# An Inquiry into the Demographic and Health-related Factors associated with the Incidence of Stroke in Jamaica

## Zandy Uriel Elliott[1] PhD, DHSc, Paul Andrew Bourne[2] PhD. DrPH

[1]University of Technology, Jamaica, WI.
[2]Voctional Training Development Institute, Kingston, Jamaica, WI.

## Abstract

**Introduction**: Stroke is a global public health phenomenon that is among the top five leading causes of death; 12 million people experience one annually, 6.5 million people die because of a stroke annually, and 25% of people will have a stroke after their 25th birthday. However, the stroke statistics for Jamaica were estimated to be 13.62% ($n$=2,479 Jamaicans) of total deaths in 2018. Yet, no study has emerged that has examined the demographic and health factors associated with the incidence of stroke in Jamaica.

**Objective**: This study evaluates the demographic and health factors associated with stroke, enabling medical professionals to understand high-risk factors better and implement preventative care strategies in Jamaica-filling a significant gap in public health knowledge.

**Methods and Materials**: This research employed an explanatory cross-sectional design that examined Jamaican demographics, health, and stroke rates. Secondary data from the Office of the Consultant Neurologist (OCN) from 2000-2023 was integrated into the Social Ecological Model (SEM). The study included 291 stroke patients aged 18 and older, excluding those under 18 and those with other health issues. A multivariate logistic regression was used to address the research questions.

**Findings**: Tertiary education was associated with a 5% higher risk of stroke (OR = 1.05) than secondary education (CI [0.402, 2.75]). Renal disease ($p = 0.055$) and employment status was not predictors of stroke ($p = 0.075$). Employed individuals had a 3.2% increase in the likelihood of getting a stroke compared to their unemployed counterparts. Alcohol consumption did not significantly predict stroke occurrence ($p = 0.070$), nor did hypertension significantly predict stroke ($p = .270$). Gender did not predict stroke, but age was a predictor. Future research should uncover demographic and health aspects in other emerging nations.

**Conclusion**: The findings can help to drive sustainable positive social change by informing stroke policies, prevention, and quality of life programs in Jamaica, resulting in positive social change.

**Keywords:** Health determinants of stroke, health-related stroke factors, stroke.

# Introduction

Stroke isthe second most prevalent cause of death around the world, and it is responsible for the third largest number of deaths and disabilities combined(Feigin et al., 2022;World Health Organization (WHO), 2022). Feigin et al. (2022), Gordon et al. (2018), and Hutchinson et al. (2019) conducted research indicating that stroke is a major contributor to adult deaths in Jamaica, which is classified as a low- and middle-income country (LMIC). According to the findings of Hutchinson et al. (2019), stroke is classified as a chronic disease. In the category of cardiovascular diseases, which are a large subgroup of non-communicable diseases stroke is included in the category of cardiovascular diseases(Hutchinson et al., 2019; Jones, 2022).

Stroke is frequently associated with demographic and health characteristics such as age, gender, education levels, employment status, alcohol consumption, and renal disease(Feigin et al., 2022; Hutchinson et al., 2019; Murray, 2022). These factors are associated with the risk of developing stroke. Hutchinson et al. (2019) and Murray (2022) found that stroke had a disproportionately negative impact on people who belong to socioeconomically disadvantaged groups. Globally, non-communicable diseases, such as stroke and renal disease, are among the most significant contributors to the main causes of death and disability(Murray, 2022). These diseases are among the major causes of death and disability. As a result, this underscores the significance of preventative healthcare and addressing risk factors to avoid these diseases (Feigin et al., 2022; Gordon et al., 2018; Hutchinson et al., 2019; Murray, 2022).

# Background

The incidence of stroke was first documented in fifthby Hippocrates, often regarded as the "father of medicine" (Joshua et al., 2022; Karenberg, 2020). He coined the term "apoplexy," derived from the Greek word meaning "struck down by violence," to describe the rapid loss of consciousness and falling of a person(Joshua et al., 2022; Karenberg, 2020). Later, Johann Jacob Wepfer, a pathologist and pharmacologist, made the significant finding that apoplexy results from the interruption of blood flow to the brain (Karenberg, 2020). Wepfer arrived at this conclusion through post-mortem examinations of individuals who had died from apoplexy and determined that the blood flow to the brain was interrupted, either because of cerebral hemorrhage or the obstruction of arteries by blood clots. William Cole coined the term "stroke"and later adopted it in the medical field (Joshua et al., 2022). Giovanni Battista Morgagni revolutionized the comprehension of stroke in the contemporary era throughout the 19th century (Joshua et al., 2022). The understanding of stroke history progressed further with the contributions of Rochoux and Rostan, who defined stroke as a "lesion" in the brain (Karenberg, 2020). Later, technology increased with the inception of CT scans and MRIs in the 1970s, pioneered by Hounsfield and Damadian, and revolutionized medical diagnostics and clinical

care(Brigo, 2023). By employing CT scans and MRIs, medical professionals successfully generated high-quality images of the blood arteries and adjacent tissues, enabling them to determine if a patient experienced an ischemic stroke or a cerebral hemorrhage (Brigo, 2023).

Stroke is classified as a "neurological condition of sudden onset, lasting more than 24 hours or causing death, with no apparent cause apart from being of vascular origin"(Cagna-Castillo et al., 2023, para 1). Furthermore, the Global Burden of Disease Study (GBD) was established 30 years ago to provide timely, accurate, and relevant assessments of critical health outcomes (Murray et al., 2022; Pacheco-Barrios et al., 2022;Roopchand-Martin et al., 2014; Tulloch-Reid et al., 2013). Stroke is one such global disease(Murray, 2022); stroke is a recurrent and well-known cardiovascular event and a leading cause of death worldwide (Cagna-Castillo et al., 2023).According to the World Health Organization (WHO), the incidence of stroke and stroke-related deaths, as well as disability-adjusted life years, has more than doubled from 1990-2019, with a growing increase between 70% and87%. Boehmeet al. (2021) argued that stroke is a growing global public health issue and is the leading cause of death and disability.

According to Global Burden of Disease 2019 Lifetime Risk of Stroke Collaborators (2021), the current lifetime risk of stroke is 25% for both men and women, and the typicalage for stroke is 71.4 years in men and 76.9 years in women globally.Feiginet al. (2019) discovered that 14 million new strokes occur each year and that there are over 80 million stroke survivors, with a strong upward trend given society's continuous aging and population growth. Stroke is the primary factor leading to long-term disability and admission to long-term care facilities in Jamaica. The consequences of a stroke are devastating and often result in other health complications. Stroke is the primary factor leading to disability in Jamaica (Feigin et al., 2022; Gordon et al., 2018; Hutchinson et al., 2019).

In addition, the Ministry of Health and Wellness (MOHW) in Jamaica is responsible for ensuring the delivery of high-quality healthcare services and promoting healthy lifestyles and environmental practices(Jones, 2022). Stroke is the major contributor to increased rates of morbidity and mortality, and lifestyle changes; the prevalence of stroke in Jamaica is approximately 1.4%, or 82 deaths per 100,000 people die from strokes each year (Hutchinson et al., 2019). According to Ananth et al. (2023), stroke mortality rates in the United States are lowercompared to Jamaica, indicating a more advanced healthcare infrastructure in the former. In 2019, the age-standardized stroke death rate was 38.7 per 100,000 for males and 30.9 per 100,000 for females (Ananth et al., 2023). Epidemiologically, these rates correlate with the availability of new medical technologies, routine screenings, and improved management of chronic illnesses such as hypertension and diabetes, which significantly contribute to stroke (Ananth et al., 2023). Nwokocha et al. (2019) discussed that stroke is the main cause of death and premature death in Jamaica, for which hypertension (HTN) is an important risk factor, because HTN is closely related to stroke. Hutchinson et al. (2019) suggested that strokes, One Health Tool (OHT), and the epidemiological modeling suggests that 75,858 strokes and 62,500 ischemic heart disease (IHD) events may occur in Jamaica between 2017-2032.Li et al. (2021), Li et al. (2022), and Wang et al. (2020) found that approximately 27.0% of patients estimate a likelihood of stroke recurrence.

In Jamaica, there has been a noticeable rise in the incidence of stroke risk factors such as hypertension, diabetes, renal disease, and alcohol consumption. This increase has been observed to be 7.8% or 29 cases per 100 person-years, according to a study by Rankine-Mullings et al. (2019).Jamaica's public health sector focuses heavily on information systems for health (IS4H). The IS4H Plan of Action focuses on essential activities. However, more extensive efforts are required to raise awareness, construct stroke units, improve emergency response, improve healthcare services, and develop national policies and infrastructure.

## Problem Statement

The incidence of stroke in Jamaica has been a notable public health concern, with a rise in rates recorded in recent years (Avan et al., 2019; Hutchinson et al., 2019;Nwokocha et al., 2019; Pinkney et al., 2017). This study aims to fill a gap in the existing literature by understanding the demographic and health factors associated with the incidence of stroke in Jamaica.Researchers have observed a significant increase in the incidence of strokes in Jamaica, which has become a serious public health concern(Avan et al., 2019; Hutchinson et al., 2019;Nwokocha et al., 2019; Pinkney et al., 2017). Hutchinson et al. (2019) reported that the rising number of strokes has strained healthcare resources, resulting in a higher incidence of disability and mortality among afflicted individuals. Due to the increase in stroke frequency, investigations have been conducted to determine the underlying factors responsible for this trend. Ministry of Health and Wellness reports that around 7,300 individuals in Jamaica suffer from a stroke each year.

In 2017, the Ministry of Health of Jamaica performed the Jamaica Health and Lifestyle Survey II, which revealed that adults aged 40 and above in Jamaica had the highest recorded incidence of stroke. Pinkney et al. (2017) documented that throughout the period spanning 2012 and 2013, a totalof 108 individuals were diagnosed with acute ischemic stroke while undergoing medical care at the University Hospital of the West Indies in Jamaica. Thirty-five percent of these individuals succumbed to the disease, while an additional 50%were hospitalized. Pinkney and colleagues (2017) raised concerns over the 18.5% of individuals not included in the study due to being lost to follow-up, out of the total 64.9%. Consequently, this leads to further concerns about education and highlights the need for government involvement to ensure adherence to policy standards.

This is required because there is insufficient knowledge to adequately address and reduce the patterns and risks that lead to strokes. The extent to which policy and program execution have impacted the Jamaican population is unknown. Although prior studies have examined this topic, the precise association between demographic and health factors and the incidence of stroke in Jamaica has not been explored due to a lack of relevant literature(Murphy, 2022).In 2020, Jamaicans experienced 2,415 stroke-related fatalities, accounting for 13.82% of all deaths, ranking number104 globally in age-adjusted death rates at 70.26 per 100,000 population(Murphy, 2022).Murphy (2022) argued that over 7,300 stroke cases in Jamaica resulted in 2,400 fatalities, prompting the Jamaica Stroke Alliance (JSA). However, a riskometeris needed to enhance preventive efforts, as suggested by a neurologist at University Hospital of the West Indies (UHWI).A riskometerquantifies an individual's likelihood of encountering a stroke (Marquez-Romero et al., 2024; Murphy, 2022).Theriskometer, developed by Auckland University of Technology, measures an individual's stroke probability. The free

Stroke Riskometer mobile app calculates the 5-year risk by assessing risk factors (Marquez-Romero et al., 2024; Merkin et al., 2023; Murphy, 2022).Murphy (2022) highlighted challenges in stroke care, including lack of centers, limited accessibility, inadequate ambulance coverage, CT scanning availability, shortage of trained physicians, and public awareness.

Furthermore, there are several stroke studies done by foreign professionals, paid for by foreign organizations, but there is no local stroke support. Consequently, there was a significant gap in knowledge understanding the demographic and health factors associated with stroke in Jamaica to reduce the national burden of this debilitating condition. The study provided insights into developing efficient interventions and policies to reduce strokes and improve health outcomes in various populations.

