuals. Therefore, implementing measures to increase social (financial) support, such as community-based programs, group therapy and support groups, may prove beneficial in promoting mental well-being in populations affected by natural disasters or other traumatic events.

5.2. Study Limitation

The empirical findings reported herein should be considered in the light of some limitations. Firstly, the duration of survey data collection in this study was comparatively shorter than other studies. Although the span of the survey was short, DPHS tried to capture the dynamics of the natural disasters that recently affected the urban areas in Ethiopia. Other research spent at least multiple years of accumulated panel data to analyze the impact of health insurance on mental health (Yuda & Lee, 2022). The shorter period of data collection may not fully capture the long-term effects of health insurance on mental health, particularly in the aftermath of shocks like natural disasters. As DPHS is an ongoing survey, looking at the relationship between urban poverty and health, future research would be able to capture long-term effects of natural disasters on health depending on the severity and temporal variations of natural disasters. In fact, in Dar es Salaam,

Tanzania, the survey is being conducted as a panel data in November and December of 2017 and September of 2018, allowing for the analysis of longitudinal health impacts over time. While the current study does not capture long-term effects of health insurance on mental health, future research using the DPHS data may provide valuable insights into the enduring effects of health insurance coverage for vulnerable populations in urban areas.

Another critical limitation is the absence of health status or self-rated health measures within the survey. Given the survey's primary objective was to explore the relationship between natural disasters and poverty within urban settings, the DPHS questionnaire was tailored to probe into topics of climate change adaptation, urbanization, urban poverty, and living conditions. Including self-rated health measures in the survey would have provided a more comprehensive understanding of the research topic, especially regarding depressive symptoms as well as the moderating effect of health insurance. However, to compensate for this limitation, the study included information on whether respondents experienced illness or injury in the past four weeks as a proxy for estimating the health status of individuals, in addition to evaluating mental health outcomes. In order to enhance the accuracy of future research, it is recommended that a more comprehensive questionnaire related to individuals' health be developed to capture multidimensional constructs to mental health.

Previous research on the subject is lacking in its examination of the three key components: mental health, disaster and the role of health insurance in resource-restricted settings. The associations between mental health and exposure to disaster and the association between health insurance and its effects on mental health have been extensively reported. Nonetheless, there remains an empirical gap that presents a protective role of health insurance on mental health following a natural disaster in developing countries. As mentioned above, addressing mental health in LMICs is challenging as such health issue is relatively understudied and underreported; insufficient attention has been given for psychological disorders. Therefore, future research should include consideration of these cultural issues and

prioritize the local context point of view for a more comprehensive understanding of the topic.

5.3. Conclusion

Natural disasters including earthquakes, floods, tsunamis, droughts, hurricanes and various natural hazards are catastrophic events that cause significant physical and psychological harm. Survivors of natural disasters are at greater risk of developing psychological disorders, especially depression and PTSD (Goldmann & Galea, 2014). The negative life events (NLEs) posits that individuals may experience psychological distress in the aftermath of stressful life events like a natural disaster as they tend to be beyond an individual's ability to cope with the stress. This disastrous life event is thought to contribute to the development of mental health issues in affected individuals.

Located in the horn of Africa, Ethiopia is recognized as one of the countries with a high risk of natural disasters, and its geographic condition makes it extremely susceptible to various natural disasters. Considering depressive symptoms among those directly experienced natural disaster are evidently higher than others, the result of this study corroborates the impact of natural disasters on mental health with much higher depressive symptoms presented by directly exposed individuals.

Moreover, it highlights a possible solution that ensures mental health care services through more available and affordable resources. Although the effects of possessing health insurance were insignificant, the direction of the estimates demonstrates lowered depressive symptoms among those who have health insurance. Since the government of Ethiopia recognized the importance of mental health it is currently expanding its resources with the support of WHO so that people in rural areas could access it. Based on the study findings, to facilitate health insurance's effective role in Ethiopia, social awareness and collective efforts to recognize mental health issue is significant.

Another notable takeaway from this study is the effects of social

(financial) support on the depressive symptoms. Those who reported having financial support around them, even it was only one person, the depressive symptoms were greatly reduced, and statistically significant across all estimation methods. The result of this study highlights the significance of resources and the mere perception thereof in reducing psychological distress. As such, disaster management strategies should prioritize post-disaster recovery planning, including interventions such as trauma group therapy or post-disaster rehabilitation, as part of comprehensive efforts to promote mental well-being and facilitate the psychological recovery of individuals affected by disasters.

As natural disasters cause immense destruction and loss of life, it is essential to recognize that the impact is often felt most acutely and destructively in developing countries, where populations are already vulnerable. In such contexts, the need for systematic interventions aimed at reducing the risk of disasters and enhancing preparedness is critical. These interventions should be designed to address the various challenges faced by these resource-deprived communities, including issues related to cultural barriers, economic development, environmental sustainability, and social inequality. By adopting a holistic and comprehensive approach, policymakers and practitioners can help mitigate the negative impact of natural disasters on these vulnerable populations' mental health. Furthermore, based on the empirical evidence presented in this study, developing nations can develop interventions to promote mental health among vulnerable populations, thereby contributing towards SDG 11.5, which seeks to mitigate the negative impacts of natural disasters, and SDG 3.8, which aims to achieve universal health coverage.

Bibliography

Abdulahi, H., Mariam, D. H., & Kebede, D. (2001). Burden of disease analysis in rural Ethiopia. *Ethiopian medical journal*, *39*(4), 271-281.

Al-Madhari, A., & Keller, A. (1997). Review of disaster definitions. *Prehospital and disaster medicine*, *12*(1), 17-21.

Alang, S. M., McAlpine, D. D., & Henning-Smith, C. E. (2014). Disability, health insurance, and psychological distress among US adults: an application of the stress process. *Society and mental health*, *4*(3), 164-178.

Aldamman, K., Tamrakar, T., Dinesen, C., Wiedemann, N., Murphy, J., Hansen, M., Elsiddig Badr, E., Reid, T., & Vallières, F. (2019). Caring for the mental health of humanitarian volunteers in traumatic contexts: the importance of organisational support. *European journal of psychotraumatology*, *10*(1), 1694811.

Aldrich, J. H., & Nelson, F. D. (1984). *Linear probability, logit, and probit models*. Sage.

Alem, A., Destal, M., & Araya, M. (1995). Mental health in Ethiopia EPHA expert group report. *Ethiopian journal of health development*, *9*(1).

