AN ASSESSMENT OF THE INFLUENCE OF A COUNTRY'S LEVEL OF EMPOWERMENT ON ITS RESILIENCE TO MAINTAIN HEALTH AND WELL-BEING AFTER THE IMPACT OF A NATURAL DISASTER

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ABSTRACT

Natural disasters are happening more frequently and more intensely around the world, potentially exacerbated by climate change. There is an increasing concern to strengthen resilience in countries from the impact of these disasters. This thesis assessed the influence of empowerment on resilience using a quantitative approach, including descriptive, interrupted time series and ordinary least square regression analyses. Using data from 177 countries spanning over 16 years from 2000 to 2015, our results demonstrated that countries with a higher level of freedom in terms of political rights or civil liberties have greater resilience to maintain health and well-being after the impact of a natural disaster and that these countries have a higher GDP, lower infant mortality, longer life expectancy, and low corruption. These results provide further insights into the factors that influence resilience and suggest that empowerment may be used as a tool for disaster resilience and better health outcomes.

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ABBREVIATIONS

GDP – Gross Domestic Product

IPCC – Intergovernmental Panel on Climate Change

WHO – World Health Organization

UNDESA – United Nations Department of Economic and Social Affairs

UNDRR – United Nations Office of Disaster Risk Reductions

EM-DAT – Emergency Events Database

CRED – Centers for Disease Control and Prevention

UNDP – United Nations Development Programme

NASA – National Aeronautics and Space Administration

ITSA – Interrupted Time Series Analysis

OLS – Ordinary Least Square

BLUE – Best Linear Unbiased Estimators

Lincom – Linear combinations of estimators

CPI – Corruption Perception Index

OECD – Organization for Economic Cooperation and Development

DROP – Disaster Resilience of Place

CoBRA – Community Based Resilience Analysis

BRACED – Building Resilience and Adaptation of Climate Extremes and Disasters

UNIGME – United Nations Inter-Agency Group for Child Mortality Estimation

AMCHP – Association of Maternal and Child Health Programs

IMF – International Monetary Fund

GNI – Gross National Income

UNISDR – United Nations Office of Disaster Risk Reductions

ABBREVIATIONS

NOAA – National Oceanic and Atmospheric Administration

GMM – Gaussian Mixture Models

CHAPTER 1: INTRODUCTION

Every year countries around the world experience various types of natural disasters, which cause severe devastations and billions of dollars in property damage, as well as significant numbers of deaths, injuries, and displaced people. Climate change has potentially exacerbated the impact of natural disasters, causing them to happen more frequently at even greater magnitude (IPCC, 2014 and Phalkey and Louis, 2016).

A natural disaster is a catastrophic act of nature that suddenly disrupts people's lives, causing widespread sufferings, including the need for medical care and basic necessities such as food, clothing, and shelter, among other necessities of life (Assar, WHO, 1971, p.8). The economic impact on a country is often a consequence of natural disasters. The destruction of properties and human life are believed to be factors that influence a country's economic growth (Mukherjee and Hastak, 2018). According to Noy (2009), "the amount of property damage incurred during a disaster is a negative determinant of GDP growth performance" (p.224).

The impact of natural disasters may differ by country according to the type of disaster and vulnerabilities within the affected country. Noy and Yonson (2018) define vulnerability as "the conditions determined by physical, social, economic, and environmental factors or processes which increase the susceptibility of an individual, a community, assets or systems to the impacts of hazards" (p.2). It is important to note that though vulnerabilities may intensify after the impact of a natural disaster, it may not necessarily be the result of a natural disaster. Some countries may be more vulnerable

because of pre-existing circumstances such as poor infrastructure, poor housing, political instability, lack of education, limited access to resources, a large population of homelessness, etc. However, natural disasters may aggravate the situation for countries with pre-existing economic crisis and vulnerabilities, causing a more significant negative impact on health and well-being and make resilience much more difficult. Regardless, studies have shown that empowerment may have a positive effect on health outcomes and increase resiliency in these countries (Garces-Ozanne et al., 2016; Morena and Shaw, 2018; Woodhall et al., 2012).

The concept of empowerment spreads across varying disciplines and contexts and as such, has different meanings. It may serve as a tool for gender equality, it is associated with educational development, viewed as a level of freedom, and is conceptualized as collective and individual approach to change (Gul, 2015; Bokova, 2017; Garces-Ozanne et al., 2016; Matthies and Uggerhaj, 2014). The United Nations Department of Economic and Social Affairs defines empowerment as "the process of enabling people to increase control over their lives, to gain control over the factors and decisions that shape their lives, to increase their resources and qualities and to build capacities to gain access, partners, networks, a voice in order to gain control" (UNDESA, 2012, p.5). In the context of disaster resilience, empowerment will enable countries to have greater access to productive resources (e.g. water, land, infrastructure, credit), allow their citizens to participate in decision-making processes that affect their lives, therefore, having the capabilities to increase resilience (Mary Robinson Foundation, 2017).

Like empowerment, the definition of resilience varies by disciplines such as sociology, medicine, and psychology. The general meaning for most discipline is the ability to adapt and bounce back from an event (Kafle, 2012). In terms of disaster, the United Nations Office for Disaster Risk Reduction (UNDRR) defines resilience as "the ability of a system, community or society exposed to hazards to resist, absorb, accommodate, adapt to, transform and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its basic structures and functions through risk management" (UNDRR, 2020). The resilience of a country from the impact of a disaster depends on several factors (such as schools, transportation, healthcare, employment, and other infrastructure), and it takes years for some countries to recover. In contrast, others can recover in as little as a few months. When natural disasters strike, they cause severe devastation. So why is it that some countries can bounce back much quicker than others?

The damages and losses that one country face may vary significantly in comparison to another based on a country's level of income, hazard probability, exposure, sensitivity, and resilience (Hallegate, 2014). For example, some countries are affected more by hurricanes than others, and some countries have more of its population living in flood-prone areas. Also, poorer countries may experience more casualties due to poor quality housing, and other countries may be able to reconstruct quicker than others (Hallegate, 2014). In other words, there may be many factors that may influence a country's ability to adapt, cope and recover from natural disasters as "the impacts of

natural disasters span across health, social, demographic and economic aspects of human life" (Phalkey and Louis, 2016, p. 2).

This chapter introduces a study aiming to ascertain whether countries with a higher level of empowerment have greater resilience to maintain health and well-being after the impact of a natural disaster. To determine this, the study will examine natural disasters, their economic effects on countries, and how countries recover from them. The chapter will first provide a background of the study, which will lead to the problem statement, then it will give the reason for conducting the research and outlines the questions that will be used to guide the study. After, it will justify the study and conclude with an outline of this thesis and a summary of the chapter.

1.1 Background

Every year, countries around the world are affected by natural disasters and suffered tremendous losses. In 2017, the Emergency Events Database (EM-DAT) provided by the Centre for Research on the Epidemiology of Disasters (CRED), reported that 318 natural disasters occurred in 122 countries which resulted in 9503 deaths and more than 90 million people were affected with a cost that totaled US$314 billion in economic damages (EM-DAT, 2018). This database contains essential core data on the occurrence and effects of over 22,000 mass disasters in the world from 1900 to the present day. It is compiled from various sources, including UN agencies, non-governmental organizations, insurance companies, research institutes, and press agencies (EM-DAT, n.d.).

The increased effect of climate change has caused an increase in the frequency and severity of natural disasters. When the temperature rises on land surfaces, it changes the hydrological cycles and heightens the intensity of drought, floods, and tropical storm cycles (Phalkey and Louis, 2016). According to the Intergovernmental Panel on Climate Change (IPCC) 2014, "each of the last three decades has been successively warmer at the earth's surface than any preceding decades since 1850. The period from 1983 to 2012 was likely the warmest 30-year period for the last 1400 years in the Northern Hemisphere" (IPCC, 2014, p. 2).

When natural disasters strike, they can cause a devastating effect on the country that is affected, including loss of lives, injuries, and damages to infrastructures and properties. They change the physical and mental well-being of the people affected and pose significant public health risks. Examples of these risks are food or water contaminated with sewage, an increase in mosquito-borne and other vectors of diseases, post-traumatic stress disorder, anxiety, depression, fear, and rage (CDC, 2011). According to the World Health Organization (WHO), "climate change affects the social and environmental determinants of health, clean air, safe drinking water, food and secure shelter" (WHO, 2018). Climate change is also expected to cause approximately 250,000 additional deaths per year between 2030 and 2050 as a result of heatwaves, diarrhea, malaria, and childhood under-nutrition (WHO, 2018). "Climate change will amplify existing risks and create new risks for natural and human systems. Risks are unevenly

distributed and are generally greater for disadvantaged people and communities in countries at all levels" (IPCC, 2014, p.13).

An economic crisis may also be a consequence of natural disasters, causing a fall in GDP, loss of revenues, inflation, or deflation. Natural disasters are bad for the economy because of the human and physical impact, i.e. the damages to properties, the disruptions they cause to labour, financial and output markets (Noy, 2009). According to Ono (2015), "natural disasters destroy tangible assets such as buildings and equipment as well as human capital and thereby deteriorate their production capacity which may sometimes be fatal to firms and result in them being forced to close down" (p.1). Business closures, as well as human costs, cause a significant negative effect on GDP growth rate and other economic implications. Besides, natural disasters affect vulnerable communities, affect health and well being, increase poverty and have a more significant impact on low-income countries which make resiliency more difficult and may prevent countries from recovering quickly (Stobl, 2012, Felbermayr and Groschl, 2014, Karim and Noy, 2015, Noy and Yonson 2016).

1.2 Statement of the Problem

There is a tremendous need for countries to be able to withstand and recover quickly from the impact of natural disasters. The frequency and severity of these natural disasters as a result of climate change have been wreaking havoc causing severe devastation and affecting health and well-being in both developed and developing countries (CRED, 2017, IPCC 2014, UNDP, 2011, Ng et al., 2015, Lowe et al. 2015).

However, middle and low-income countries are the ones that are feeling the greatest brunt of the impact. Because these countries are usually more vulnerable, it is more difficult for them to adapt, cope and bounce back from these disasters (Hallegate, 2014, Klomp, 2016, Stobl, 2012, Noy and Yonson, 2016). Studies have shown that for countries to recover quickly from these disasters, they must reduce vulnerability and become more resilient (Bergholt, 2012, Stobl, 2012, Karim and Noy, 2014, 2015, Noy and Yonson, 2016). The resilience literature finds that countries are more resilient and experience better health outcomes when the citizens are educated and are able to make their own decisions, when women are empowered and when there is strong governance and community collaboration (Gil-Rivas and Kilmer, 2016, Arban, et al., 2016, Gul, 2016, Garces-Ozanne et al., 2016, Moreno and Shaw, 2018, Comerio, 2014).

Despite the extensive literature on disaster resilience, little is known about the influence of empowerment on the resilience to maintain health and well-being after the impact of a natural disaster.

1.3 Purpose of the Study

The purpose of this study is to determine if a country's level of empowerment influences its resilience to maintain health and well-being after the impact of a natural disaster. The study intends to find out why some countries are more resilient than others. It will also evaluate the health outcomes of these countries after these disasters impact them, using life expectancy and infant mortality as proxies to measure resilience. The study will examine over 170 countries between 2000 and 2015. The research design for

this study will be quantitative, using both descriptive statistics and regression-based approaches. This will be done using secondary data from various sources, including the EM-DAT database, Freedom House, and the World Bank.

1.4 Research Questions and Hypothesis

The hypothesis is that more empowered countries have greater resilience to maintain health and well-being after the impact of natural disasters. As such, the following questions will serve as a guide to the research study:

- Does a country's level of empowerment influence its resilience to maintain health and well-being after the impact of a disaster?
- What distinguishes countries that are highly resilient from those that are not?

1.5 Study Justification

The importance of resilience from the impact of a natural disaster is being recognized globally as a necessity, especially for low and middle-income countries. Disasters appear to be increasing due to climate change, which causes their impacts to be more frequent and severe. Some countries are better protected from these problems, but others are much more vulnerable. Promoting greater economic and social justice is essential, and as such, there is a need to understand the factors that allow countries to respond better to these disasters.

This study will fill the knowledge gap in the existing disaster resilience literature and hopes to lead to a better understanding of how the empowerment of a country influences its ability to recover from a natural disaster. The result of the study may enable

low and mid-low empowered countries to assess and evaluate their coping strategies so that they may be able to plan, mitigate, anticipate, cope and recover much quicker from the impact of these disasters. This will place countries in a better position to maintain health and well-being in crisis situations. Besides, this study should serve as a reference for future researchers who are examining the impact of climate change.

1.6 Outline of the Research Study

The introductory chapter laid the foundation for the study by outlining the background and providing a rationale for the study. Chapter two will give an overview of the existing literature by critically comparing and contrasting theories relating to natural disasters, their economic impact, empowerment, resilience, and health, and well-being. Chapter three will describe the methodology, which will include the study design and data sources. Chapter four will provide a detailed analysis of the findings derived from the study. Subsequently, chapter five will conclude with a discussion of the results, strengths of the study, its limitations, and provide recommendations and directions for future research.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This literature review will explore previous studies concerning empowerment and disaster recovery. It will first provide an overview of the type of natural disasters, then it will examine the disaster literature and discuss the economic effects of natural disasters on countries. After, it will look at the research relating to empowerment and resilience to gain an understanding of how they may relate to disaster recovery. This chapter will also analyze the literature that surrounds disasters' impact on health and well-being and will conclude with a summary of the main findings.

2.2 Search Strategy

For this literature review, a comprehensive literature search was conducted by accessing several online databases through the Memorial University online library via OneSearch. These databases include ProQuest, EBSCOhost, PubMed, Springer, Sage, Science Direct, Directory of Open Access Journals, and the World Bank eLibrary. I also used Google Scholar and the assistance of a librarian at the Memorial University library. These searches were carried out using BOOLEAN operators. The keywords used were natural disasters, economic disaster, empowerment, resilience, health, and well-being. Also, the literature review included information from sources such as EM-DAT, the World Health Organization, and UNDP. The searches were restricted to mostly scholarly and peer-reviewed articles. I eliminated information that was dated, duplicated, and was not relevant to my search.

2.3 Natural Disasters and Economic Activity (GDP)

2.3.1 Natural Disasters

Natural disasters kill thousands of people every year and disrupt the quality of lives of millions around the world. As a result of climate change, natural disasters have been occurring more frequently at an even higher intensity. Several studies have shown that the earth is heating up in the last three decades (WHO 2018, NASA 2017, and IPCC 2014). According to the World Health Organization, "in the last 130 years, the world has warmed by approximately 0.85 degrees Celsius with each of the last three decades being successively warmer than any preceding decade since the 1850" (WHO, 2018). Specifically, the earth became much warmer in the last 35 years with 2016 being the warmest year on record and 2018 being the fourth warmest year since 1880 (NASA, 2017, NASA, 2019). According to NASA (2019), "the past four years are collectively the warmest years in the modern record."

The warming of the earth results in extreme weather patterns, worsening many types of natural disasters such as hurricanes, floods, heatwaves, droughts, etc. Besides the physical and economic impacts resulting from this warming, the main consequences are a risk to public health and safety which include, an increase in fatality, outbreak of diseases, pollution, poor quality drinking water and lack of access to basic resources.

For this study, natural disasters will be classified into five categories. EM-DAT (2017), described these disasters as follows:

- Geophysical – This is a hazard originating from solid earth. Examples of these are earthquakes, volcanic eruptions, and tsunamis.
- Meteorological – This is a hazard caused by short-lived micro to extreme mesoscale weather and atmospheric conditions that last from minutes to days, for example, storms, hurricane, tornados, fog, and extreme temperatures.
- Hydrological – This is a hazard caused by the occurrence of movement and distribution of surface and subsurface freshwater and saltwater, for example, floods, landslides, and wave action.
- Climatological – This is a hazard caused by long-lived meso to macro-scale atmospheric processes, including intra-seasonal and multi-decadal climate vulnerability. Examples are drought, wildfires, and glacial lake outbursts.
- Biological – This is a hazard caused by exposure to living organisms and their toxic substances, for example, an epidemic, insect infestation, and accident caused by animals.

Natural Disasters are happening in all categories around the world but with greater frequency and intensity, and they cause devastation to many countries disrupting the lives of many people. In 2017, "almost 90% of deaths due to disasters were due to climatological, hydrological or meteorological disasters with nearly 60% of people affected by disasters affected by floods and 85% of economic damages were due to storms" (EM-DAT, 2017, p.1). Since 2006, hydrological disasters have been the most frequently occurring form of natural disasters. According to the Centre for Research on

the Epidemiology for Disasters (CRED), 51% of natural disaster occurrences were hydrological, followed by meteorological with 28.1%, then climatological and geophysical with 11.1% and 9.1%, respectively (CRED, 2017). Also, in 2017, "the Asian continent experienced the highest disaster occurrence (43% of the total) with China being the most disaster-affected country impacted by 25 events (fifteen floods/landslides and six storms)" (EM-DAT, 2017, p.2).

In 2016, floods were the deadliest form of natural disasters in Africa, Asia, and Western Europe. Storms were the result of most natural disaster-related fatalities in North and Central America, the Caribbean, New Zealand, and Melanesia. Earthquakes caused most of the deaths in South America, and Southern Europe and extreme temperatures killed some people in East Europe (CRED, 2017, p.3). It is evident that "different types of natural disasters have different potential effects" (Stobl, 2012), and affect certain geographical regions more frequently than others and at varying severity. Several studies conclude that developing countries are most commonly and severely affected by natural disasters (Stobl, 2012, Klomp, 2016, Comerio, 2014). According to Stobl (2012), "the last three decades have witnessed an increase in the number of occurrences and developing countries seem to be those bearing the brunt of these events and ultimately the economic consequences (p.1)."

2.3.2 Economic Growth Impact of Natural Disasters

Climate change is said to increase the frequency and intensity of disasters and, as such, causes a significant impact on a country's economy. Natural disasters have direct

and indirect effects. While direct impacts have to do with the loss of lives, displacement, the collapse of infrastructure and closure of businesses, etc., indirect impacts mostly relate to economic activities such as changes to production compositions, demand and supply shocks, shifting terms of trades, inflation, and deflation, etc. (Bergholt, 2012).

Bergholt (2012) believes that different types of disasters seem to have a disparate impact on the economy. He postulates that "disasters linked to climate change have a significantly larger impact than geophysical disasters" on the economy (p.62). He conducted a study on the disaster-growth-conflict relationship of 165 countries from 1980-2007. To study the short-term growth effects from natural disasters on economic growth, Bergholt employed a quantitative approach using data from EM-DAT to examine the causal relationship between different natural disasters and economic growth in the short run. He did this by estimating OLS regressions with both fixed and random effects coefficients. The results of the study proved that people affected by economic disasters are important for economic growth but those who experienced direct economic damages are of less importance (Bergholt, 2012). Also, he found that disasters resulting from the impact of climate change have a greater impact on the economy and a statistically larger impact than geophysical disasters (Bergholt, 2012). For example, between 1998 and 2017, climate-related disasters accounted for 73% of all economic losses, with the greatest loss (46%) relating to storms, while geophysical disaster accounted for only 23% (CRED and UNISDR, 2018).

Likewise, Klomp (2016), also believes that different disasters have a disparate impact on the economy but has drawn a somewhat different conclusion from Bergholt. In his study, he found that the effects of meteorological and geophysical disasters caused a significant negative impact on economic growth in the short run but show a positive impact in the long term (Klomp, 2016, p.78). In like manner, "climatic and hydrological disasters have only a significant temporary adverse impact, within two years the impact disappeared, and the accumulated impact after ten years is zero" (Klomp, 2016, p.79).

While Bergholt used data from EM-DAT to conduct his analysis, Klomp used nighttime light intensity to measure the impact of large-scale natural disasters on economic development. He used this method because he believed that "for a disaster to have an empirical significant impact, it should be of a magnitude that can directly cause damage to the national production capacity, public infrastructure or affect a substantial number of people" and "many of the disaster data in EM-DAT will not have any impact on economic development" (p.71). Klomp used a dynamic data panel consisting of more than 1000 large scale disasters in more than 140 countries between 1992 and 2008 retrieved from the National Oceanic and Atmospheric Administration (NOAA). He conducted an OLS-FE estimator to determine the magnitude of the time-varying scaling factor needed to compute true light from observed light based on satellite images of nighttime light intensity in a specific country or region. According to Klomp (2016), “true light imperfectly measured by the satellites as humidity, sunlight, moonlight and cloud” (p.72). He assumed that observed light is related to true light and true light is

related to GDP. By conducting his analysis, he was able to compare the growth rate of the light intensity before and after the occurrence of a large-scale natural disaster and demonstrated that “climatic and hydrological disasters cause a drop in the luminosity in developing and emerging markets, while geophysical and meteorological disasters decrease light intensity more in industrialized countries” (Klomp, 2016, p.85).