## Purpose of the Study

This quantitative study aims to understand the association between demographic and health factors and the incidence of stroke in Jamaica. The demographic and health factors include age, gender, education level, renal disease, hypertension, employment status, and alcohol consumption. Increasing age is a major factor in determining the risk of stroke. In Jamaica, as well as in many other countries, the incidence of stroke tends to increase concurrently with the progression of age (Willie-Tyndale et al., 2019; Martinez et al., 2023). The older population is at an increased risk because of factors such as changes in blood vessels and the combined effects of various risk factors. Stroke incidence may vary according to gender (Blake et al., 2023). Historically, while males have demonstrated a greater vulnerability to strokes, this difference is decreasing(Blake et al., 2023). Blake and colleagues suggested that stroke incidence rates in men in Jamaica are higher than those in women, although the difference may not be statistically significant in all age groups. Hypertension is the foremost modifiable risk factor for stroke (Blake et al., 2023). Hypertension progressively damages blood vessels, increasing the risk of a stroke (Ferguson et al., 2022). High blood pressure is prevalent in Jamaica and significantly contributes to the occurrence of strokes (Ferguson et al., 2022).

Demographic factors, such as education level, can have an impact on the risk of stroke. There is a significant association between employment status and the risk of acquiring cardiovascular diseases such as stroke, particularly in demanding or high-pressure positions that cause high amounts of job-related stress. Differences in healthcare access and health outcomes among different socioeconomic groups in Jamaica may have an impact on the incidence of strokes.The goal of this study is to understand better the physiological changes associated with aging that increase the likelihood of having a stroke, as well as the association between aging, hypertension, renal disease, and other risk factors. It also investigates gender differences in the likelihood of having a stroke, as well as the effect of education on the likelihood of having a stroke. The study also looks at early signs of renal disease, employment status, and the impact of alcohol on the risk of stroke. The goal is to provide gender-specific preventive measures and interventions for occupational wellness. The study also intends to assess risk inequalities within subcategories of age, gender, and educational attainment.

## Research Questions and Hypotheses

The study explores the association between demographic and health factors and the incidence of stroke in Jamaica. The following research questions and hypotheses guided the study:

*RQ1*. What is the association between education level and the incidence of stroke, while controlling for confounders such as age and gender among individuals living in Jamaica?

$H_0 1$: There is no significant association between education level and the incidence of stroke when controlling for confounders such as age and gender among individuals living in Jamaica.

$H_a 1$: There is a significant association between education level and the incidence of stroke when controlling for confounders such as age and gender among individuals living in Jamaica.

*RQ2*. What is the association between hypertension and the incidence of stroke, while controlling for confounders such as age and genderamong individuals living in Jamaica?

$H_0 2$: There is no significant association between hypertension and the incidence of stroke while controlling for confounders such as age and genderamong individuals living in Jamaica.

$H_a 2$: There is a significant association between hypertension and theincidence of stroke while controlling for confounders such as age and genderamong individuals living in Jamaica.

*RQ3*. What is the association between renal disease and the incidence of stroke, while controlling for confounders such as age and genderamong individuals living in Jamaica?

$H_0 3$: There is no association between renal disease and the incidence of stroke while controlling for confounders such as age and genderamong individuals living in Jamaica.

$H_a 3$: There is a significant association between renal disease and the incidence of stroke while controlling for confounders such as age and gender among individuals living in Jamaica.

*RQ4*. What is the association between employment status and the incidence of stroke, while controlling for confounders such as age and genderamong individuals living in Jamaica?

$H_0 4$: There is no significant association between employment status and the incidence of stroke while controlling for confounders such as age and genderamong individuals living in Jamaica.

$H_a 4$: There is a significant association between employment status and the incidence of stroke while controlling for confounders such as age and gender among individuals living in Jamaica.

*RQ5*. What is the association between alcohol consumption and the incidence of stroke, while controlling for confounders such as age and genderamong individuals living in Jamaica?

$H_0 5$: There is no significant association between alcohol consumption and the incidence of stroke while controlling for confounders such as age and genderamong individuals living in Jamaica.

$H_a 5$: There is a significant association between alcohol consumption and the incidence of stroke while controlling for confounders such as age and gender among individuals living in Jamaica.

## Theoretical Framework for the Study

The primary theoretical framework for this research study was based on the Social Ecological Model (SEM). The SEM provides a comprehensive framework for understanding the multiple levels of influence on health behaviors and outcomes (Lee & Park, 2021).Lee and Park (2021) argue that the SEM posits that behavior is influenced by several factors at the individual level and the broadersocial, physical, and policy contexts. Social-ecological systems are founded on the notion that humans are integral to the natural world, a term originally proposed by Berkes and Folke (van Tol, 2023). Furthermore, sociologists affiliated with the Chicago School introduced socioecological models to urban studies following the First World War in response to developmental psychologists' limited focus on research. These models connect behavioral theories that emphasize small-scale environments and anthropological theories (Baatiema et al., 2021). Urie Bronfenbrenner's Ecological Framework for Human Development, which was initially offered as a conceptual model in the 1970s, codified as a theory in the 1980s, and continuously amended by Bronfenbrenner until he died in 2005, uses socioecological models inthe study of human development, as outlined by the SEM. Bronfenbrenner's founding idea posited that a comprehensive understanding of human development necessitates considering the entire ecological system in which growth occurs. In later versions, Bronfenbrenner recognized the significance of biological and genetic factors in human development (Kvieskienė & Celiešienė, 2023). The Social Ecological Model (SEM) is a theoretical framework employed to comprehend and tackle individuals' intricate interplay, physical environment, and social context (Baatiema et al., 2021; van Tol, 2023).

The SEM emphasized individuals who are both influenced by and have an impact on a wide range of social factors and interconnected environmental associations. The SEM comprises five distinct levels: individual, interpersonal, community, and, by extension, the policy (society) factors. This research study explained how age, gender, education level, renal disease, hypertension, alcohol consumption, and employment status fit within the SEM framework. At the individual level, aman with a lower level of education and hypertension may face an elevated risk of stroke if he engages in regular alcohol consumption. At the interpersonal level, an individual's family members and friends can encourage or discourage their drinking habits. Insufficient access to healthcare or limited availability of healthy lifestyle choices at the community level can expose individuals to increased risks. Nevertheless, implementing restrictions on drinkingand offering assistance for abstinence initiatives at the societal level can effectively reduce the likelihood of an individual experiencing a stroke (Perue et al., 2023).

## Nature of the Study

This study employed secondary data to address quantitative research questions instead of doing an experimental study. The Office of Consultant Neurology (OCN) provided secondary data for stroke patients. The data were obtained through a questionnaire administered by the neurologist's office. The utilization of secondary data enhanced comprehension of the correlation between age, gender, hypertension, alcohol consumption, renal disease, and their impact on stroke. The selected research methodology is per the study's criteria as it employs Socioecological Model (SEM) frameworks to ascertain the association between predictor and criterion variables and the

presence of mediating effects. It was suitable for my research study because it allowed for substantial data collection, evaluated and reported in numerical and categorical formats. The initial data were collected using a straightforward sampling method. The study employed a non-experimental cross-sectional design.

The cross-sectional study design was used to identify important information on several characteristics related to educational level, renal disease, hypertension, and employment status as the predictor variables, and stroke as the criterion variable while controlling for age and gender. An analysis of the mediating effect was also conducted to explore the effect of hypertension and renal disease, as well as alcohol use, on stroke, with a focus on identifying any mediating association. The statistical tool was suitable for my research topic due to its quantitative nature, with the criterion variable being binary and the predictor variable encompassing both continuous and categorical aspects. The multivariate logistic regression technique enables the assessment of the unique impacts of predictor variables on the probability of a binary outcome while controlling for potential confounding factors such as age and gender. Utilizing multivariate logistic regression analysis provides a comprehensive understanding of the association between the variables of interest.

## Definitions

This section provides concise and accurate explanations of the terminology used throughout the study, to explain their meanings and how they are applied in real-world situations. Chapter 3 contains comprehensive explanations for most definitions, whereas operational definitions are obtained from literature based on evidence from empirical studies. This section contains several conceptual definitions.

*Alcohol consumption*: Alcohol consumption pertains to the excessive and persistent use of alcohol, marked by an inability to control intake and a continual, long-term dependency on alcohol (Carr et al., 2024).

*Education level*: According to these ideas, exclusion in education often leads to exclusion in other areas of society due to the importance of education for inclusion, among others, the labor market (Vanderstraeten, 2021).

*Employment status*: Employment status pertains to an individual's connection with the job market, marked by personalized negotiation, meager salaries, financial hardship, restricted working privileges, and a lack of ability to assert one's rights (Park et al., 2020).

*Hypertension*: Hypertension, a common chronic medical illness, is distinguished by a persistent increase in arterial pressure and is associated with a high mortality rate. Hypertension is the leading risk factor for deaths that can be directly linked to it (Iqbal& Jamal, 2023; Ruilope et al., 2024).

*Information systems for health (IS4H)*: Information systems for health (IS4H)is a comprehensive initiative aimed at integrating interconnected systems, data, knowledge, processes, standards, people, and institutionsto enhance efficient planning and decision-making(Jones,2022).

*One Health Tool (OHT)*: The One Health Tool (OHT) is a sophisticated epidemiological model designed to forecast the incidence of stroke episodes in Jamaica from 2017 to 2032 (Hutchinson et al., 2019).

*Noncommunicable diseases*: Noncommunicable diseases are medical conditions or diseases that are not contagious and cannot be passed on from one person to another (Hutchinson et al., 2019).

*Renal disease*: Chronic kidney disease (CKD) is characterized by kidney damage or a glomerular filtration rate below 60 ml/min per 1.73 square meters, lasting three months or longer, regardless of the cause (Ruilope et al., 2024; Vaidya & Aeddula, 2022).

*Riskometer:* A riskometer is a device utilized to assess an individual's likelihood of encountering a stroke (Marquez-Romero et al., 2024; Murphy, 2022). The Auckland University of Technology in New Zealand developed the Stroke Riskometer mobile application, which is a tool that calculates the 5-year absolute risk of stroke by evaluating various risk factors associated with the overall risk of stroke and cardiovascular disease (Merkin et al., 2023).

*Stroke*: Disruption of blood circulation to the brain can result in diminished oxygen levels in brain tissue and cell death (ASA, 2020; Walter, 2022; Xu, 2021).

## Assumptions

The research study assumes participants provided truthful responses to a questionnaire, with secondary data from the Office of Consultant Neurology (OCN) accurately representing the Jamaican population. However, self-reporting raises concerns about potential response bias, as individuals may provide socially acceptable answers (Kilkenny et al., 2024). The incidence of chronic medical conditions among participants is also a significant challenge. To reduce response biases, meticulous survey design and unbiased research questions are crucial, allowing statistical approaches to address and correct biases.

## Scope and Delimitations

The study aimed to explore the association between demographic and health factors and the occurrence of stroke in Jamaica. The demographic and health factors considered in this study, based on the Office of Consultant Neurology (OCN) data, included age, gender, education level, renal disease, hypertension, employment status, and alcohol consumption. It was presumed that all participants were at least 18 years old. The participants included in this study were individuals who had experienced a stroke. The criteria for exclusion in this study were individuals who had health-related issues unrelated to stroke disorders and individuals who were under the age of 18 years. The study's generalizability to the Jamaican population may have been handicapped due to the omission of certain health-related diseases while examining the association between demographic and health factors and stroke.