Alexander, D. (2018). *Natural disasters*. Routledge.

American Geological Institute. (1984). *Glossary of geology*. American Geological Institute.

Andresen, E. M., Malmgren, J. A., Carter, W. B., & Patrick, D. L. (1994). Screening for depression in well older adults: Evaluation of a short form of the CES-D. *American journal of preventive medicine*, *10*(2), 77-84.

Armstrong, A. R., Galligan, R. F., & Critchley, C. R. (2011). Emotional intelligence and psychological resilience to negative life events. *Personality and Individual Differences*, *51*(3), 331-336.

Asmamawu, A. (2018). Community based health insurance in Ethiopia: enrollment, membership renewal, and effects on health service utilization. *Creative Commons*.

Atkinson, R. L., Atkinson, R. C., Smith, E. E., & Benn, D. J. (1990). *Introduction to Psychology Tenth Edition*. Harcourt Brace Jovanovich Inc.

Atnafu, D. D., Tilahun, H., & Alemu, Y. M. (2018). Community-based health insurance and healthcare service utilisation, North-West, Ethiopia: a comparative, cross-sectional study. *BMJ open*, *8*(8), e019613.

Ayano, G. (2016). Primary Mental Health Care Services in Ethiopia: Experiences, Opportunities and Challenges from East African Country. *Journal of Neuropsychopharmacology & Mental Health*, *1*(4). https://doi.org/10.4172/2472-095X.1000113

Ayano, G., Assefa, D., Haile, K., & Bekana, L. (2016). Experiences, strengths and challenges of integration of mental health into primary care in Ethiopia. Experiences of East African Country. *Fam Med Med Sci Res*, *5*(204), 2.

Bagnoli, L. (2019). Does health insurance improve health for all? Heterogeneous effects on children in Ghana. *World development*, *124*, 104636.

Baicker, K., Allen, H. L., Wright, B. J., Taubman, S. L., & Finkelstein, A. N. (2018). The effect of Medicaid on management of depression: evidence from the Oregon Health Insurance Experiment. *The Milbank Quarterly*, *96*(1), 29-56.

Baumeister, R. F., Bratslavsky, E., Finkenauer, C., & Vohs, K. D. (2001). Bad is stronger than good. *Review of general psychology*, *5*(4), 323-370.

Beaglehole, B., Mulder, R. T., Frampton, C. M., Boden, J. M., Newton-Howes, G., & Bell, C. J. (2018). Psychological distress and psychiatric disorder after natural disasters: systematic review and meta-analysis. *The British Journal of Psychiatry*, *213*(6), 716-722.

Belete, H., Misgan, E., & Belete, T. (2021). Prevalence and associated factors of suicidal behavior among patients and residents in northwest ethiopia. *Frontiers in Psychiatry*, *12*, 560886.

Boscarino, J. A. (2004). Posttraumatic stress disorder and physical illness: results from clinical and epidemiologic studies. *Annals of the New York Academy of sciences*, *1032*(1), 141-153.

Breen, R., Karlson, K. B., & Holm, A. (2018). Interpreting and understanding logits, probits, and other nonlinear probability models. *Annual Review of Sociology*, *44*, 39-54.

Briere, J., & Elliott, D. (2000). Prevalence, characteristics, and long-term sequelae of natural disaster exposure in the general population. *Journal of Traumatic Stress*, *13*, 661-679.

Brooks, M. A., Dasgupta, A., Taşğın, N. Ş., Meinhart, M., Tekin, U., Yükseker, D., Kaushal, N., & El-Bassel, N. (2022). Secondary traumatic stress, depression, and anxiety symptoms among service providers working with Syrian refugees in Istanbul, Turkey. *Journal of Immigrant and Minority Health*, *24*(6), 1421-1430.

Burton, I., & Kates, R. W. (1963). The perception of natural hazards in resource management. *Nat. Resources J.*, *3*, 412.

Bush, R. (1985). Natural Disasters: Acts of God or Acts of Man? In: JSTOR.

Catani, C., Jacob, N., Schauer, E., Kohila, M., & Neuner, F. (2008). Family violence, war, and natural disasters: A study of the effect of extreme stress on children's mental health in Sri Lanka. *BMC psychiatry*, *8*, 1-10.

Colombo, F., & Tapay, N. (2004). Private health insurance in OECD countries: the benefits and costs for individuals and health systems.

Deke, J. (2014). *Using the linear probability model to estimate impacts on binary outcomes in randomized controlled trials*.

Deribew, A., Tesfaye, M., Hailmichael, Y., Apers, L., Abebe, G., Duchateau, L., & Colebunders, R. (2010). Common mental disorders in TB/HIV co-infected patients in Ethiopia. *BMC infectious diseases*, *10*(1), 1-8.

Deryugina, T. (2022). Economic effects of natural disasters. *IZA World of Labor*.

Deyessa, N., Berhane, Y., Alem, A., Hogberg, U., & Kullgren, G. (2008). Depression among women in rural Ethiopia as related to

socioeconomic factors: a community-based study on women in reproductive age groups. *Scandinavian journal of public health*, *36*(6), 589-597.

Disaster Risk Management Technical Working Group. (2016). *Ethiopia: Drought Response. Situation Report No. 04 (as of 31 August 2016)*. https://reliefweb.int/sites/ reliefweb.int/files/resources/ethiopia_drought_response_situation_report_no._04_as_of_31_ august_2016_0.pdf

Ehring, T., Razik, S., & Emmelkamp, P. M. (2011). Prevalence and predictors of posttraumatic stress disorder, anxiety, depression, and burnout in Pakistani earthquake recovery workers. *Psychiatry research*, *185*(1-2), 161-166.

Ehrlich, M., Harville, E., Xiong, X., Buekens, P., Pridjian, G., & Elkind-Hirsch, K. (2010). Loss of resources and hurricane experience as predictors of postpartum depression among women in southern Louisiana. *Journal of Women's Health*, *19*(5), 877-884.

Ein, N., Plouffe, R. A., Liu, J. J., Gervasio, J., Baker, C., Carleton, R. N., Bartels, S. A., Lee, J. E., Nazarov, A., & Richardson, J. D. (2023). Physical and psychological challenges faced by military, medical and public safety personnel relief workers supporting natural disaster operations: a systematic review. *Current Psychology*, 1-16.

