International Journal of Dentistry, Diabetes, Endocrinology and Oral Hygiene, 6(1) pp,40-56, 2024
Print ISSN: ISSN 2631-567X
Online ISSN: ISSN 2631-5688
Website: https://www.eajournals.org/
Publication of the European Centre for Research Training and Development-UK

The Impact of Flood Disaster Response Strategies on Health Outcomes: A Study of Western Equatoraia

Tabitha Meseka
MBA Student, Texila America University
Department of Public Health

doi: https://doi.org/10.37745/ijddeoh.18/vol6n14056 Published November 21, 2024

Citation: Meseka T. (2024) The Impact of Flood Disaster Response Strategies on Health Outcomes: A Study of Western Equatoraia, *International Journal of Dentistry, Diabetes, Endocrinology and Oral Hygiene*, 6(1) pp,40-56

Abstract: *The purpose of the study was to investigate the impact of flood disaster response strategies on health in South Sudan. The convenient sampling technique was used to gather data from 395 respondents in Western Equatorial State. The Statistical Package for Social Science version 21 and Excel 2020 was used to analyse the data gathered. The findings of the study revealed a general agreement of the responses to the most common causes of flooding in Western Equatoria such as climate change, deforestation, industrialization and rivers. However, there was disagreement among respondents on hurricane and cyclone as the most causes of flooding in Western Equatorial County. Additionally, the study's findings revealed panicking and fear, illness, trauma and loss of appetite as some of the behaviours/attitude people experienced after flooding. There was a general agreement to these behaviours/attitude as the average mean of the responses was above 2.9. Policy direction and direction for future studies were discussed.*

Keywords*:* flood disaster, flood disaster response strategy, health, South Sudan

INTRODUCTION

Flooding is regarded the most common type of natural disaster world-wide (Alifu et al., 2022) as about 40% of all natural disaster reported involves flooding (Merz et al., 2021). The world over has experience floods in different magnitudes, as floods continue to escalate in different regions of the world due to climate change. A natural disaster is a major adverse event resulting from the natural processes of the earth. Dwamena-Agyei (2020) defines flood "as overflowing water bodies such as rivers, streams, and main channels leading to inundations" It is difficult to think about natural disaster without paying attention to flood. According to World Statista Report 2023, in 2021 alone there were 223 flood disasters recorded world-wide, the second highest figures recorded in the indicated year. From 210-2019 for instance, more than 130 major flood disasters were declared in the United States, averaging 13 disasters per year. In the United Kingdom, about 50% reported cases of natural disaster were flood (WHO, 2022). Flooding is not only prone to the developed world. Africa is also a victim to flooding as reported by (Davis et al., 2023). Davis et

al. (2023) intimated that floods affected most of Africa throughout 2022, killing over 2,100 people. Extant literature reported the devastating effects of floods to lives and properties (Jia et al., 2021; Panda & Barik, 2021; Tavakkoli et al., 2022). The extreme weather across the African continent in 2022 has killed hundreds and forced millions to flee their homes (WHO, 2022). In buttressing this, Rahman et al. (2021) shared that floods do not only damage properties but also spread disease and pose a very significant risk to life. Singha et al. (2020) also posited that flood has severe implications for livelihoods, food security, and loss of property. Whilst it is an undeniably the case that the occurrence of floods cannot be avoided, response strategies can help ameliorate the debilitating effects on fatalities, properties and the environment. Sulaiman et al. (2022) suggested that response strategies are crucial to prevent high casualties, loss of lives and properties. The study of Wang (2021) intimated the importance of response strategies to flood disaster in preventing severe calamities.

In South Sudan, floods have worsened over the past years as South Sudan is suffering increasingly from the consequences of climate change. According to UNICEF report 2021, floods are affecting every year. In the assertion of WHO (2020), thousands of people vacate their homes every year during flood amidst fatalities and casualties. Interestingly, record rainfall in the past three years and overflowing rivers, have flooded thousands of hectares of farmland in eight states, destroying the environment, properties and spreading of diseases which are deleterious to human lives**.** Prior studies identify South Sudan as a vulnerable country to several natural hazards, including drought, floods, and climate change (Mayen, Wood & Frazier, 2022).

According to Smith (2023), flood-related deaths and homelessness are concentrated in Less Developed Countries and South Sudan is no exception. The effects of flooding can never be overemphasized as homes are flooded annually (Adams, 2021). The flood problem in South Sudan has a long history. The country experienced one of the worst flood disasters as far back as 19788 where 1.5 million people were estimated to lose their homes with the accompanied outbreaks of disease such as: malaria, typhoid and cholera. The cholera outbreak alone claimed about 1,200 lives. The situation has not been better in recent years either as available data shows that between the period 2020/2022 unprecedented floods have submerged large swathes of the country and displaced hundreds of thousands of people. The situation was alarming in 2022 as in July alone an estimated one million people were affected by severe flooding in 36 counties across South Sudan (WHO 2023). Despite the numerous measures put in place by the Sudanese government and its agencies, the problem continues to rise. The question then is: How has flood disaster response strategies impact lives and health among the citizenry of South Sudan citizen particularly those in Western Equatorial?