## Limitations

This research study attempted to consider the full range of demographic and health factors that impact stroke patients during the duration of its exploration. The gathered data may not represent

a sufficient sample size of the Jamaican population that has suffered a stroke. A lack of generalizability in other groups may arise because ofa specific sample population selection. For instance, many Haitian immigrants are entering the Jamaican population in search of refuge due to the crisis in Haiti. I neglected to consider migrant populations from countries other than Jamaica. Extensive research has been conducted on hypertension, renal disease, and alcohol consumptionabout stroke in various regions such as the Caribbean, the US, Europe, and Africa. However, there is a lack of dedicated research specifically focused on Jamaica (Ashby-Mitchell et al., 2021; Martinez et al., 2023; Willie-Tyndale et al., 2019).The purpose of this study was to analyze the associations between demographic and health factors using the obtained results. Furthermore, using a cross-sectional study design in this investigation made it impossible to demonstrate a conclusive causal association between the variables while also increasing study feasibility and reducing long-term follow-up.

## Significance

This research has the potential to exert a positive change insocial transformation in Jamaica, thus emphasizing the significance of this study. Factors such as age, gender, hypertension, employment status, and demographic variables like education level might contribute to positive social changes in Jamaica. These factors can facilitate change through a multitude of diverse mechanisms. The methods encompass enhanced health outcomes, empowerment and equity in health, socioeconomic progress, community involvement, and social harmony. Jamaica may achieve its sustainable development goals by implementing targeted interventions, policies, and community engagement activities to address these challenges and foster constructive social transformation while empowering its citizens. The study explores the social implications and potential contributions to the field. Social implications of public health benefits include reduced patient deficits, long-term disabilities, and healthcare costs associated with strokes. This could lead to improved patient outcomes, such as enhanced functional status following astroke and reduced morbidity and mortality rates associated with strokes and other underlying conditions.

## Literature Review

## Introduction

The incidence of stroke in Jamaica has been a significant public health concern, with rates rising in recent years (Avan et al., 2019; Hutchinson et al., 2019; Nwokocha et al., 2019; Pinkney et al., 2017). Chen et al. (2022) state that hypertension is a significant health factor that has severe health consequences, such as an increased likelihood of experiencing a stroke. However, the goal of this quantitative study wasto explore the relationship between demographic and health factors and the incidence of stroke in Jamaica. Age, gender, education level, kidney disease, hypertension, employment status, and alcohol consumption are all examples of demographic and health characteristics. Furthermore, the existing research gives a thorough context and relevance to the problem affecting stroke patients. For example, the incidence of stroke in Jamaica is about 1.4%, with an annual mortality rate of 82 stroke-related fatalities per 100,000 people (Hutchinson et al., 2019). Conversely, in comparison to the United States, the mortality rate of stroke was 38.7 per 100,000 for males and 30.9 per 100,000 for women (Ananth et al., 2023). Furthermore,

while exploring Jamaica, it is worth noting that it is classified as a Low- and Middle-Income Country (LMIC) that faces a disproportionate burden. Specifically, around 70% of strokes and 87% of stroke-related fatalities and disabilities occur in Jamaica (Hutchinson et al., 2019). The current lifetime risk of stroke is 25% for both men and women, and the average age forstroke is 71.4 years in Jamaica (Feigin et al., 2019; Maddox, 2020). Blake et al. (2023) and Qiqi et al. (2021) have found that stroke is more prevalent among men between the ages of 30 and 74 and among women aged 75 and above. Conversely, stroke is uncommon among individuals aged 45 and younger, constituting just 10% to 15% of all stroke cases. Cagna-Castillo et al. (2023) proposed that stroke be considered a medical emergency due to the high risk of death, with a cumulative risk of death of 28%, 41%, and 60% at 28 days, 1 year, and 5 years of follow-up, respectively. Katito and Davies (2021), Tang et al. (2023), and Zhang et al. (2023) concur that stroke is a prominent contributor to impairment in individuals of middle-aged and older age groups.

## Literature Search Strategy

A comprehensive examination of the current literature was conductedto compile and assess the research study. In order to adhere to the socioecological model (SEM) paradigm established by Urie Bronfenbrenner, an analysis of both present and historical empirical data was conducted. During the past five years, I have actively sought papers pertinent to my ongoing study topic. However, I found severalpapers crucial and pertinent to the literature study. EBSCO, PubMed, JSTOR, Academic Search Complete, ERIC, ScienceDirect, CINAHL, Biomed Central, and AMED were among the queried databases. Additional databases that were investigated include AMED and CINAHL. These institutions and organizations provide reports on issues related to strokes.

Organizations such as the Statistical Institute of Jamaica (STATIN), the World Health Organization (WHO), the Center for Disease Control and Prevention, and the Pan American Health Organization belong to this category. Throughout this analysis, various key search keywords and combinations of search terms were utilized to ensure compatibility and preparedness for the study. The search keywords used in the Jamaican population included *stroke, hemorrhagic stroke, ischemic stroke, renal disease, education level, hypertension, employment status*, and *alcohol consumption*. Additional search terms from affiliated organizations, such as STATIN, were also analyzed to ensure the inclusion of a wide range of search queries. The Statistical Institute of Jamaica (STATIN) is a governmental entity tasked with collecting, compiling, analyzing, and distributing statistical data pertaining to Jamaica. It functions within the jurisdiction of the Ministry of Finance and the Public Service of Jamaica. STATIN functions as Jamaica's national statistical office, with a crucial responsibility of generating official statistics to aid in planning, policy creation, and monitoring of the country's development objectives (Statistical Institute of Jamaica [STATIN], 2017).In this research study, several terms like the *burden, incidence, risks, epidemiology,* and *mortality* of stroke in Jamaica to find new and important sources of data on the incidence, impact, and death rates related to stroke. These search terms were employed to collect data on the incidence of stroke in Jamaica.

## Theoretical Foundation

The research study is based on the socioecological model (SEM) as the theoretical framework. The theoretical basis of this study is rooted in the demographic and health aspects within the socioecological model created by Urie Bronfenbrenner in the 1970s (Kechi et al., 2024; Kvieskienė & Celiešienė, 2023). Bronfenbrenner's fundamental concept suggests that a thorough comprehension of human development requires considering the complete ecological system in which growth occurs (Bullock, 2024; Fisher, 2024). The SEM was employed to explore the influence of demographic and health factors across five distinct levels: individual, interpersonal, community, and policy (Thibodeaux, 2024). The social ecological model (SEM) demonstrates that an individual's growth and actions are influenced by the diverse systems in which they participate (Fisher, 2024).

However, to fully address stroke within this framework, it is crucial to incorporate the particular demographic and health aspects at every level of the socio-ecological model. The individual level examines factors such as age, gender, educational level, alcohol consumption, work employment status, and specific health issues, including hypertension and renal disease, considering their immediate surroundings. At the interpersonal level, cooperation among social support networks, families, and employers is enhanced to facilitate comprehensive management of overall health. The community level aims to include individuals in preventive measures to improve social activities that target wider health factors and boost stroke prevention. The societal level utilizes public health policy initiatives to modify intervention strategies based on individuals' evolving requirements and circumstances throughout their lives, as well as in reaction to historical patterns in health and disease management. By analyzing stroke from a socioecological perspective, we can develop more efficient and tailored prevention, management, and rehabilitation approaches considering the intricate interplay of individual, societal, and environmental factors.

This study employed the SEM framework because of its emphasis on the influence of human association on health. The SEM framework adopts a holistic approach to exploring stroke, a complex condition that is influenced by a multitude of factors spanning from biological to societal aspects. Nevertheless, the SEM facilitates the development of multi-level interventions by acknowledging the various levels of influence, including individual, interpersonal, community, and policy (society). The SEM plays a crucial role in stroke prevention and management as it allows for the development of solutions that account for individual behaviors, social support systems, community resources, and wider societal factors. Multiple factors, such as age, gender, education, employment status, and health behaviors, have an impact on the risk of stroke and its effects. The socioecological model facilitates comprehension of the interplay between these variables across different layers of the environment, considering how the familial support network and community support services combine to impact an individual's ability to manage hypertension. Figure 1 shows a theoretical framework between the SEM and demographic and health factors.
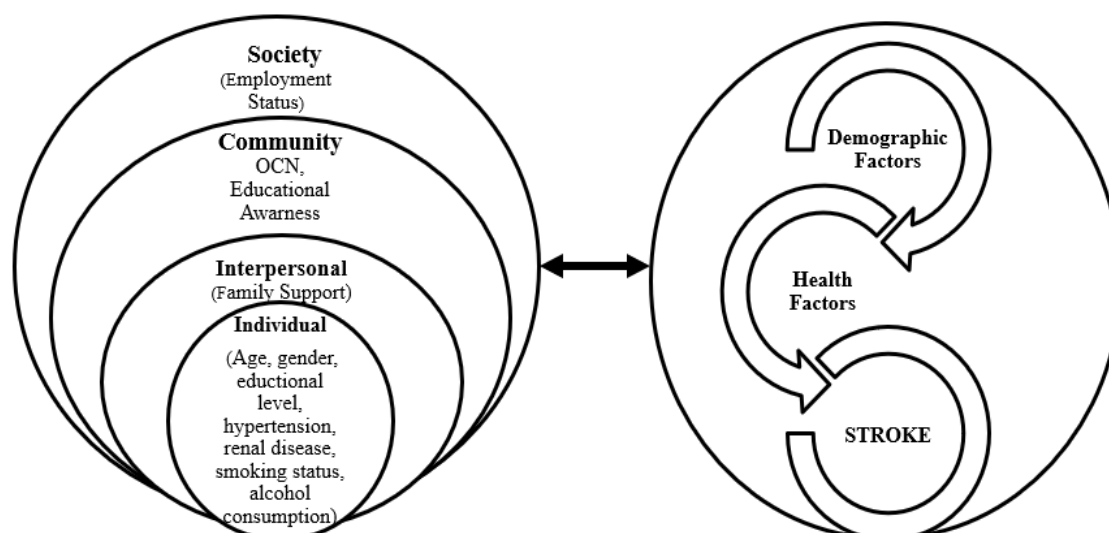
**Figure 1: Theoretical Framework of SEM and Demographic and Health Factors**

*Note.* Theoretical framework between the Socioecological Model (SEM) and demographic and health factors. Adapted from "PrEP inequities among Black and Latino MSM in the United States: Identifying barriers and opportunities using a socialecological model (SEM) framework," by R. Fisher, 2024, 2-22. https://doi.org/10.57709/36295333

The justification in this context is relevant to the SEM employed in previous research before the current study. The concept emphasizes the importance of considering the context while addressing health issues, tailoring interventions, and implementing initiatives and health plans for specific populations, such as Jamaica. TheSEM demonstrates that demographic factors, such as age and gender, and health factors, such as renal disease and hypertension, are not independent but are interconnected and affected by the surrounding social and physical environment. This environment has been influenced by policymakers, as noted by Nagase (2024) and WaukeandPizzinato (2024). The SEM incorporates the chronosystem, the fifth level of Bronfenbrenner's ecological system theory. The chronosystem includes significant life transitions and explains changes that occur throughout time (Crawford, 2020). It is crucial to consider that stroke patients may experience changes in risk factors and health outcomes due to factors such as aging, life events, and historical trends in healthcare facilities, community support systems, and public health policies.

The socioecological approach guides the development of policies and practices in Jamaica to establish supportive settings for stroke prevention and management by focusing on healthcare institutions, community support services, and public health policies at various levels. The SEM actively promotes advancing policies that foster health, including those that guarantee healthcare accessibility, encourage the development of healthy communities, and provide financial assistance for community health programs. The concept promotes the integration of many sectors and specialties through collaboration. To achieve optimal stroke prevention and management, healthcare providers, public health experts, policymakers, educators, and community organizations must collaborate and cooperate. The socioecological model functions as a collective framework for this collaboration. SEM amplifies the talents of individuals and communities by recognizing their role in advancing health. Interventions based on the

socioecological paradigm often include elements that strengthen individual empowerment and community capabilities, leading to significant and long-lasting improvements in health. By selecting the socioecological model, we may tackle the intricate aspects of stroke and create more efficient, comprehensive approaches for preventing, treating, and recovering from it, while considering the intricacies of real-life settings within the population.