Freedy, J. R., Saladin, M. E., Kilpatrick, D. G., Resnick, H. S., & Saunders, B. E. (1994). Understanding acute psychological distress following natural disaster. *Journal of Traumatic Stress*, *7*(2), 257-273.

Freedy, J. R., & Simpson Jr, W. M. (2007). Disaster-related physical and mental health: a role for the family physician. *American family physician*, *75*(6), 841-846.

Friis, R., & Nanjundappa, G. (1986). Diabetes, depression and employment status. *Social Science & Medicine*, *23*(5), 471-475.

Fry, C. E., & Sommers, B. D. (2018). Effect of Medicaid expansion on health insurance coverage and access to care among adults with depression. *Psychiatric Services*, *69*(11), 1146-1152.

Fu, H., Si, L., & Guo, R. (2022). What is the optimal cut-off point of the 10-item center for epidemiologic studies depression scale for screening depression among chinese individuals aged 45 and over? An exploration using latent profile analysis. *Frontiers in Psychiatry*, *13*.

Futterman, I. D., Grace, H., Weingarten, S., Borjian, A., & Clare, C. A. (2023). Maternal anxiety, depression and posttraumatic stress disorder (PTSD) after natural disasters: a systematic review. *The Journal of Maternal-Fetal & Neonatal Medicine*, *36*(1), 2199345.

Ginexi, E. M., Weihs, K., Simmens, S. J., & Hoyt, D. R. (2000). Natural disaster and depression: a prospective investigation of reactions to the 1993 midwest floods. *American journal of community psychology*, *28*(4), 495-518.

Girma, E., Ketema, B., Mulatu, T., Kohrt, B. A., Wahid, S. S., Heim, E., Gronholm, P. C., Hanlon, C., & Thornicroft, G. (2022). Mental health stigma and discrimination in Ethiopia: evidence synthesis to inform stigma reduction interventions. *International journal of mental health*

systems, *16*(1), 1-18.
Godfrey, S., & Hailemichael, G. (2017). Life cycle cost analysis of water supply infrastructure affected by low rainfall in Ethiopia. *Journal of Water, Sanitation and Hygiene for Development*, *7*(4), 601-610.
Goldmann, E., & Galea, S. (2014). Mental health consequences of disasters. *Annual review of public health*, *35*, 169-183.
Green, D. C., Buehler, J. W., Silk, B. J., Thompson, N. J., Schild, L. A., Klein, M., & Berkelman, R. L. (2006). Trends in healthcare use in the New York City region following the Terrorist Attacks of 2001. *Biosecurity and Bioterrorism: Biodefense Strategy, Practice, and Science*, *4*(3), 263-275.
Guindon, G. E. (2014). The impact of health insurance on health services utilization and health outcomes in Vietnam. *Health Economics, Policy and Law*, *9*(4), 359-382.
Guo, S., & Fraser, M. W. (2014). *Propensity score analysis: Statistical methods and applications* (Vol. 11). SAGE publications.
Hadley, J., & Waidmann, T. (2006). Health insurance and health at age 65: implications for medical care spending on new Medicare beneficiaries. *Health services research*, *41*(2), 429-451.
Hailemariam, M., Fekadu, A., Prince, M., & Hanlon, C. (2017). Engaging and staying engaged: a phenomenological study of barriers to equitable access to mental healthcare for people with severe mental disorders in a rural African setting. *International journal for equity in health*, *16*(1), 1-12.
Hailemariam, S., Tessema, F., Asefa, M., Tadesse, H., & Tenkolu, G. (2012). The prevalence of depression and associated factors in Ethiopia: findings from the National Health Survey. *International journal of mental health systems*, *6*(1), 1-11.
Han, J., Lee, H., Jung, J., & Park, E.-C. (2019). Effects of self-reported hearing or vision impairment on depressive symptoms: a population-based longitudinal study. *Epidemiology and Psychiatric Sciences*, *28*(3), 343-355.
Hanlon, C., Alem, A., Lund, C., Hailemariam, D., Assefa, E., Giorgis, T. W., & Chisholm, D. (2019). Moving towards universal health coverage for mental disorders in Ethiopia. *International journal of mental health systems*, *13*, 1-16.
Hardin, S. B., Weinrich, M., Weinrich, S., Hardin, T. L., & Garrison, C. (1994). Psychological distress of adolescents exposed to Hurricane Hugo. *Journal of Traumatic Stress*, *7*, 427-440.
Harman, J. S., Edlund, M. J., & Fortney, J. C. (2004). Disparities in the adequacy of depression treatment in the United States. *Psychiatric Services*, *55*(12), 1379-1385.
Harris, L. B., Taylor, A. H., Kassa, H., Leta, S., & Powell, B. (2023). Humans and climate modulate fire activity across Ethiopia. *Fire Ecology*, *19*(1), 1-16.
Hirono, T., & Blake, M. E. (2017). The role of religious leaders in the restoration of hope following natural disasters. *Sage open*, *7*(2), 2158244017707003.