RESEARCH OBJECTIVES

1. To identify the most common causes of flooding in Western Equatoria;
2. To examine flooding experience on people's behaviours and attitude in Western Equatoria;

3. To determine the socio-economic variables that influence vulnerability to flood disaster in Western Equatoria

Significance of the Study

The frequency and severity of floods has increased in different regions of the world due to climate change. As a result, more research needs to be conducted particularly in Equatoral County to bring to bear the causes and the effects of flooding on the health of the people. In that regard, a study of this magnitude is contemporary as it is hoped to benefit the following: First, the outcome of the study will be of immense benefit to the government and its agencies to formulate rigorous flood disaster response strategies to help curb fatalities and casualties, Secondly, the study stands to contribute to extant literature as students, academia and researchers who would want to dive deeper on the subject will find the study significant. Thirdly, the study will be of significance to international agencies or organizations to make informed decisions regarding the South Sudan flood disaster

LITERATURE REVIEW

Conceptual Review

Flood Disaster

The concept of flooding has a multi-disciplinary definition based on the interest of the defining discipline. However, flood is generally taken to include 'any case where land not normally covered by water becomes covered by water' (FWMA, 2017). In recent decades there have been raging scientific and media debates on likely changes in flood regimes generated by land-use changes and climate change (Ran et al, 2023). The crux of most of these debates is centred on the simulated risk from such flood events. These risks are related to human health, infrastructure, socio-economic well-being of affected individuals and damage also to archaeological relics. Methods of evaluating and assessing flood risk have been developed in the field of insurance, technological and environmental fields (Jones, 2021). Although river flooding is often related to natural disasters, the impacts of human activities such as urbanization have been observed by many scholars (Kang et al, 2020; Ranzi et al, 2023).

Causes of Flooding

Merz et al. (2021) categorized flooding into natural causes and human-induced causes. Natural causes of flooding simply refer to those causes of flooding which do not have any direct human influence (EPA, 2018). However, the human causes of flooding has a direct human influence (Action Aid, 2018)

.

Natural Causes of Flooding

Rainfall

Anokwa et al. (2022) considered heavy rainfall as the first natural cause of flooding. Rainfall occurs in every part of the globe and, therefore, generally refers to as a common cause of river flooding. According to Appeaning et al. (2021), heavy rainfall raises the water level of rivers as well as other water bodies beyond the carrying capacity of the channels subsequently leading to

the overflowing of excess water first onto the immediate floodplains and beyond. The river bodies in South Sudan such as: Jonglei, Unity, Upper Nile, Northern Bahr El Ghazal, Warab, Central Equatoria, and El Buheyrat in Western Equatoria County usually overflow its banks after a heavy downpour of rain thereby causing flooding. It is worth noting that this is reinforced by the influence of human activities. Flooding is prevalent in low lying areas or lowlands. Since rivers flow more slowly in such areas, if the water volume increases abruptly or suddenly, floods occur. In the Western Equatoria for instance, the terrain is generally not undulating flat land. Most communities along the county get flooded during heavy rainfall. Coastal Flooding occurs by virtue of the fact that the sea level at a point in time is higher than the adjoining coastal area. Thus, river flooding occurs because land lying close to the sea can be submerged by sea water during high tides, tsunamis or storms. Under such circumstances, low lying coastal areas are flooded. A typical example is that which occurred on the In the months of August-September 2022, continuous heavy rainfall caused flooding across Mundri especially in areas of Hai Tiriri, Matara B&C, Landrewa, Jarangala, Rogyi, Tarawa, Bandala, Ngolawa, Miri-moto, Miri-moto, and Miri-magya are areas badly affected by floods in Mundri Payam impacting their houses, lands, livelihoods, and infrastructure. A woman lost her life while crossing stream (drown) has been reported in Amadi Payam. Figure 1 presents the flood modeling and analysis of river flooding in South Sudan

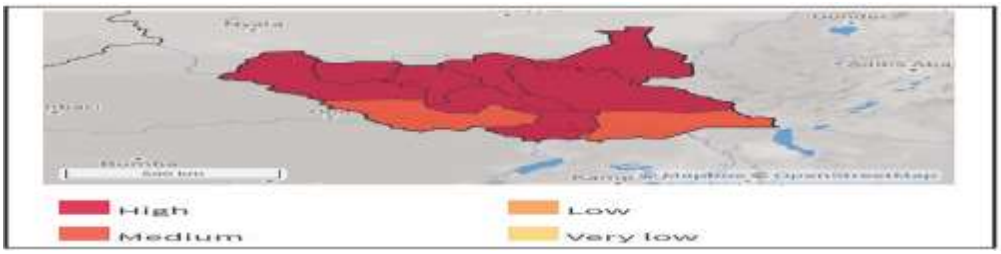

Figure 1: Flood modeling and analysis of river flooding in South Sudan
Source: Thinkhazard, 2018

In Figure 1, the flood modeling and analysis of river flooding in South Sudan classified Jonglei, Unity, Upper Nile, Northern Bahr El Ghazal, Warab, Central Equatoria, and El Buheyrat at high threat levels (red) of river flooding. The flood modeling for the states of Western and Eastern Equatoria (dark orange) indicates medium threat levels.

Hurricanes: Hurricanes also affect floods too. When a hurricane reaches land, there is an enormous amount of water that is carried along with it. This water dumped on land and as water levels rise, flooding is created. However, a general consensus has not yet been reached upon as to the extent to which climate change adds to flood risk, both globally and in the South Sudan. The recurrent incidence of floods and their magnitude globally in recent times have raised major concerns that the effect of climate change is already being felt the world over (Robson, 2022).