## Literature Review Related to Key Variables and/or Concepts

The socioecological model (SEM) developed by Urie Bronfenbrenner offers a comprehensive framework for analyzing the various complex factors that cause stroke. This review examines the latest research conducted between 2019 and 2024 in Jamaica. It investigates the relationship between demographic and health characteristics, including age, gender, education level, renal illness, hypertension, employment status, and alcohol use, and their impact on the occurrence of stroke. The influential studies by Gheorghe et al. (2018), Moghadam-Ahmadi et al. (2023), and Saeed et al. (2020) emphasized the significant impact of demographic and health factors on the risk of stroke. These studies highlighted the need to adopt a comprehensive strategy, as suggested by the socioecological model. Although there may be difficulties in adopting a comprehensive framework, the potential advantages of using targeted and effective therapies make it a promising paradigm for treating stroke risk in Jamaica.

## Age and Gender and Incidence of Stroke

Research repeatedly demonstrates that age is a notable risk factor for stroke, with older persons being more susceptible to this condition(Moghadam-Ahmadi et al., 2023). The American Stroke Association (2023) and Moghadam-Ahmadi et al. (2023) contend that a significant proportion of stroke patients are aged 60 and above, with males being disproportionately impacted compared to females. This is attributed to the higher prevalence of hypertension among men in Jamaica. Cagna-Castillo et al. (2023) agree with Ahmadi and colleagues, stating that the incidence rates of stroke were comparable between genders, with males exhibiting a higher rate of incidence than females. Stroke is the leading cause of death among women in Jamaica, claiming the lives of twice as many women as cancer does annually(Cagna-Castillo et al., 2023; Pinkney et al., 2017). Stroke is the second leading cause of death among Jamaican males(Cagna-Castillo et al., 2023). Stroke is the primary cause of enduring and prolonged disability among Jamaican people of working age. Stroke is a significant contributor to poverty in numerous Jamaican households, as it affects the primary breadwinner's ability to produce cash (Pinkney et al., 2017; Roopchand-Martin&Creary-Yan,2014). According to Kramer et al. (2018), stroke continues to be the primary cause of mortality in both males and females.

## Education Level and Incidence of Stroke

Moghadam-Ahmadi et al. (2023) further asserted that individuals with lesser levels of education are more prone to experiencing an elevated risk of stroke, mostly because they have restricted access to health-related knowledge and healthcare facilities. Research conducted in the Caribbean and Jamaica suggest that those who have not completed secondary education are at a higher risk of experiencing strokes(Bahall,2024; Lazo-Porras et al., 2024; Moghadam-Ahmadi et

al., 2023). This relationshipis linked to poorer levels of health literacy and a lower socioeconomic status.The level of education plays a crucial role in determining health outcomes, including the incidence of stroke. Recent studies in Jamaica indicates an intricate correlation between education and the likelihood of experiencing a stroke (Bahall,2024; Lazo-Porras et al., 2024). Lazo-Porras and colleagues found that individuals with greater levels of education are more inclined to adopt health-promoting habits and make use of preventative healthcare services, hence decreasing their susceptibility to stroke. Madu et al. (2021) found a significant correlation between schooling and stroke in the Caribbean, with differences exacerbating over time. Madu and colleagues asserted that a growing disparity in stroke mortality rates, based on education levels, accounted for 17.4% of the total disparity in life expectancy. This finding ranked second only to cancer. Hence, education is closely linked to both health literacy and income, both of which significantly influence the provision of cardiovascular disease services (Olindo et al., 2017; Pacheco-Barrios et al.,2022).

## Renal Diseaseand Hypertension and Incidence of Stroke

Gheorghe et al. (2018) and Saeed et al. (2020) indicated that renal disease and hypertension are critical factors. Hypertension is highly prevalent in Jamaica, often poorly managed, leading to increased stroke risk. Studies highlight that effective management of blood pressure can significantly reduce stroke incidence.Ashby-Mitchell et al. (2021) found that approximately 80.0% of participants had two or more coexisting conditions, with hypertension and stroke leading causes of death in Jamaica, according to theSTATIN and the 'Ministry of Health and Wellness. The population in Jamaica, similar to that of the rest of the globe, is experiencing the process of aging, which is a notable indicator of chronic illness. Although Jamaica has made progress in enhancing its healthcare system, namely in terms of improving access to medical treatment, providing comprehensive care for neurological ailments continues to be a difficult task. Jamaica exhibits a greater incidence of stroke compared to numerous other nations because of the substantial rise in hypertension and renal disease that significantly increase the likelihood of stroke in the Jamaican population (Ashby-Mitchell et al., 2021; Jones, 2022).

Hypertension contributes significantly to the prevalence of diseases in Jamaica(Nwokocha et al., 2019). The primary cause of mortality and early demise in Jamaica is stroke, with hypertension (HTN) being a significant contributing factor. Hypertension impacts more than 25% of the Jamaican population (Nwokocha et al., 2019).Renal disease and stroke are significant public health problems in Jamaica, mirroring global trends where both conditions are prevalent and have a substantial influence.Bahall(2024)revealed that almost 13% of Jamaican people have a high incidence of renal disease. Investing in healthcare infrastructure to provide accessibility to dialysis, kidney transplants, acute stroke care, and rehabilitation programscan significantly enhance outcomes.Kramer et al. (2018) acknowledged the increasing incidence of renal disease in Jamaica, primarily caused by hypertension. However, they also noted that certain cases were linked to lupus nephritis and chronic glomerulonephritis. These factors contributed to a significant 32% rise in the mortality rate.

As a result, it is crucial to enhance outcomes by increasing awareness of the indications and symptoms of stroke, as well as the need for preventive measures and prompt intervention policies

and community initiative. Boehme et al. (2021) argued that a considerable gap between recommended preventive strategies and community support services and performance of risk variables, can assist individuals with timely and appropriate treatment to diminish the severity of brain damage while enhancing long-term outcomes, such as quality of life. Gordon et al. (2018) and Feigin et al. (2022) added that individuals in Jamaica do not undergo therapy after a stroke due to financial constraints and limited servicesoptimize recovery and enhance general well-being. According to Hutchinson et al. (2019), stroke burden remains a significant problem and is a prominent contributor to disability and mortality in the population. Furthermore, there are restricted availability of healthcare facilities and resources in Jamaica, leading to disparities in stroke treatment and outcomes(Hutchinson et al., 2019; Murray, 2022).

## Employment Status and Incidence of Stroke

The yearly financial strain on Jamaican households caused by stroke is calculated to be more than $310 million US Dollars (USD), with a corresponding effect on Jamaica's Gross Domestic Product (GDP) of 2.42%1(Murphy, 2022). Stroke has a significant impact on the workforce in terms of employment status (Murphy, 2022). Murphy reported that a mere 40% of Jamaicans who experienced a stroke achieved a satisfactory level of recovery that enabled them to resume their employment. This results in a decline in employment, means of subsistence, and earnings, impacting not just the individual who suffered a stroke but also their family and, consequently, the economy. Gheorghe et al. (2018) revealed that employment status impacts health outcomes, where unemployment is associated with higher stress levels, reduced healthcare access, and poorer health behaviors, increasing stroke risk. Gheorghe and colleagues (2018) found that being unemployed is linked to elevated stress levels, limited access to healthcare, and unhealthy habits, all of which contribute to an increased risk of stroke. However, the presence of economic instability in the population hinders individuals from being able to buy necessary medications or sustain healthy lives (Saeed et al., 2020).

## Alcohol Consumption and Incidence of Stroke

Although moderate alcohol use has been linked to a reduced risk of stroke in certain studies, excessive alcohol consumption is globally associatedwith over 1 million strokes per year, highlighting the significance of alcohol as a risk factor for stroke (World Stroke Organization [WSO], 2024). Research suggests that consuming excessive amounts of alcoholgreatly increases the risk of having a stroke (Chrystoja et al., 2022; Hennis et al., 2002; Harvard Health Publishing, 2019; Stroke Association, 2014). Over 27% of the Jamaican population are both smokers and consumers of alcohol(Murphy, 2022).The American Stoke Association (2023) and Saeed et al. (2020) have asserted that excessive alcohol intake are widely proven risk factors for stroke. Alcohol is a contributing factor to the development of atherosclerosis and the creation of blood clots. On the other hand, excessive alcohol consumption raises the risk of hypertension and atrial fibrillation. Jamaican public health efforts should prioritize drinking abstinence advocating for moderation in alcohol usage as preventive measures.

## Access to Care and Stroke

Key institutions and facilities involved in stroke care in Jamaica include the Office of Consultant Neurology (OCN), Jamaica Stroke Alliance, and the Rehabilitation Institute of the Caribbean(Murray, 2022; Jamaica Stroke Alliance [JSA], 2020).The care provided by these facilities includes Tissue Plasminogen Activator (tPA) and Computed Tomography (CT) (Perue et al., 2023). Tissue Plasminogen Activator (tPA) is frequently employed to treat ischemic strokes, which arise from the obstruction of a cerebral blood artery by a blood clot (Perue et al., 2023). Administering tPA within a defined timeframe (typically between 3 to 4.5 hours after the stroke begins) can greatly enhance results by reinstating blood circulation to the affected region. tPA is also employed in the management of specific cases of heart attacks (myocardial infarctions) to dissolve clots in the coronary arteries. Additionally, tPA can be utilized in the treatment of pulmonary embolism, a condition characterized by blood clots obstructing blood vessels in the lungs (Perue et al., 2023). Perue et al. (2023) proposed that Computed Tomography (CT) is a medical imaging method that employs a blend of X-rays and computer technology to generate cross-sectional images (slices) of the body. CT scans are employed for the purpose of monitoring the advancement of diseases and evaluating the efficacy of treatments (Perue et al., 2023).

Furthermore, the OCN plays a vital role in delivering specialist neurological care, encompassing stroke management, diagnostic services, treatment planning, and continuous care for stroke patients(Feigin et al., 2022; JSA, 2020). This facility encounters obstacles such as limited resources and a lack of qualified staff. Additionally, insufficient funding and infrastructure may cause delays in providing appropriate intervention, which is crucial in stroke cases where prompt treatment can mitigate serious consequences. The primary objective of the Jamaica Stroke Alliance (JSA) is to increase public knowledge and understanding of stroke prevention(Murray, 2022; JSA, 2020).

Additionally, the JSA aims to advocate for enhanced stroke care procedures and perhaps offer assistance to stroke survivors and their families. The JSA encounters the obstacle of insufficient funds for public health campaigns and outreach initiatives aimed at educating the public on identifying stroke symptoms and promptly seeking medical assistance (Murphy, 2022). The Rehabilitation Institute of the Caribbean (RIC) focuses on post-stroke rehabilitation, offering specialized physical therapy, occupational therapy, and speech therapy to individuals who have experienced a stroke (James et al., 2021). These therapies aim to facilitate recovery and enhance the overall quality of life for stroke survivors. According to James et al. (2021), there are numerous issues faced by the OCN and the JSA. The Rehabilitation and Integration Center (RIC) encounters obstacles in providing rehabilitation services, including difficulties in accessing remote areas, limited transportation options, and inadequate capacity within the healthcare system (Hendrix, 2024).

## Impact on Mortality and Timely Care

In Jamaica, a country classified as a low- and middle-income country (LMIC), the lack of timely access to stroke care, which includes diagnosis, treatment, and rehabilitation, can lead to higher

fatality rates. Timely intervention is crucial for stroke victims to limit brain damage and sequelae. The rehabilitation institutions encounter constraints in terms of inadequate resources, infrastructure challenges, and deficiencies in public awareness efforts, resulting in delays in stroke care. Delayed arrival at a stroke unit might result in unsuccessful attempts to provide clot-busting medicines or perform thrombectomy, both of which are time-sensitive therapies that can greatly enhance outcomes (Marshall et al., 2022). To tackle these issues, it is essential for healthcare professionals, policymakers, and community stakeholders in Jamaica to work together in a coordinated manner. The goal is to enhance the availability of prompt and efficient stroke care (Marshall et al., 2022).