Hirth, J. M., Leyser-Whalen, O., & Berenson, A. B. (2013). Effects of a major US hurricane on mental health disorder symptoms among adolescent and young adult females. *Journal of adolescent health*, *52*(6), 765-772.
Hobfoll, S. E. (1989). Conservation of resources: A new attempt at conceptualizing stress. *American psychologist*, *44*(3), 513.
Hobfoll, S. E., & Schumm, J. A. (2009). Conservation of resources theory: Application to public health promotion. *Emerging theories in health promotion practice and research*, *2*, 131-156.
Hooley, B., Afriyie, D. O., Fink, G., & Tediosi, F. (2022). Health insurance coverage in low-income and middle-income countries: progress made to date and related changes in private and public health expenditure. *BMJ Global Health*, *7*(5), e008722.
Howe, L. D., Galobardes, B., Matijasevich, A., Gordon, D., Johnston, D., Onwujekwe, O., Patel, R., Webb, E. A., Lawlor, D. A., & Hargreaves, J. R. (2012). Measuring socio-economic position for epidemiological studies in low-and middle-income countries: a methods of measurement in epidemiology paper. *International journal of epidemiology*, *41*(3), 871-886.
ICF, E. P. H. I. E. E. a. (2019). Ethiopia Mini Demographic and Health Survey 2019: Key Indicators.
Irwin, M., Artin, K. H., & Oxman, M. N. (1999). Screening for depression in the older adult: criterion validity of the 10-item Center for Epidemiological Studies Depression Scale (CES-D). *Archives of internal medicine*, *159*(15), 1701-1704.
Jeney-Gammon, P., Daugherty, T. K., Finch Jr, A., Belter, R. W., & Foster, K. Y. (1993). Children's coping styles and report of depressive symptoms following a natural disaster. *The Journal of Genetic Psychology*, *154*(2), 259-267.
Jenkins, R., & Meltzer, H. (2012). The mental health impacts of disasters. *Government Office of Science, UK*.
Joseph, S., Mynard, H., & Mayall, M. (2000). Life-events and post-traumatic stress in a sample of English adolescents. *Journal of Community & Applied Social Psychology*, *10*(6), 475-482.
Kane, S., Kok, M., Ormel, H., Otiso, L., Sidat, M., Namakhoma, I., Nasir, S., Gemechu, D., Rashid, S., & Taegtmeyer, M. (2016). Limits and opportunities to community health worker empowerment: a multi-country comparative study. *Social Science & Medicine*, *164*, 27-34.
Keskinen-Rosenqvist, R., Michélsen, H., Schulman, A., & Wahlström, L. (2011). Physical symptoms 14 months after a natural disaster in individuals with or without injury are associated with different types of exposure. *Journal of psychosomatic research*, *71*(3), 180-187.
Komendantova, N., Patt, A., & Scolobig, A. (2014). Understanding risk: The evolution of disaster risk assessment. In: GFDRR/International Bank for Reconstruction and Development.
Kopala-Sibley, D., Kotov, R., Bromet, E., Carlson, G., Danzig, A., Black, S., & Klein, D. (2016). Personality diatheses and Hurricane Sandy: Effects on post-disaster depression. *Psychological Medicine*, *46*(4), 865-875.
Kousky, C. (2016). Impacts of natural disasters on children. *The Future of*

children, 73-92.
Kraaij, V., Arensman, E., & Spinhoven, P. (2002). Negative life events and depression in elderly persons: a meta-analysis. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, *57*(1), P87-P94.
Kubzansky, L. D., Koenen, K. C., Jones, C., & Eaton, W. W. (2009). A prospective study of posttraumatic stress disorder symptoms and coronary heart disease in women. *Health Psychology*, *28*(1), 125.
Labrague, L. J., & De los Santos, J. A. A. (2020). COVID-19 anxiety among front-line nurses: Predictive role of organisational support, personal resilience and social support. *Journal of nursing management*, *28*(7), 1653-1661.
Lang, M. (2013). The impact of mental health insurance laws on state suicide rates. *Health economics*, *22*(1), 73-88.
Lee, T. J., Choi, S. M., & Son, K. B. (2018). *Developing strategies and action plans for health insurance to achieve universal health coverage in Ethiopia : KOFIH*.
Lemessa, D. (2001). *Forest Fires in Ethiopia: Reflections on Socio-economic and Environmental Effects of the Fires in 2000 : Assessment Study, June-September 2001*. Undp-Eue. https://books.google.co.kr/books?id=FPbutwEACAAJ
Li, D., Su, M., Guo, X., Liu, B., & Zhang, T. (2023). The association between chronic disease and depression in middle-aged and elderly people: The moderating effect of health insurance and health service quality. *Frontiers in Public Health*, *11*, 118.
Lin, B., & Okyere, M. A. (2020). Multidimensional energy poverty and mental health: Micro-level evidence from Ghana. *International journal of environmental research and public health*, *17*(18), 6726.
Lin, P. H., Liao, S. C., Chen, I. M., Kuo, P. H., Shan, J. C., Lee, M. B., & Chen, W. J. (2017). Impact of universal health coverage on suicide risk in newly diagnosed cancer patients: population-based cohort study from 1985 to 2007 in Taiwan. *Psycho-Oncology*, *26*(11), 1852-1859.
Linnerooth-Bayer, J., Mechler, R., & Pflug, G. (2005). Refocusing disaster aid. *Science*, *309*(5737), 1044-1046.
Maes, K., Closser, S., Tesfaye, Y., Gilbert, Y., & Abesha, R. (2018). Volunteers in Ethiopia's women's development army are more deprived and distressed than their neighbors: cross-sectional survey data from rural Ethiopia. *BMC public health*, *18*(1), 1-11.
Makwana, N. (2019). Disaster and its impact on mental health: A narrative review. *Journal of family medicine and primary care*, *8*(10), 3090.
Mamun, M. A., Huq, N., Papia, Z. F., Tasfina, S., & Gozal, D. (2019). Prevalence of depression among Bangladeshi village women subsequent to a natural disaster: a pilot study. *Psychiatry research*, *276*, 124-128.
Martin, N. C., Felton, J. W., & Cole, D. A. (2016). Predictors of youths' posttraumatic stress symptoms following a natural disaster: The 2010 Nashville, Tennessee, flood. *Journal of Clinical Child & Adolescent Psychology*, *45*(3), 335-347.

Mayner, L., & Arbon, P. (2015). Defining disaster: The need for harmonisation of terminology. *Australasian Journal of Disaster & Trauma Studies*, *19*.

Mebratie, A. D., Sparrow, R., Yilma, Z., Abebaw, D., Alemu, G., & Bedi, A. S. (2019). The impact of Ethiopia's pilot community based health insurance scheme on healthcare utilization and cost of care. *Social Science & Medicine*, *220*, 112-119.

Mekonen, T., Chan, G. C., Belete, T., Menberu, M., Davidson, L., Hides, L., & Leung, J. (2022). Mental health service utilization in a low resource setting: A qualitative study on perspectives of health professionals in Northwest Ethiopia. *Plos one*, *17*(11), e0278106.

Merga, B. T., Balis, B., Bekele, H., & Fekadu, G. (2022). Health insurance coverage in Ethiopia: financial protection in the Era of sustainable development goals (SDGs). *Health Economics Review*, *12*(1), 43.

Miller, G., Chen, E., & Cole, S. W. (2009). Health psychology: Developing biologically plausible models linking the social world and physical health. *Annual review of psychology*, *60*, 501-524.

Mitiku, E. (2018). *My experiences with the mental health stigma in Ethiopia*. University of St. Thomas. https://threesixty.stthomas.edu/mental-illness-and-my-community-my-experiences-with-the-mental-health-stigma-in-ethiopia/

Morduch, J. (2005). *Consumption smoothing across space: Testing theories of risk-sharing in the ICRISAT study region of South India*. Oxford: Oxford University Press.