Klomp is not the only author who believes that the EM-DAT database is not an effective tool for measuring the disaster impact on economic growth. Equally, Felbermayr and Groschl (2014) cited two reasons why EM-DAT is not a useful tool. First, EM-DAT disaster intensity measures are more likely to correlate with GDP per capita because the monetary damage of a given disaster is higher in a richer economy. Second, the possibility that insurance coverage is correlated with GDP per capita could lead to an upward bias in empirical estimates of disasters on growth per capita income, resulting from the probability of this inclusion into the database (Felbermayr and Groschl, 2014).

As such, they formulated their database and called it GeoMet. This database represented information from geophysicists and meteorologists, which comprise the physical strength of all-natural disasters that happened in various countries from 1970 to 2010 (Felbermayr and Groschl, 2014). They did a study to prove whether natural disasters lower GDP. Like Klomp, they found that "natural disasters do indeed lower GDP per capita temporarily with low- and middle-income countries experiencing the highest losses across disaster types" (Felbermayr and Groschl, 2014, p.104).

It is important to note that although Klomp, Felbermayr, and Groschl do not believe that EM-DAT is a good tool to measure the economic growth based on disaster impact, they do believe that it is a good source to assess the human and economic impact of natural disasters. According to Felbermayr and Groschl (2014), "EM-DAT database has proven a very useful tool for the analysis of direct human and monetary damages caused by natural disasters." Despite using nighttime light intensity to measure the effect of natural disasters on economic development, Klomp used EM-DAT information to construct several measures on the frequency and severity of natural disasters (Klomp, 2016, p.68). However, he addressed the endogeneity problem related to the economic consequences of a natural disaster by estimating a system GMM model (Klomp, 2016, p.68). He addressed this problem by adopting a decision rule that filtered the disasters included in the EM-DAT to meet several criteria and only disasters that fit those criteria would be included in the estimation. These criteria are that the number of persons killed is no less than 1000, the number of persons injured is no less than 1000, the number of affected is no less than 100000, and the amount of damages is no less than US$1 billion.

Other studies implied that natural disasters lower economic growth and create vulnerable communities, increase poverty and inequalities (Bergholt, 2012, Stobl, 2012, Karim and Noy, 2015, Noy and Yonson, 2016). Vulnerable populations are usually faced with greater risks. They may suffer negative impacts from these disasters, and when there is an economic crisis, it exacerbates the situation causing economic vulnerabilities. Karim and Noy (2015) argued that the reason for this is that direct damages are not evenly

distributed and that there are differences in the costs associated with natural disasters across different countries as a result of income. In other words, this happens most dramatically in countries where those resources suffer less because they may be economically more stable, have access to better supports and have a stronger voice to advocate for their own needs. According to Karim and Noy (2015), "countries with higher permanent income and wealth will be able to devote more resources to prevention and mitigation and that poorer households are more vulnerable and will bear direct damages" (p.13, 4). In an earlier study, Karim and Noy (2014) did a meta-regression analysis of the existing literature on the impacts of disasters on households focusing on the poor and poverty measures. They “extracted 161 observations from 38 studies of direct and indirect impact on poverty and welfare indicators impacted through different types of sudden and slow onset naturally occurring events” (Karim and Noy, 2014, p.6). The measures of poverty and welfare outcomes were accumulated and grouped in several categories which comprise income, consumption, poverty, wealth, health, education and labour (Karim and Noy, 2014). They found that natural disasters have an adverse effect on families in general, but the effect is more significant on people with lower incomes and wealth.

More recently, Noy and Yonson (2016), explored economic vulnerability and resilience and their relation to natural hazards. Noy and Yonson (2016) used econometric methods to identify the underlying factors influencing vulnerability and resilience. They considered vulnerability to be a pre-disaster concern that is linked to prevention,

preparedness and mitigation while resilience is viewed as a post-disaster issue linked to response, rehabilitation, reconstruction and recovery (Noy and Yonson, 2016). The results of the study indicated, "that development influences vulnerability to disasters but there is a difference in the findings as to the direction of the relationship between the level of economic development and disasters as well as the extent to which the level of development influences vulnerability between developed and developing countries and regions" (Noy and Yonson, 2016, p. 17).

In response, Klomp posits that "developing countries are more affected by the frequency effect of disasters caused by hydrological disasters while economic development in industrialized countries reacts more strongly to the scale effect of geological and meteorological disasters" (Klomp, 2016, p. 81). Both authors summarized that natural disasters have a greater impact on low-income countries. Noy and Yonson demonstrated that countries with a higher level of development are more resilient to natural disasters and countries with a lower level of development are more vulnerable and less resilient (Noy and Yonson, 2016, p.20,24) while Klomp, in his study, shows that countries that are more financially developed experienced a less severe impact from natural disasters (Klomp, 2016).

According to Cred and UNISDR (2018), "people in the poorest countries were on average six times more likely than people in rich nations to be injured, lose their homes, be displaced or evacuated, or require immediate medical assistance, food or shelter and suffer the consequences of damage to critical infrastructure including the loss of public

utilities, damaged schools, health facilities and places of employment (p.21). As a result, these countries become even more vulnerable and less resilient to the impact of natural disasters and because more developed countries better infrastructure and the resources, they are better able to combat the impact of these disasters, making them more resilient.

These authors found that natural disasters do have a severe impact on the affected countries. While everyone is affected, there is evidence to prove that wealthier countries are able to prevent and mitigate the economic impact of disasters because they have the resources to do so. Vulnerable and more impoverished countries find it a lot more challenging to cope.

2.4 Empowerment

The definition of empowerment may be viewed from many different concepts. "How the concept is defined depends on the life situation of those who define it. Today, the term empowerment is often used to refer to a wide range of very different processes and practices and is used in many academic disciplines" (Matthies and Uggerhaj, 2014, p.72, p.64).

According to Matthies and Uggerhaj (2014), "Empowerment should be seen as a process and not an outcome. It is a never-ending process because people's life and wishes are constantly changing" (p.72). They also stated that "promoting empowerment means believing that people are capable of making their own choices and decisions and that human beings possess the strength and potential to resolve their own life situations and are willing to contribute to society" (p.63).

From a legal standpoint, Cisse et al. (2013) believed that empowerment might be achieved by "using the law as a tool to improve one's life" (p.34). The authors further stated that "legal empowerment advances the rule of law in the sense that empowered people will be in a position to demand good governance, and it transcends the rule of law by lifting the focus from governance to more general poverty alleviation" (p.34). "Empowerment is also viewed as an approach to enable people who lack the power to become more powerful and gain some degree of control over their lives and health" (Woodhall et al, 2012, p.1). According to Woodhall et al. (2012), "empowerment concerns combating oppression and injustice and is a process by which communities work together to increase the control they have over events that influence their lives and health" (p.1). Specifically, "empowerment is a matter of freeing this oppressed will through participatory resilience programming enabling subjects to make their own adaptation decisions and then realize these goals (Grove, 2014, p.244).

Garces-Ozanne et al. (2016) defined empowerment as individual and collective. They described individual empowerment as "having the autonomy to make meaningful decisions about their lives" and collective empowerment as "a devolution of decision making to communities or groups to allow them to take charge of their own fortunes." In other words, "recovery programs that engaged citizens in decisions about the future, have the advantage of empowering these individuals, turning passive into active, turning lack of control into control and promoting community engagement" (Comerio, 2014, p.64).

Likewise, Matthies and Uggerhaj (2014) also viewed empowerment as both individual and collective. In their book, Petra Videmsek, along with five experts-by-experience in the field of mental health, performed participatory user research. This research was done from 2007 to 2008 to find out how do these experts understand and define the concept of empowerment. It was done by controlling the empowerment process, using a basic questionnaire that participants were required to complete before, after six months, and at the end of the research (p.66). Videmsek found that "on an individual level, participants gain more self-esteem, and they recognized themselves as experts on their particular condition" (p.70). Through participation, "they gain a sense of mastery over one's life which appears to be central in attaining a high level of functioning and good outcomes from the illness" (p.70). However, Woodhall et al. (2012) noted that "individual empowerment does not consider or challenge the social determinants of people's health and does not constitute full empowerment in the sense of transforming the relations of power. Individual empowerment alone has a limited impact on addressing health inequalities and may be illusory in that it does not lead to an increase in actual power or resources" (p.2). In other words, power is only something that can be exercised and not a thing in and of itself. The possibilities for exercising power and making change reside within groups, communities or countries because social conditions enable them to participate in the process.

As Cisse et al. (2013) believed that poverty alleviation promotes empowerment, Garces-Ozanne et al. (2016), also summarized that poverty reduction, increased access to

education, and readily available and affordable information and communication technology may empower individuals. The study measured empowerment by measuring political rights and civil liberties at the national level, which revealed that “wealth, education and empowerment in terms of political rights and civil liberties promote better health outcomes” (Garces- Ozanne, et al., 2016).

While Garces-Ozanne et al. (2016) used political rights and civil liberties to measure empowerment, Gul (2016) measured women’s empowerment in seven dimensions. That is economic empowerment, freedom of movement, political empowerment, community-level empowerment, asset ownership, marriage decisions, and leadership. In 2015, Gul conducted a pilot study in rural Khyber-Pakhtunkhwa (KP) province of Pakistan, which was hit by a flood in 2010 by collecting information regarding households' financial and physical capital for a year before the storm, a year after and also in 2015 (p.5). She used linear regression models to determine if there was a link between women's empowerment levels in a household and resilience. Using a dynamic approach to estimate resilience, Gul (2016), collected households’ financial and physical capital data for three years, a year before the disaster, a year immediately after the disaster, and five years after that year, and measured resilience by the change in capital over time. The results revealed, "that high resilience contributes to empowering women and empowered women contributes towards increasing households' resilience" (Gul, 2016, p.39). In other words, the more resilient the household, the greater the level of women empowerment.

Conversely, Moreno and Shaw (2018) proposed that "resilience can be the pathway to produce long term changes in gender relation and empower women in the context of disaster" (p.217). Moreno and Shaw studied the response and recovery phases of the 2010 earthquake and tsunami which hit El Morro, one of the poorest communities in Chile, over 7 years. They did this to find out the conditions under which disasters trigger changes in gender relations and if resilience contributes to reducing women's vulnerability in the long term (p.209). Their study was done using an inductive approach, which included a variety of data collection methods generated from 54 semi-structured interviews with residents, municipal officials, NGO practitioners, and relief workers (pp.210, 211). The results showed "that disasters can trigger long-term changes in gender relations, even in highly patriarchal context and that the internal aspects of leadership and women's organizations suggest that changes can be stimulated "from the inside out" by promoting women's inner strengths, mutual learning, and collaboration" (pp.220,221).

Additionally, "investing in building women's resilience both internally and externally can increase their adaptive capacity to climate change and disaster which can be encouraged by gender-sensitive programs at the national and local levels that address gender relations from the holistic and multi-stakeholder approach and improve gender inequality and women's empowerment" (p.221). Actually, in El Morro, over the seven years, women have become more empowered in the community and have contributed economically, socially and politically to the community’s development by developing management skills and becoming leaders which eventually contributed to reducing the

unequal gender relations in the community and breaking historical patriarchal regimes. (Morena and Shaw, 2018).

Morena and Shaw (2018) referred to these women as being “active agents of change” and no longer “passive victims” (p.216) because the conditions in which they could exercise some power over their lives were changed, creating opportunities to become more empowered. After the 2010 earthquake, women’s economic roles were changed with them contributing to an upsurge in women’s activism. For example, an organization in El Morro called the Fisherman’s Union was led by men since 1941, but after the disaster, it was led by a woman and of all the male-only organizations in the community, only remains the same (Morena and Shaw, 2018).

According to Gul (2016), "empowerment serves as an important tool in addressing gender inequality" p.13). Her models further suggested that "the ratio of literate women and education of the household head are contributing factors in improving women empowerment score" (p.6). Like Garces-Ozanne et al. (2016) and Gul (2015), Bokova (2017) believed that education plays a vital role in making an individual, community, or country more empowered when he stated that "education is not only a right, it is also a force of empowerment. It gives boys, girls, women, and men the tools to make the most of change and withstand its pressure" (Bokova, 2017, p.4). According to Bokova (2017), "the soft power of education, culture, the sciences, communication, and information is a lifeline in times of trials and are what determine the capacity to resist, to anticipate and to

adapt to a changing or dangerous environment when institutions and infrastructures are jeopardized or weakened in conflict or disaster situations" (p.2).

Similarly, Noy and Yonson (2016) stated that "households with high levels of education are more resilient to the adverse effects of floods and droughts" (p.24). This was demonstrated in a previous study conducted by Noy (2009). He did a two-fold study on 109 countries from 1970 to 2003 using a panel data set to quantify the short-run impact of disasters on the macroeconomy and to examine the determinants of these impacts. The second inquiry results revealed that "countries with higher income per capita, greater trade openness and literacy rate, higher levels of public spending and better institutions are able to withstand the initial impact of disasters and are also able to prevent spillovers" (Noy and Yonson, 2016, p.20). This, therefore, means that more educated people with greater freedom are better able to make more informed decisions regarding their health and are more resilient from the adverse effect of natural disasters.

2.5 Resilience

There is varied literature on the theory of resilience, and this theory has been used in different subject areas such as archaeology, sociology, medicine, and psychology, with each having a different perspective, and each may have a different definition based on the subject area. The American Psychological Association provides a general definition of resilience: "the process of adapting well in the face of adversity, trauma, tragedy, threats or significant sources of stress such as family and relationship problems, serious health problems or workplace and financial stressors (APA, 2014)." The foci of

resilience are said to be "on the recovery and return time following a disturbance and on how much a system can be disturbed and still persist without changing function" (Kafle, 2012, p.317).

Ledesma (2014) viewed resilience as the ability to bounce back from adversity, frustration, and misfortune, while Zimmerman (2013) saw it as a protective and compensatory model. He described the compensatory model as a "protective factor that neutralizes risk in a counteractive fashion" and the protective factor as "promotive assets or resources that modify the relationship between a risk and the promotive factor and outcomes" (pp.2, 3).

According to the Committee on Increasing National Resilience to Hazards, Engineering and Public Policy Committee on Science and the National Academies and Global Affairs staff (2012), "resilience is not a task that can be marked as "completed", no perfect end state or end condition of resilience exist." The process of building resilience requires continuous assessment, planning, and refinement by the community and all levels of government. In fact, "building resilience means building strong communities that contain adequate essential public and private services including schools, transportation, healthcare, utilities, roads and bridges, public safety and businesses" (pp.18,19). As such, community resilience may be defined as "an ideal condition where the community has the capacity to anticipate, prepare for, respond to and recover from quickly from the impacts of disasters" (Kafle, 2012, p.317). Particularly, "a resilient community is able to respond to change or stress in a positive way and is able to maintain

its core function as a community despite these stresses" (Kafle 2012, p.318). While there are many views of resilience, this literature review will focus on the theory of disaster resilience.

2.5.1 Disaster Resilience

The study of disaster resilience has occurred since the late 1970s and was seen as a positive reflection of vulnerability. However, disaster resilience has a lot to learn from climate change adaptation and is defined as "the ability to anticipate, adapt, absorb and recover" (Matyas and Pelling, 2015, p.11). Fan (2015) regarded resilience as "the key to developing sustainable methods of "living with risk" (p.27), while Arbon et al. (2016) viewed resilience as being collaborative and coordinated. They believed that for countries to be resilient, "a coordinated and collaborated effort is required to enhance the capacity of countries to withstand and recover from emergencies and disasters" (p.1). This coordinated and collaborated effort must be established at multiple levels across various disciplines and sectors to influence the economic, social-cultural, and political forces that shape the community (Gil-Rivas and Kilmer, 2016, p.1322). "A community was considered to be resilient when members of the population were connected to one another and worked together so that they were able to function and sustain, critical systems, even under stress, adapt to changes in the physical, social and economic environment; be self-reliant if external resources were limited or cut off; and learned from experience to improve itself over time" (Arbon et al, 2016, p.3).

UNDP (2014) defined building resilience as a "transformation process of strengthening the capacity of men, women, communities, institutions, and countries to anticipate, prevent, recover from and transform in the aftermath of shocks, stresses, and change”(p.4). Critically, Matyas and Pelling (2015) argued that it is not possible to bounce back to the same position once learned from an experience. This is because the individuals and organizations within the structures have been changed and that for resilience to happen, reflexivity in decision making (i.e., using personal feelings or instincts to influence the decision-making process), social learning, and self-organization must be primary components of resilience.

Conversely, Cutter et al. (2010) believed that "resilience is a set of capacities that can be fostered through interventions and policies which in turn help build and enhance a community's ability to respond and recover from disasters” (p2). In their study, they used a theoretical framework and the disaster resilience of place (DROP) model to measure the recovery progress after a disaster impact and to analyze the present conditions influencing resilience within communities. They examined 736 counties within the US Federal Emergency Management Agency Region IV by developing baseline resilience indicators for communities (BRIC). These indicators are classified in the following five components:

- Social Resilience – This is the differential social capacity within and between communities. Social resilience is evident in communities that exhibit higher levels of education equality, fewer elderly, disabled residents, non-native English-

speaking residents, a high percentage of inhabitants with vehicle access, telephone access, and health insurance may also demonstrate higher levels of resilience (Cutter et al., 2010).

- Economic Resilience – This "measures the economic viability of communities, including housing capital, equitable incomes, employment, business size, and physician access" (p.8).
- Institutional Resilience – This "contains characteristics related to mitigation, planning and prior disaster experience" (p.8).
- Infrastructural Resilience – This refers to the evaluation of “community response and recovery capacity, for example, sheltering, vacant rental housing units, and healthcare facilitator" (p.9).
- Community Capital – This "captures the relationship that exists between individuals and their neighbourhoods and communities" (p.9)

By conducting this analysis, the authors discovered that metropolitan areas showed high levels of resilience, and the rural regions showed medium to low levels of community resilience. They believed that communities that showed high levels of resilience are the results of "a high degree of social homogeneity, diverse economies with elevated levels of property ownership, high employment rate and the institutional capacities to mitigate the effects of natural disasters and resilience in rural areas are a function of lower than average infrastructure and institutional resilience" (p.14). In other words, Cutter et al. (2010), sees resilience from the perspective of the upper class and

wealthy and does not examine the contributions of the poor, the elderly and disabled in building resilience based on adverse experience.

Although high resilience of communities is possible when all five components of resilience measured by Cutter et al. (2010) are functioning above average, Olshansky and Johnson (2014) posited that government intervention is paramount in supporting and facilitating community recovery process (p.293). The authors did a historical review of federal government involvement in recovery in the United States, focusing on three themes. That is, "the continuing expansion of federal funding of recovery following disasters; the tension between recovery and improvement; and the tension between the roles the federal government plays as a financier, leader, and facilitator of local activities" (pp.293, 294). Based on this review, the authors identified the challenges that the federal government continues to face which have to do with "how best to provide federal resources, facilitate coordination among a multiplicity of recovery actors, streamline funding streams while requiring accountability and promote leadership and knowledge development at the local level" (p.301). They suggested that communities may become highly resilient if the federal government "facilitates and funds timely pre- and post-disaster planning at the community level to inform and empower recovery actors includes incentives to achieve substantive goals of rebuilding in a way that is sustainable, cost-effective, timely and reduces the chances of future disasters in recovery policies and address existing inefficiencies and inequities in the built environment" (p.301).

Similarly, Comerio (2014) surmised that the government plays an important role in community resilience. The kinds of assistance policies that governments implement are critical in determining recovery in terms of how it is defined, financed and evaluated (Comerio, 2014). It is evident that resilience cannot be achieved in a vacuum but requires a coordinated effort from both the community and the government. In other words, "resilience cannot be accomplished by simply adding a cosmetic layer of policy or practice to a vulnerable community, long term shifts in physical approaches (new technologies, methods and infrastructure systems) and social practices and initiatives (the people, management processes, institutional arrangements, and legislation) are needed to advance community resilience" (The Committee on Increasing National Resilience to Hazards, Engineering and Public Policy Committee on Science and the National Academies and Global Affairs staff, 2012, p.197).