## Research Methods and Materials

## Introduction

Stroke remains the second most widespread cause of mortality globally, and it accounts for the third highest number of fatalities and impairments combined (Feigin et al., 2022). Stroke is a significant problem in Jamaica, leading to a disabling condition (Gordon et al., 2018; Feigin et al., 2022; Hutchinson et al., 2019; Murray, 2022). Hutchinson et al. (2019) found that the stroke burden continues to be an important problem and is a major cause of disability and death in the Jamaican population. The purpose of this study was to explore the association between demographic and health factors and the incidence of stroke in Jamaica. Low- and middle-income countries (LMIC) still experience a disproportionate burden of stroke (Hutchinson et al., 2019). The Global Burden of Disease 2019 Lifetime Risk of Stroke Collaborators (2021) report that the present lifetime risk of stroke is 25% for both males and females. Cagna-Castillo et al. (2023) demonstrated that stroke is a widely recognized cardiovascular ailment and a prominent contributor to global mortality. The World Health Organization (WHO) has observed that the prevalence of stroke, also known as disability-adjusted life years, has continued to increase globally. Murray (2022) identifies stroke and renal disease as prominent factors in the primary causes of death and disability. The Westmoreland Stroke Foundation (2023) agreed with the World Health Organization's assertion that the incidence of stroke had doubled, resulting in almost 1.9 million neuronal deaths each minute. Furthermore, delaying or not receiving treatment exacerbates brain damage. According to the Westmoreland Stroke Foundation and WHO, and Boehme et al. (2021) contended that stroke is an escalating worldwide public health issue and is the primary cause of mortality and disability, with hypertension (HTN) being a significant contributing factor.

## Research Design and Rationale

Akinyemi et al. (2021), Katan and Luft (2018), and Pandian et al. (2018) have highlighted that stroke is a significant worldwide issue of great concern. Blake et al. (2023), Feigin et al. (2022), and Hutchinson et al. (2019) have demonstrated that Jamaica, categorized as a low- and middle-income nation (LMIC), has experienced a rise in the incidence of stroke among both men and women. The study employed a quantitative approach to examine the relationship between the numerous variables, as this method is deemed most suitable for comprehending such relationships (Weyant, 2022). According to Creswell and Creswell (2017), the quantitative

approach is more effective in comprehending novel methodologies for calculating the incidence of stroke in various populations, as well as identifying and quantifying the risk factors connected with stroke.

Researchers whouse quantitative methods for analysis take a systematic deductive approach. Alternatively, data was collected from stroke patients in the general population of Jamaica, using a questionnaire technique driven by the Office of Consultant Neurology (OCN) intended to measure the outcome using numerical data (Kilkenny et al., 2024). This study aimed to explore the relationship between demographic and health factors and the incidence of stroke in Jamaica. The study encompasses several demographic and health factors, such as age, gender, education level, renal disease, hypertension, employment status, and alcohol consumption, which are considered as the study variables.

This studyemployed a cross-sectional research methodology to examine the demographic and health factors associated with the incidence of stroke in Jamaica. Although there is extensive research on the relationship between demographic and health factors and the incidence of stroke, there is a lack of literature exploring how these factors are understood in low- and middle-income countries (LMICs) like Jamaica. The research issues being studied can determine the relationship between age, gender, education level, renal disease, hypertension, employment status, as well as alcohol consumption in a representative sample of the Jamaican population.

This information is vital for comprehending the demographic makeup of the population under investigation. The utilization of a cross-sectional research design would facilitate the gathering of data pertaining to diverse health parameters, including the incidence of hypertension, and renal disease trends within the selected population. These factors have been identified as influential in determining the incidence of stroke. According to Creswell and Creswell (2017), the utilization of a cross-sectional research design enables researchers to investigate the relationship between demographic and health factors and the incidence of stroke. This approach can yield valuable insights into the existing composition of demographic and health factors. Cross-sectional studies provide a snapshot of data at a particular moment in time. Comparatively, the designs are frequently more practical and effective than longitudinal or experimental designs. Cross-sectional research design enables researchers to analyze relationships between factors within a population and can provide insights for public health policies and interventions (Creswell & Creswell, 2017).

## Methodology

Stroke is a major worldwide public health issue that leads to large levels of illness and death (Boehme etal., 2021; Cagna-Castillo et al., 2023; Ferguson et al., 2010; Hutchinson et al., 2019). It is essential to comprehend the demographic and health factors associated with stroke incidence in Jamaica, as well as to develop efficient measures for prevention and therapy. The purpose of this study is to examine these factors among the Jamaican population, offering valuable insights that can guide specific initiatives and healthcare policy. The study specifically aimed to identify demographic factors, such as age, gender, and education level, that are connected with the

incidence of stroke in Jamaica. Additionally, the study explored health factors, including hypertension, and renal disease, as potential risk factors for stroke.

To evaluate the spatial distribution of stroke incidence among several parishes in Jamaica, this study utilizes a cross-sectional study design, utilizing data from the Office of Consultant Neurology (OCN) questionnaire completed in Jamaica. The cohort consisted of participants who were 18 years of age or older. The study spanned from 2000 to 2023 to gather data on incidence and health factors. The OCN was used as a source of secondary data, and the convenience sampling approach was used to ensure that different demographic groups and geographical parishes within Jamaica were represented. The sample size estimates consider the anticipated incidence of stroke and the necessary degree of accuracy. Descriptive statistics were employed to succinctly summarize the demographic and health variables of the research. A multivariate logistic regression was performed to analyze the relationship between demographic and health factors while controlling for potential confounding variables.

## Population

This study employed the stroke dataset previously gathered by the Office of Consultant Neurology (OCN). The OCN facility is essential for delivering stroke rehabilitation treatments and fostering educational outreach. The data from OCN will be used in this retrospective secondary data analysis for the quantitative research study consisting of information on stroke patients from individuals residing in 14 distinct parishes in the Jamaican population between the years 2000 and 2023. This study covered regular civilian individuals who are not institutionalized and reside within the Jamaican population. A total of 350 participants completed the questionnaire form at the OCN. Out of the total 350 participants, a majority of 291 participants (83%) have successfully finished the questionnaire, while a smaller group of 59 participants (17%) have initiated the questionnaire but have not completed it. The participants in the OCN questionnaire were stroke patients aged 18 years and above. The OCN posed targeted inquiries and gathered data from laboratory analysis, medical examinations, affected regions, medication history, and known or unknown complications to investigate the selected group. The included features of the OCN datasets encompass questions pertaining to the patient's age, gender, education level, renal disease, hypertension, employment status, and alcohol consumption.

## Sampling and Sampling Procedures

Convenience sampling is a highly effective research approach because it allows for the inclusion of a diverse variety of individuals from different demographics across the entire Jamaica who meet specified criteria that are relevant to the research (Campbell et al., 2020). A sample was drawn from the population, consisting of all persons aged 18 years and older from the 14 different parishes of Jamaica. Considering the characteristics and extent of the research, as well as the requirement for inclusivity across various demographics and health variables, a non-probabilistic convenience sampling technique was used for the inclusion criteria for this study consisting of patients who had suffered a stroke. The exclusion criteria in this study were health conditions unrelated to stroke and participants under 18 years of age. The primary statistical

analysis conducted for this study used multivariate logistic regression. In a multivariate logistic regression analysis, a sample size of 291 resulted in a power of 80% with an odd ration (OR = 1.4) and a significance alpha level (α) 0.05 (5%). To assess the adequacy of the overall sample size of 291 participants for this research, calculations were performed using the G*power utility (Buchner et al., 2013). This establishes the point at which statistical significance is determined, which indicates the probability of incorrectly rejecting the null hypothesis (Type I error).The predictor variables in this analysis include age, gender, education level, renal disease, hypertension, employment status, and alcohol consumption. The criterion variable being tested is stroke (Campbell et al., 2020; Creswell &Creswell, 2017;Weyant, 2022; Willie-Tyndale et al., 2019).

## Procedures for Recruitment, Participation, and Data Collection

The recruitment technique was derived from the OCN questionnaire. The OCN had directly contacted stroke patients selected for the study through the health facilities. Furthermore, the Office of Consultant Neurology (OCN) facility also plays a crucial role in providing stroke rehabilitation services and promoting educational awareness. The healthcare professional at the OCN institution delivered explicit information regarding the study's objectives, methodologies, and possible benefits and risks. Prior to enrollment, the OCN ensures that patients who completed the medical form were provided with informed consent to participate in the questionnaire on a voluntary basis. The OCN underscores participants that the research study is voluntary, and participants have the option to quit at any point without facing any repercussions. The participants completed informed consent about the privacy and confidentiality protocols of the research study, which guarantees the protection of participants' sensitive information and compliance with ethical requirements. The data were obtained by using a questionnaire that gathered demographic and health information such as age, gender, education level, employment status, hypertension, renal disease, alcohol consumption, and stroke.

## Instrumentation and Operationalization of Constructs

The secondary analysis was retrospectively conducted using data from the completed Office of Consultant Neurology (OCN) questionnaire in Jamaica. The OCN questionnaire was created utilizing a convenience sampling technique that is complex, stratified, and time-consuming. During the data collection phase for OCN, individuals from multiple parishes in Jamaica were evaluated to ascertain the occurrence of stroke.

During the data collection phase for OCN, individuals from multiple parishes in Jamaica were evaluated to ascertain the incidence of stroke among them.

The process of sample selection is systematically conducted in several stages spanning multiple years (2000-2023). There are a total of 14 parishes located in various regions of the country. Prior to administering the questionnaire, the OCN informed each participant about the questionnaire. Ultimately, every participant was chosen according to specific criteria. Individuals who met the specific criteria for inclusion were selected to be part of the OCN sample. They were informed in advance about the study and were notified that they would need to complete a

questionnaire during visitation hours. Upon the commencement of visitation hours, each participant was provided with information and instructions regarding the informed consent and the questionnaire that they were required to complete voluntarily and without coercion as part of the recruitment process at the OCN.Every participant was guaranteed the confidentiality of the data obtained from the questionnaire. They were told about their rights and asked to sign the consent form. All relevant information about the stroke patient's visit to OCN was recorded in the OCN database. Upon finishing the questionnaire, participants were asked to complete a section regarding demographic and health factors associated with stroke patients. This study was exclusively conducted on individuals who voluntarily provided their agreement by signing a form, thereby agreeing to take part in the demography and health study at OCN. Permission was granted by the Office of Consultant Neurology (OCN)to use a secondary dataset on stroke patients (Appendix B).

## Data Analysis Plan

A multivariate logistic regression analysis was performed using the Statistical Package for the Social Sciences (SPSS) Version 29 for statistical analysis. Conducting a multivariate logistic regression analysis enables you to evaluate the distinct influences of the predictor variables on the probability of the binary criterion variables, while considering the possible confounding impacts of age and gender. This study offers a more thorough and comprehensive approach to the relationship between the variables of interest (Schüppert, 2009). Data cleaning and data screening will be conducted on the dataset to facilitate a comprehensive analysis of the data. A review of inconsistencies and errors will be applied to the data set for validation to prevent incorrect data entry. The data will undergo verification to ensure its authenticity, accuracy, completeness, consistency, uniqueness, and uniformity.

The purpose of this quantitative study was to explore the association between demographic and health factors and the incidence of stroke in Jamaica. To examine the research questions, a multivariate logistic regression was conducted to assess if age, gender, education level, renal disease, hypertension, employment status, and alcohol consumption predict stroke. To be more precise, the study was guided by the following research questions:

*RQ1.* What is the association between education level and the incidence of stroke, while controlling for confounders such as age and gender among individuals living in Jamaica?

$H_0 1$: There is no significant association between education level and the incidence of stroke when controlling for confounders such as age and gender among individuals living in Jamaica.

$H_a 1$: There is a significant association between education level and the incidence of stroke when controlling for confounders such as age and gender among individuals living in Jamaica.

*RQ2.* What is the association between hypertension and the incidence of stroke, while controlling for confounders such as age and gender among individuals living in Jamaica?