Muttarak, R., & Lutz, W. (2014). Is education a key to reducing vulnerability to natural disasters and hence unavoidable climate change? *Ecology and society*, *19*(1).

Mysiak, J., Aerts, J., & Surminski, S. (n.d.). Comments on the Open-ended Intergovernmental Expert Working Group Indicators and Terminology Relating to Disaster Risk Reduction.

Naoaj, M. S. (2023). From Catastrophe to Recovery: The Impact of Natural Disasters on Economic Growth in Developed and Developing Countries. *European Journal of Development Studies*, *3*(2), 17-22.

Newnham, E. A., Mergelsberg, E. L., Chen, Y., Kim, Y., Gibbs, L., Dzidic, P. L., DaSilva, M. I., Chan, E. Y., Shimomura, K., & Narita, Z. (2022). Long term mental health trajectories after disasters and pandemics: A multilingual systematic review of prevalence, risk and protective factors. *Clinical Psychology Review*, 102203.

Nishikawa, S., Fujisawa, T. X., Kojima, M., & Tomoda, A. (2018). Type and Timing of Negative Life Events Are Associated with Adolescent Depression. *Front Psychiatry*, *9*, 41. https://doi.org/10.3389/fpsyt.2018.00041

Norris, F. H., Perilla, J. L., Riad, J. K., Kaniasty, K., & Lavizzo, E. A. (1999). Stability and change in stress, resources, and psychological distress following natural disaster: Findings from Hurricane Andrew. *Anxiety, Stress & Coping*, *12*(4), 363-396.

OCHA. (2023). *Ethiopia: Humanitarian Response Plan 2023* U. O. f. t. C. o. H. Affairs. https://reliefweb.int/report/ethiopia/ethiopia-humanitarian-response-plan-2023-february-2023

Odom, K. (n.d.). *Mental Health is a Human Right: Greater Awareness and Capacity Building Support is Needed in Ethiopia and Beyond*. WI-HER. https://wi-her.org/mental-health-is-a-human-right-greater-awareness-and-capacity-building-support-is-needed-in-ethiopia-and-beyond/

Organization, W. H. (2010). *The world health report: health systems financing: the path to universal coverage: executive summary*.

Ouden, D.-J. d., Dirkzwager, A. J., & Yzermans, C. J. (2005). Health problems presented in general practice by survivors before and after a fireworks disaster: associations with mental health care. *Scandinavian Journal of Primary Health Care*, *23*(3), 137-141.

Padli, J., & Habibullah, M. S. (2008). Natural disaster death and socio-economic factors in selected Asian countries: A panel data analysis.

Pan, J., Lei, X., & Liu, G. G. (2016). Health insurance and health status: exploring the causal effect from a policy intervention. *Health economics*, *25*(11), 1389-1402.

Patel, S. K., Mukherjee, S., & Nanda, A. (2021). Importance of Insurance Mechanisms in Natural Disasters' Risk Mitigation: A case study in Indiav. *Journal of Disaster and Emergency Research*.

Pearl, J. (1980). Causality: models, reasoning, and inference. In: Cambridge University Press, New York, second edition, 2009a. Forthcoming.

Pennington, M. L., Carpenter, T. P., Synett, S. J., Torres, V. A., Teague, J., Morissette, S. B., Knight, J., Kamholz, B. W., Keane, T. M., & Zimering, R. T. (2018). The influence of exposure to natural disasters on depression and PTSD symptoms among firefighters. *Prehospital and disaster medicine*, *33*(1), 102-108.

Perrin, P. B., Johnston, A., Vogel, B., Heesacker, M., Vega-Trujillo, M., Anderson, J., & Rittman, M. (2010). A culturally sensitive Transition Assistance Program for stroke caregivers: examining caregiver mental health and stroke rehabilitation. *Journal of Rehabilitation Research & Development*, *47*(7).

Phillips, A. C., Carroll, D., & Der, G. (2015). Negative life events and symptoms of depression and anxiety: stress causation and/or stress generation. *Anxiety, Stress, & Coping*, *28*(4), 357-371.

Platania, S., Castellano, S., Petralia, M. C., Digrandi, F., Coco, M., Pizzo, M., & Di Nuovo, S. F. (2020). The moderating effect of the dispositional resilience on the relationship between Post-traumatic Stress Disorder and the professional quality of life of the military returning from the peacekeeping operations. *Mediterranean Journal of Clinical Psychology*, *8*(3).

Pluym, I. D., Holliman, K., Afshar, Y., Lee, C. C., Richards, M. C., Han, C. S., Krakow, D., & Rao, R. (2021). Emergency department use among postpartum women with mental health disorders. *American journal of obstetrics & gynecology MFM*, *3*(1), 100269.

Polusny, M. A., Ries, B. J., Schultz, J. R., Calhoun, P., Clemensen, L., & Johnsen, I. R. (2008). PTSD symptom clusters associated with physical health and health care utilization in rural primary care patients exposed to natural disaster. *Journal of Traumatic Stress*,