Cyclone: Cyclones occur in a low-pressure zone where winds rotate inwardly. Cyclones can be accompanied by a massive storm and lead to extreme weather conditions. Eastern coastal states in

South Sudan, such as Hai Tiriri, Matara B&C, Landrewa, Jarangala, Rogyi, Tarawa, Bandala, Ngolawa, Miri-moto, Miri-moto, and Miri-magya Osho experience cyclonic floods in South Sudan

Hunman-Induced Causes

Urbanization: Since the industrial revolution, humans have migrated mainly to the urban areas, and as a side effect, population growth enlarges around urban areas. Urbanization and flooding are intricately linked in both developed and developing countries. Increasing population growth and continued urban expansion has led to a reduction in surface permeability which invariably increases surface runoff in the absence of alleviating urban drainage design (Kang et al, 2020; Parker, 2022). Urbanization has caused countries even with small rivers by world standards, with the tendency for smaller-scale floods to occur (Wheater, 2017). In the views of Mark et al, (2023), considerable economic and infrastructural losses arise from urban flooding. Thus urbanization can represent a very significant increase in flood losses at small catchment scale

Industrialization: Ojo (2020) defines industrialization as "the process of moving resources into the industrial sector. It is the transformation methods of production involving the use of traditional or modern equipment or mechanized equipment. Extant literature shows that industrial emissions such as carbon dioxide (CO2), methane (CH4), nitrous oxide(N2O), Hydro fluorocarbons (HFCs), per fluorocarbons (P.F.C.s), Sulphur hexafluoride (SF6) and water vapor result in greenhouse gases which increases global warming and attendant anomalies in local temperature, humidity, wind speed, precipitation, soil moisture, and sea level.

Deforestation: Deforestation has long been the imputed cause of ecological degradation. Define as change in forest area over time (Urgar, 2022), deforestation is one of the major human causes of floods. Trees act like a sponge that helps to hold soil and water and prevent flooding. As trees are being cut down at a fast pace to make way for urbanization to grow, more water runs towards a river during heavy rainfall. As a result, a flood occurs.

Climates and Environments: One of the biggest issues facing humankind on planet earth globally today is climate change. Climate change has commonly been determined to be the result of increased levels of carbon dioxide in the atmosphere, as a result of a rise in usage of fossil fuels (Karl et al, 2020).. Climate change can be described as the persistent change in the weather pattern engendered by anthropogenic activities mostly linked to industrialization. It manifests in a long-term shift in the statistics of the weather (including its averages).

Flooding Experiences on People's Behaviour and Attitude

Flooding has devastating experience both on human and the environment. Be it natural or human made, flood disasters are devastating and this calls for competent mental health professionals to provide for disaster relief services to the victims. Flood disaster might respond differently depending on their personal experience. Flood survivors panic immediately after the flood strikes as they become confused and cannot think at that moment (Gilliland & James, 2020). Adults desperately search everywhere, looking for their missing family members. Victims are exposed to horrors of the aftermath and they are surrounded by death and devastation. The time is described

as "pain". At this stage, an appropriate intervention would be an emotionally driven psychological intervention strategy. This strategy helps the individual to recollect themselves and to start focusing on the way forward. Lour (2021) is of the view that health professionals should at this point engage in emotionally driven talk with the victims in order to help relief their anxieties surrounding their crisis. Lour (2021) also furthered that health professionals should provide emotional help on how individuals can recover their property and probably their beloved family members.

Socio-Economic Variables that Influence Vulnerability to Flood Disaster

Socio-economic variables such as age, gender, education and income influence flood disaster vulnerability (Wijesinghe et al., 2023). According to Kuriakose (2023), older people have a disproportionate vulnerability to the effect of disasters. As older people find it difficult to leave flood scenes as quickly as required, younger folks are aggressive and tend to move faster than older folks. Prior studies found the influence of poverty on vulnerability to flood disaster (Lawanson et al., 2023). . Poorer people are less likely to be adequately insured for flood damage, more likely to live in homes at particular risk of flooding (i.e. caravans) and to have lower levels of education which may impede the reception of warnings. Apart from socio-economic variables, other studies (Ward, 2023) also found disability and illness, special needs populations and race and ethnicity to influence the vulnerability flood disaster. Those with physical or mental disability or long term illness may have particular difficulties receiving warnings and being able to respond to them. Residential care homes, hospitals, schools etc. may experience particularity difficulty in evacuation. More so, race and ethnicity such as language differences may obstruct reception of flood warnings and cultural differences may exacerbate the impact of floods

Empirical Review of Impact of Climate Change on Health

Climate change gives rise to environmental conditions that can have far reaching effects on human health and existence. Direct effects are diseases and deaths as a result of extreme weather events like heat, flooding, mud slides, storms and hurricanes (Bibi & Kara, 2023). Indirect effects are those that result from changes in the ecosystem, such as conditions that facilitate infectious diseases, changes in agricultural production and the availability of (clean) water. But climate change can also have indirect effects on health from the social and economic turmoil brought on by drought, flooding, famine, epidemics and movement of refugees. Climate change affects health via a cascade of different mechanisms as shown in extreme weather conditions normally associated with climate change, apart from causing physical discomfort can also affect the immune system as well as causing the proliferation of disease vectors and increasing the resistance of pathogens (Xu et al., 2023). Many infectious disease agents such as viruses and bacteria and vectors such as mosquitoes and rodents are influenced by seasonality and changes in temperatures, rainfall and humidity (Ahmad et al., 2023). It has been suggested that climate change can lead to novel genetic changes in pathogens. In some cases, it may be a genetic transfer that results in more virulence and increased resistance to antibiotics. This can be attributed to resilience resulting from the pathogens adaptation tendencies (Kim et al., 2023). McMichael (2020) noted that the effect of climate change on health is partly due to changes in physical living conditions but mostly from the