$H_0 2$: There is no significant association between hypertension and the incidence of stroke while controlling for confounders such as age and gender among individuals living in Jamaica.

$H_a2$: There is a significant association between hypertension and theincidence of stroke while controlling for confounders such as age and genderamong individuals living in Jamaica.

*RQ3.*What is the association between renal disease and the incidence of stroke, while controlling for confounders such as age and genderamong individuals living in Jamaica?

$H_03$: There is no association between renal disease and the incidence of stroke while controlling for confounders such as age and genderamong individuals living in Jamaica.

$H_a3$: There is a significant association between renal disease and the incidence of stroke while controlling for confounders such as age and gender among individuals living in Jamaica.

*RQ4.*What is the association between employment status and the incidence of stroke, while controlling for confounders such as age and genderamong individuals living in Jamaica?

$H_04$: There is no association between employment status and the incidence of stroke while controlling for confounders such as age and genderamong individuals living in Jamaica.

$H_a4$: There is a significant association between employment status and the incidence of stroke while controlling for confounders such as age and gender among individuals living in Jamaica.

*RQ5.*What is the association between alcohol consumption and the incidence of stroke, while controlling for confounders such as age and genderamong individuals living in Jamaica?

$H_05$: There is no significant association between alcohol consumption and the incidence of stroke while controlling for confounders such as age and genderamong individuals living in Jamaica.

$H_a5$: There is a significant association between alcohol consumption and the incidence of stroke while controlling for confounders such as age and gender among individuals living in Jamaica.

Multivariate logistic regression is an appropriate statistical analysis when the purpose of research is to assess if a set of predictor variables predict a dichotomous criterion variable (Pituch& Stevens, 2015). The criterion variable in a multivariate logistic regression was represented as the natural logarithm of the odds ratio 1.3 for membership in one of the response categories, which can be modeled as a linear function of the predictors. Multivariate logistic regression assumes an absence of multicollinearity among the predictor variables, which will be assessed by calculating variance inflation factors (VIF). A predictor with a VIF value of 10 or more will be reported as having high multicollinearity (Menard, 2009).Model significance will be determined using a $\chi^2$ omnibus test. McFadden's $R^2$will be examined to estimate the overall variance in the outcome that can be accounted for by the predictors.

The coefficients will be interpreted by calculating the exponential ($e^B$), also known as odds ratio coefficients. The multivariate logistic regression computed coefficients that indicate the magnitude and direction of the relationships between predictors and criterion variables. The p-values indicate the level of significance .05 to determine the statistical significance of the relationships. The effect size takes into account, such as the R-squared value in regression analysis, in order to ascertain the proportion of variance that is accounted for by the model.

## Threats to Validity

In performing research on the demographic and health factors associated to the incidence of stroke in Jamaica, it essential to take into account many threats to validity that could potentially affect the accuracy and reliability of the study. These threats have the potential to undermine the reliability and generalizability of the findings of the research. This study will examine the internal, empirical, external, content, and construct validity.

### *Internal validity*

To ensure the study's validity, it is necessary to take additional precautions during the collecting and processing of data. The Office of Consultant Neurology (OCN) has a longstanding history and has been gathering data since the 2000s.The validity of the questionnaire, specifically focused on stroke patients, has been consistently tested over the years from the 2000s to 2023s by OCN Neurologists. These studies on stroke patients have been published in the West Indian Medical Journal by Ferguson et al. (2010), Mani et al. (2014), Pinkney et al. (2017), and Williams et al. (2009). To address mistakes that arose during data collecting, modifications were made to the dataset in order to enhance the development, implementation, and administration of the questionnaire. The OCN data specifies the following forms of validity: internal validity, empirical validity, external validity, content validity, and construct validity (Frankfort-Nachmias &Nachmias, 2008).

### *Empiricalvalidity*

The Office of Consultant Neurology (OCN) takes various steps to ensure that the questionnaire is empirically valid and can be replicated. OCN had to ensure that the questions in the questionnaire accurately measured the desired outcomes for all stroke patients. This involved collecting data from visits that adhered to the guidelines and protocols of OCN. This is closely associated to predictive validity, where the measures can help establish the expected associations. In many secondary analysis studies, software such as SPSS has been used to analyze OCN data(Mani et al., 2014; Pinkney et al., 2017). In this study, specifically Version 29 of this statistical package was used to ensure the empirical validity of the proposed study(Ferguson et al., 2010; Mani et al., 2014; Roopchand-Martin &Creary-Yan, 2014).

### *External validity*

Upon conclusion of understanding demographic and health factors associated with stroke in Jamaica are fully understood, the results and findings of the research can be applied to other contexts, not only within the Caribbean area but also globally. This entails examining similarities and disparities in lifestyle, healthcare availability, genetic predispositions, and socio-economic determinants (McIntyre et al., 2020). The cultural and socio-economic backdrop of Jamaica is essential for understanding the occurrence of stroke. To determine the external validity of the findings, it is necessary to compare these contextual characteristics with those of other countries or areas (Pinkney et al., 2017). This comparison will help determine if comparable patterns exist

or if Jamaica's unique context yields distinctive conclusions. Variances in healthcare systems can additionally impact the frequency and consequences of stroke in Jamaica.

Therefore, evaluating the external validity would entail examining the relative accessibility, quality of care, and preventive measures pertaining to stroke in Jamaica's healthcare system compared to other systems (Pinkney et al., 2017).It is necessary to assess the suitability of the techniques employed for understanding the demographic and health factors associated to stroke in Jamaica for their relevance in different external contexts. In addition, external validity necessitates evaluating the effectiveness of applying identical approaches in diverse cultural and clinical contexts. Ultimately, the external validity of the study hinges on the extent to which the findings about the association between demographic and health factors and stroke in Jamaica can be generalized to other populations. This necessitates meticulous examination of the shared similarities and disparities in characteristics such as the frequency of risk factors including hypertension and renal disease, as well as genetic predispositions. Additionally, a comparison analysis is necessary to ascertain the wider relevance of the study's findings outside the specific context of Jamaica (McIntyre et al., 2020; Pinkney et al., 2017).

## *Content validity*

This study ensures the content validity of the Consultant Neurology (OCN) questionnaire using multiple methods and implements special steps to prevent bias. By employing stratification and sampling convenience in the questionnaire, one can guarantee content validity. In addition, the OCN questionnaire employs objective assessments such as examinations in conjunction with questionnaire responses. The study aims to comprehensively examine the subject matter and thoroughly investigate all pertinent demographic and health factors that may impact the incidence of stroke in Jamaica. Content validity will encompass many demographic factors, such as age, gender, educational level, and employment status, as well as health factors including hypertension, renal disease, and alcohol consumption. These factors are recognized or hypothesized to be associated with the incidence of stroke. The research study will comprehensively consider all significant variables that may influence the outcomes. The study is based on the Social Ecological Model (SEM), which provides a rationale for selecting specific demographic and health factors to explore the incidence of stroke in Jamaica(Mani et al., 2014; Pinkney et al., 2017). This approach ensures that the study's scope and emphasis are suitable and that the findings will make a significant contribution to the understanding of stroke in Jamaica.

## *Construct validity*

In this study, construct validity will be used to operationalize essential constructs, such as demographic factors including age, gender, educational level, and employment status; all these variables will be categorized and quantified. The assessment will include an examination of particular health factors such as hypertension, renal disease, and alcohol consumption. This assessment will be based on the theoretical framework of the Social Ecological Model (SEM). The data obtained from the Consultant Neurology (OCN) questionnaire is precisely recorded. Moreover, the research variables selected in this study are based on current research interest, a thorough evaluation of existing literature, and the availability of data acquired through the OCN

questionnaire. The specific details regarding each variable from the OCN questionnaire are comprehensively discussed.

## *Criterion variable*

**Stroke**. A binary indicator of stroke and transient ischemic attack(TIA)was established based on the presence or absence of stroke. The presence of stroke was scored as 1, while the absence of stroke was coded as 0. Stroke was deemed to be present if participants responded "yes" to the presence of stroke, and it was considered to be absent if participants responded "no" to the absence of stroke on the questionnaire administered by OCN between the years 2000 and 2023 (Hutchinson et al., 2019; Tulloch-Reid et al., 2013).

## *Predictor variables*

**Educational level**. A questionnaire regarding the educational levels of the participants was also established. To align with the existing research, the educational level was categorized into two distinct groups: The two categories that were dummy coded are "tertiary" (coded as 1) and "secondary" (coded as 2). Additional responses were excluded and not included in the dataset for analysis.

**Employment status**. Additionally, a questionnaire was conducted to gather information on the employment status of the participants. In order to conform to the study, the employment status was divided into two separate groups: "employed" (coded as 1) and "unemployed" (coded as 2), both of which were represented by dummy codes. Excluded replies were omitted from the dataset for analysis.

**Hypertension**. Hypertension (coded as 1) was characterized as having an average systolic/diastolic blood pressure of 140/90 mm Hg or higher, or self-reported use of antihypertensive medication. The remaining portion was classified as non-hypertensive, indicated by a value of 0 (Blake et al., 2023; Hutchinson et al., 2019).

**Renal disease**. A binary indicator of renal disease was also established based on the presence or absence of renal disease. The presence of renal disease was scored as 1, while the absence of renal disease was coded as 0. Renal disease was deemed to be present if participants responded "yes" to the presence of renal disease, and it was considered to be absent if participants responded "no" to the absence of renal disease on the questionnaire administered by OCN between the years 2000 and 2023 (Murray, 2022; Rankine-Mullings et al., 2019).

**Alcohol consumption**. The question "Do you consume alcohol?" served as the criterion for determining the participants' consumption of alcohol. To align with the existing research, two specific categories were selected to define alcohol use. Participants were classified as consuming alcohol if they answered "yes"(coded 1) to alcohol consumption on the questionnaire provided by OCN between the years 2000 and 2023. Conversely, participants were classified as not consuming alcohol if they answered "no"(coded 0) to alcohol consumption(Carr et al., 2024).

## Control variables

**Age.** The age of each participant was determined based on the age or date of birth reported by the participants. The age groups in this study were encoded using dummy coding. Specifically, individuals aged 18-40 were assigned a code of 1, those aged 41-63 were assigned a code of 2, those aged 64-86 were assigned a code of 3, and individuals aged 87 and greater were assigned a value of 4. The aforementioned categories were employed in the descriptive statistics section to present the age distribution of the study. Age was treated as a continuous variable in all subsequent statistical analyses conducted in the study.

**Gender**. The OCN research participants were queried about their gender, specifically if they identified as male or female. In the study, gender categories were encoded as binary variables, with "Male" represented by 0 and "Female" represented by 1.

## Ethical Procedures

Various ethical principles must be accounted for when conducting studies with human participants. Prior to data collection for the Office of the Consultant Numerologist (OCN), the OCN implements ethical policies and procedures. These policies involve participants reviewing information and being guided by a consultant receptionist through the information provided on each form. The OCN adheres rigorously to the many rules and regulations designed to safeguard the confidentiality and safety of participants from the University Hospital of the West Indies (UHWI).Furthermore, the Ministry of Health and Wellness has implemented additional protective guidelines and protocols to collect data on human subjects. This data is categorized into five different categories (category 1- category 5) as determined by the Advisory Panel on Ethics and Medico-Legal Affairs at the Ministry of Health, Jamaica (Ministry of Health and Wellness, 2010). The Ministry of Health and Wellness (2010) mandates that participants' records containing confidential information must be securely and privately storedand should not be disclosed to the public unless local laws or regulations necessitate it.