21(1), 75-82.
Quarantelli, E. L. (1985). What is disaster? The need for clarification in definition and conceptualization in research. *Disasters and mental health: Selected contemporary perspectives*, 41-73.
Radloff, L. S. (1977). The CES-D scale: A self-report depression scale for research in the general population. *Applied psychological measurement*, *1*(3), 385-401.
Ranasinghe, P. D., Zhang, X., Hwang, J., Ranasinghe, P. M., Karunathilake, I. M., & Everly, G. S. (2023). PTSD and Depression 8 Years After the 2004 Tsunami in Sri Lanka. *Disaster medicine and public health preparedness*, *17*, e183.
Rentschler, J. E. (2013). Why resilience matters-the poverty impacts of disasters. *World Bank Policy Research Working Paper*(6699).
Rondet, C., Cornet, P., Kaoutar, B., Lebas, J., & Chauvin, P. (2013). Depression prevalence and primary care among vulnerable patients at a free outpatient clinic in Paris, France, in 2010: results of a cross-sectional survey. *BMC Family Practice*, *14*(1), 1-9.
Sanchez, J. I., Korbin, W. P., & Viscarra, D. M. (1995). Corporate support in the aftermath of a natural disaster: Effects on employee strains. *Academy of Management Journal*, *38*(2), 504-521.
Sastry, N., & VanLandingham, M. (2009). One year later: mental illness prevalence and disparities among New Orleans residents displaced by Hurricane Katrina. *American journal of public health*, *99*(S3), S725-S731.
Sharpe, I., & Davison, C. M. (2021). Climate change, climate-related disasters and mental disorder in low-and middle-income countries: a scoping review. *BMJ open*, *11*(10), e051908.
Simpson, A., Philips, E., Balog, S., Fraser, S., Jongman, B., Ledden, M. v., Murnane, R., & Himmelfarb, A. (2019). *Disaster Risk Profile: Ethiopia (2019)*. G. F. f. D. R. a. R. World Bank.
Siskind, D., Parker, G., Lie, D., Martin-Khan, M., Raphael, B., Crompton, D., & Kisely, S. (2015). Mental health implications for older adults after natural disasters-a systematic review and meta-analysis. *Australian and New Zealand Journal of Psychiatry*, *49*, 60-61.
Sood, N., Bendavid, E., Mukherji, A., Wagner, Z., Nagpal, S., & Mullen, P. (2014). Government health insurance for people below poverty line in India: quasi-experimental evaluation of insurance and health outcomes. *Bmj*, *349*.
Spaan, E., Mathijssen, J., Tromp, N., McBain, F., Have, A. t., & Baltussen, R. (2012). The impact of health insurance in Africa and Asia: a systematic review. *Bulletin of the World Health Organization*, *90*, 685-692.
Spitzer, C., Barnow, S., Völzke, H., John, U., Freyberger, H. J., & Grabe, H. J. (2009). Trauma, posttraumatic stress disorder, and physical illness: findings from the general population. *Psychosomatic medicine*, *71*(9), 1012-1017.
Sunjaya, D. K., Sumintono, B., Gunawan, E., Herawati, D. M. D., & Hidayat, T. (2022). Online mental health survey for addressing psychosocial

condition during the COVID-19 pandemic in Indonesia: instrument evaluation. *Psychology Research and Behavior Management*, 161-170.
Tachibana, T., Goto, R., Sakurai, T., Rayamajhi, S., Adhikari, A., & Dow, W. H. (2019). Do remittances alleviate negative impacts of disaster on mental health? A case of the 2015 Nepal earthquake. *Social Science & Medicine*, *238*, 112460.
Tao, T. J., Lee, T. M. C., Fung, A. L. C., Li, T. W., Ettman, C. K., Galea, S., & Hou, W. K. (2022). Low assets predict persistent depression through living difficulties amid large-scale disasters: A cohort study. *Journal of Affective Disorders*, *315*, 282-290.
Tapsell, S. M., Penning-Rowsell, E. C., Tunstall, S. M., & Wilson, T. L. (2002). Vulnerability to flooding: health and social dimensions. *Philosophical transactions of the royal society of London. Series A: Mathematical, Physical and Engineering Sciences*, *360*(1796), 1511-1525.
Tesera, B. (2014). Prevalence of depression and potential risk factors in Ethiopia. *Ethiop J Health Sci*, *24*(2), 161-169.
The Center for Disaster Philanthropy. (2023). *Ethiopia Humanitarian Crisis*. https://disasterphilanthropy.org/disasters/ethiopia-tigray-crisis/
The World Bank. (2017). *Disaster-Poverty Household Survey (DPHS), Dire Dawa and Addis Ababa, Ethiopia 2017. Ref: ETH_2017_DPHS_v01_M.* . microdata.worldbank.org
The World Bank Group. (2019). *Disaster risk profile: Ethiopia*.
The World Bank Group. (2020). *Climate Risk Profile: Ethiopia*
Tian, D., Qu, Z., Wang, X., Guo, J., Xu, F., Zhang, X., & Chan, C. L.-W. (2012). The role of basic health insurance on depression: an epidemiological cohort study of a randomized community sample in Northwest China. *BMC psychiatry*, *12*(1), 1-11.
Toya, H., & Skidmore, M. (2007). Economic development and the impacts of natural disasters. *Economics letters*, *94*(1), 20-25.
Tural, Ü., Coşkun, B., Önder, E., Çorapçioğlu, A., Yildiz, M., Kesepara, C., Karakaya, I., Aydin, M., Erol, A., & Torun, F. (2004). Psychological consequences of the 1999 earthquake in Turkey. *Journal of Traumatic Stress: Official Publication of The International Society for Traumatic Stress Studies*, *17*(6), 451-459.
U.S. Department of Veterans Affairs. (2021). *Disaster risk and resilience*. National Center for PTSD. https://www.ptsd.va.gov/understand/types/disaster_risk_resilence.asp
United Nations. (2015). *Sendai Framework for Disaster Risk Reduction 2015-2030*. http://www.wcdrr.org/uploads/Sendai_Framework_for_Disaster_Risk_Reduction_2015-2030.pdf
United Nations. (2018). *Economic Losses and Displacement Should Drive Disaster Risk Reduction Efforts*. UN Chronicle. https://www.un.org/en/chronicle/article/economic-losses-and-displacement-should-drive-disaster-risk-reduction-efforts
United Nations Development Programme. (2012). *Ethiopia's Climate Resilient Green Economy Strategy*.