Similarly, Peregrine (2017) suggested that for societies to become resilient to catastrophic climate-related disasters, there should be greater flexibility in citizens' participation in governance and decision making. He hypothesized that "societies in which political leaders encourage more inclusive and participatory political structures are more resilient to climate-related disasters than societies in which leaders tightly control access to political authority" (pp.322, 323). To prove if his hypothesis is true, he conducted a systematic cross-cultural analysis of 21 archaeologically known societies for 100 years before and 100 years following 15 catastrophic natural disasters. He found that "more corporately oriented societies are more resilient to catastrophic climate-related

disasters, specifically in terms of population, community, organization and communal ritual than are more exclusionary ones" (p.323). In other words, societies that encourage citizen's participation in political decision making at various levels show greater resilience to natural disasters than those who do not. It is important to note that corporately oriented societies (corporatism) are societies that allow large-scale corporate organizations to get involved in their economic, social and political decision-making process (Scott, 2015).

2.6 The Effects of Natural Disasters on Health and Well-being

When disasters happen, it poses significant public health issues such as mental health problems, other sicknesses, diseases, damages to infrastructure, and properties. Natural disasters such as floods and droughts are likely to lead to an increase in morbidity and mortality, which most times have a more significant impact on vulnerable communities, including rural and remote areas (Ng et al., 2015, pg.2). "Equally, in resource-poor countries, the range of problems brought by a disaster entails displacement, family and social disruptions erosion of traditional value system, a culture of violence, weak governance, the absence of accountability and poor access to health services" (Herrman, 2012, p.83).

These disasters may affect health and well-being both in the short term and in the long run. The short term and long-term effects may vary by disaster types. For example, the evidence of the short-term effects of floods may include high levels of morbidity and mortality, infectious diseases, extensive property loss, high levels of psychological

distress, and increased stress/anxiety levels. In contrast, its long-term effect may include post-traumatic stress disorder and higher levels of chronic anxiety. Drought generally has a long-term impact on well-being and may consist of the development of chronic health conditions such as hypertension, cardiac disease, and mental health condition. Besides, there may be social and financial consequences due to the destruction of land resulting from the impact of these disasters (Ng et al., 2015).

Ng et al. (2015) conducted a qualitative analysis whereby they explored the perception and experiences of residents in four rural communities of New South Wales, Australia, who have experienced floods and drought in the last five years. They did this to gain an understanding of the impact that flood and drought have on the well being of rural Australia. The study was conducted one year after the most recent event. It included 46 participants with an average age of 57.7 years using purposive and convenience sampling for rural communities in two local government areas. The data were collected with the use of focus groups and face-to-face interviews (pp.3,4). The results of the study demonstrated that these types of disasters have a major impact on emotional well-being, such as fear, loss, and stress, which also affect the livelihood of the community and farmers and community well-being. However, these negative impacts may be buffered through the continual strengthening and promotion of community resilience through groups, events, and sports groups, which may help communities to adapt to extreme weather (Ng et al., 2015, p.11). In other words, "resilience is more likely to be acquired or

present when a child or adult can avoid strong, frequent or prolonged stress or when the effects are buffered by supportive relationships" (Herrman, (2012, p.84).

Lowe et al. (2015) also confirmed that disasters do have a negative effect on health and well-being. They conducted a study to determine the impact of disasters on mental health wellness and general well-being in Galveston, Texas, after 2008, Hurricane Ike. They quantify both mental health wellness (resilience across multiple mental health conditions) and general wellness (resilience across mental health, role functioning, and physical health domains) in a three-wave population-based study, which was completed by 448 participants (p.164). These interviews were conducted using a computer-assisted interview system, and the data were analyzed using hierarchical logistic regression models. They found that approximately half of the participants show resilience. However, "specific hurricane-related stressors decreased the likelihood of both mental health wellness and general wellness outcomes whereby loss of possessions, pets and financial loss showed to be negatively associated with mental health wellness and personal property loss was negatively associated with general well-being" (p.168). Some of the conditions that were highlighted from the study that were said to be negatively associated with both forms of wellness are panic-like symptoms of shortness of breath, tremulousness, racing heart and sweating (Lowe et al. 2015, p.168). The study also summarized that disaster-related loss of income also influences mental health wellness, making it difficult to recover from these disasters (Lowe et al., 2015).

Noy and Yonson (2016) showed income plays a role in the resilience of a community or country. In other words, loss of income or low-income earners who live from paycheck to paycheck may find it difficult to cope during and after a disaster, and this may affect not just their mental health but also their physical health. Previous studies have indicated that low-income and less developed countries are more vulnerable and less resilient than countries with higher levels of development (Noy and Yonson, 2016, Gil-Rivas and Kilmer, 2016, Cutter et al., 2010, Karim and Noy, 2014, 2015). "Poorer individuals and countries take a longer time to recover from disaster because of lack of resources while wealthier countries have the resources to prevent and mitigate these disasters," (Karim and Noy, 2015, p.3). Poor countries such as small islands and developing nations are less resilient because of their vulnerability to climate change, their reliance on tourism, agriculture, fishing combined with weak infrastructure, higher rates of poverty, and environmental degradation (Lichtveld, 2018).

Gender inequality has also contributed to the health and well-being of women in disaster-affected countries. According to Parida (2015), "the psychological effects of disasters occur more thickly within social strata such as widows, female-headed households, minority women, single and elderly women than others" (p.271). Parida (2015) did a qualitative study in 2013 after the Uttarakhand flood disaster in India. He interviewed 68 women from the three worst-affected districts between the ages of 20 to 75 years, taking into consideration factors such as initial well-being, livelihood resilience, self-protection, social protection, and social capital (p.271). From the results of this study,

he summarized that the incidences of high morbidity in women was not a direct result of the flood but rather resulting from them being overworked due to the increase in domestic and income-based work. This causes them to become mentally nervous and physically weak and not having enough time to recover is what led to their deaths (Parida, 2015). Besides, "women also expressed increased incidence of depression, illness, anxiety disorders, somatization and frustration related to the care they were provided before the disaster" and this was exacerbated by "the loss of livelihood, financial and personal losses which were seen to be mostly connected to depression, anxiety, somatic complaints, general stress, and traumatic stress" (pp.264, 266).

Based on these studies, it is evident that disasters impacted health and well-being. It is also apparent that loss of income does affect health and well-being, making it much more difficult to cope, adapt, and recover from the impact of these disasters.

2.7 Summary of the Literature

Based on the findings from this literature review, it is evident that climate change increases the frequency and severity of natural disasters and make resiliency more difficult for low income and developing countries. However, resilience is possible after the impact of a disaster, but some countries may recover much quicker than others. According to the literature, wealthier countries are more likely to recover much faster than poorer countries. The literature also proves that disasters do influence the health and well-being of an individual, community, or nation. What is lacking in the literature is how empowerment among a population contributes to resilience. As such, there is a need for

future research to determine if there is an association between empowerment and resilience in maintaining health and well-being after the impact of a natural disaster.

CHAPTER 3: METHODOLOGY

3.1 Introduction

The research aims to determine whether a country's level of empowerment influences its resilience to maintain health and well-being after the impact of a natural disaster. This chapter describes the research methods, methodology, and the process for analyzing the data. It explains the research design, outlines how each variable contributes to the research objectives and questions. It further discusses the data collection procedures. The chapter then goes on to discuss the analysis process by outlining the steps taken in analyzing the data.

3.2 Research Design

For this study, a quantitative methodological approach which includes descriptive and regression-based analyses, specifically, an interrupted time series analysis (ITSA) and ordinary least square (OLS) regression analyses were employed. This approach was chosen to gain a better understanding of the magnitude of disaster impacts on countries, to examine the relationships between variables, and mostly to test the research hypothesis about a country's level of empowerment and its resilience to maintain health from the impact of natural disasters. According to Mavundla (2017), "data collection through quantitative research are believed to yield more accurate and objective information because they were collected using standardized methods, can be replicated and can be analyzed using sophisticated statistical techniques unlike qualitative data" (pg. 39).

A descriptive analysis was used to describe the phenomena, making the data easier to interpret and understand for further quantitative analysis. While this technique provides a good description of each variable, it does not suggest a causal pathway. As such, to assess the impact, recovery patterns and to determine the relationship between country-level empowerment and resilience, an interrupted time series and OLS regression analyses were also conducted. The ITSA is considered an appropriate design in assessing the effects of intervention in public health and for conducting health research analysis (Bernal, et al., 2017; Linden, 2015). According to Bernal et al. (2017), "the interrupted time series (ITS) study design is increasingly being used for the evaluation of public health interventions; particularly suited to interventions introduced at a population level over a clearly defined time period and that target population-level outcomes" (p.349). As such, the ITSA is an appropriate analytical tool for this study because it will provide a better understanding of disaster impacts and recovery patterns as it relates to health and well-being.

For this research, the ITSA was done using a Newey-West estimation approach. Newey is an OLS regression-based model specifically designed for time-series data. The Newey "estimates the coefficients by OLS regression but produces Newey-West standard errors to handle autocorrelation as well as possible heteroskedasticity" (Linden, 2015). Autocorrelation determines whether there is a relationship between the values of the same variables across different observations in the dataset while heteroskedasticity refers to random or unequal variables across the range of values of a second set of predictor

variables. When using a regression-based time series approach, it is important to test for autocorrelation and heteroskedasticity to ensure that the model is reliable. In other words, the test is necessary to ensure that the model produced the best linear unbiased estimates (BLUE), according to the Gauss-Markov assumptions, that the variance across all observations is the same (homoscedasticity), and that it does not violates the assumption of independence of residuals (Boldina I., Beninger P.G., 2016 p. 87,88).

In an interrupted time series analysis, a time series of a particular outcome is used to determine an underlying trend (Bernal et al., 2016). This trend is then interrupted by an intervention which is known as a point in time. (Bernal et al., 2017). According to Linden (2015) "in an interrupted time series analysis, an outcome variable is observed over multiple equally spaced time periods before and after the introduction of an intervention that is expected to interrupt its level or trend" (Linden, 2015, p.480). It is important to note that for this study, rather than looking at the impact of an intervention, the ITSA is adopted to look at an event – a disaster. This study employed a single group ITSA whereby Bo is the intercept, B1 is the slope before the event, B2 refers to the change in level in the period following the event initiation, and B3 is the difference between the pre-event and the post-event slopes (Linden, 2015, p.482).

The ITSA also produces post-event linear trend results using a linear combination of estimators (lincom). According to Stata, "lincom computes point estimates, standard errors, t or z statistics, p-values, and confidence intervals for linear combinations of coefficients after any estimation command" (Stata, n.d., p.1). In the case of this study,

lincom manipulates the combination of B1 and B3 to gain a better understanding of the relationship between the pre-event and post-event periods of the analyses. However, for the ITSA analysis, the focus will be on B2 and B3, while for the OLS regression analyses, the focus will be on both event periods (B2 and B3) and the post-event linear trend.

While the ITSA was able to show the impact and recovery patterns of a disaster, it was not able to directly determine the association between empowerment and resilience. As such, to further refine the study and to test the main hypotheses, several OLS regression analyses were conducted. An OLS regression analysis is said to be one of the oldest statistical methods. It is considered to be the most efficient and unbiased estimator of the linear parameters because it produces the least sampling variability, and it does not systematically over or under-estimate the true population variability (Boldina I., Beninger P.G., 2016, p.86). For the OLS regression analyses, an ITSA was conducted for each country, and each of the three outcome measures, that is, GDP per capita, infant mortality, and life expectancy. After, a new dataset was created, comprised of each B2, B3, and the post-event linear trend (B1+B3) coefficients. These coefficients were derived from the ITSA analysis for each country and each outcome measures, on which the OLS regression was used with measures of empowerment (political rights, civil liberties, corruption) for each country. The standard ITSA regression model assumes the following form: $Y_t = \beta_o + \beta_1 T_t + \beta_2 X_t + \beta_3 X_t T_t + \epsilon_t$

3.2.1 Description of Variables and Indicators

3.2.1.1 Natural Disaster

Natural disasters may be described as extreme catastrophic events (such as, droughts. earthquakes, floods, hurricanes, etc.) that may have a direct or indirect impact and can result in fatalities, property damage, and social, environmental disruption (Xu et al., 2016). When a disaster happens, the health and well-being, the physical infrastructure, and the economy of a country are likely to be affected. For this study, there was no distinction made between the different types of natural disasters, but rather it looked at the overall effects of natural disasters at the national level. Further, the study used the same indicators employed by the EM-DAT database maintained by CRED (Centre for Research on the Epidemiology of Disasters) to measure disaster impact, which is classified as human and economic. The indicators for human impact are total deaths and total affected. The economic impact indicator is the total financial damage. EM-DAT is proven to be an effective database for measuring disaster impact and is compiled from several governmental and non-governmental organizations. It is important to note that EM-DAT contains essential core natural disaster data on occurrences and effects of over 14,000 natural disasters in the world from nineteen hundred to present-day (Guha-Sapir et al., 2016). Also, for a disaster to be entered in the EM-DAT database, ten or more people must be reported killed or one hundred or more people affected, or there is a declaration of a state of emergency or a call for international assistance (Guha-Sapir et al., 2016). As such, the EM-DAT indicators are believed to be good indicators to measure the human

and economic impact of disasters at the national level. The following provides a detailed description of these indicators:

- Occurrence – This gives the total disasters that happened each year for each country over the 16 years that is being observed.
- Total Deaths – This represents the number of people who lost their lives because of the disaster and the number of people whose whereabouts since the disaster were unknown and presumed dead based on official figures.
- Total Affected – The total affected is the sum of the total number of people injured, affected, and homeless. Injured represents the people who suffered from physical injuries, trauma, or illness regarding immediate assistance as a direct result of a disaster. The affected constitutes people who required immediate assistance during an emergency. At the same time, the homeless include the number of people whose house was destroyed or heavily damaged and need shelter after an event.
- Total Damaged - This is the value of all damages and economic losses directly or indirectly related to the disaster.

3.2.1.2 Empowerment

The United Nation defines empowerment as "the process of enabling people to increase control over their lives, to gain control over the factors and decisions that shape their lives, to increase their resources and qualities and to build capacities to gain access, partners, network, a voice in order to gain control" (United Nations, 2012, pg. 5). A

fundamental assumption is that the more freedom a country has, the higher the level of empowerment. As such, empowerment was measured using *political rights*, *civil liberty* from Freedom House's flagship annual report, Freedom in the World and *corruption* from the Transparency International's Corruption Perception Index. Since 1973, Freedom in the World assesses the condition of political rights and civil liberties around the world, composed of numerical ratings and supporting descriptive texts for 195 countries and 14 territories. It has become the most read and cited report of its kind (Freedom House, 2019).

According to Carin and Bates-Eamer (2012), "civil and political rights are the cornerstones of empowerment and that the goal on civil and political rights focuses on people's ability to participate in, negotiate with, influence, control and hold accountable, the institution that affects their lives." Garces-Ozanne et al (2016), in their study on empowerment and self-determination, also measure empowerment using Freedom House ratings of political rights and civil liberties whereby total freedom is equal to civil rights plus political rights. They believed that these are good proxies for measuring empowerment because they capture the concept that individuals are able to make their own decisions, have the capacity to influence governments and the will to make changes, resulting in the empowerment of citizens (Garces-Ozanne et al (2016). Political rights and civil liberties are further discussed below:

- Political Rights and Civil Liberties - Political rights measure the extent to which a country enjoys free and fair election, elected candidates rule, political parties are

competitive, the opposition plays an important role, enjoy real power and the interest of minority groups is well represented in politics and government. Civil liberties are the extent to which individuals within a country enjoy rights such as freedom of expression, assembly association, education, and religion; there is a fair legal system, free economic activity, equality of opportunity for everyone, including women and minority group (Freedom House, 2019). Political rights and civil liberties are used as indices in Freedom in the World annual report conducted by Freedom House. The report comprises of over 200 countries and territories with its methodology obtained from the Universal Declaration of Human Rights. In this report, each country is assigned a rating for political rights and one for civil liberties. These ratings range from 1 to 7, with 1 representing the greatest degree of freedom and 7 the lowest degree of freedom (Freedom House, 2019).

Corruption is also a good index for measuring empowerment because empowerment appears to be linked to corruption and it is believed that countries that allow their citizens to make their own decisions have lower levels of corruption. According to Transparency International, "recent analysis suggests that higher rates of female participation in a country's national legislature could be associated with lower levels of corruption" (Transparency International, 2010, p.4). Another study also used political rights, civil liberties and corruption as variables to measure the effect of corruption on globalization and found that high freedom countries in terms of civil liberties are associated with a low degree of corruption. In contrast, low freedom

countries are associated with high corruption levels (Lalountas et al. (2011). Transparency International has been tracking corruption since 1993 and published its first Perception Corruption Index in 1995 (Transparency International, 2018). The Perception Corruption Index rates countries and territories according to their perceived level of corruption, and the report is widely used by decision-makers, companies, and journalists worldwide (Transparency International, 2015). Corruption is described in more details below:

- Corruption – Transparency International defines corruption as "the abuse of entrusted power for private gain which may be classified as grand, petty and political depending on the amount of money lost and the sector where it happens (Transparency International, 2018). The Corruption Perception Index (CPI), which includes bribery, extortion, and nepotism is a research product of Transparency International that ranks 180 countries and territories according to their perceived levels of public sector corruption by experts and businesspeople. The Corruption Perception Index (CPI) is calculated using thirteen different data sources from twelve different institutions that capture perceptions of corruption by business people and country experts of the level of corruption in the public sector within the past two years (Transparency International, 2018). To be included in the CPI, a country must be assessed by a minimum of three sources; the scores are then calculated as the average of all standardized scores for that country (Transparency International, 2018). It uses a scale of 0 to 100, where 0 equals the

highest level of perceived corruption, and 100 equals the lowest level of perceived corruption (Transparency International, 2018). Although CPI only captures perceptions of the extent of corruption in the public sector, it is still considered a reliable and consistent measure. The Joint European Commission confirms this when it conducted an audit in 2017 of CPI and its methodology and found it to be conceptually and statistically coherent and has a balanced structure (Transparency International, 2018).

3.2.1.3 Health and Resilience

For this study, health was measured using infant mortality and life expectancy. These indicators have been proven to be good proxies for measuring health outcomes by various organizations, including World Bank, WHO, CDC, and UNDP. According to WHO, "health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (WHO, 2014, p.1). Disasters affect both the physical and mental well-being of humans.

Resilience contributes to a country's ability to maintain health after the impact of a disaster. It is a multifaceted phenomenon that is complex, dynamic, and difficult to measure. "To date, there is no single set of established indicators or framework for quantifying resilience" (Cutter et al., 2010). There are several attempts to define and measure resilience. Among these are the global footprint for disaster risk reduction, the Hyogo, and the Sendai frameworks, the Disaster Resilience of Place (DROP), and UNDP's Community Based Resilience Analysis (CoBRA). "However, the complexity of

the mechanisms at stake and the heterogeneity of countries, households, and disasters make the definition of a resilience indicator extremely difficult and its measurement even more" (Hallegate, 2014, pp. 2,3).

For this study, resilience is viewed as an outcome and is measured as the recovery from a disaster event. This is captured by B3 in the ITSA regression technique, which is applied to GDP per capita, infant mortality, and life expectancy at birth to measure resilience. Building Resilience and Adaptation of Climate Extremes and Disasters (BRACED) also sees resilience as an outcome and describes it as "a mean rather than an end in itself (with the ultimate goal of improved well-being situated at impact level)" (BRACED, 2018). Table 3.1 below describes the key health and resilience indicators included in the study:

Table 3. 1 Key Health and Resilience Indicators and Their Relevance

Indicators	Conceptual Relevance to Health
Infant Mortality	Infant mortality is the number of infants dying before their first birthday, expressed as per 1000 live births (UNIGME, 2018). The infant mortality data were retrieved from the United Nations Inter-Agency Group for Child Mortality Estimation (UNIGME). Infant mortality is widely used to measure the health of children and families worldwide ((AMCHP, 2013). According to the Association of Maternal & Child Health Programs (AMCHP), infant mortality is a "crude indicator of community health status, poverty and socioeconomic status levels in a community, and availability and quality of health services and medical technology" (AMCHP, 2013). Though health needs may vary based on disaster types, the coping capacity and vulnerability in a community, infant mortality is a good marker of the

	quality of care (Egawa, et.al., 2018, Lepine et al, 2018). Also, infant mortality is an economic indicator that reflects changes in economic and environmental circumstances and is viewed as an outcome of community resilience (Sherrieb, et.al., 2010)).
Life Expectancy at Birth	OECD defines life expectancy at birth as "how long, on average, a newborn can expect to live, if current death rates do not change" and is one of the most frequently used health status indicators (OECD, 2019). It is a basic population statistic that indicates total health outcome (Egawa, et.al., 2018). Life expectancy at birth is also a good indicator to measure resilience because the data is based on several factors which include a rising standard of living, improved lifestyles, better education and greater access to quality health services (OECD, 2019). These factors are important to determine the resilience of a country to maintain health after the impact of a natural disaster. Also, Egawa et al (2018), confirm that "natural hazards such as earthquakes, tsunamis, and tropical cyclones positively correlated with life expectancy and that the institutional and infrastructural categories of the lack of coping capacity dimension negatively correlated with life expectancy" (p. 1057). This data was retrieved from the United Nation Development Program (UNDP).
GDP Per Capita	GDP per capita is a well-accepted indicator for measuring the economic impact of a disaster and it is also necessary for determining the economic resilience of a country as it is viewed as a country's economic health. According to Investopedia, "GDP is the total monetary or market value of all finished goods and services produced within a country's border in a specific time period (Investopedia, 2019), Chappelow, J., 2019). Among a list of variables, Noy and Yonson (2018) named GDP as one of the most common economic variables to assess vulnerability and resilience to natural hazards. The International Monetary Fund (IMF) considered GDP to be important because it provides information about the size of the economy and of how an economy is performing (Callen, IMF., 2018). In this study, we examined GDP per capita over the 16-year

	observation period for each country as previous studies have shown a strong correlation between GDP per capita and resilience from natural disasters (Felbermayr and Groschl, 2014, Klomp, 2016 and Noy and Yonson, 2014). The GDP per capita data for the countries included in the study was taken from the World Development Bank Indicators (World Bank, 2019).