The OCN guarantees the secure storage of acquired data, where all personally identifiable information (PII) is substituted with codes, rendering it untraceable for participants. Due to the significant variation in literacy and health literacy levels, the OCN implements additional precautions to guarantee that the consent is written at a level of literacy that is comprehensible to most of the community. This study utilized existing secondary data obtained from OCN.Prior to data collection, the receptionist consultant sought informed consent from all stroke patients. Following the gathering of data, identifiable personal information, such as the tax registration number (TRN), name, email address, and birth date, is eliminated prior to the aggregation of the

data. As this study cannot be identified or linked to any specific participant, it does not compromise the confidentiality of the participants. Prior to collecting any data from the OCN and doing data analysis, permission was obtained from the Institute Review Board at Walden University to fulfill additional ethical requirements. The IRB approval number is 08-28-24-1062278 (Appendix A). Furthermore, the primary objective of this study was to address gaps in knowledge without any intention of obtaining financial gains. Additionally, there is no financial interest associated with this study. The primary focus from a research perspective is the rehabilitation of stroke patients and the comprehension of the demographic and health factors associated with the incidence of stroke in Jamaica.

## Results

## Introduction

The purpose of this study was to understand the association between demographic and health factors and the incidence of stroke in Jamaica. This study examined the hypothesis that various demographic and health factors, such as age, gender, education level, renal disease, hypertension, employment status, and alcohol consumption, independently contribute to an increased risk of stroke in Jamaica. The analysis was conducted using the dataset from the Office of Consultant Neurology (OCN) and focused on individuals aged 18 years and older. The subsequent research questions and hypotheses guided the study:

*RQ1*. What is the association between education level and the incidence of stroke, while controlling for confounders such as age and gender among individuals living in Jamaica?

$H_0 1$: There is no significant association between education level and the incidence of stroke when controlling for confounders such as age and gender among individuals living in Jamaica.

$H_a 1$: There is a significant association between education level and the incidence of stroke when controlling for confounders such as age and gender among individuals living in Jamaica.

*RQ2*. What is the association between hypertension and the incidence of stroke, while controlling for confounders such as age and genderamong individuals living in Jamaica?

$H_0 2$: There is no significant association between hypertension and the incidence of stroke while controlling for confounders such as age and genderamong individuals living in Jamaica.

$H_a 2$: There is a significant association between hypertension and theincidence of stroke while controlling for confounders such as age and genderamong individuals living in Jamaica.

*RQ3*. What is the association between renal disease and the incidence of stroke, while controlling for confounders such as age and genderamong individuals living in Jamaica?

$H_0 3$: There is no association between renal disease and the incidence of stroke while controlling for confounders such as age and genderamong individuals living in Jamaica.

$H_a 3$: There is a significant association between renal disease and the incidence of stroke while controlling for confounders such as age and gender among individuals living in Jamaica.

*RQ4.* What is the association between employment status and the incidence of stroke, while controlling for confounders such as age and genderamong individuals living in Jamaica?

$H_04$: There is no significant association between employment status and the incidence of stroke while controlling for confounders such as age and genderamong individuals living in Jamaica.

$H_a4$: There is a significant association between employment status and the incidence of stroke while controlling for confounders such as age and gender among individuals living in Jamaica.

*RQ5.* What is the association between alcohol consumption and the incidence of stroke, while controlling for confounders such as age and genderamong individuals living in Jamaica?

$H_05$: There is no significant association between alcohol consumption and the incidence of stroke while controlling for confounders such as age and genderamong individuals living in Jamaica.

$H_a5$: There is a significant association between alcohol consumption and the incidence of stroke while controlling for confounders such as age and gender among individuals living in Jamaica.

This chapter provides a detailed explanation of the data-collecting procedure and methods employed to gather the data. The chapter additionally presents the descriptive Statistics of the study sample, which includes details about the predictor variables and the criterion variable. Anexplanation of the results of multivariate logistic regression was provided, along with the effect size and the findings of the study.A summary of Chapter 4 encompasses the conclusion derived from the study findings.

## Data Collection

A quantitative cross-sectional non-experimental study methodology was employed to understand the association between demographic and health factors and the incidence of stroke in Jamaica. The study utilized secondary data obtained from the Office of Consultant Neurology (OCN) dataset. The OCN had directly contacted stroke patients selected for the study, who also have a vital role in offering stroke rehabilitation services and raising awareness through education.The recruitment approach was based on the OCN questionnaire. The sample selection process was carried out systematically in many stages over a duration of several years (2000-2023). The survey collected secondary data from participants aged 18 and older who provided responses to questions regarding demographic and health factors including age, gender, education level, renal disease, hypertension, employment status,alcohol consumption, and stroke. Prior to accessing the OCN dataset, Institutional Review Board (IRB) approval was obtained (# 08-28-24-1062278) for all variables used in the research study. The OCN dataset had $n = 291$ sample participants with diverse demographic and health characteristics. The response rate was 83%, calculated as 83 out of 100 multiplied by 350, resulting in 291 participants. Notably, there were no missing data in the dataset.

## Results

## Descriptive Statistics

A comprehensive analysis of the research participants was performed using Statistical Package for the Social Sciences (SPSS) Version 29 to examine the descriptive and frequency statistics of the participants. The data analysis consisted of 291 cases and focused on the demographic and health factors affecting the participants, which were collected through secondary data from the OCN survey conducted between 2000 and 2023. Frequencies and percentages were calculated for age, gender, employment status, education level, hypertension (HTN), renal disease, alcohol consumption, and stroke. The age category most observed was 64-86, with a frequency of 162, accounting for 55.7%. The predominant gender category was female, with a total of 172, accounting for 59.11% of the sample. The most observed employment status category was "employed" with a total of 146 individuals, accounting for 50.2% of the sample. The education level most observed was secondary, with a total of 267 cases, accounting for 91.8% of the sample. The category of hypertension that was most observed"yes", with a total of 204 cases, accounting for 70.1% of the sample. The most observed category of renal disease was the lack of renal disease, with a total of 177 cases (60.8%). The most observed category of alcohol intake was "yes" ($n$ = 155, 53.3%). The category of stroke that was most observed was "no" ($n$ = 174, 59.8%). Frequencies and percentages are in Table 1.

**Table 1: Study Participants Demographic and Frequency Table**

| Variables | | Frequency | Percent |
|---|---|---|---|
| Age | 18-40 | 22 | 7.6% |
| | 41-63 | 104 | 35.75 |
| | 64-86 | 162 | 55.7% |
| Gender | Female | 172 | 59.1% |
| | Male | 119 | 40.9% |
| Employment Status | Employed | 146 | 50.2% |
| | Unemployed | 145 | 49.8% |
| Education Level | Secondary | 267 | 91.8% |
| | Primary | 24 | 8.2% |
| Hypertension | No | 87 | 29.9% |
| | Yes | 204 | 70.1% |
| Renal Disease | Absence | 177 | 60.8% |
| | Presence | 114 | 39.2% |
| Alcohol consumption | No | 136 | 46.7% |
| | Yes | 155 | 53.3% |
| Stroke | No | 174 | 59.8% |
| | Yes | 117 | 40.2% |

Note. N=291

The study was led by five research questions to investigate the association between demographic and health factors and the incidence of stroke in Jamaica. The study establishes a confidence

interval of 95% and a margin of error of 5% for the data analysis, with a significance level set at $p< 0.05$.

## Multivariate Logistic Regression Analysis

### Research Question 1

The initial study question was as follows:

*RQ1*. What is the association between education level and the incidence of stroke, while controlling for confounders such as age and gender among individuals living in Jamaica?

$H_0 1$: There is no significant association between education level and the incidence of stroke when controlling for confounders such as age and gender among individuals living in Jamaica.

$H_a 1$: There is a significant association between education level and the incidence of stroke when controlling for confounders such as age and gender among individuals living in Jamaica.

Multivariate logistic regression was conducted to understand whether education level while controlling for age and gender, had a significant effect on stroke. The assumption of the absence of multicollinearity was examined. When performing a multivariate logistic regression, it is important to consider certain factors. These include the use of a dichotomous criterion variable (categorical), predictor variables that are categorical and independent of each other, and a criterion variable that is mutually exclusive and has an adequate sample size ($n = 291$) (Pituch& Stevens, 2015).

**Variance inflation factors.** Variance Inflation Factors (VIFs) were computed to identify the existence of multicollinearity among predictors. Elevated VIFs suggest a heightened presence of multicollinearity in the model. Variance inflation factors (VIFs) that exceed 5 are concerning whereas VIFs reaching 10 should be regarded as the absolute top threshold (Menard, 2009). All predictors in the regression model have Variance Inflation Factors (VIFs) that are below 10. Table 2 displays the Variance Inflation Factor (VIF) for the predictor variable, educational level while controlling for age and gender.

**Table 2:** *Variance Inflation Factors*

| Variable | VIF |
|---|---|
| Education Level | 1.00 |
| Age | 1.00 |
| Gender | 1.00 |

The model coefficient was not statistically significant ($p$=.075). The Hosmer and Lemeshow Test indicates that the model fit was not statistically significant, suggesting that the model was a good fit. The overall model coefficient based on an alpha of .05, $\chi^2(3) = 6.92$, $p = .075$, suggesting that education level, age, and gender did not have a significant effect on the odds of observing stroke, which indicates that the model was a good fit. Table 3 displays the Hosmer and Lemeshow model fit.

**Table 3: Hosmer and Lemeshow Test Indicating Model Fit**

| Step | Chi-square | df | Sig. |
|---|---|---|---|
| 1 | 5.889 | 5 | .317 |

The variation explained in the criterion variable (stroke) was based on the model ranges from 2.3% to 3.2% Cox & Snell $R^2$ and Nagelkerke$R^2$, respectively, with an overall classified 59.5% of cases. Table 4 summarizes the results of the model summary. The Nagelkerke $R^2$ of 3.2% indicates that the model explains a proportion of the variance in the criterion variable. The specificity of stroke patients predicted as not having the observed characteristics was 98.9% in this case.The sensitivity of the percentage of cases that were correctly predicted by the model of patients having a stroke was 0.9%. According to the classification table, barely 1% of cases might be accurately diagnosed by assuming that all cases had been identified as "no" stroke. With the inclusion of predictor variables, the model achieves an overall classification accuracy of 59.5%. In other words, incorporating the predictor variables improves the overall accuracy of predicting cases and assigning them to their observed categories of the criterion variable. Table 5 summarizes the results of the predicted and observed model.

**Table 4: Summary Model Showing Variation in the Stroke from Education Level**

| Step | -2 Log liklihood | Cox & Snell R Square | Nagelkerke R Square |
|---|---|---|---|
| ` | 385.262a | .023 | .032 |

*Note.* a - Estimation terminated at iteration number 4 because parameters change by less than .001. Final solution cannot be found.

**Table 5: Classification Predicted and Observed Model**

| Observed | | | Predicted | | |
|---|---|---|---|---|---|
| | | | Stroke: No | Stroke: Yes | Percentage Correct |
| Step 1 | Stroke | No | 172 | 2 | 98.9 |
| | | Yes | 116 | 1 | 0.9 |
| Overall Percentage | | | | | 59.5 |

Note. The cute value is .500.

According to Table 6, the variable gender did not significantly impact the model. The OR = 1.05 indicated that individuals with tertiary education level are 5% more likely to experience a stroke compared to secondary education level, and CI [0.402, 2.75]. The findings from the study also indicated that females are 20% more likely to experience a stroke than their male counterparts. Furthermore, given the wide confidence interval and the non-significant Wald test, the educational level does not appear to be a strong predictor for this model. Nevertheless, the predictor variables of age ($p = .018$) were statistically significant, while gender ($p = .389$) was not statistically significant. Table 6 represents education level as the predictor variable and age and gender as a control variable. During the model testing, it was observed that the predictor variableage, was a significant predictor for stroke. Although the null hypothesis was retained, the model fit (Nagelkerke $R^2$ and Hosmer-Lemeshow test) indicates that the model structure is reasonable and that it fits the data well.

**Table 6: Regression Results with Education Level, Age and GenderPredicting Stroke**

| Variables | Odds Ratio (OR) | 95% CI (Confidence Interval) | p-value |
|---|---|---|---|
| Education level | 1.052 | .402 - 2.753 | .918 |
| Age groups | 1.601 | 1.084 - 2.363 | .018 |
| Gender | 0.800 | 0.481 - 1.330 | .389 |

## Research Question 2

*RQ2.*What is the association between hypertension and the incidence of stroke, while controlling for confounders such as age and genderamong individuals living in Jamaica?