biophysical and ecological systems that determine the prospects of population health. Besides, the possibility of providing a conducive atmosphere for disease outbreaks, McMichael (2020) observed that extreme weather conditions can culminate in excessive heat, storm, mudslide hurricane can have severer effects on human health. Ebi et al. (2023) posited that extreme heat can lead to exhaustion, heat cramps, heat stroke, and heat-related death. People with chronic lung or heart illnesses or other conditions are at greater risk of heat-related complications or death. High-intensity heatwaves may end in violent events, which generate heavy rainfall, especially when heatwaves are short and hot (You &Wang 2021). Also, the study of Chen et al. (2021) established that increasing and accelerating trends in the contribution of hot weather to extreme precipitation events. This was also confirmed in the studies of Ning et al. (2022). Silveira et al.(2023) also affirmed that changes in physical living conditions as a result of climate change can have dire effects on cardiovascular and respiratory mortality. Inferring from the literature, the study hypotheses that:

H1: There is a significant relationship between heat and human health
H2: There will be a significant relationship between storm and human health
H3: There will be a significant relationship between mudslide and human health
H4: There will be a significant relationship between hurricane and human health

Conceptual Framework

Figure 2 depicts the framework that relates the concepts and the central themes of the study. The conceptual framework establishes the operationalization of climate change inducing heat, storm, mudslide and hurricane and links it to the expected health

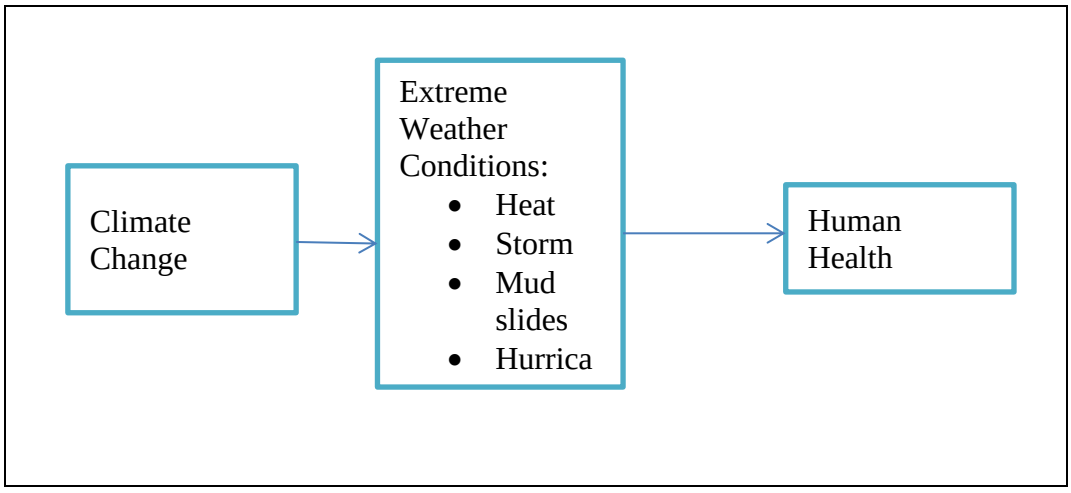

Figure 2: Conceptual Framework
Source: Author's Construct, 2024

On the bases of the framework in Figure 2, climate change is conceptualized operationally to constitute extreme weather condition inducing heat, storm mudslide and hurricane. The outcomes

of these extreme weather condition inducing heat, storm mudslide and hurricane affects human health. The independent variables in the model above are extreme weather condition such as: heat, storm mudslide and hurricane and the dependent variable is human health. The hypotheses of the study are therefore reflected by the links between extreme weather conditions: such as: heat, storm mudslide, hurricane and human health

METHODOLOGY

The study adopted the descriptive survey design. The targeted population included all residents of Western Equatoria in South Sudan. The convenience sampling technique was adopted to select a subset of the population to represent the population. The Sullivan (2015) calculation was computed using the minimum sample size required for accuracy in estimating proportions by considering standard normal deviation set at 95% confidence level (1.96), percentage picking a response (50% = 0.5) and the confidence interval (0.05 = ±5). The computed formula realized a sample size of 384 however, the sample size was increased to 395 to make room for any anomaly. Primary data was the main source of data collection. The study used structured questionnaires to obtain data from the respondents. Structured questionnaire was used because it lowers the cognitive load of information on the respondents. The Cronbach Alpha (α) was used to ascertain the reliability of the study whilst pre-testing was also used to ascertain the validity of the questionnaire instruments.

The responses gathered through the questionnaires were grouped according to the categories of respondents. The questionnaires given to each category of respondent was serially numbered for easy coding, checked for blank options and out of range responses. The coded responses were fed into the computer using the SPSS version 21 and Excel 2020. The data was then summarized into tables, and figures using descriptive statistics, specifically, in frequencies and percentages for the presentation and discussion of results. The qualitative data was mainly transcribed, categorized and analysed manually based on emerged themes. And some were verbatim quotes used directly to support the claims while the observations were used to add more value to the issues under description by providing images of some of the interesting scenes observed.
Informed and formal consent were obtained from respondents as their confidentiality was assured of any information they provided. The next chapter presented the discussions of the findings.