3.3 Population Description

The data is constructed as a panel dataset of 177 countries, which includes both developed and developing countries and is observed for 16 years between 2000 and 2015. Initially, there were a total of 202 countries. However, data were not available for all the countries across all the variables. As a result, to achieve completeness and consistency, 25 countries were eliminated from the dataset as more than 10% of the data for these countries were missing. The remaining countries used in the analysis were grouped according to income levels based on the World Bank Income Level grouping ranging from low to high income. Table 3.2 below illustrates this:

Table 3.2 List of Countries by Income Levels

Low-Income Countries (34)	Mid-Low-Income Countries (44)	Mid-High-Income Countries (51)	High-Income Countries (48)
Afghanistan, Benin, Burkina Faso, Burundi, Central African Republic, Chad, Comoros, Congo Dem. Rep., Eritrea, Ethiopia, Gambia, Guinea,	Angola, Bangladesh, Bhutan, Bolivia, Cabo Verde, Cambodia, Cameroon, Congo, Côte d'Ivoire, Djibouti, Egypt, El	Albania, Algeria, Armenia, Azerbaijan, Belarus, Belize, Bosnia and Herzegovina, Botswana, Brazil, Bulgaria, China,	Antigua and Barbuda, Argentina, Australia, Austria, Bahamas, Barbados, Belgium, Canada, Chile, Croatia, Cyprus,

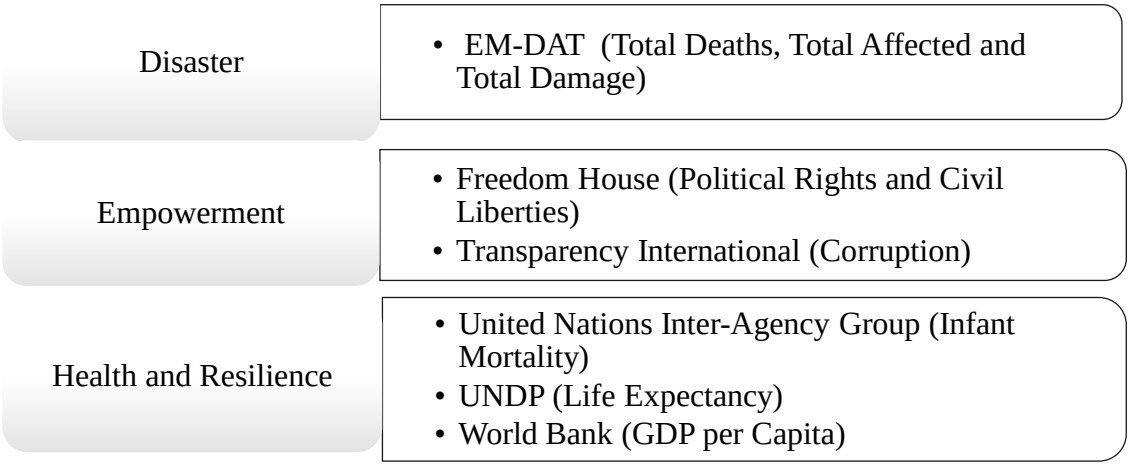
Guinea-Bissau, Haiti, Korea Dem. Rep., Liberia, Madagascar, Malawi, Mali, Mozambique, Nepal, Niger, Rwanda, Senegal, Sierra Leone, Somalia, South Sudan, Syria, Tajikistan, Tanzania, Togo, Uganda, Yemen Zimbabwe	Salvador, Georgia, Ghana, Honduras, India, Indonesia, Kenya, Kiribati, Kyrgyzstan, Lao, Lesotho, Mauritania, Micronesia, Moldova, Mongolia, Morocco, Myanmar, Nicaragua, Nigeria, Pakistan, Papua New Guinea, Philippines, Solomon Islands, Sri Lanka, Sudan, Swaziland, Timor-Leste, Tunisia, Ukraine, Uzbekistan, Vanuatu, Vietnam Zambia	Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, Ecuador, Equatorial Guinea, Fiji, Gabon, Grenada, Guatemala, Guyana, Iran, Iraq, Jamaica, Jordan, Kazakhstan, Lebanon, Macedonia, Malaysia, Maldives, Marshall Islands, Mauritius, Mexico, Montenegro, Namibia, Paraguay, Peru, Romania, Russia, Samoa, Serbia, South Africa, St. Lucia, St. Vincent and the Grenadines, Suriname, Thailand, Tonga, Turkey, Venezuela	Czech Rep., Denmark, Estonia, Finland, France, Germany, Greece, Hong Kong, Hungary, Ireland, Israel, Italy, Japan, Korea Rep., Latvia, Lithuania, Luxembourg, Netherlands, New Zealand, Norway, Oman, Panama, Poland, Portugal, Saudi Arabia, Seychelles, Singapore, Slovakia, Slovenia, Spain, Sweden, Switzerland, Taiwan, Trinidad and Tobago, United Kingdom, United States, Uruguay

3.4 Sources of Data and Collection Method

The data collection method is an integral part of the research process. In answering the research questions, the data collection focused on the key variables in the study. That is natural disaster, empowerment, health, and resilience. As a result, secondary data was collected electronically from multiple sources for the observation

period of 2000 to 2015. The data from these websites were in excel format, and were easily accessible, have a high-quality measure and provided the external validity that was needed for the study. These sources are listed in the diagram below:

Figure 3.1 Sources of Data



3.5 Data Processing and Methods of Analysis

The analysis of the data was carried out in four stages using both Excel and Stata 16.

3.5.1 Stage 1: Preparing the Data

In this stage, the data variables were combined into one complete dataset using Excel. The data was then exported to Stata to check for missing data and transform the necessary variables. As mentioned in the population description, we eliminated countries that have more than 10% of data missing across all variables. To transform the data and create consistency across the dataset, the disaster indicators (total deaths, total affected,

and total damaged) were normalized as per 10,000 population using the population figure per country for each year. This creates a unified measure and captures the size of the disaster impact on each country. The formula used was disaster indicator/population x 10000. The population data for each country was retrieved from the United Nations Department of Economics and Social Affairs Population Division (2019). The countries were then classified into four income groups. These groups are low, mid-low, mid-high, and high-income countries, as seen in Table 2, which is classified according to the World Bank Income grouping. As of July 2018, the World Bank defined low-income economies as those with a GNI per capita of $995 or less; lower-middle-income economies are those with a GNI per capita between $996 and $3,895; upper-middle-income economies are those between $3,896 and $12,055; high-income economies are those with a GNI per capita of $12,055 or more (The World Bank, 2018).

The empowerment indicators were standardized using a standard normal transformation to ensure that there is internal consistency among indicators. Transformation is used to add items together that are measured on different scales, which is the case with the empowerment indicators (1-7 and 0-100). As the indicators used to measure empowerment have different units of measurement, the scores for each of these indicators were averaged, that is, political rights (1-7), civil liberties (1-7), and corruption (0-100) for each country for the 16 years. The scores were then standardized using Stata to create new units of measurement for each indicator. These new scores were then averaged, creating one score for each country, which ranges from -1.80 to 1.68. This was

then grouped into the four categories, that is, low, mid-low, mid-high, and high freedom countries. Further details of this classification and the list of countries according to each category are summarized in table 3.3 below:

Table 3.3 Description and List of Countries for Empowerment Indicators

Empowerment Level	Countries
Low Freedom Countries (Score = -1.8 to -.55)	Afghanistan, Algeria, Angola, Azerbaijan, Belarus, Burundi, Cambodia, Cameroon, Central African Republic, Chad, China Congo, Congo Democratic Republic, Cuba, Cote d' Ivoire, Djibouti, Egypt, Equatorial Guinea, Eritrea, Ethiopia, Gambia, Guinea, Haiti, Iran, Iraq, Kazakhstan, North Korea, Kyrgyzstan, Lao's People Democratic Republic, Mauritania, Myanmar, Oman, Pakistan, Russia, Rwanda, Saudi Arabia, Somalia, South Sudan, Sudan, Swaziland, Syria, Tajikistan, Uzbekistan, Vietnam, Yemen, Zimbabwe
Moderately Low Freedom Countries (Score = -.74 to -.12)	Armenia, Bangladesh, Bhutan, Bosnia & Herzegovina, Burkina Faso, Colombia, Comoros, Ecuador, Fiji, Gabon, Georgia, Guatemala, Guinea-Bissau, Honduras, Jordan, Kenya, Lebanon, Liberia, Madagascar, Nepal, Nicaragua, Niger, Nigeria, Papua New Guinea, Paraguay, Sierra Leone, Solomon Islands, Sri Lanka, Tanzania, Thailand, Timor-Leste, Togo, Tunisia, Turkey, Uganda, Ukraine, Venezuela, Zambia
Moderately High Freedom Countries (Score = -.10 to .72)	Albania, Antigua & Barbuda, Argentina, Belize, Benin, Bolivia, Botswana, Brazil, Bulgaria, Croatia, Dominica Republic, El Salvador, Ghana, Greece, Grenada, Guyana, Hong Kong, India, Indonesia, Jamaica, South Korea, Latvia, Lesotho, Macedonia, Mali, Mexico, Mongolia, Montenegro, Namibia, Panama, Peru, Philippines, Romania, Samoa, Senegal, Serbia, Seychelles, Singapore, South Africa, Suriname, Tonga, Trinidad & Tobago, Vanuatu
High Freedom countries (score = .80 to 1.68)	Australia, Austria, Bahamas, Barbados, Belgium, Cabo Verde, Canada, Chile, Costa Rica, Cyprus, Czech Republic, Denmark, Dominica, Estonia, Finland, France, Germany, Hungary, Ireland, Israel, Italy, Japan, Kiribati, Lithuania, Luxembourg, Marshall

	Islands, Mauritius, Micronesia, Netherlands, New Zealand, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, St. Lucia, St. Vincent & the Grenadines, Sweden, Switzerland, Taiwan, United Kingdom, United States, Uruguay

3.5.2 Stage 2: Descriptive Analysis

To simplify and gain an in-depth understanding of the data, a descriptive analysis was conducted of all the indicators for each of the key variables. This includes indicators for natural disasters, empowerment, health, and resilience. The natural disaster indicators were examined to show the trends, frequency of occurrences, most affected countries, and to see whether low-income countries are more susceptible to natural disasters than high-income countries. This includes finding the averages of all the key indicators over the 16 years. All indicators were grouped by income levels except for health and resilience, which was grouped by both income and empowerment levels. This is to gain a further understanding of the health and resilience data based on country level empowerment and income levels. The data was displayed using tables and graphs.

3.5.3 Stage 3: Interrupted Time Series Analysis (ITSA)

The Interrupted Time Series Analysis (ITSA) was used to assess the disaster impact at a specified time and to determine the recovery pattern over the 16 years for each country. Though a specific measure for resilience was not identified, the ITSA was used to estimate how resilient are other measures in this study, that is, GDP, infant mortality, and life expectancy. Essentially, for this study, resilience is determined based on the

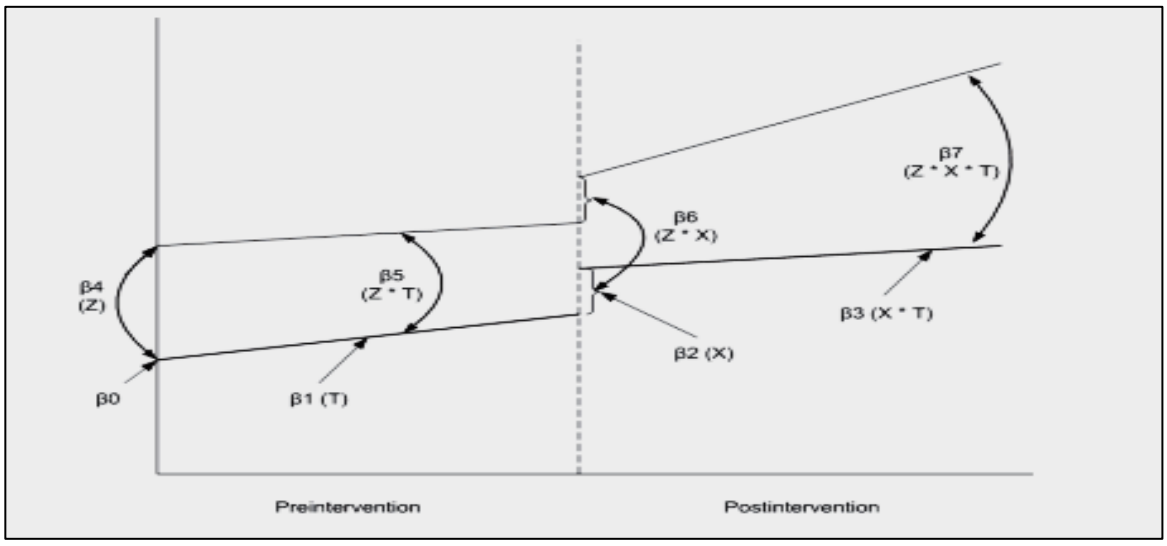
extent to which directly measured indicators such as GDP, infant mortality, and life expectancy “bounce back” following the impact of a natural disaster.

A single group ITSA was used to establish any changes after a significant impact of a natural disaster on a country. The single group ITSA is used when there is no comparison group, and the pre-event trend projected into the treatment period serves as the counterfactual (Linden A., 2015). To examine the recovery pattern of each country and to determine if highly empowered countries are more resilient than less-empowered countries, the ITSA approach measures whether outcome trajectories are changing after a disaster.

The analysis consists of four components, including the pre-event, the event, post-event, and post-event linear trend. For the ITSA, the study focused on the event (B2) and post-event (B3) which will be interpreted as the resilience measures. B2 is referred to as the immediate effect, which represents the immediate effect after the impact of a natural disaster, and B3 is referred to as post effect period, which is the changes over time in outcome following the impact of a natural disaster.

This diagram below is a visual depiction of an ITSA:

Figure 3.2 Visual Depiction of an ITSA from Linden and Adams (2011)



The diagram above shows both a single group (lower line) and a multiple group (upper and lower lines) ITSA whereby B2 represents the change in level in the outcome that occurs in the period immediately following the event initiation (compared with counterfactual), and B3 represents the difference between the pre-event and post-event slopes of the outcome (Linden, 2015). In this study, the slope represents the strength of resilience where a steeper slope suggests a quicker return to normalcy or greater resiliency. B2 is the one-time impact of the natural disaster, while B3 is the change in the slope from its original trend following the impact of the natural disaster. More importantly, B3 measures how much the outcome changes as a result of a natural disaster. In other words, B3 is the change in GDP per capita, infant mortality, and life expectancy over time following the impact of a natural disaster.

To determine the year for the immediate effect period (the event), the data were inspected visually for each country. The year that had the most significant disaster impact

for each country in terms of total affected, total deaths, and total damaged were used to conduct this analysis. While it is possible to have more than one significant disaster year, the ITSA model is used for single group analysis. That is why, the year with the greatest disaster impact was selected from total affected, total deaths or total damaged, whichever showed the greatest impacted year. As such, the year for the immediate effect periods varies by country. For this analysis, the coefficients of the ITSA were used for each of these periods for GDP, infant mortality, and life expectancy. The ITSA model is estimated using the Newey-West technique with one lag and is formulated as follows: "itsa (outcome indicator), single treat (country#) trperiod (year) lag (1) posttrend figure (post-event linear trend)." The coefficients scores derived from the ITSA were averaged to estimate the immediate effect and post effect period for each of these outcome indicators. These results were then grouped according to income levels and then presented in the forms of charts.

3.5.4 Stage 4: Ordinary Least Square (OLS) Regression Analysis

While the ITSA used a form of OLS regression analysis, the results did not provide a cause and effect in terms of empowerment but rather showed the impact of disasters on countries and the recovery trend in terms of GDP, life expectancy, and infant mortality. As such, nine OLS regression analyses were conducted to capture resilience, three for each of the outcome indicators. These analyses were used to determine the relationship between empowerment and resilience. Particularly, they were done to find out whether

empowerment influences recovery and if countries with a higher level of empowerment have greater resilience from the impact of a natural disaster.

The first three OLS regressions were done using the ITSA coefficient scores of GDP with immediate effect (B2), post effect (B3) and the post-event linear trend (post trend) as the dependent variables and political rights, civil liberties, corruption and income levels as the independent variables. The additional six analyses were done in like manner for infant mortality and life expectancy using the same dependent and independent variables. The ITSA estimates of B2 examined whether less empowered countries tend to experience more significant immediate impact than high empowered countries. At the same time, B3 measured the effect of empowerment on resilience, and the post trend assessed the resilience trend after the impact of a natural disaster.

CHAPTER 4: RESULTS

Three sets of results are reported in this chapter. The first set consists of the findings from the descriptive analysis for each of the variables used in this study. The second set of results includes a summary of the interrupted time series analysis (ITSA) model, which displays the average coefficient scores of each of the resilience indicators by income and empowerment levels. The final sets of results consist of the findings of the ordinary least square regression analyses using the resilience measures as the dependent variables and the empowerment indicators and income levels as the independent variables.

4.1 Descriptive Analysis

4.1.1 Natural Disasters

The countries included in the study varied widely in terms of economic development and empowerment levels. A total of 177 countries were included: 34 countries were low-income countries, 44 were low to middle-income countries, 51 were middle to high-income countries, and 48 were high-income countries. The table below summarizes the disaster data for the relevant period under study by providing the averages for each disaster indicators classifying the countries by income levels:

Table 4.1 16-Year Average for Disaster Indicators by Country Income Groups

Mean disaster indicators by income groups (177 countries) for the 2000-2015 observation period per 10,000 population				
Income Level	**occurrence**	**total deaths**	**total affected**	**total damages (US Dollar)**
Low-Income Countries (34)	2.26	0.60	288.89	$31,417.26
Mid-Low-Income Countries (44)	2.82	0.14	260.41	$58,713.01
Mid-High-Income Countries (51)	2.32	0.07	154.33	$353,205.90
High-Income Countries (48)	2.00	0.05	27.56	$394,419.30

Table 4.1 illustrates that all countries experience almost the same frequency of disaster occurrences per year. However, mid-low-income countries are shown to have higher disaster occurrences than all the other income levels. High-income countries experience the lowest occurrence but suffer the most cost in damages and have the least affected. On the other hand, low-income countries suffer the least in terms of cost in damages but record the most deaths from the impact of natural disasters.

The table also shows that on average mid- low-income countries experience approximately three disasters per year (n=2.82), with low- and mid-high-income countries having approximately two disasters per year (n=2.26) and (n=2.32) respectively. High-income countries have the lowest occurrence of disasters per year (n=2.00) but experience the most significant costs in damages (n=$394,419.30) per 10,000 population. While low- and mid-low-income countries have the least costs in damages, they experience the most

deaths and are most affected overall. The deaths from the impact of disasters amount to 0.60 and 0.14 per 10,000 population for low- and mid-low-income countries, respectively.

4.1.2 Disaster Indicators by Year and Country Income Groups

The graphs below show the trends for each disaster indicators over the 16-year observation period.