United Nations Office for Disaster Risk Reduction. (2015). *Global assessment report on disaster risk reduction 2015*.
United Nations Office for the Coordination of Humanitarian Affairs (OCHA). (2021). *Humanitarian Needs Overview 2021: Ethiopia*. https://www.humanitarianresponse.info/sites/www.humanitarianresponse.info/files/documents/files/ethiopia_hno_2021_1.pdf
United Nations Office for the Coordination of Humanitarian Affairs (UN-OCHA). (2016). *Humanitarian funding analysis: Flood and impacts in Ethiopia. In UN Office for the Coordination of Humanitarian Affairs, Crisis Briefing.*
van Hees, S. G., O'Fallon, T., Hofker, M., Dekker, M., Polack, S., Banks, L. M., & Spaan, E. J. (2019). Leaving no one behind? Social inclusion of health insurance in low-and middle-income countries: a systematic review. *International journal for equity in health*, *18*, 1-19.
Varnes, D. J. (1984). *Landslide hazard zonation: a review of principles and practice*.
Wagenaar, B. H., Hagaman, A. K., Kaiser, B. N., McLean, K. E., & Kohrt, B. A. (2012). Depression, suicidal ideation, and associated factors: a cross-sectional study in rural Haiti. *BMC psychiatry*, *12*(1), 1-13.
Wallemacq, P., & House, R. (2018). *Economic Losses, Poverty and Disasters 1998-2017*. C. f. R. o. t. E. o. D. U. N. O. f. D. R. Reduction.
Wang, X., Gao, L., Shinfuku, N., Zhang, H., Zhao, C., & Shen, Y. (2000). Longitudinal study of earthquake-related PTSD in a randomly selected community sample in north China. *American journal of psychiatry*, *157*(8), 1260-1266.
Warner, K., Ranger, N., Surminski, S., Arnold, M., Linnerooth-Bayer, J., Michel-Kerjan, E., Kovacs, P., & Herweijer, C. (2009). Adaptation to climate change: Linking disaster risk reduction and insurance. *United Nations International Strategy for Disaster Reduction, Geneva*.
Weldegebriel, Z. B., & Amphune, B. E. (2017). Livelihood resilience in the face of recurring floods: an empirical evidence from Northwest Ethiopia. *Geoenvironmental Disasters*, *4*, 1-19.
White, G. F. (1974). *Natural hazards, local, national, global*. Oxford University Press.
WHO. (2022). *Mental Health Atlas 2020 Country Profile: Ethiopia*. W. H. Organization. https://cdn.who.int/media/docs/default-source/mental-health/mental-health-atlas-2020-country-profiles/eth.pdf?sfvrsn=ac12fb2b_7&download=true
Wickrama, T., & Ketring, S. A. (2012). Change in the health of tsunami-exposed mothers three years after the natural disaster. *International journal of social psychiatry*, *58*(3), 278-288.
Wijkman, A., & Timberlake, L. (2021). *Natural disasters: acts of God or acts of man?* Routledge.
Wink, P., Dillon, M., & Larsen, B. (2005). Religion as moderator of the depression-health connection: Findings from a longitudinal study. *Research on Aging*, *27*(2), 197-220.
World Health Organization. (2008). mhGAP : Mental Health Gap Action Programme: scaling up care for mental, neurological and substance

use disorders. In. Geneva: World Health Organization.
World Health Organization. (2017). *Joint mission of the United Nations Interagency Task Force on the prevention and control of noncommunicable diseases: Ethiopia, 13-17 November 2017 (No. WHO/NMH/NMA/18.92).* W. H. Organization.
World Health Organization. (2019). *The WHO special initiative for mental health (2019-2023): universal health coverage for mental health*.
Yabe, Y., Hagiwara, Y., Sekiguchi, T., Sugawara, Y., Tsuchiya, M., Itaya, N., Yoshida, S., Sogi, Y., Yano, T., & Onoki, T. (2019). Musculoskeletal pain and new-onset poor physical function in elderly survivors of a natural disaster: a longitudinal study after the great East Japan earthquake. *BMC geriatrics*, *19*, 1-8.
Yitbarek, K., Birhanu, Z., Tucho, G. T., Anand, S., Agenagnew, L., Ahmed, G., Getnet, M., & Tesfaye, Y. (2021). Barriers and facilitators for implementing mental health services into the Ethiopian Health Extension Program: a qualitative study. *Risk Management and Healthcare Policy*, 1199-1210.
Yoda, T., Yokoyama, K., Suzuki, H., & Hirao, T. (2017). Relationship between long-term flooding and serious mental illness after the 2011 flood in Thailand. *Disaster medicine and public health preparedness*, *11*(3), 300-304.
Yu, S.-C., Lin, Y.-H., & Hsu, W.-H. (2013). Applying structural equation modeling to report psychometric properties of Chinese version 10-item CES-D depression scale. *Quality & Quantity*, *47*, 1511-1518.
Yuda, M., & Lee, J. (2022). Protective effects of health insurance against disasters: an insight from the Great East Japan Earthquake. *Journal of Pension Economics & Finance*, *21*(4), 502-518.
Zacher, M., Raker, E. J., Arcaya, M. C., Lowe, S. R., Rhodes, J., & Waters, M. C. (2021). Physical health symptoms and Hurricane Katrina: individual trajectories of development and recovery more than a decade after the storm. *American journal of public health*, *111*(1), 127-135.
Zou, P., Sun, L., Yang, W., Zeng, Y., Chen, Q., Yang, H., Zhou, N., Zhang, G., Liu, J., & Li, Y. (2018). Associations between negative life events and anxiety, depressive, and stress symptoms: A cross-sectional study among Chinese male senior college students. *Psychiatry research*, *270*, 26-33.

국문 초록

에티오피아의 자연재난 경험이 우울증상에 미치는 영향: 건강보험의 조절효과 중심으로

안 세 영
서울대학교 보건대학원
보건학과 보건정책관리학 전공

연구배경: 재해는 재난으로 인한 피해를 뜻하고 재난은 통상적으로 재해 발생 원인에 따라 자연재해, 인적재난, 사회재난 등의 유형으로 분류된다. 자연재해는 자연현상으로 인해 발생하며 최근 기후변화로 인해 전 세계적으로 대규모 자연재해가 증가하여 그 피해도 커지고 있다. 자연재해를 경험한 사람들은 신체적 건강뿐만 아니라 정신 건강에도 위협을 받는다. 자연재해의 규모나 피해, 국가의 소득 수준에 상관없이 자연재해를 경험한 후 겪는 정신적 피해는 세부 유형이나 피해의 정도가 다를 수는 있으나 전 세계 공통적으로 보고되고 있다. 그러나 자연재해로 인한 피해는 저소득 국가들과 사회적 취약계층에 더욱 가중되어 부정적인 영향을 나타내는 경향이 있다. 자연재해의 위험에 노출된 저소득국가 중 에티오피아의 경우 가뭄, 홍수, 산사태, 지진 등 다양한 유형의 자연재해를 경험하는 것으로 알려져 있다. 이러한 자연재해를 경험한 사람들은 다양한 정신질환에 취약해지고 그중에서도 우울증으로 인한 피해가 흔히 보고되고 있다. 에티오피아 국내 질병 유병률의 9.1%가 우울증으로 보고되고 있다. 이는 정신질환 중 가장 높은 유병률이며 본 연구에서는 우울증에 취약한 에티오피아에서 자연재해로 인한 우울증상에 초점을 둔다. 에티오피아 정부는 2012년 이래 정신건강 문제와 부족한 자원에 적극적으로 대처하여 일차 의료에 정신건강 서비스를 통합하고 의료 서비스를 높은 접근성과 저비용으로 이용할 수 있게 만들었다. 따라서 에티오피아