RESULTS AND DISCUSSIONS

Demographic Characteristics of Respondents

The study ascertained demographic information of respondents to help understand the context and characteristics of the respondents who were the residents of Western Equatoria County in South Sudan. The findings revealed that the majority of the respondents 225.2 (57.1%) were females while the remaining 169.8 (43.9%) were males. Findings of the study also showed that that the respondents 60.4 (15.2%) were aged from 24 and below years whilst 334.6 (84.8%) of the respondents were aged from 25 and above years. It can be deduced from the results that the majority of the respondents were 25 years and above age.

The respondents were asked to show the occupation they engage in. 319 (80.8%) of the respondents were self-employed, 66 (16.7%) of the respondents were unemployed and 10 (2.5%) of the respondents were public servants.

The results clearly indicate that a high proportion of the respondents were self-employed. Hussein (2014) also similarly found the majority of the respondents in his sample to be were self-employed Also on education, the findings indicated that the majority of the respondents had primary education. A high majority, being 178 out of the 395 respondents (45.1%) had primary education with 147 (37.2%) having secondary education. Only 12 (3%) had received higher tertiary education whilst 58 (14.7%) had no formal education.

Most Common Causes of Flooding in Western Equatoria County

The first objective of the study identified the most common causes of flooding in Western Equatoria County. The average score for the most common causes of flooding show that respondents agree to flooding when it comes to climate change (mean = 3.54), deforestation (4.22); industrialization (4.29), rivers (mean= 4.31), but there was strong agreement among respondents on urbanization as the most causes of flooding (mean = 4.83). Also there was disagreement among respondents on hurricane and cyclone as the most causes of flooding in Western Equatorial County. Table 1 presents the findings.

Table 1: Causes of Flooding

Variable	Mean	Test-statistics Test Value=3	P-value
Climate change	3.54	594.33	0.000
Deforestation	4.22	239.43	0.000
Industrialization	4.29	873.58	0.000
Rivers	4.31	457.92	0.000
Urbanization	4.83	850.02	0.000
Hurricane	2.342	442.01	0.000
Cyclone	2.284	428.02	0.000
Flooding	4.41	473.78	0.000

Interpretation of mean score: $1 \leq$ mean ≤ 1.49 (strongly disagree), $1.50 \leq$ mean ≤ 2.49 (disagree), $2.50 \leq$ mean ≤ 3.49 (uncertain), $3.50 \leq$ mean ≤ 4.49 (agree), and $4.50 \leq$ mean ≤ 5 (strongly agree).
Source: Field Survey (2024)

The result in Table 1 also shows that the respondents agree to flooding in Western Equatoria County. The study used the one sample statistic and tested whether the mean score is significantly different from the average value of 3. The result on each of the causes indicated that flooding is

significantly different from the average score of 3. This is evidenced by the fact that the probability values of the test statistics were less than 5% significance level. In the study of Tahir et al. (2021) similar causes of flooding were identified. The findings are also in consistent with the study of Navaro et al. (2020). Navaro et al. (2020) bemoaned the incessant deforestation as a result of industrialization leading to flood in most countries. Most of the forests in South Sudan have been taken over by estate developers, making way for urbanization resulting in flooding in most of these areas.

Flooding Experience on People's Behaviours and Attitude in Western Equatoria

The second objective of the study examined flooding experience on people's behaviours and attitude in Western Equatoria. On a 5- point Likert scale rated as *1= Strongly disagree; 2= Disagree; 3=Neither agree nor disagree; 4=Agree and 5=Strongly agree, the* opinion of the respondents were measured. The analysis of the responses was done with the use of descriptive statistics such as mean and standard deviation. On a scale of 1-5, the midpoint is 2.9, hence any mean score below 2.9 denote disagreement and any mean score above 2.9 represents agreement (Creswell, 2007). Measures of variations were also computed (Saunders, Lewis and Thornhil, 2015).

The responses gathered showed a general agreement to the flooding experience on people's behaviours and attitude as the average mean is above 2.9. The respondents were in agreement that there was loss of appetite during flooding M=3.45, SD=1.39), we are traumatized during flood (M=3.48, SD=1.28), people fall ill during flood (M=3.56, SD=1.29), there is panic M=3.66., SD=1.27). However, respondents strongly agreed they panic and fear during flooding, with the least agreement being loss of appetite.

The findings are consistent with prior studies (Bakhshian et al., 2023). According to Bakhshian et al. (2023), victims of flood disaster often panic immediately after the flood strikes as they become confused and cannot think at that moment. This is because of the dangers victims are exposed to in the aftermath of the flood disaster. However, Wang et al. (2023) intimated that fear and panic depends on how devastating and the havoc caused by the flood. Table 2 presents the findings.