4.1.2.1 Occurrence

Figure 4.1. Average Occurrence by Country Income Groups

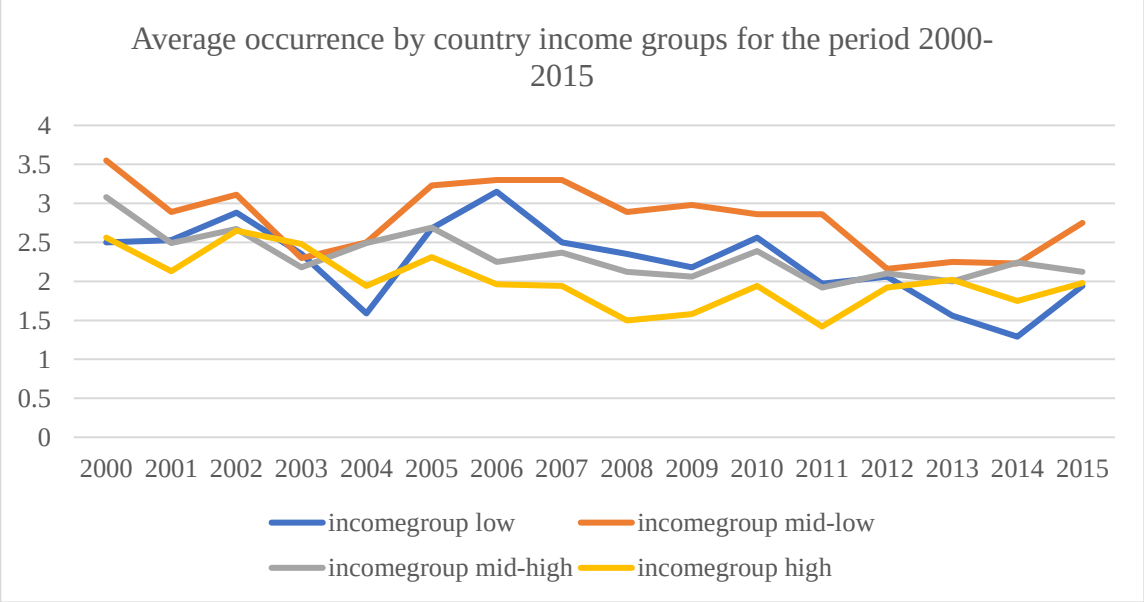
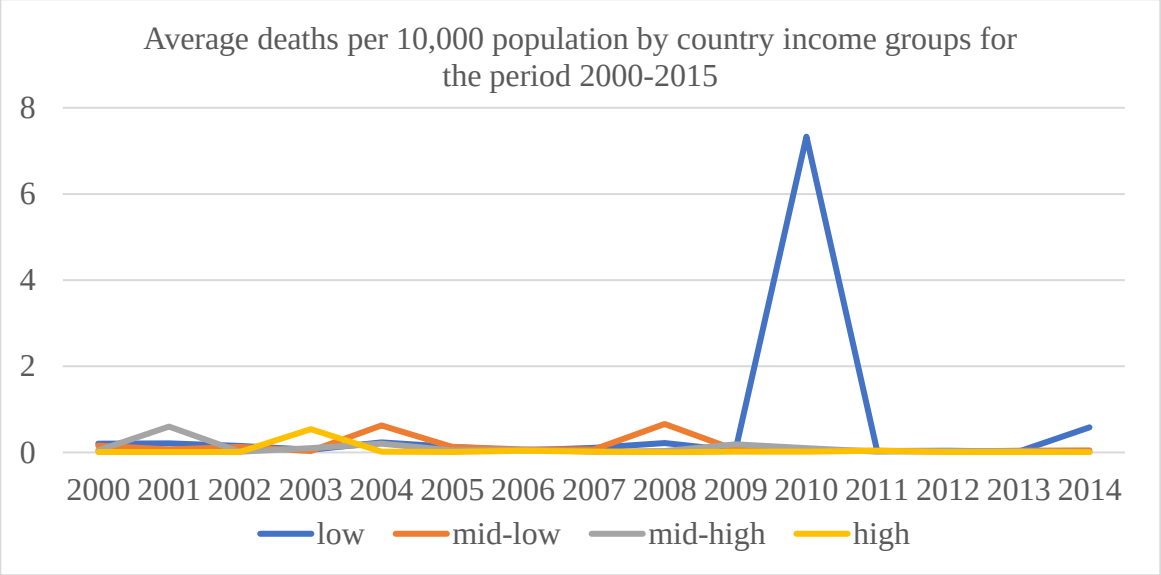


Figure 4.1. illustrates that almost every year, mid-low-income countries experience more disaster occurrences with the highest occurrences happening in the year 2000 (n=3.55) and the least happening in the year 2012 (n=2.16). Low-income countries experience, on average, between one and three disasters per year with the highest

occurrences happening in 2006 (n=3.15) and the lowest in 2014 (n=1.29). The disaster occurrences for mid-high-income countries remain consistent over the 15 years with the highest and lowest occurrence happening in 2000 (3.08) and 2011 (1.92), respectively. As mentioned before, high-income countries have the fewest disaster occurrences except in 2004 and 2014, where low- income countries experienced the least disaster occurrences.

4.1.2.2 Total Deaths

Figure 4.2 Average Total Deaths by Country Income Groups



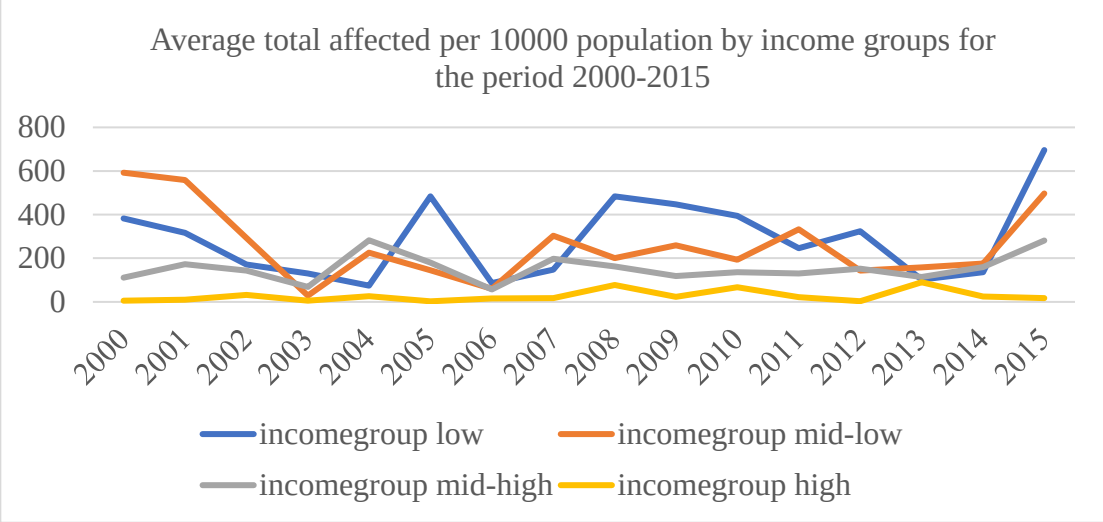
The data displayed in figure 4.2 shows that low- and mid-low-income countries have the most deaths with 2010 recording the highest number of persons to die from the impact of a natural disaster. In 2010, low-income countries recorded an average of 7.3 deaths per 10,000 population. However, it appeared that the spike in deaths for low-income countries in that year was as a result of the earthquake in Haiti. Of the 177

countries, Haiti recorded the highest number of deaths for that year, a total of 231 per 10,000 population. The average number of deaths per year for low- and mid-low-income countries is approximately 0.6 and 0.14 per 10,000 population, respectively. High-income countries recorded an average of 0.05 deaths per 10,000 population, with the highest amount being in 2003, an average of 0.54 per 10,000 population. The average number of persons that died from the impact of natural disasters per year in mid-high- income countries is 0.1 per 10,000 population with 2004 and 2008, showing the highest number of deaths.

4.1.2.3 Total Affected

Total affected includes the sum of injured persons, those that are homeless and those affected from the impact of a natural disaster where affected are people requiring immediate assistance during a period of emergency i.e., requiring basic survival needs such as food, water, shelter, sanitation and immediate medical assistance (EM-DAT, n.d.). Figure 4.3 below represents the average total affected by country income levels.

Figure 4.3 Average Total Affected by Country Income Groups



In figure 4.3, all four country income groups fluctuated over the years in terms of total affected by natural disasters. However, low- and mid-low-income countries showed the greatest fluctuations and were the most affected. It is important to note that while low- and mid-low countries show the highest numbers for total affected, some of these countries recorded little to no deaths from the impact of natural disasters. The average total affected for low-income countries ranges from 74.52 per 10,000 population in 2004, being the lowest number of people affected to the highest being 696.02 per 10,000 population in 2015. As it relates to mid-low-income countries, the lowest number of people affected was in 2003, which amounted to an average of 28.7 per 10,000 population. The highest number of people affected in this income group is an average of 592.17 per 10,000 population, which occurred in the year 2000. Mid-high-income countries showed a high and low of total affected to be an average 57.11 per 10,000

population in 2006 and 282.47 per 10,000 population in 2004, respectively. High-income countries are the least affected, with the lowest amounted to be an average of 3.1 per 10,000 population in 2012 and the highest being 89.97 per 10,000 population in 2013.

4.1.2.4 Total Damaged

Total Damaged represents the amount of damage to property crops and livestock. The value of estimated damage is given in US$ and is calculated per 10,000 population.

Figure 4.4 Average Total Damaged by Country Income Groups

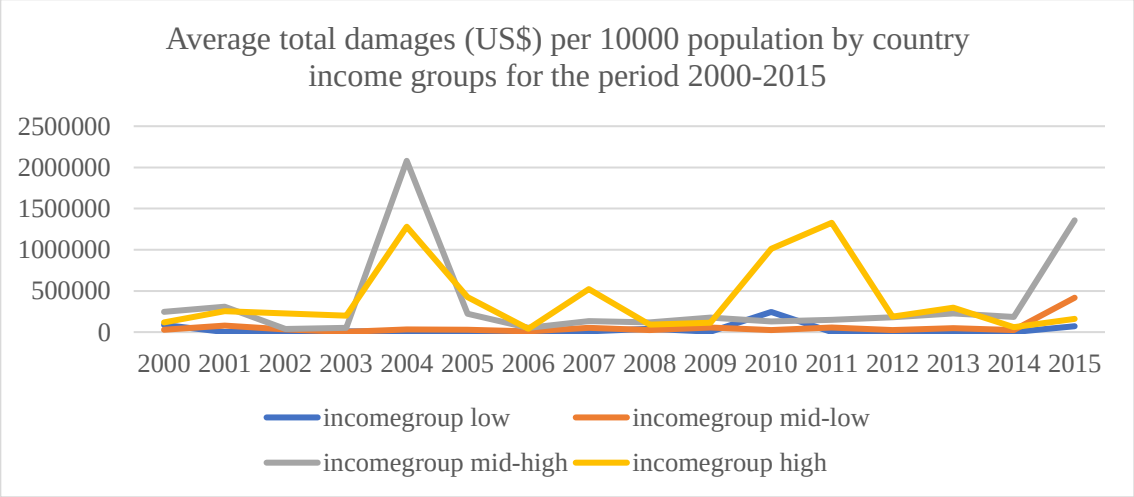


Figure 4.4 displays the average total damaged by income levels. Figure 4.4 shows that, while every income group experienced some amount of costs in damages, high and mid-high-income countries experienced the most damages in costs. For high-income countries, the greatest costs in damages were in 2004 and 2011 totaling an average of US$1,278,240 and US$1,327,213 per 10,000 population, respectively. The lowest costs in damages averaged US$40,457.21 in 2006 and US$58,769.04 in 2014 per 10, 000

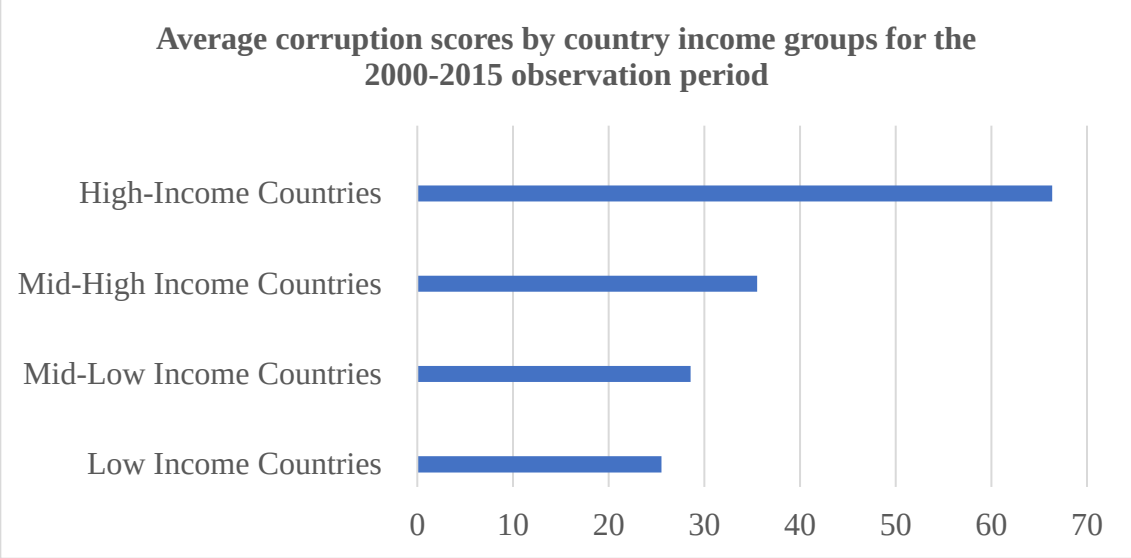
population. Mid-high-income countries also experienced comparably higher costs in damages, with the highest being recorded in 2004 and 2015. In 2004, the highest amount recorded was an average of US$2,079,729 per 10,000 population and an average of US$1,355,911 per 10,000 population in 2015. The highest costs in damages for low and mid-low-income countries averaged US$244,525.40 and US$417,536.80 per 10,000 population in 2010 and 2015, respectively. The lowest costs in damages for these income groups were an average of US$683.16 per 10,000 population in 2014 for low-income countries and an average of approximately US$2992.92 per 10,000 population in 2003 for mid-low-income countries.

4.1.3 Empowerment

To have a better understanding of the empowerment data, a descriptive analysis of the empowerment indicators, which included political rights, civil liberties, and corruption was conducted. The charts below illustrate these results:

Figure 4.5 Average Civil Liberties and Political Rights Scores by Country Income Groups

Figure 4.6 Average Corruption Scores by Country Income Groups



Figures 4.5 and 4.6 show the average civil liberties, political rights, and corruption scores for countries according to income levels. As mentioned previously in the methodology, political rights and civil liberties are measured on a scale of 1 to 7, with 1 being the highest degree of freedom level and 7, the lowest degree of freedom. Concerning corruption, the corruption scale ranges from 0 to 100, with 0 being highly corrupt and 100 being very clean of corruption. The diagrams above follow a specific order in terms of freedom and corruption scores with high-income countries having the most freedom and being the least corrupt. At the same time, low-and middle-low-income countries are having less freedom and being the most corrupt. The analysis shows that high-income countries score an average of approximately 1.6 in terms of political rights and civil liberties and 67 for corruption with low-income scores being around 5 for political rights and civil liberties and 26 for corruption. The analysis further showed that

mid-high-income countries have a slightly higher freedom level than mid-low countries, showing average scores of approximately 3.5 and 4, respectively. Likewise, the corruption scores reflect the same order with mid-high-income countries scoring about 36 and mid-low-income countries scoring 29. See Appendix A for the list of countries with the average scores for civil liberties, political rights, and corruption.

4.1.4 Health

4.1.4.1 Life Expectancy and Infant Mortality

The health indicators are important in this study because the aim is to find out if empowerment influences the resilience of countries to maintain health after a natural disaster. As a result, a descriptive analysis was done to get a better interpretation of the health data for the observed countries. This analysis grouped countries by both country income groups and empowerment levels. Infant mortality is expressed as per 1000 live births and Life expectancy is expressed as years. The bar charts below summarize this:

Figure 4.7 Infant Mortality and Life Expectancy by Country Income Groups

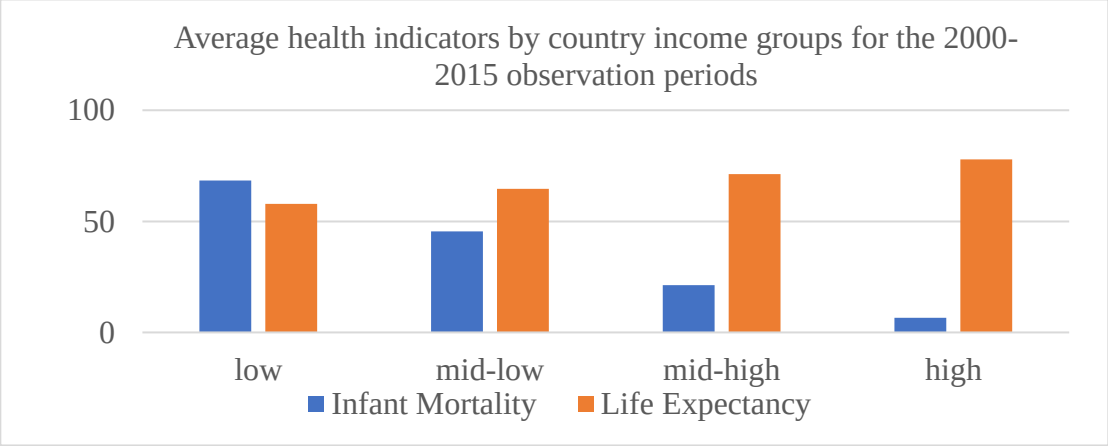


Figure 4.7 above simplifies the data for the health indicators, which include infant mortality and life expectancy grouped by country income groups. The chart shows that high-income countries experienced the least number of deaths in infants. The results of both health indicators show a substantially better outcome for high and upper-middle-income countries. This means that these countries have low infant mortality rates and the ability to live longer, healthier lives. However, mid-low-income countries have higher infant mortality rates and lower life expectancy than mid-high- and high-income countries. Alternatively, the results show a negative outcome for both indicators in low-income countries, showing significantly high rates in infant mortality and low scores in life expectancy in comparison to all other income groups. This suggests that these countries have a higher rate of infant mortality and limited ability to live longer lives than the other groups of countries.

Figure 4.8 Infant Mortality and Life Expectancy by Empowerment Levels

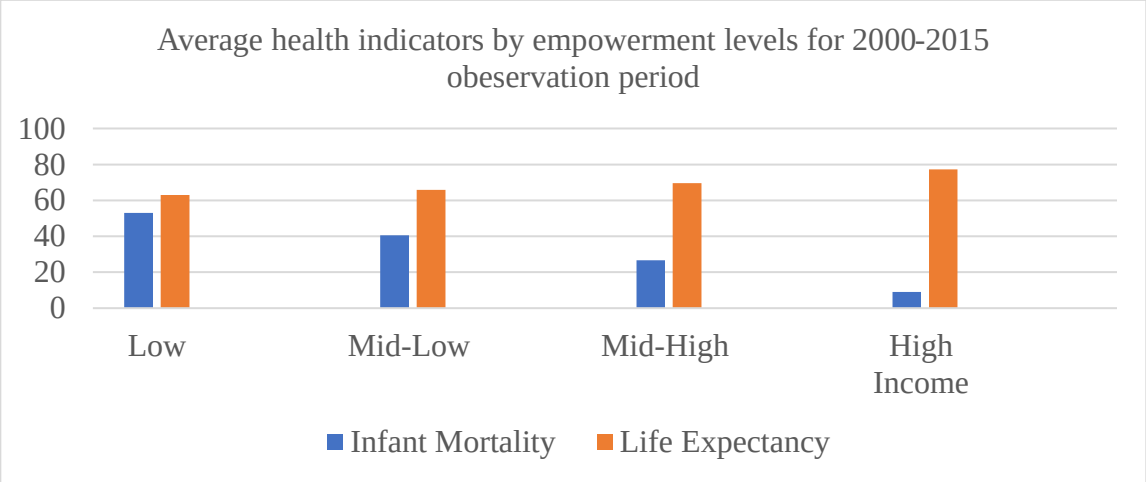


Figure 4.8 shows the results of the health indicators classified by empowerment levels. These results show similar results to those in figure 4.7 with high empowered countries having better outcomes in both health indicators than other countries with empowered levels. In figure 4.8, high empowered countries have the lowest infant mortality rates of an average rate of 9 infant mortalities and the highest life expectancy of an average of 77 years old for the observation period 2000-2015. Followed by high empowered countries, in terms of better health outcomes, is mid-high empowered countries showing an average rate of 27 infant mortalities per 1000 live births and an average of 70 years in life expectancy rate. On the other hand, low empowered countries fared the worst, having the highest infant mortality rates of an average of 53 per 1000 live births and the lowest life expectancy showing an average of 63 years while the results for mid-low empowered countries show an infant mortality rate of 41 per 1000 live births and a life expectancy of 66 years.