에서 정신건강 서비스에 대한 접근성을 높이기 위해서는 더욱 많은 국민이 건강보험에 가입되어 있는 것이 중요하다. 하지만 에티오피아 인구의 1/3만이 건강 보험에 가입되어 있다. 에티오피아에서 정신 건강, 건강 보험 그리고 자연재해 노출 간의 관계에 대한 연구는 부족한 실정이다. 또한 에티오피아 정부의 노력에도 불구하고 정신건강이라는 주제는 에티오피아에서 여전히 생소하고 낯선 주제이며, 정신 질병을 가진 사람들에 대한 낙인과 차별이 계속해서 존재한다. 따라서 본 연구에서는 에티오피아의 자연재해가 우울증상에 미치는 영향을 확인하고 건강보험 가입 여부가 자연재해와 우울증상에 미치는 조절 효과를 살펴보고자 한다. 더 나아가 에티오피아에서 자연재해로 직접 영향을 받은 인구의 정신 건강에 건강 보험이 미치는 영향에 대한 학술적 증거를 도출하여 에티오피아와 다른 개발도상국을 위한 정책적 함의를 탐색하고자 한다.

연구 방법: 본 연구는 에티오피아의 성인(18-64세)을 대상으로 2017년 5월부터 6월까지 세계은행 (World Bank)이 수집한 국가 수준의 자료인 Disaster Poverty Household Survey (DPHS) 자료를 사용한 횡단면 분석을 수행했으며 자연재해가 정신 건강에 미치는 영향과 건강 보험의 조절 효과를 조사했다. 연구 방법은 다음과 같다. 자연재해가 에티오피아 성인들의 우울 증상에 미치는 영향을 알아보기 위해 두 가지 모형을 이용한 분석을 수행했다. 우울점수를 연속형 변수로 한 최소자승법 (Ordinary Least Squares; OLS)과 우울점수를 이분형으로 구분한 종속변수를 프로빗 모형 (probit model)과 선형 확률 모형 (linear probability model; LPM)을 이용한 분석을 실시했다. 또한 각 모형을 세 가지로 하위유형으로 나누어 독립변수를 각각 자연재해 노출(모델 1), 건강보험 소지(모델 2), 자연재해 노출과 건강보험 가입 여부의 상호작용항(모델 3) 결과를 살펴 보았다. 통제변수로는 나이, 성별, 교육수준, 혼인여부, 종교, 자산소유, 고용상태, 금전적 지원, 질병유무, 병원 접근성을 선택했다. 또한, 직접 자연재해를 경험한 군과 그렇지 않은 군의 특성의 차이를 줄이기 위해 성향점수 매칭 (propensity score matching; PMS)을 실

시했다.

연구 결과: 회귀분석 결과 자연재해를 경험한 사람들에서 높은 우울 증상이 나타났으며 통계적으로 유의한 연관성이 있었다 ($p<0.01$). 우울증상 점수를 비교했을 때 자연재해에 직접 노출된 군의 우울점수가 그렇지 않은 군에 비해 약 6점 이상 높은 것으로 나타났으며 LPM의 결과에 따르면 자연재해에 직접 노출된 군에서 우울 증상이 나타날 확률이 약 17.6% 높았다. 그러나 자연재해 노출과 건강보험 가입 여부의 상호작용항을 투입한 결과 자연재해를 직접 경험한 사람들의 우울 증상은 건강보험으로 인해 감소되는 것으로 나타났지만, 이는 통계적으로 유의하지 않았다. 또한, 결혼 또는 동거 상태에 있거나 냉장고를 자산으로써 소유하고 금전적 지원을 인식하는 것이 우울 증상 감소와 통계적으로 유의한 연관성이 있음을 발견했다.

결론: 본 연구는 자연재해가 에티오피아 성인인구의 우울 증상에 미치는 영향을 밝히는 동시에 개발도상국 맥락에서 우울경감을 위해서는 자연재해 발생 후 재난 관리 차원의 효과적인 정신건강 서비스 확대의 중요성을 제시했다. 본 연구의 결과는 에티오피아에서 직접 자연재해를 겪은 사람들의 우울 증상이 위협당하고 있는 것을 보여준다. 또한 결혼 상태, 자산 소유, 금전적 지지와 같은 사회인구학적인 요인이 우울 증상 감소와 연관이 있다는 것을 발견했다. 그러나 자연재해 노출이 우울 증상에 미치는 영향에서 건강보험 소지여부의 유의한 조절 효과는 관찰되지 않았다. 이러한 결과는 에티오피아 내 부족한 보험 가입자 수, 정신 건강에 대한 낙인 및 편견, 불충분한 자원 등 다양한 요인이 존재하며 건강보험이 주요한 역할이나 효과적인 역할을 하기 위해서는 중저소득 국가 내에서 정신질환 치료에 대한 사회적 인식 개선도 같이 이루어져야 함을 시사한다. 본 연구는 개발도상국에서 자연재난 발생 시 효과적인 정서적, 물질적 지지의 중요성과 큰 도시에서 자주 발생하는 자연재해에 대비해 취약계층을 위한 정신 건강 서비스 정책의 필요성을 강조한다. 더 나아

가 도시에 이미 존재하는 사회적 불평등을 인지하고 재난경험자의 정신건강을 위해 시의적절하고 접근성 높은 의료 서비스를 제공하는 과정에서 형평성을 고려해야 한다. 본 연구의 결과는 에티오피아 주변 아프리카 국가에서 빈번히 발생하는 자연재해에 대처하는 정신 건강 서비스 정책 도입을 고려할 때 근거자료로 이용될 수 있을 것이며, 취약계층의 건강을 위한 보다 체계적인 자연재해 관리 정책 및 위험 관리 정책을 확대하는 계기가 될 것이다. 또한 에티오피아라는 개발도상국의 현지 맥락을 중심으로 한 재난 피해 분야에 정신건강을 융합시켜 새로운 연구 방향을 제시한 점에 의의를 둘 수 있다. 궁극적으로 중저소득 국가에서의 위험관리 정책 확대는 SDGs 11.5 and 3.8 목표를 달성하는 데 기여할 수 있을 것이다.

주요어 : 자연재해, 우울증, 건강보험, 에티오피아, 재난관리
학 번 : 2021-24467