Table 2 Flooding Experience on People's Behaviours and Attitude

Statements	Mean	Standard deviation
There is panic and fear during floods	3.66	1.27
People fall ill during floods	3.56	1.29
We are traumatized during floods	3.48	1.28
We loss appetite during floods	3.45	1.39

Source: Field Survey, 2024

Socio-Economic Variables that influence vulnerability to Flood Disaster

Object three of the study determined the socio-economic variables that influence vulnerability to flood disaster. On a 5- point Likert scale rated as *1= Strongly disagree; 2= Disagree; 3=Neither agree nor disagree; 4=Agree and 5=Strongly agree, the* opinion of the respondents were

measured. The analysis of the responses was done with the use of descriptive statistics such as mean and standard deviation. On a scale of 1-5, the midpoint is 2.9, hence any mean score below 2.9 denote disagreement and any mean score above 2.9 represents agreement (Creswell, 2007). Measures of variations were also computed (Saunders, Lewis and Thornhil, 2015).
The respondents agreed that age influence vulnerability to flood disaster (*M*=3.47; *SD*=1.29), poverty influence vulnerability to flood disaster (*M*=4.53; *SD*=1.22) Also, the level of education influence vulnerability (*M*=3.36; *SD*=1.52). disability influences vulnerability to flood disaster (*M*=3.22;*SD*=1.37) and illness influence vulnerability to flood disaster.

The findings indicate that people become vulnerability to flood disaster due to socio-economic variables. Older people in the age bracket have high vulnerability rate to flood disasters in that during flood disaster, the aged has to be assisted to leave flood scenes than the younger generation (Biswas & Nautiyal, 2023). Also, people with low income mostly settle in flood prone area since accommodation is relatively cheaper compared to other locations. Further Munsaka (2023) posited that people with higher education level appreciate the devastating effects of flood disaster better than the uneducated. He intimated that in the events of flood disaster, they are able to receive insurance cover than the uneducated. However, other literature shares otherwise. For instance, Phuong et al. (2023) explained that people with flood disaster experience turn to appreciate it the more than any other thing. Table 3 presents the findings.

Table 3: Socio-Economic Variables that influence vulnerability to Flood Disaster

Statements	Mean	Standard Deviation
Age influence vulnerability to Flood Disaster	3.47	1.29
Poverty influence vulnerability to Flood Disaster	4.53	1.22
The level of education influence vulnerability to Flood Disaster	3.36	1.52
Disability influence vulnerability to Flood Disaster	3.28	1.24
Illness influence vulnerability to Flood Disaster	3.22	1. 37

Source: Field Survey, 2024

Hypothesis

To ascertain the relationship between the independent variables (Heat, storm, mudslide and hurricane) and the dependent variables (human health), a regression analysis was performed. Findings of the regression's summary of as presented in Table 4. The R square shows the variation in the independent variables and the dependent variable. The R square value of .248 was an indication that the independent variables (heat, storm, mudslide and hurricane) had 24.8% influence on the dependent variable (human health). From the findings, it became obvious that 75.2% of other variables contributed to human health issues. Table 4 presents the results.

Table 4: Model Summary

Model	R	R2	Adjusted R2	Std. Error and Estimate
1	.484	.248	.664	.320

Predictors: (Constant), heat, storm, mudslide and hurricane (independent variables) human health (dependent variable)
Dependent variable: human health

ANOVA

The ANOVA was used to also ascertain the significance level of rejection or acceptance. From Table 5, a significant level of 0.000a was determined which is less than .05 indicating acceptance.

Table 5: ANOVA

Models		**Sum of squares**	**Df**	**Mean square**	**F**	**Sig.**
1	Regression	12.162	4	4.230	14.246	.000b
	Residual	10.124	65	.145		
	Total	**22.286**	**69**			

Predictors: (Constant), Heat, storm, mudslide and hurricane (independent variables) human health (dependent variable)
Dependent variable: human health

Table 6: Coefficients

Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**T**	**Sig.**
1		**B**	**Std. Error**	**Beta**		
	Constants	.664	.587		2.434	.001
	Heat	.442	.686	.388	2.228	.000
	Storm	.468	.648	.274	2.464	.124
	mudslide	.576	.588	.234	1.228	.122
	Hurricane	.484	.489	.362	1.654	.122

a. Predictors: (Constant), Heat, storm, mudslide and hurricane (independent variables) and human health (dependent variable)
b. Dependent variable: human health

From the statistics, the independent variable (heat) has beta value of is .388 indicating heat as an independent variable explains 38.8% of human health (dependent variable). The p-value is .001, which showed significant association between heat and human health.

Another independent variable (storm) showed a beta value .274 implying that storm (which is the independent variable) explained 27.4% of the dependent variable (human health). The p-value is .124, which showed a moderate but significant association of storm and human health.

Also, mudslide as an independent variable had a beta value is .234 implying that mudslide explain 23.4% of the dependent variable human health. The p-value is .122, which also showed a significant but moderate association between mudslide and human health.

Additionally, hurricane as an independent variable had a the beta value of .362 which showed that hurricane as an independent variable explains 36.2% of the dependent variable human health. The p-value is .122, which showed a moderate association of hurricane and human health.

H1: There is a Significant Relationship between Heat and Human Health

Inferring from the regression analysis obtained the independent variable (heat) has beta value of is .388 indicating heat as an independent variable explains 38.8% of human health (dependent variable) whist about 61.2% is explained by other variables. Therefore, the study's hypothesis: *H1: There is a significant relationship between heat and human health can be accepted as we* reject the alternative hypothesis *H2: There is no significant relationship between heat and human health.* The result of the study is consistent with extant literature. For instance, Burns, Pettigrew & Harding (2023) intimated that heat causes physical discomfort as well as serving as a conducive atmosphere for insects such as mosquitoes which are detrimental to human health to thrive. Burns et al. (2023) further shared that many infectious disease thrive under such temperature leading to ill health. Additionally, Ebi et al. (2023) averred that extreme heat can lead to exhaustion, heat cramps, heat stroke, and heat-related death. People with chronic lung or heart illnesses or other conditions are at greater risk of heat-related complications or death.