4.1.5 Resilience

GDP per capita, life expectancy, and infant mortality are used to measure the resilience of a country to maintain health after the impact of a disaster. Figure 4.7 above already provided a descriptive analysis of infant mortality and life expectancy by income levels, showing high-income countries having the lowest infant mortality per 1000 live births (n=6.51), followed by mid-high (n=21.16), mid-low (n=45.50) and with low-income countries having the highest rate (n=68.40). As it relates to life expectancy, high-income countries, and mid-high-income countries having the highest, while mid-low and

low-income countries have the lowest life expectancy, respectively. Besides, peoples in high-income countries are expected to live 20 years (n=77.93) longer than in those in low-income countries (n=57.85). Mid-high-income countries life expectancy is 71 years (n=71.21) and mid-low income is almost 65 years (n=64.63).

4.1.5.1 GDP per Capita

Figure 4.9 GDP Per Capita by Country Income Groups

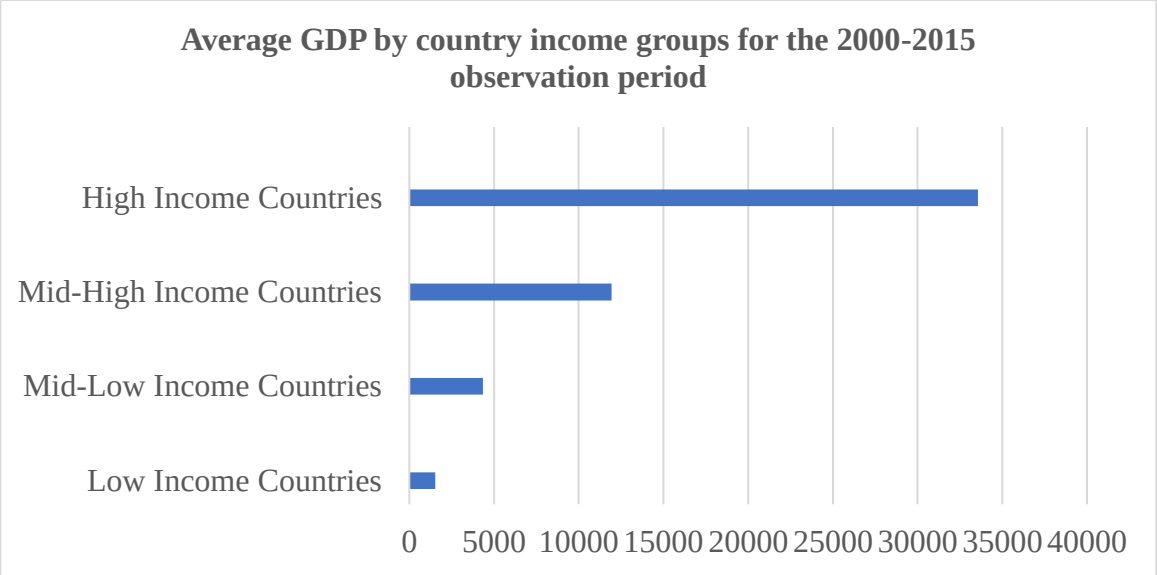
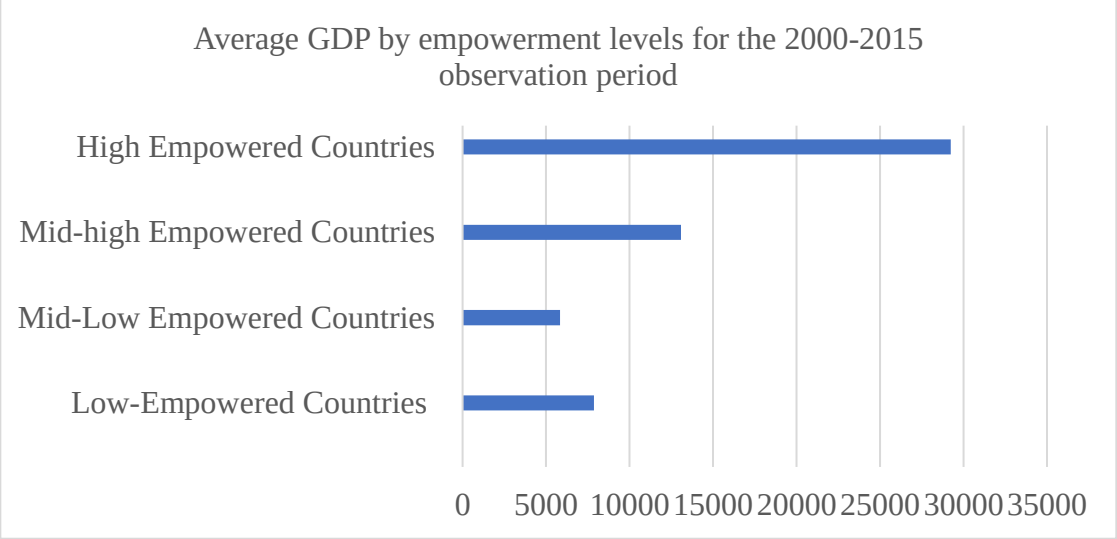


Figure 4.9 shows that high-income countries have a higher GDP per capita than all other country income groups. The average GDP per capita for high-, mid-high-, mid-low- and low-income countries are approximately US$34000, US$12000, US$4400 and US$1500 respectively.

Figure 4.10 GDP Per Capita by Empowerment Levels



As it relates to GDP by empowerment levels, figure 4.10 above shows a similar comparison to GDP by income levels. GDP by empowerment levels showed high empowered countries having a higher GDP per capita (n = US$29,237.56) than all other empowered levels. However, the difference with GDP by empowerment levels is that mid-low empowered countries showed a lower GDP per capita (n = US$5,829.45) than low empowered countries (n = US$7,829.45). Followed high empowered countries are mid-high empowered countries with an average GDP per capita of US$13,076.45.

4.2 Interrupted Time Series Analysis (ITSA)

Data from 177 countries were used to conduct this analysis. Using the whole time series for each country, which is from the year 2000 to 2015, the ITSA was used to determine the impact and recovery pattern of countries after they experience the impact of a natural disaster. As such, a descriptive analysis of the average coefficient scores derived

from the ITSA analysis for each of the outcome indicators (infant mortality, GDP, and life expectancy) is presented. As described in the methodology of this study on page 67, the ITSA was done by taking the 16-year period of each country and identifying the most impactful natural disaster that occurred during this period. That is, taking the most significant disaster year for each country whether that represents total affected, total deaths or total damaged. The natural disaster interrupts the time series. The ITSA then estimates the immediate impact of the disaster (B2) and the recovery from the disaster (B3). As mentioned in Chapter 3, The standard ITSA regression model assumes the following form: $Y_t = \beta_o + \beta_1 T_t + \beta_2 X_t + \beta_3 X_t T_t + \epsilon_t$.

The regression coefficients derived from each of these analyses were taken for each outcome indicators (GDP per capita, life expectancy, and infant mortality) for each country, averaged and then grouped by country income groups and empowerment levels. As explained in the methodology, the empowerment indicators were recoded as they had a different scale of measurements, For the ITSA, empowerment levels range from a score of -1.8, representing low freedom countries to 1.68, representing high freedom countries. The results of the ITSA is displayed for each indicator using tables and is further explained below.

4.2.1 GDP by Country Income Groups

Table 4.2 Average ITSA Coefficient Scores for GDP Per Capita by Country Income Groups

GDP		
Income Level	**Immediate Effect**	**Post Effect**
low	11.64	5.72
mid-low	28.54	26.95
mid-high	421.05	-128.75
high	283.04	-249.36

Table 4.2 shows the results of the ITSA coefficient scores for all income groups for the immediate effect (B2) and post effect (B3) event periods. In the first year of the event (B2) or immediate effect period, all income groups showed an increase in GDP per capita with low and mid-low-income countries showing the lowest growth. Alternatively, high and mid-high-income countries showed the most significant increase in GDP per capita during this period. Also, they were the only two income groups to show a decrease in GDP per capita during the post-event (B3) or post effect period. However, in this period, low and mid-low countries continue to show an increase in GDP per capita.

To provide a visual understanding of the ITSA, an example of a single group ITSA is used to assess the impact of natural disasters in terms of GDP using Afghanistan as the country and 2011 as the event year. The year of event for Afghanistan was determined using total damaged. Although there were other significant impacted years indicated in total deaths and total affected, total damaged was most significant in 2011 than all the

other years combined. The model is estimated using the Newey-West technique with one lag. These results are shown in the diagrams below:

Table 4.3 Results of Single Group ITSA with Newey West Standard Errors and One Lag

```
        panel variable:  c_id (strongly balanced)
         time variable:  year, 2000 to 2015
                 delta:  1 unit

Regression with Newey-West standard errors      Number of obs      =         14
maximum lag: 1                                  F(  3,        10)  =      67.69
                                                Prob > F           =     0.0000
```

gdp	Coef.	Newey-West Std. Err.	t	P>|t|	[95% Conf.	Interval]
_t	71.54573	13.80132	5.18	0.000	40.79447	102.297
_x2011	158.5131	114.4136	1.39	0.196	-96.41625	413.4424
_x_t2011	-57.96623	22.08026	-2.63	0.025	-107.1641	-8.768348
_cons	998.4617	61.36604	16.27	0.000	861.7297	1135.194

Postintervention Linear Trend: 2011

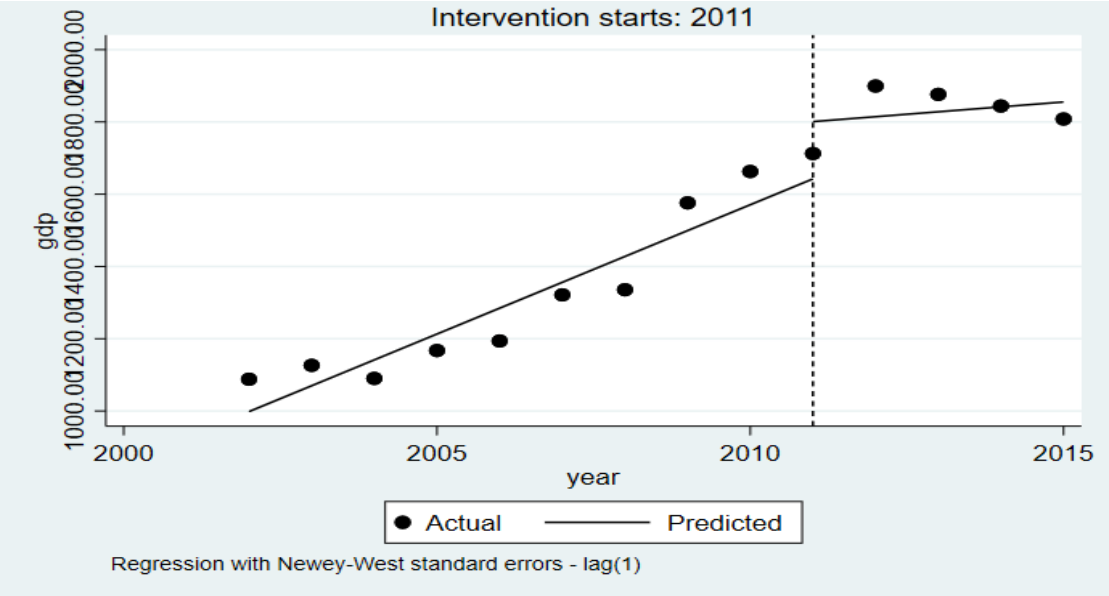
Treated: _b[_t]+_b[_x_t2011]

Linear Trend	Coeff	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Treated	13.5795	21.1815	0.6411	0.5359	-33.6159	60.7749

As shown in the regression table (table 4.3) above, before the event, the GDP per capita in Afghanistan was estimated to be US$998.46 showing a significant yearly increase of US$71.54 (P < 0.0001, CI = [4.79 – 102.30]), prior to the time series interruption due to disaster in 2011. In 2011, the immediate effect period (B_2), though not significant, GDP per capita shows a further increase of US$158.51 (P < 0.0001, CI = [-96.42 – 413.44]). Followed the immediate effect period is the post effect (B_3) which shows a significant decrease in the annual trend of GDP per capita of US$57.97 (P < 0.0001, CI = [-107.16 – [-8.77]). Also, the results show that at the post-event linear trend period, there appeared to be an annual increase in GDP at a rate of US$13.58 (P <

0.0001[-33.62 – 60.78]). A visual depiction of these results is shown in figure 4.11 below:

Figure 4.11 Results of Single Group ITSA with Newey West Standard Errors and One Lag



4.2.2 GDP by Empowerment Levels

Table 4.4 Average ITSA Coefficient Scores for GDP by Empowerment Levels

GDP		
Empowerment Level	**Immediate Effect**	**Post Effect**
Low	345.79	-90.02
mid-low	242.67	-10.12
mid- high	174.59	-183.08
high	64.38	-110.21

Table 4.4 shows that in the immediate effect period, all countries regardless of empowerment levels experience an increase in GDP per capita. This may be as a result of the rebuilding efforts that take place after the impact of a disaster whereby high and mid-high empowered countries use their resources to build new infrastructure and pump money into their economies and low and mid-low received substantial international aids, all of which may lead to higher output causing a rise in GDP. However, mid-high and high empowered countries were the most affected, having the lowest increase in GDP per capita. Alternatively, in the post effect period, there was a negative effect on GDP per capita at all levels of empowerment, showing a decrease in GDP per capita. Though all empowerment levels seem to experience a decrease in GDP per capita in the post effect period, mid-low empowered countries were least affected in terms of GDP per capita with mid-high empowered countries showing the highest decrease.

4.2.3 Infant Mortality by Income Levels

Table 4.5 Average ITSA Coefficient Scores for Infant Mortality by Country Income Groups

Infant Mortality		
Income Level	**Immediate Effect**	**Post Effect**
low	0.58	0.82
mid-low	-0.17	0.34

mid-high	0.22	0.23
high	-0.01	0.05

The diagram above (Table 4.5) indicates that in the immediate effect period, low-income and mid-high-income countries showed an increase in infant mortality with low-income countries showing the highest increase. Although high-income countries showed a decrease in infant mortality, it was not a significant decline. In comparison, mid-low-income countries showed a greater decline than high-income countries.

In the post effect period, all income groups showed an increase in infant mortality. Mid-low and mid-high-income countries showed almost the same level of increase with mid-low-income countries showing a slightly higher increase than mid-high-income countries. On the other hand, low-income countries showed the greatest increase which was even greater than in the immediate effect period. High-income countries showed the lowest level of increase in infant mortality in this period.

4.2.4 Infant Mortality by Empowerment Levels

Table 4.6 Average ITSA Coefficient Scores for Infant Mortality by Empowerment Levels

Infant Mortality		
Empowerment Level	**Immediate Effect**	**Post Effect**
Low	0.10	0.26
mid-low	0.16	0.77

mid- high	0.18	0.23
high	0.10	0.02

Table 4.6 shows that all empowerment levels experience an increase in infant mortality in the immediate effect period. However, mid-low and mid-high -empowered countries showed the highest increase while low and high empowered countries showed the same level of increase in infant mortality rates. Similarly, in the post-effect period, all empowerment levels showed an increase in infant mortality with mid-low showing a significantly higher increase than the other empowered levels and high empowered countries showing the lowest increase in infant mortality rates.

4.2.5 Life Expectancy by Income Levels

Table 4.7 Average ITSA Coefficient Scores for Life Expectancy by Country Income Groups

Life Expectancy		
Income Level	**Immediate Effect**	**Post Effect**
low	0.12	0.04
mid-low	0.19	-0.01
mid-high	0.13	0.05
high	-0.08	-0.02

In Table 4.7, at the immediate effect period, all income groups showed an increase in life expectancy except for high-income countries which showed a decrease in this period. Interestingly, in the post effect period low and mid-high-income countries showed an increase in life expectancy while mid-low and high-income countries showed a decrease.

4.2.6 Life Expectancy by Empowerment Levels

Table 4.8 Average ITSA Coefficient Scores for Life Expectancy by Empowerment Levels

Life Expectancy		
Empowerment Level	**Immediate Effect**	**Post Effect**
Low	0.16	0.09
mid-low	0.18	-0.06
mid- high	0.08	0.05
high	-0.06	-0.01

Table 4.8 shows that life expectancy increases at all empowerment levels in the immediate effect period except for high empowered countries which is the only level that showed a decrease in life expectancy. In this period, both low and mid-low empowered countries showed greater levels of increase in life expectancy than mid-high empowered countries which showed a slight increase. However, in the post effect period, low and

mid-high empowered countries showed an increase in life expectancy while mid-low and high empowered countries showed a decrease.

4.3 OLS Regression Analysis

The OLS regression analysis was conducted to determine the association between empowerment and resilience in terms of GDP, infant mortality and life expectancy. More importantly, the OLS regression analyses are to determine the association between empowerment and resilience in the immediate effect and the post effect period of a natural disaster. The post trend estimates will also be displayed to further assess this relationship. The confidence interval for all analyses is at the 95% confidence level. The main dependent variables in this study were immediate effect (B2), post effect (B3), and post trend which represent the ITSA coefficient scores, derived from each of the ITSA that was done using GDP, infant mortality and life expectancy based on the most impacted disaster year for each country. The independent variables were the empowerment indicators, that are civil liberties, political rights, and corruption as well as country income groups. In these analyses, the dependent variables captured the immediate impact of a disaster (B2) (where B2 is the change in GDP level, infant mortality level or life expectancy level), the recovery from a disaster (B3) and the post trend (the interaction between the pre-event (B1) and the recovery (B3) periods. The null hypothesis is that there is no association between a country's level of empowerment and its resilience to maintain health after the impact of a disaster. These results are summarized below:

4.3.1 Immediate Effect OLS Regression Results Based on GDP ITSA Coefficient Scores

Table 4.9 OLS Regression for Immediate Effect (B2 where B2 is GDP) and Civil Liberties, Political Rights, Corruption and Country Income Groups

```
. regress B2 incomegrp civ_libs poli_rights corr
```

Source	SS	df	MS	Number of obs	=	170
				F(4, 165)	=	3.92
Model	36814973.7	4	9203743.43	Prob > F	=	0.0045
Residual	387257989	165	2347018.12	R-squared	=	0.0868
				Adj R-squared	=	0.0647
Total	424072963	169	2509307.47	Root MSE	=	1532

B2	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
incomegrp	411.0133	158.8015	2.59	0.011	97.46839	724.5583
civ_libs	350.5113	283.6741	1.24	0.218	-209.5879	910.6104
poli_rights	-2.694547	220.6859	-0.01	0.990	-438.427	433.0379
corr	8.00014	9.756368	0.82	0.413	-11.26328	27.26356
_cons	-2323.365	730.9505	-3.18	0.002	-3766.587	-880.1425

Concerning GDP, table 4.9 presents the findings of the effect of empowerment measures and country income groups on resilience in the immediate effect period of a natural disaster. As evident in table 4.9, the results showed an overall statistically significant linear trend concerning the effect of empowerment and country income groups on resilience at the immediate effect ($P > F = 0.0045$). The results also showed that regards to GDP, political rights, civil liberties, and corruption do not affect resilience in this period of a natural disaster ($p = 0.218$, $p = 0.990$ and $p = 0.413$, respectively). However, when holding all other variables constant, country income groups are positively

significantly correlated with resilience at the immediate effect (P = 0.011). This means that countries with high incomes (those that belong to high-income groups) experience high immediate disaster impact.

4.3.2 Post Effect OLS Regression Results Based on GDP ITSA Coefficient Scores

Table 4.10 OLS Regression for Post Effect (B3 – measured in terms of GDP change) and Civil Liberties, Political Rights, Corruption and Country Income Groups

```
. regress B3 incomegrp civ_libs poli_rights corr
```

Source	SS	df	MS		
Model	2799149.47	4	699787.367	Number of obs	= 170
Residual	49793023.9	165	301775.903	F(4, 165)	= 2.32
				Prob > F	= 0.0592
Total	52592173.4	169	311196.292	R-squared	= 0.0532
				Adj R-squared	= 0.0303
				Root MSE	= 549.34

B3	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
incomegrp	-153.5045	56.94278	-2.70	0.008	-265.9349	-41.07407
civ_libs	60.31288	101.7194	0.59	0.554	-140.5265	261.1523
poli_rights	-33.82346	79.1332	-0.43	0.670	-190.0677	122.4207
corr	6.111727	3.498422	1.75	0.082	-.7957183	13.01917
_cons	-28.2795	262.103	-0.11	0.914	-545.7877	489.2287

Table 4.10 shows the results of the effect of the empowerment measures and country income groups on resilience based on GDP in the post effect period of a natural disaster. In terms of GDP, the overall results showed little association between empowerment, country income groups and resilience (P > F = 0.0592). This means that while some variables are strongly correlated, others are not. To confirm this, the results show a negative significant association between resilience and group income groups (P =

0.008), and marginally significant association with corruption (p = 0.082). All the other variables do not show any significant correlation with resilience measure. These results further illustrate that resilience in terms of GDP, increases in low-income countries, and slightly increases when corruption increases. There is a possibility that GDP increases in low-income countries because of new investments they might have received in terms of international aids causing huge economic gains, thereby adding to their increase in resiliency. The results show that political rights and civil liberties relating to GDP do not affect resilience in the aftermath of a natural disaster.

4.3.3 Post Trend OLS Regression Results Based on GDP ITSA Coefficient Scores

Table 4.11 OLS Regression for Post Trend and Civil Liberties, Political Rights, Corruption and Country Income Groups

```
. regress postintlineartrend incomegrp civ_libs poli_rights corr
```

Source	SS	df	MS		
Model	3135048.81	4	783762.203	Prob > F	0.0024
Residual	29879316.1	165	181086.764	R-squared	0.0950
Total	33014364.9	169	195351.272	Adj R-squared	0.0730
				Root MSE	425.54

postintlin~d	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
incomegrp	121.5285	44.11027	2.76	0.007	34.4352	208.6219
civ_libs	35.65104	78.79612	0.45	0.652	-119.9276	191.2297
poli_rights	13.47975	61.29991	0.22	0.826	-107.5536	134.5131
corr	3.016275	2.710025	1.11	0.267	-2.334523	8.367072
_cons	-390.3791	203.036	-1.92	0.056	-791.2628	10.50448

The results presented in table 4.11 indicate a strong correlation between resilience, country income groups, and empowerment in terms of GDP per capita ($p>F = 0.0024$) in the post trend. Though the overall model is statistically significant, country income groups was the only variable to show a positive statistically significant association with resilience in terms of GDP per capita ($p = 0.007$). This means that after the impact of a natural disaster, the resilience of countries in high-income groups also increases. The model shows no statistically significant relationship between resilience and other variables. In other words, empowerment does not appear to be strongly correlated with resilience in this model.

4.3.4 Immediate Effect OLS Regression Results Based on Infant Mortality ITSA Coefficient Scores

Table 4.12 OLS Regression for Immediate Effect (B2 where B2 is infant mortality) and Civil Liberties, Political Rights, Corruption and Country Income Groups

```
. regress B2 incomegrp civ_libs poli_rights corr
```

Source	SS	df	MS	Number of obs	=	170
				F(4, 165)	=	3.16
Model	50.0872911	4	12.5218228	Prob > F	=	0.0155
Residual	653.073047	165	3.95801846	R-squared	=	0.0712
				Adj R-squared	=	0.0487
Total	703.160338	169	4.16071206	Root MSE	=	1.9895

B2	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
incomegrp	-.1109666	.2086427	-0.53	0.596	-.5229202	.300987
civ_libs	1.159195	.367981	3.15	0.002	.4326364	1.885753
poli_rights	-.9831539	.2866279	-3.43	0.001	-1.549085	-.4172228
corr	.0053593	.012719	0.42	0.674	-.0197537	.0304722
_cons	-.349714	.9510369	-0.37	0.714	-2.227485	1.528057

Concerning the relationship between empowerment, country income groups, and resilience relating to infant mortality at the immediate effect of a natural disaster, the results in Table 4.12 show that civil liberties and political rights strongly correlates in this period (p = 0.002, p = 0.001), while income levels and corruptions showed no statistical correlation (p = 0.596, p = 0.674). However, civil rights showed a positive association while political rights showed a negative association. This means that as civil liberties increase and political rights decrease, resilience in terms of infant mortality increases in this period of a disaster impact.

4.3.5 Post Effect OLS Regression Results for Infant Mortality

Table 4.13 OLS Regression for Post Effect (B3) and Civil Liberties, Political Rights, Corruption and Country Income Groups

```
. regress B3 incomegrp civ_libs poli_rights corr
```

Source	SS	df	MS	Number of obs	=	170
				F(4, 165)	=	3.42
Model	11.64965	4	2.91241251	Prob > F	=	0.0102
Residual	140.479292	165	.85138965	R-squared	=	0.0766
				Adj R-squared	=	0.0542
Total	152.128942	169	.900171256	Root MSE	=	.92271

B3	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
incomegrp	-.2680181	.0967673	-2.77	0.006	-.4590798	-.0769564
civ_libs	.1095935	.1706674	0.64	0.522	-.2273801	.446567
poli_rights	-.0945229	.1329363	-0.71	0.478	-.3569984	.1679527
corr	.002996	.005899	0.51	0.612	-.0086512	.0146432
_cons	.8804	.4410853	2.00	0.048	.009501	1.751299

Table 4.13 represents the results of the OLS regression analysis to determine if there is an association between empowerment, country income groups, and resilience in the post effect period of a natural disaster concerning infant mortality. In this analysis, all empowerment measures show no correlation with resilience except for income groups which show a negative significant effect on resilience measure in this period. The results showed country income groups to be strongly correlated with resilience measures (P = 0.006). This means that during the post effect period of a natural disaster, those countries in low-income groups experience increases in resilience (lower infant mortality rates). The results further reveal that civil liberties, political rights, and corruption are not directly related to resilience concerning infant mortality in this period.

4.3.6 Post Trend OLS Regression Results for Infant Mortality

Table 4.14 OLS Regression for Post Trend and Civil Liberties, Political Rights, Corruption and Country Income Groups

```
. regress postIntlineartrend incomegrp civ_libs poli_rights corr
```

Source	SS	df	MS	Number of obs	=	170
				F(4, 165)	=	0.90
Model	79.2521641	4	19.813041	Prob > F	=	0.4633
Residual	3618.08164	165	21.9277675	R-squared	=	0.0214
				Adj R-squared	=	-0.0023
Total	3697.3338	169	21.8777148	Root MSE	=	4.6827

postIntlin~d	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
incomegrp	.3060204	.4910904	0.62	0.534	-.6636109	1.275652
civ_libs	-.0305927	.8661312	-0.04	0.972	-1.740722	1.679536
poli_rights	-.3096511	.6746472	-0.46	0.647	-1.641705	1.022403
corr	-.0195683	.0299371	-0.65	0.514	-.0786776	.0395409
_cons	.5594253	2.238493	0.25	0.803	-3.860357	4.979207

Table 4.14 above presents the results of the OLS regression analysis used to test the post trend association between empowerment, country income groups, and resilience in terms of infant mortality and show no statistically significant relationships among variables ($p > 0.4633$). In this model, income groups ($p = 0.534$) and empowerment [civil liberties ($p = 0.972$), political rights ($p = 0.647$), corruption ($p = 0.514$) are not directly related to resilience regarding infant mortality in the post trend of a natural disaster.

4.3.7 Immediate Effect OLS Regression Results for Life Expectancy

Table 4.15 OLS Regression for Immediate Effect (B2) and Civil Liberties, Political Rights, Corruption and Country Income Groups

```
. regress B2 incomegrp civ_libs poli_rights corr
```

Source	SS	df	MS	Number of obs	=	170
				F(4, 165)	=	2.46
Model	2.80461052	4	.701152629	Prob > F	=	0.0476
Residual	47.0821842	165	.285346571	R-squared	=	0.0562
				Adj R-squared	=	0.0333
Total	49.8867947	169	.295188134	Root MSE	=	.53418

B2	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
incomegrp	-.0822777	.0558006	-1.47	0.142	-.1924529	.0278975
civ_libs	-.2270901	.0987804	-2.30	0.023	-.4221267	-.0320535
poli_rights	.1874134	.0769828	2.43	0.016	.035415	.3394118
corr	-.0009807	.0033774	-0.29	0.772	-.0076493	.0056879
_cons	.4756039	.2578579	1.84	0.067	-.0335225	.9847303

Table 4.15 displays the result of the OLS regression analysis conducted to determine the effect of empowerment and country income groups on resilience in terms of life expectancy at the immediate impact of a natural disaster. Table 4.15 illustrates that there is an association between civil liberties, political rights and resilience measure ($p = 0.142$, $p = 0.016$) In this analysis, political rights and civil liberties shows a strong correlation with resilience in terms of life expectancy except for corruption and income levels which do not appear to be statistically significant ($p = 0.142$, $p = 0.772$). Political rights show a positive association while civil liberties show a negative association. This suggests that resilience in terms of life expectancy increases as political rights increases and civil rights decreases in the post effect period of a natural disaster decreases.

4.3.8 Post Effect OLS Regression Results for Life Expectancy

Table 4.16 OLS Regression for Post Effect (B3 where B3 is life expectancy) and Civil Liberties, Political Rights, Corruption and Country Income Groups

```
. regress B3 incomegrp civ_libs poli_rights corr
```

Source	SS	df	MS	Number of obs	=	170
				F(4, 165)	=	0.15
Model	.06406994	4	.016017485	Prob > F	=	0.9634
Residual	17.7755841	165	.107730813	R-squared	=	0.0036
				Adj R-squared	=	-0.0206
Total	17.8396541	169	.105560083	Root MSE	=	.32822

B3	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
incomegrp	-.0045857	.0342864	-0.13	0.894	-.0722824	.063111
civ_libs	-.0337484	.0606952	-0.56	0.579	-.1535879	.086091
poli_rights	.0284306	.0473018	0.60	0.549	-.0649642	.1218254
corr	-.0006081	.0020753	-0.29	0.770	-.0047056	.0034894
_cons	.0732976	.1584397	0.46	0.644	-.239533	.3861282

Concerning life expectancy, table 4.16 shows little or no relationship between the empowerment measures, income groups, and resilience in the post effect period of a natural disaster. The result of the analysis shows that there is a marginally significant association between civil liberties, political rights ($p = 0.579$, $p = 0.549$) and resilience, while income groups and corruption appear to have no effect on resilience in the post effect period of a natural disaster ($p = 0.894$, $p = 0.770$).

4.3.9 Post Trend OLS Regression Results for Life Expectancy

Table 4.17 OLS Regression for Post Trend and Civil Liberties, Political Rights, Corruption and Country Income Groups

```
. regress postintlineartrend incomegrp civ_libs poli_rights corr
```

Source	SS	df	MS	Number of obs	=	170
				F(4, 165)	=	7.60
Model	1.92903362	4	.482258404	Prob > F	=	0.0000
Residual	10.4751217	165	.063485586	R-squared	=	0.1555
				Adj R-squared	=	0.1350
Total	12.4041553	169	.073397369	Root MSE	=	.25196

postintlin~d	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
incomegrp	-.0985329	.0263202	-3.74	0.000	-.1505008	-.046565
civ_libs	-.0785704	.0465932	-1.69	0.094	-.1705661	.0134252
poli_rights	.0666973	.0363116	1.84	0.068	-.004998	.1383925
corr	.0000797	.0015931	0.05	0.960	-.0030658	.0032251
_cons	.639625	.1216275	5.26	0.000	.3994781	.8797718

Table 4.17 above shows the results of the OLS regression analysis done to test the post trend resilience in terms of life expectancy and its association with income groups and empowerment. The model showed significantly strong correlations between resilience and some of the other measures ($p > 0.000$). The results showed income groups to be highly significant ($p = 0.000$), civil liberties and political rights to be marginally significant ($p = 0.094$, $p = 0.068$) and corruption ($p = 0.960$) appears to have no significant effect on resilience. The results further show that resilience increases as income groups and civil liberties decrease (countries become less empowered) and political rights increase (countries become more empowered).

4.4 Summary of the Findings

The findings of the research regarding the influence of a country's level of empowerment on its resilience to maintain health and well-being suggest that high

income and highly empowered countries have higher GDP, greater freedom levels, higher life expectancy, lower infant mortality and lower corruption. These results are summarized as follows:

- High-income and highly empowered countries both have higher GDP per capita and lower corruption than low-income and low empowered countries.
- GDP is affected in the short-term effect as a result of natural disasters regardless of a country's income or empowerment levels, in the long-term, the effect on GDP per capita is negative in high and mid-high income and high and mid-high empowered countries.
- In terms of GDP, resilience is dependent on income levels but not on empowerment levels.
- Resilience is quicker in countries with low corruption.
- Natural disasters have a negative impact in terms of infant mortality in low- and mid-low-income countries. However, based on empowerment levels, infant mortality increases for all levels in the first year of the natural disaster impact but appears to have a greater negative long-term effect on low and mid-low countries.
- In terms of life expectancy, there is greater resilience where there are greater political rights.
- In terms of infant mortality, resilience is stronger when there are greater civil liberties.
- Natural disasters have a negative impact on life expectancy on all high-income and high empowered countries both on impact and in the aftermath of a natural disaster while showing a positive effect on low income and low empowered countries.

- Corruption does not affect the resilience of a country in terms of GDP, infant mortality or life expectancy.

The descriptive analysis, the interrupted time series analysis, and the OLS regression analysis all demonstrated that countries with higher empowerment and higher income levels showed greater resilience to maintain health after the impact of a natural disaster. Chapter five will conclude with a detailed discussion of the findings, the implications, and the limitations. It will further provide recommendations and suggestions for future studies.

CHAPTER 5: DISCUSSIONS AND CONCLUSION

This chapter concludes this research by providing an overview of the study, its purpose, and its methods. It will discuss the analytical interpretations concerning the research questions outlined at the outset of this research. The chapter will further discuss the strengths and limitations of the study, as well as provide suggestions for future research.

5.1 Overview of the Study

The study specifically captured the impact of natural disasters on countries around the world. Natural disasters have been wreaking havoc on both developed and developing countries. It is widely accepted that climate change is causing more frequent and intense natural disasters (IPCC, 2014; Phalkey & Louis, 2016). It is also evident that these disasters caused high economic costs and have a negative effect on health and well-being (Klomp 2016, Noy & Yonson, 2016, Karim & Noy, 2015, N.g. et al., 2015, Lowe et al., 2015, WHO, 2018). These situations require countries to become more resilient to be able to withstand, cope, mitigate, and recover from the impact of a natural disaster.

In chapter 2 of this study, the literature review highlighted that wealthier countries are better able to recover from the impact of natural disasters than poorer countries (Noy & Yonson, 2016, Karim & Noy, 2015). The literature also suggested that highly empowered countries promote better health outcomes compared to low empowered countries (Garces-Ozanne et al., 2016). However, what has not been explored is the association between empowerment and resilience in maintaining health and well-being

after the impact of a natural disaster. This study aims to fill this gap by answering the following questions:

- Does a country's level of empowerment influence its resilience to maintain health and well-being after the impact of a disaster?
- What distinguishes countries that are highly resilient from those that are not?

The purpose of this study was to determine if a country's level of empowerment influences its resilience to maintain health and well-being after the impact of a natural disaster. To achieve this, data collected for 177 countries were used to analyze disaster impacts observed over 16 years from 2000-2015. The methodology adopted was a quantitative study utilizing a multi-method approach, including descriptive analysis, interrupted time series analysis (ITSA), and ordinary least square regression analyses.

5.2 Discussion of the Research Findings

The discussions of the findings involve the analysis of the effects of natural disasters on countries and their recovery in terms of health and well-being.

5.2.1 Descriptive Analysis Findings

From the results of the descriptive analysis, it can be concluded that disaster occurrences do not necessarily favour one country over another. However, it is evident that high-income and high empowered countries fared much better than low-income and low empowered countries from the impact of natural disasters. The results suggested that high-income countries experienced the greater brunt of disasters in terms of economic costs, which may be a result of them having more to lose in the first place. However, they

are the least affected in terms of the number of deaths and the total number of persons affected overall. On the other hand, low-income countries are the most affected in terms of total deaths, injuries, and homelessness. The findings supported previous studies which suggested that high-income countries are able to cope and recover much quicker than low-income countries because they have the resources to prevent and mitigate the impact of these disasters (Noy & Yonson, 2016, Karim & Noy, 2015). This argument proves true from the descriptive results, as it showed that high-income countries have a higher GDP per capita than low-income countries.

The study also revealed that high-income countries experienced better health outcomes, as is evident in the descriptive analysis, which showed that these countries have low infant mortality and longer life expectancy than low-income countries. However, high-income countries enjoyed greater freedom and are also less corrupt than low- and mid-low-income countries. These results are in line with a study conducted by Lalountas et al. (2011). They found that countries with higher levels of freedom are associated with a low degree of corruption. In contrast, countries with low freedom levels are associated with high corruption levels (Lalountas et al., 2011, p. 641). Consequently, high levels of corruption may hamper low income and low empowered countries from recovering from the impact of natural disasters due to improper governance and unequal allocation of resources. According to Welle and Berkmann (2017), "high levels of corruption and crimes are indicators for limited coping capacities, and coping capacities

are seen as capacities that help people to deal with the immediate impact of extreme events" (p.4).

5.2.2 Interrupted Time Series Analysis (ITSA) Findings

5.2.2.1 GDP per Capita

The ITSA results showed that, on average, GDP per capita increase in the year of the natural disaster for all income levels with high and mid-high showing the most significant increase in income. Alternatively, in the years following the impact of a natural disaster, GDP per capita declines for high and mid-high-income countries but continues to show an increase for low and mid-low-income countries. These results reflect the possibility of low- and middle-income countries receiving substantial amounts of foreign aid which may contribute to the stimulation of production and support industries to ensure the continuation of production. A study conducted by Bello (2017) revealed that the rate of growth per capita government spending in Central America and the Caribbean rose by 0.6 percentage point in the first year after a disaster impact. However, he suggested that for these countries to sustain growth, assistance is needed to deal with emergencies, so countries do not suffer at the national level. According to Hochrainer (2009), "higher aid rates, as well as higher remittances, importantly lessen the adverse negative macroeconomic consequences, while direct capital stock losses had the largest effects in causing adverse GDP effects" (p.24). Also, Becerra, Cavallo, and Noy (2014) found that "countries with higher GDP per capita receive less disaster aid, controlling for the magnitude of the disaster" (p.455). This may be a possible reason why

the results for the mid-high- and high-income countries show a decline in GDP per capita in the post effect period of a natural disaster.

Similarly, the results showed that regardless of a country's level of empowerment, GDP per capita increases in the immediate effect and decreases in GDP in the post effect period. According to Bello (2017), “a shock to the GDP growth rate of high-income countries has a positive effect on GDP growth at approximately 0.8 percentage points in the first year, and climate disasters in Latin American and Caribbean countries produced a positive and statistically significant in the first year of 0.5 percentage points” (p.30). However, mid-high and high empowered countries appeared to be the most affected, showing the lowest increase in GDP per capita in the immediate effect period while in the post effect period, low and mid-low empowered countries were the least affected, showing the lowest decline in GDP per capita. These results suggested that, whether positively or negatively, natural disasters influence GDP per capita. This also means that in terms of GDP per capita, natural disasters proved to have a positive effect on countries at the time of the disaster impact.

5.2.2.2 Infant Mortality

Over the years, natural disaster claims the lives of many infants, both directly and indirectly. The indirect effect of natural disasters on the health of infants may be as a result of various illnesses resulting from food and water contamination, limited access to healthcare, and loss of income (Datar, et al., 2013). According to Datar et al. (2013), "disasters may also compromise water and sewage infrastructure that can have an impact

on child health and increase exposure to vector-borne diseases" (p.3). The results of the analysis in terms of infant mortality indicated that natural disasters have the greatest impact on low-income countries. Low-income countries recorded the highest increase in infant mortality within the first year of the disaster impact.

In contrast, lower-middle-income and high-income countries showed a decrease in this period. In the post effect period, natural disasters increase infant mortality for all income groups. However, low-income countries appeared to be the most affected recording the highest increase in infant mortality while high-income countries recorded the lowest increase in infant mortality. This means that natural disasters have a negative impact on low-income countries in terms of infant mortality both on impact and in the aftermath of such disasters. It is quite likely that natural disasters negatively affect infant mortality rates in low-income countries because the services in these countries may be more disrupted. This may be a result of damaged equipment and facilities which are less likely to be replaced as compared to wealthier countries. According to a study conducted by Anttilla-Hughes and Hsiang (2013), “infant mortality does not result from the physical exposure from the storm but rather 94% of mortality is attributable to the deterioration of economic conditions and subsequent disinvestment in health and human capital” (p.41).