H2: There will be a Significant Relationship between Storm and Human Health

Evidence from the regression statistics showed a relationship exists between the independent variables (storm) and the dependent variable (human health). From the statistics, there was 27.4% storm variation on human health whilst about 72.6% variations are caused by other variables. The relation is said to be moderate but also significant. As a result, the study's hypothesis: *H2: There will be a significant relationship between storm and human health was accepted as we reject the alternative hypothesis: There will be no significant relationship between storm and human health.* Storms have the potential to harm human lives and property through storm surge. The findings are in consonance with the study of Broomandi et al. (2023) who found out that storm has potential health impact on human lives especially infants.

H3: There will be a Significant Relationship between Mudslide and Human Health

As indicated by the regression statistics, mudslide as an independent variable had an association with human health. With a beta value of .234, mudslide explained 23.4% by implication to human health. Whilst about 76.6% are contributed by variables. This clearly showed a moderate but significant association between mudslide and human health. As a result, the study's hypothesis: *H3: There will be a significant relationship between mudslide and human health* was accepted

The study's results corroborated with literature (Alimohammadlou et al., 2020). Spegel & Ek (2022) posits that mudslide can result in significant human and economic losses. For instance, mudslide can negatively impact drinking water sources by introducing suspended sediment and organic materials. Poor water quality is thought to be linked to landslide activity in watersheds above drinking water reservoirs. It can also lead to broken electrical, water, gas, and sewage lines that can result in injury or death

H4: There will be a Significant Relationship between Hurricane and Human Health

The statistics showed a significant relationship between hurricane and human health. The beta value of .362 indicated that hurricane explained 36.2% variation to human health whilst about 63.8% variations are caused by other variables. Therefore, the study's hypothesis *H4: There will be a significant relationship between hurricane and human health* was accepted. Aly, Casillas, Luo, McDonald, Wade, Zhu & Rusyn (2021) opined that hurricanes generate projectiles and debris that can cause injury during the event. Waddell, Jayaweera, Mirsaeidi, Beier & Kumar (2021) also found out that hurricane can also increase the potential for hazardous chemicals and waterborne and vector-borne pathogens to spread through communities and the environment due to facility damage and flooding which has negative impact on human health.

CONCLUSION

It is sheer impossible to avoid floods as floods are natural process caused by large surges of water in short periods of time. The devastating effects of floods on human health and the environment have been underscored by scholars and researchers alike.

The study therefore concluded that the most common causes of flooding in Western Equatoria were climate change, deforestation, industrialization and rivers. Also, panicking and fear, illness, trauma and loss of appetite were some of the behaviours/attitude people experienced after flooding. Additionally, it can be concluded that age, poverty, education, disability and illness were the socio-economic variables that influence vulnerability to flood disaster.

Policy Direction

The fight against floods should be a collective and collaborative effort among the government and the various stakeholders in South Sudan. The government, regulatory bodies and all stakeholders should enforce afforestation to enhance climate change. Since industrialization cannot be scrapped, taxes from some of these industries must be channeled in distilling rivers to be to accommodate floods during rains.

The government, regulatory bodies and all stakeholders should ensure that health professionals as well as paramedics are deployed in the aftermath of flood to psych the minds of the affected people in order to ameliorate the trauma experience as well as offer treatment to those with casualties. Furthermore, the government should ensure that good economic and social policies are put in place to bridge the socio-economic gaps existing between the counties. Also, affordable housing can be built for low income earner in order to prevent them from living in flood prone areas.

Additionally, the government and county authorities should adopt the best flood mitigation strategies to ease the flooding effects on human health and the environment. Sea barrier, levees, dams, public engagement, regulatory body and meteorological forecasting should be adopted to mitigate flood disaster.

Direction for Future Studies

The primary aim of the study is to investigate the impact of flood disaster response strategies on human health in Western Equatorial, South Sudan. The study was largely quantitative in nature. Future studies could be explored with a qualitative focus.

REFERENCES

Ahmad, D., Kanwal, M., & Afzal, M. (2023). Climate change effects on riverbank erosion Bait community flood-prone area of Punjab, Pakistan: an application of livelihood vulnerability index. *Environment, Development and Sustainability*, *25*(9), 9387-9415.

Alifu, H., Hirabayashi, Y., Imada, Y., & Shiogama, H. (2022). Enhancement of river flooding due to global warming. *Scientific Reports*, *12*(1), 20687.

Alimohammadlou, Y., Najafi, A., & Yalcin, A. (2020). Landslide process and impacts: A proposed classification method. *Catena*, *104*, 219-232.

Bibi, T. S., & Kara, K. G. (2023). Evaluation of climate change, urbanization, and low-impact development practices on urban flooding. *Heliyon*, *9*(1).

Broomandi, P., Davletov, K., Kim, J. R., & Karaca, F. (2023). Dust Storm and Infant Health. In *Dust and Health: Challenges and Solutions* (pp. 113-136). Cham: Springer International Publishing.

Caldera, H. J., & Wirasinghe, S. C. (2022). *A universal severity classification for natural disasters. Natural hazards,* 111(2), 1533- 1573.

Chen, J., Shao, Z., Huang, X., Cai, B., & Zheng, X. (2023). Assessing the impact of floods on vegetation worldwide from a spatiotemporal perspective. *Journal of Hydrology*, *622*, 129715.