In terms of a country's level of empowerment, the results suggested that natural disasters increase infant mortality for all countries despite their levels of empowerment. A study done by Tashiro et al. (2018) indicated that in 2011, the occurrences of the natural disaster and the existence of fewer medical resources were associated with increased

infant mortality in Japan. The ITSA shows that at the immediate impact of a natural disaster, mid-high and mid-low empowered countries experience the highest number of infant mortalities. However, in the post effect period, natural disasters appeared to have a significant adverse effect on infant mortality in low and mid-low empowered countries with mid-low countries showing the highest increase in infant mortality rates. In fact, only high empowered countries did not show any significant changes and appeared to be the least affected. Interestingly, in comparison to the immediate effect, in the post effect periods, all empowerment levels showed a greater increase in the rates of infant mortality except for high empowerment level, which showed a smaller increase than in the immediate effect period. Also interesting was that there is a decreasing trend in the infant mortality rates for some countries. This somewhat confirms Matyas and Pelling (2015) theory on disaster resilience, that it is not possible to bounce back to the same position once learned from experience. In other words, once disaster strikes, it is difficult for countries to return to its pre-disaster position. In this case, none of these countries, regardless of their income or empowerment levels, were able to record the same rate of infant mortality before the event period.

5.2.2.3 Life Expectancy

The results confirm that natural disasters have an impact on life expectancy. These results show that life expectancy decreases for high-income countries but increases for all other income levels in the immediate effect period. In the years following the impact of a

natural disaster, the results show that life expectancy increases for low and upper-middle-income countries but decreases for lower middle income and high-income countries.

Similarly, as it relates to empowerment levels, in the immediate effect period, the results showed a decrease in life expectancy for high empowered countries and an increase for all other levels of empowerment. Contrarily, in the post effect period, both low and mid-high empowered countries showed an increase in life expectancy. In contrast, mid-low and high empowered countries recorded a decrease in life expectancy. The varying results at the different event periods suggest that there could be many other contributory factors besides natural disasters that may have caused life expectancy to decline in some countries and increase in others on impact and in the aftermath of a natural disaster. These contributory factors may include countries citizens' health and well-being, environment and the level of economic development. According to Egawa et al. (2018), natural disasters occur everywhere, regardless of a country's life expectancy. Their study also speculates that life expectancy is more strongly associated with vulnerability and lack of coping capacity and that life expectancy was negatively correlated with social vulnerability (Egawa et al., 2018).

While this study does not indicate why some countries show an increase or decrease in life expectancy when disasters occurred, it confirms that there are other factors in play concerning the variations in life expectancy in the immediate impact and aftermath of a natural disaster. As such further studies are needed as to why some countries increase in life expectancy while others decrease when disaster strikes.

5.2.3 Ordinary Least Square (OLS) Regression Findings

The OLS results concluded that there is a strong association between some of the empowerment indicators, income levels, and resilience measures. The OLS regression analyses were done to determine the influence of empowerment, if any, on resilience to maintain health and well-being based on two event periods and the trend following these events: The event periods are:

- The immediate effect period (the most impacted year of a natural disaster)
- The post effect period (the years following the impact of a natural disaster)

The results showed a strong overall correlation between empowerment measures, income groups, and resilience relating to GDP per capita at the immediate effect period of a disaster impact. However, this strong overall correlation was based on a positive statistically significant relationship between income groups and resilience in terms of GDP per capita, since there was no correlation with the empowerment measures (political rights, civil liberties, and corruption) and resilience. This means that as income levels increase, GDP per capita increases and thereby increases resilience. This may be interpreted that countries with higher levels of income also have higher GDP per capita and are therefore better able to cope with and recover from the impact of a natural disaster. Previous studies agree with these results. They have suggested that countries with higher GDP per capita and higher levels of development are able to allocate resources that will make them better able to cope, mitigate and recover from the impact of these disasters (Karim and Noy, 2014, Noy and Yonson, 2016,).

On the other hand, the results also showed that in the post effect period, resilience in terms of GDP is significantly negatively correlated with income groups. In contrast, corruption showed a marginally positive association. This means that as income levels decrease and corruption increases, resilience relating to GDP also increases. These results showed that GDP increases in the long term after the impact of a disaster regardless of the level of corruption or income groups. This may be because of the significant international aids that lower-income groups receive which sometimes cause an increase in corruption as resources become scarce. These results are also in line with Klomp's argument, which suggested that the economic impact of a disaster disappears after two years, while the accumulated impact after ten years becomes zero (Klomp, 2016).

The results for the post trend showed that empowerment is not associated with resilience regarding GDP per capita. However, income levels continue to show a positive effect on resilience in terms of GDP per capita. These results suggested that in terms of GDP per capita, political rights, civil liberties, and corruption is not a factor when it comes to resilience in this period. However, while GDP per capita might not be affected by political rights, civil liberties and corruption in this study, the role that GDP per capita plays in post-disaster recovery is linked to political freedom and corruption.

Conversely, in terms of infant mortality in the immediate effect period, political rights and civil liberties strongly correlate with resilience. Civil liberties showed a positive correlation, while political rights showed a negative correlation. The results showed no significant association with income levels and corruption. The results

suggested that in this period, resilience concerning infant mortality increases when there is an increase in civil liberties (more empowered) and even when political rights decrease (less empowered), which means that resilience (in terms of infant mortality) increases when countries have some levels of empowerment. On the other hand, in the post effect period, the results showed no statistical relationship between the empowerment measures and resilience but showed a strong negative association between income levels and resilience in terms of infant mortality. This means that as income levels decrease, resilience (infant mortality) rises in this period. However, the post trend shows no correlation with income levels, empowerment, and resilience in terms of infant mortality.

The results in relation to life expectancy, at the immediate effect period, political rights, and civil liberties, are strongly associated with resilience concerning life expectancy. However, in terms of life expectancy, political rights are positively associated, while civil liberties are negatively associated with resilience. There was no significant association with income levels and corruption. In the post effect period, the results mirrored those of the immediate effect period, where there is no association with income levels and corruption. However, civil liberties and political rights showed a marginally significant association with resilience both in this period and in the post trend. The post trend results also showed income levels to be highly correlated with resilience in terms of life expectancy but showed no association with corruption.

The findings from the OLS regression analysis regarding infant mortality and life expectancy, based on the two time periods and the post trend, are somewhat consistent

with a study done by Garces-Ozanne et al. (2016) on empowerment and self-determination on health outcome. In their research, they find that empowerment is associated with longer life expectancy and lower infant mortality, whereas countries with more political rights have a higher female life expectancy and lower infant mortality while civil liberties are associated with longer male life expectancy (Garces-Ozanne et al., 2016). In this study, the findings confirm that resilience in terms of infant mortality is stronger when civil liberties increase and resilience relating to life expectancy is better when political rights increase. In other words, countries with higher levels of freedom, whether civil liberties or political rights, experience better health outcomes.

5.3 Implications of the Study

The research findings from the analysis confirm the hypothesis that highly empowered countries have greater resilience to maintain health and well-being from the impact of natural disasters. It also answers the study's research questions of whether a country's level of empowerment influences resilience and what distinguishes countries that are highly resilient than others. While empowerment in terms of political rights and civil liberties are good proxies to strengthen country-level disaster resilience and to promote better health outcomes, there are other contributory factors to strengthen empowerment. The disaster literature discussed education, income equality, gender equality, and good governance as other factors which may increase a country's level of empowerment and further strengthen resilience to maintain health and well-being after the impact of a natural disaster (Garces-Ozanne, 2016, Gul, 2017, Gil-Rivas & Kilmer,

2016, Noy & Yonson, 2016, Bokova, 2017, Cutter et al., 2010, Parida, 2015, Morena & Shaw, 2018). In addition to increasing political rights and civil liberties, stakeholders in developing countries should develop programs tailored to promote economic development by incorporating these factors.

This study adds value to the disaster literature and demonstrates that while empowerment contributes to influencing resilience and promoting better health outcomes, income is still a significant contributory factor. This suggests that in a world where climate-related disasters seem likely to increase, building the necessary infrastructure to withstand these events will be crucial. Therefore, it may serve as a useful reference for future researchers. The study is also significant for policymakers to influence policy decisions relating to disaster resilience, climate change, and health outcomes. This study may help decision-makers globally to be better able to plan, mitigate, cope, and recover from the impacts of climate change and natural disasters.

5.4 Conclusion

This research aimed to assess whether a country's level of empowerment influences its resilience to maintain health and well-being after the impact of a natural disaster. The study provides measurable evidence that answers the research questions. It confirms that resilience to maintain health and well-being is possible when countries have greater levels of freedom, whether it is political rights or civil liberties. The research also suggested that higher GDP, low corruption, higher civil liberties, and political rights, lower infant mortality, and higher life expectancy are what distinguishes highly resilient

countries from others. However, in this study, corruption is not directly associated with resiliency but may be a good indicator to measure resilience in other studies.

5.5 Recommendation

It is recommended that governments of low and mid-low empowered countries focus on economic development to increase income, political rights, and civil liberties as well as lower corruption. Also, they should explore what role does political rights and civil liberties play in fostering resilience and what creative solutions are evident in low-income countries. As a result, these will increase empowerment levels and strengthen resilience to promote better health outcomes after the impact of a natural disaster, especially in developing countries.

5.6 Limitations

The main aim of the study is to assess if a country's level of empowerment influences its resilience to maintain health and well-being after the impact of a natural disaster. Although a thorough investigation was done while exploring the aim of the study, some limitations within this study must be considered and discussed:

- **Limited prior research** – While there is some research about empowerment and resilience, there is limited research in terms of country-level empowerment relating to disaster resilience and health and well-being. Many of the prior studies focused on women empowerment and community level empowerment but not on a national level. However, this study was able to identify this gap and provide new theoretical foundations for further development in this area of study.

- **Flawed methodology** – Resilience is dynamic and challenging to measure. As such, the regression coefficients generated from the ITSA for the two event periods were used as resilience measures. Although the use of ITSA to assess resilience during the event periods of a disaster was impactful, it did not provide a complete picture of the assessment. While this analysis was able to examine the effect of natural disasters during different time periods, it could not be used to draw a strong conclusion of disaster resilience to maintain health and well-being based on empowerment levels. An ITSA would be more impactful for studies done on a smaller scale. Furthermore, the development of a resilience measure to assess disaster resilience to maintain health and well-being is a topic for future studies.

5.7 Suggestions for Future Studies

The limitations of this research have opened new opportunities for future studies concerning disaster resilience and empowerment at the national level. The following are a few possible suggestions for future studies:

- Contributory factors to country-level empowerment that are attributable to disaster resilience to improve health and well-being.
- A resilience measure designed to assess a country's resilience to maintain health and well-being after the impact of a disaster.
- An investigation as to why some countries increase in life expectancy while others do not after the impact of a natural disaster.

Natural disasters are happening more frequently and more intensely around the world, and resilience is a key indicator to maintain health and well-being, especially in developing countries. Empowerment may lead to better economic development, education, and health outcomes and may help to strengthen resilience in these countries. As such, researchers and policymakers should consider empowerment as a tool for disaster resilience and better health outcome when considering further research and policy decisions.

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APPENDIX

Appendix A: List of countries with average civil liberties, political rights and corruption scores.

Country	Income Level	Emp. Level	Civil Liberties	Political Rights	Corruption
Afghanistan	1	1	6.06	5.94	13.90
Albania	3	3	3.19	3.06	29.79
Algeria	3	1	5.00	6.00	30.92
Angola	2	1	5.13	6.00	19.47
Antigua	4	3	2.00	2.69	
Argentina	4	3	2.13	2.06	30.38
Armenia	3	2	4.00	5.00	30.29
Australia	4	4	1.00	1.00	85.31
Austria	4	4	1.00	1.00	78.31
Azerbaijan	3	1	5.19	6.00	22.63
Bahamas	4	4	1.00	1.00	71.50
Bangladesh	2	2	4.00	3.56	20.00
Barbados	4	4	1.00	1.00	70.92
Belarus	3	1	6.00	6.75	31.20
Belgium	4	4	1.13	1.00	73.27
Belize	3	3	1.94	1.00	41.50
Benin	1	3	2.00	2.13	31.58
Bhutan	2	2	4.94	4.94	58.20
Bolivia	2	3	3.00	2.69	27.81
Bosnia	3	2	3.25	3.88	34.00
Botswana	3	3	2.00	2.44	59.88
Brazil	3	3	2.31	2.13	38.44
Bulgaria	3	3	2.13	1.56	39.00
Burkina Faso	1	2	3.31	4.80	34.08
Burundi	1	1	5.13	4.81	20.64
Cabo Verde	2	4	1.25	1.00	54.11
Cambodia	2	1	5.06	6.00	20.73
Cameroon	2	1	6.00	6.06	22.94
Canada	4	4	1.00	1.00	86.13
Central A.R.	1	1	5.19	5.44	22.60
Chad	1	1	5.63	6.56	18.58
Chile	4	4	1.13	1.19	72.13
China	3	1	6.00	7.00	35.25

Colombia	3	2	3.81	3.31	36.75
Comoros	1	2	4.00	3.81	25.22
Congo	2	1	4.75	5.94	20.09
Congo Dem. Rep.	1	1	4.69	5.75	22.00
Costa Rica	3	4	1.00	1.00	49.38
Côte d'Ivoire	2	1	5.13	5.88	24.06
Croatia	4	3	2.06	1.56	40.88
Cuba	3	1	6.50	7.00	42.38
Cyprus	4	4	1.00	1.00	60.77
Czech Rep.	4	4	1.25	1.00	46.13
Denmark	4	4	1.00	1.00	93.69
Djibouti	2	1	5.00	5.19	32.11
Dominica	3	4	1.00	1.00	55.33
Dominica Rep.	3	3	2.19	2.06	30.53
Ecuador	3	2	3.00	3.00	25.75
Egypt	2	1	5.69	5.75	32.19
El Salvador	2	3	3.00	2.00	38.06
Equatorial New Guinea	3	1	6.56	6.94	19.00
Eritrea	1	1	6.44	7.00	24.42
Estonia	4	4	1.25	1.00	63.25
Ethiopia	1	1	5.38	5.38	28.27
Fiji	3	2	3.63	5.19	
Finland	4	4	1.00	1.00	93.69
France	4	4	1.13	1.00	69.75
Gabon	3	2	4.44	5.69	31.92
Gambia	1	1	4.81	5.25	27.85
Georgia	2	2	3.53	3.63	36.50
Germany	4	4	1.13	1.00	78.56
Ghana	2	3	2.19	1.31	39.13
Greece	4	3	2.13	1.31	41.94
Grenada	3	3	2.00	1.00	34.50
Guatemala	3	2	4.00	3.38	28.33
Guinea	1	1	5.06	5.75	20.50
Guinea Bissau	1	2	4.44	4.50	20.33

Guyana	3	3	2.69	2.06	26.73
Haiti	1	1	5.25	4.75	17.86
Honduras	2	2	3.44	3.44	26.07
Hong Kong	4	3	2.31	4.50	79.94
Hungary	4	4	1.56	1.06	50.88
India	2	3	3.00	2.00	32.19
Indonesia	2	3	3.50	2.31	25.56
Iran	3	1	6.00	6.00	25.92
Iraq	3	1	6.00	6.06	17.38
Ireland	4	4	1.00	1.00	74.44
Israel	4	4	2.31	1.00	63.38
Italy	4	4	1.31	1.06	46.63
Jamaica	3	3	2.94	2.00	35.64
Japan	4	4	1.81	1.00	73.50
Jordan	3	2	4.69	5.44	49.00
Kazakhstan	3	1	5.00	6.00	26.31
Kenya	2	2	3.63	4.00	22.13
Kiribati	2	4	1.00	1.00	
Korea Dem. Rep. (North)	1	1	7.00	7.00	8.40
Korea Rep. (South)	4	3	2.00	1.44	50.38
Kyrgyzstan	2	1	4.75	5.38	22.31
Lao	2	1	6.00	7.00	23.45
Latvia	4	3	1.75	1.56	44.56
Lebanon	3	2	4.25	5.31	28.62
Lesotho	2	3	3.13	2.44	38.27
Liberia	1	2	4.50	3.88	31.60
Lithuania	4	4	1.31	1.06	49.69
Luxembourg	4	4	1.00	1.00	84.44
Macedonia	3	3	3.06	3.19	35.77
Madagascar	1	2	3.63	4.19	28.64
Malawi	1	2	3.81	3.44	31.44
Malaysia	3	2	4.19	4.25	49.06
Maldives	3	2	4.50	4.88	26.80
Mali	1	3	3.06	2.88	29.92

Mauritius	3	4	1.00	1.00	
Marshall Islands	3	4	4.81	5.69	27.90
Mauritania	2	1	1.88	1.00	49.50
Mexico	3	3	2.75	2.38	34.06
Micronesia	2	4	1.19	1.00	
Moldova	2	2	3.63	2.94	29.56
Mongolia	2	3	2.13	1.75	31.75
Montenegro	3	3	2.56	3.00	38.20
Morocco	2	2	4.25	5.00	35.53
Mozambique	1	2	3.44	3.44	27.79
Myanmar	2	1	6.63	6.81	16.85
Namibia	3	3	2.31	2.00	47.38
Nepal	1	2	4.13	4.19	25.92
Netherlands	4	4	1.00	1.00	87.19
New Zealand	4	4	1.00	1.00	93.63
Nicaragua	2	2	3.25	3.63	26.13
Niger	1	2	3.81	3.50	28.25
Nigeria	2	2	4.25	4.13	21.00
Norway	4	4	1.00	1.00	86.81
Oman	4	2	5.00	6.00	52.54
Pakistan	2	1	5.00	5.00	24.87
Panama	4	3	2.00	1.19	34.80
Papua New Guinea	2	2	3.00	3.19	22.92
Paraguay	3	2	3.00	3.19	22.29
Peru	3	3	3.06	2.00	37.13
Phillipines	2	3	3.00	2.88	28.06
Poland	4	4	1.25	1.00	47.00
Portugal	4	4	1.00	1.00	62.94
Romania	3	3	2.00	2.06	35.19
Russia	3	1	5.06	5.75	24.88
Rwanda	1	1	5.25	6.19	40.55
Samoa	3	3	2.00	2.00	
Saudi Arabia	4	1	6.63	7.00	41.54
Senegal	1	3	2.94	2.38	34.00
Serbia	3	3	2.00	2.56	33.92

Seychelles	4	3	3.00	3.00	47.75
Sierra Leone	1	2	3.31	3.19	24.85
Singapore	4	4	4.13	4.69	90.94
Slovakia	4	4	1.31	1.00	43.56
Slovenia	4	4	1.00	1.00	60.56
Solomon Islands	2	2	3.13	3.69	28.00
Somalia	1	1	7.00	6.63	10.90
South Africa	3	3	2.00	1.63	45.81
South Sudan	1	1	7.00	7.00	13.00
Spain	4	4	1.13	1.00	65.44
Sri Lanka	2	2	3.88	4.00	34.36
St. Lucia	3	4	1.38	1.00	70.29
St. Vincent & Grenadines	3	4	1.00	1.00	62.00
Sudan	2	1	7.00	7.00	16.46
Suriname	3	3	2.00	1.69	35.27
Swaziland	2	1	5.00	6.81	33.90
Sweden	4	4	1.00	1.00	91.38
Switzerland	4	4	1.00	1.00	87.75
Syria	1	1	6.69	7.00	25.69
Taiwan	4	4	1.69	1.38	58.44
Tajikistan	1	1	5.38	6.00	21.46
Tanzania	1	2	3.13	3.63	28.69
Thailand	3	2	3.69	3.94	34.94
Timor-Leste	2	2	3.56	3.50	26.40
Togo	1	2	4.56	5.13	27.00
Tongo	3	3	2.75	4.06	
Trinidad and Tobago	4	3	2.25	2.31	39.20
Tunisia	2	2	4.50	5.19	44.75
Turkey	3	2	4.13	3.13	40.31
Uganda	1	2	4.19	5.38	24.81
Ukraine	2	2	2.94	3.56	24.00
United Kingdom	4	4	1.13	1.00	81.44
United States	4	4	1.00	1.00	74.25
Uruguay	4	4	1.00	1.00	64.19

Uzbekistan	2	1	6.69	7.00	20.31
Vanuatu	2	3	2.13	1.81	32.60
Venezuela	3	2	4.50	4.13	21.56
Vietnam	2	1	5.31	7.00	27.31
Yemen	1	1	5.50	5.50	22.54
Zambia	2	2	3.94	3.50	30.38
Zimbabwe	1	1	5.94	6.13	23.25