Chioma, O.C., Chitakira, M., Olanrewaju, O.O., Louw, E., (2019). Impacts of flood disasters in Nigeria: A critical evaluation of health implications and management. *Jàmbá J. Disaster Risk Stud*

Dwamena-Agyei, S. (2020). The Issues and Challenges of Flood-related Agencies in Ghana *Environment-Behaviour Proceedings Journal*, 5(13), 285-290.

Ebi, K. L., Capon, A., Berry, P., Broderick, C., de Dear, R., Havenith, G., & Jay, O. (2021). Hot weather and heat extremes: health risks. *The lancet*, *398*(10301), 698-708.

Gelbach, R. A. (2021). Trauma, research, and EMDR: A disaster responder's wish list. *Journal of EMDR Practice & Research*, *2*(2), 146–155

Goodman, R. D., & West-Olatunji, C. A. (2023).Applying critical consciousness: Culturally competent disaster response outcomes. *Journal of Counseling & Development*, *87*(4), 458–465.

Jia, W., Ma, M., Chen, J., & Wu, S. (2021). Plant morphological, physiological and anatomical adaption to flooding stress and the underlying molecular mechanisms. *International Journal of Molecular Sciences*, *22*(3), 1088.

Kim, Y., Oka, K., Kawazu, E. C., Ng, C. F. S., Seposo, X., Ueda, K., ... & Honda, Y. (2023). Enhancing health resilience in Japan in a changing climate. *The Lancet Regional Health–Western Pacific*.

Kuriakose, S. L. (2023). Flood vulnerability of a few areas in the foothills of the Western Ghats: a comparison of AHP and F-AHP models. *Stochastic Environmental Research and Risk Assessment*, *37*(2), 527-556.

Lawanson, O. I., Proverbs, D., & Ibrahim, R. L. (2023). The impact of flooding on poor communities in Lagos State, Nigeria: The case of the Makoko urban settlement. *Journal of Flood Risk Management*, *16*(1), e12838.

Merz, B., Blöschl, G., Vorogushyn, S., Dottori, F., Aerts, J. C., Bates, P. & Macdonald, E. (2021). Causes, impacts and patterns of disastrous river floods. *Nature Reviews Earth & Environment*, *2*(9), 592-609.

Navarro, O., Restrepo-Ochoa, D., Muñoz-Duque, L. A., Zapa-Perez, K., Ameline, A., Mercier, D., & Fleury-Bahi, G. (2020). Determinants of coping strategies in two types of natural hazards: Flash floods and costal flooding. *International journal of disaster risk reduction*, *46*, 101514.

Ning, G., Luo, M., Zhang, W., Liu, Z., Wang, S., & Gao, T. (2022). Rising risks of compound extreme heat-precipitation events in China. *International Journal of Climatology*, *42*(11), 5785-5795.

Panda, D., & Barik, J. (2021). Flooding tolerance in rice: Focus on mechanisms and approaches. *Rice Science*, *28*(1), 43-57.

Ran, Y., Zhu, K., Ma, M., Wu, S., & Huang, P. (2023). Periodic flooding enhances the function of soil Fe/Al oxides in stabilizing particulate organic carbon in a water level drawdown zone. *Soil and Tillage Research*, *231*, 105740.

Silveira, I. H., Cortes, T. R., Bell, M. L., & Junger, W. L. (2023). Effects of heat waves on cardiovascular and respiratory mortality in Rio de Janeiro, Brazil. *Plos one*, *18*(3),

Singha, M., Dong, J., Sarmah, S., You, N., Zhou, Y., Zhang, G., & Xiao, X. (2020). Identifying floods and flood-affected paddy rice fields in Bangladesh based on Sentinel-1 imagery and Google Earth Engine. *ISPRS Journal of Photogrammetry and Remote Sensing*, *166*, *278-293*.

Spegel, E., & Ek, K. (2022). Valuing the impacts of landslides: a choice experiment approach. *Economics of Disasters and Climate Change*, *6*(1), 163-181

Sulaiman, N., She, T. W., Fernando, T., WeiChan, S., Roslan, A. F., & Latib, S. K. (2022). Multi-agency collaboration in flood disaster management in Sarawak, Malaysia. Int. J. Innov. The International Journal of Innovative Technology and Exploring Engineering, 8, 411-419.

Tahir, W., Jani, J., Endut, I. R., Mukri, M., Ali, N. E. M., & Kordi, N. E. (2021). Practicability and effectiveness of flood disaster standard operating procedures (SOPs) in Malaysia. In IOP Conference Series: Earth and Environmental Science (Vol. 685, No. 1, 012004).

Tavakkoli, O., Kamyab, H., Shariati, M., Mohamed, A. M., & Junin, R. (2022). Effect of nanoparticles on the performance of polymer/surfactant flooding for enhanced oil recovery: A review. *Fuel*, *312*, 122867.

Waddell, S. L., Jayaweera, D. T., Mirsaeidi, M., Beier, J. C., & Kumar, N. (2021). Perspectives on the health effects of hurricanes: a review and challenges. *International journal of environmental research and public health*, *18*(5), 2756.

Ward, E. (2023). Whether or not to go: the travel impact of nuisance flooding and heavy rain for disabled and older people.

Xu, K., Zhuang, Y., Bin, L., Wang, C., & Tian, F. (2023). Impact assessment of climate change on compound flooding in a coastal city. *Journal of Hydrology*, *617*, 129166.