$H_0 2$: There is no significant association between hypertension and the incidence of stroke while controlling for confounders such as age and genderamong individuals living in Jamaica.

$H_a 2$: There is a significant association between hypertension and theincidence of stroke while controlling for confounders such as age and genderamong individuals living in Jamaica.

A multivariate logistic regression was conducted to understand whether hypertension, while controlling for age and gender, had a significant effect on stroke.The assumption of the absence of multicollinearity was examined.The use of a dichotomous criterion variable (categorical), predictor variables that are categorical and independent of each other, and a criterion variable that is mutually exclusive, and an adequate sample size ($n$ = 291) was observed (Pituch& Stevens, 2015).

**Variance inflation factors.** Variance Inflation Factors (VIFs) were computed to identify the existence of multicollinearity among predictors. All predictors in the regression model have Variance Inflation Factors (VIFs) that are below 10. As a result, multicollinearity was not observed. Table 7 displays the Variance Inflation Factor (VIF) for the predictor variable, hypertension while controlling for age and gender.

**Table 7: Variance Inflation Factors for Hypertension, Age, and Gender**

| Variable | VIF |
|---|---|
| Hypertension | 1.00 |
| Age | 1.00 |
| Gender | 1.00 |

The model coefficient was not statistically significant ($p$= .270). The Hosmer and Lemeshow Test indicates that the model fit was not statistically significant ($p$ = .123), suggesting that the model wasa good fit.Table 8 displays the Hosmer and Lemeshow model fit.The overall model coefficient based on an alpha of .05, $\chi^2(3) = 8.13$, $p$ = .270, suggesting that hypertension, while controlling for age and gender,had a significant effect on the odds of observing stroke.Table 9 show the variation in the criterion variable.

**Table 8: Hosmer and Lemeshow Test Indicating Model Fit for Hypertension**

| Step | Chi-square | df | Sig. |
|---|---|---|---|
| 1 | 11.373 | 7 | .123 |

The variation explained in the criterion variable (stroke) was based on the model ranges from 2.8% to 3.7% Cox & Snell $R^2$ and Nagelkerke $R^2$, respectively, with an overall classified 59.8% of cases. Table 9 summarizes the results of the model summary. The Nagelkerke $R^2$ of 3.7% indicates that the model explains a proportion of the variance in the criterion variable. The specificity of the observed characteristics predicted no stroke was 99.4%, but the sensitivity observed characteristics was 0.9%. According to the classification table, barely 1% of cases might be accurately diagnosed by assuming that all cases had been identified as "no" stroke. With the inclusion of predictor variables, the model achieves an overall classification accuracy of 59.8%. In other words, incorporating the predictor variables improves the overall accuracy of predicting cases and assigning them to their observed categories of the criterion variable. Table 5 summarizes the results of predicted and observed model.

**Table 9: Summary Model Showing Variation for Stroke from Hypertension**

| Step | -2 Log likelihood | Cox & Snell R Square | Nagelkerke R Square |
|---|---|---|---|
| 1 | 384.045a | .028 | .037 |

*Note.* Estimation terminated at iteration number 4 because parameter estimates changed by less than .001.

According to Table 10, the variables of age had a significant impact on the model($p = .029$). The study findings indicated that hypertension was not significant $p=.270$, and OR = 1.35 suggested that individuals with hypertension are 35% more likely to experiencing a stroke compared to those without hypertension, and CI [0.790, 2.32].The study findings also indicated that females are 18% more likely to experience a stroke than their male counterparts. Nevertheless, the predictor variable of age ($p = .029$) was statistically significant, while gender ($p = .428$) did not have a significant impact on the model. Although the null hypothesis was retained, the model fit (Nagelkerke $R^2$ and Hosmer-Lemeshow test) indicates that thestructure was reasonable.

**Table 10: Regression Results with Hypertension, Age, and Gender Predicting Stroke**

| Variables | Odds Ratio (OR) | 95% CI (Confidence Interval) | p-value |
|---|---|---|---|
| HTN (Ref=No) | 1.353 | .790 - 2.317 | .270 |
| Age groups | 1.538 | 1.046 - 2.262 | .029 |
| Gender (Ref=?) | .821 | .505 - 1.336 | .428 |

## Research Question 3

*RQ3.*What is the association between renal disease and the incidence of stroke, while controlling for confounders such as age and genderamong individuals living in Jamaica?

$H_03$: There is no association between renal disease and the incidence of stroke while controlling for confounders such as age and genderamong individuals living in Jamaica.

$H_a3$: There is a significant association between renal disease and the incidence of stroke while controlling for confounders such as age and gender among individuals living in Jamaica.

A multivariate logistic regression was conducted to understand whether renal disease, while controlling for age and gender, hada significant effect on stroke.

*Assumptions.* The assumption of absence of multicollinearity was examined. The use of a dichotomous criterion variable (categorical), predictor variables that are categorical and independent of each other, and an adequate sample size ($n = 291$)(Pituch& Stevens, 2015).

**Variance inflation factors.** Variance Inflation Factors (VIFs) were computed to identify the existence of multicollinearity among predictors. All predictors in the regression model have Variance Inflation Factors (VIFs) that are below 10. As a result, no multicollinearity was observed among the predictor variables. Table 11 displays the VIF for the predictor variables.

**Table 11: Variance Inflation Factors for Renal Disease, Age, and Gender**

| Variable | VIF |
|---|---|
| Renal disease | 1.01 |
| Age | 1.01 |
| Gender | 1.00 |

The model coefficient was not statistically significant ($p> .055$). The Hosmer and Lemeshow Test indicates that the model fit is not statistically significant ($p= .526$), suggesting that the model wasa good fit. Table 12 displays the Hosmer and Lemeshow model fit.

The overall model coefficient based on an alpha of .05, $\chi^2(3) = 7.62$, $p = .055$, suggesting that renal disease, while controlling for age and gender, did not have a significant effect on the odds of observing stroke.

**Table 12: Hosmer and Lemeshow Test Indicating Model Fit for Renal Disease**

| Step | Chi-square | df | Sig. |
|---|---|---|---|
| 1 | 6.119 | 7 | .526 |

The variation explained in the criterion variable (stroke) was based on the model ranges from 2.6% to 3.5% Cox & Snell $R^2$ and Nagelkerke $R^2$, respectively, with an overall classified 59.5% of cases. Table 13 summarizes the results of the model summary. The Nagelkerke $R^2$ of 3.5% indicates that the model explains a proportion of the variance in the criterion variable. The specificity of the observed characteristics predicted no stroke (98.9%), but the sensitivity observed characteristics was 0.9%. According to the classification table, barely 1% of cases accurately diagnosed by assuming that all cases had been identified as "no" stroke. But with the inclusion of predictor variables, the model achieves an overall classification accuracy of 59.5%. In other words, incorporating the predictor variables improves the overall accuracy of predicting cases and assigning them to their observed categories of the criterion variable. Table 5 summarizes the results of predicted and observed model.

**Table 13: Summary Model Showing Variation in the Criterion Variable (Stroke)**

| Step | -2 Log likelihood | Cox & Snell R Square | Nagelkerke R Square |
|------|-------------------|----------------------|---------------------|
| 1 | 384.553a | .026 | .035 |

*Note.* a Estimation terminated at iteration number 4because parameter estimates changed by less than .001.

According to Table 14, the variables of age (*p*= .018) was statistically significant, while gender did not have a significant impact on the model. The study found that renal disease was not significant *p*= .055, and OR = 0.810, showed a decrease in the likelihood of stroke to occur by 19% (since 1 - 0.810 = 0.19), and CI [.496, 1.32]. The study findings also indicated that females are 20% more likely to experience a stroke than their male counterparts. This suggests that there was no significant effect of renal disease on the criterion variable. The null hypothesis was retained.

*Regression Results With Renal Disease, Age and Gender Predicting Stroke*

**Table 14: Regression Results with Renal Disease, Age and Gender Predicting Stroke**

| Variables | Odds Ratio (OR) | 95% CI (Confidence Interval) | p-value |
|-----------|-----------------|------------------------------|---------|
| Renal disease | .810 | .496 - 1.321 | .397 |
| Age groups | 1.583 | 1.082 - 2.316 | .018 |
| Gender | .804 | .495 - 1.306 | .377 |

## Research Question 4

*RQ4.*What is the association between employment status and the incidence of stroke, while controlling for confounders such as age and genderamong individuals living in Jamaica?

$H_04$: There is no significant association between employment status and the incidence of stroke while controlling for confounders such as age and genderamong individuals living in Jamaica.

$H_a4$: There is a significant association between employment status and the incidence of stroke while controlling for confounders such as age and gender among individuals living in Jamaica.

A multivariate logistic regression was conducted to understand whether employment status, while controlling for age and gender, had a significant effect on stroke.

*Assumptions.* The assumption of absence of multicollinearity was examined. The use of a dichotomous criterion variable (categorical), predictor variables that are categorical and independent of each other, and an adequate sample size (*n* = 291)(Pituch& Stevens, 2015).

**Variance inflation factors.** Variance Inflation Factors (VIFs) were computed to identify the existence of multicollinearity among predictors. No multicollinearity was observed among the predictor variables. Table 15 displays theVIF for the predictor variables.

**Table 15: Variance Inflation Factors for Employment Status, Age, and Gender**

| Variable | VIF |
|---|---|
| Employment Status | 1.30 |
| Age | 1.30 |
| Gender | 1.00 |

The model coefficient was not statistically significant ($p$= .075). The Hosmer and Lemeshow Test indicates that the model fit was not statistically significant ($p$= .529), suggesting that the model was a good fit. Table 16 displays the Hosmer and Lemes how model fit. The overall model coefficient based on an alpha of .05, $\chi^2(3) = 6.92$, $p = .075$, suggesting that employment status, while controlling for age and gender, did not have a significant effect on stroke.

**Table 16: Hosmer and Lemeshow Test Indicating Model Fit for Employment Status**

| Step | Chi-square | df | Sig. |
|---|---|---|---|
| 1 | 5.115 | 6 | .529 |

The variation explained in the criterion variable (stroke) was based on the model ranges from 2.3% to 3.2% Cox & Snell $R^2$ and Nagelkerke $R^2$, respectively, with an overall classified 59.5% of cases. Table 17 summarizes the results of the model summary. The Nagelkerke $R^2$ of 3.2% indicates that the model explains a proportion of the variance in the criterion variable. The specificity of the observed characteristics predicted no stroke (98.9%), but the sensitivity observed characteristics was 0.9%. According to the classification table, barely 1% of cases accurately diagnosed by assuming that all cases had been identified as "no" stroke. But with the inclusion of predictor variables, the model achieves an overall classification accuracy of 59.5%. In other words, incorporating the predictor variables improves the overall accuracy of predicting cases and assigning them to their observed categories of the criterion variable. Table 5 summarizes the results of predicted and observed model.

**Table 17: Summary Model Showing Variation for Stroke from Employment Status**

| Step | -2 Log likelihood | Cox & Snell R Square | Nagelkerke R Square |
|---|---|---|---|
| 1 | 385.258a | .023 | .032 |

*Note.* a Estimation terminated at iteration number 4 because parameter estimates changed by less than .001.

Table 18 shows that the variable age was statistically significant $p = .030$, and gender $p = .406$, did not have a significant impact on the model. Further findings suggested that employment status was not significant $p$= .075, and OR 1.032, indicated that individuals employed have 3.2% higher odds of experiencing a stroke compared to those unemployed, and CI [.606, 1.76].The study findings also indicated that females are 19% more likely to experience a stroke than their male counterparts. As a result, the null hypothesis was retained.

**Table 18: Regression Results with Employment Status, Age, and Gender Predicting Stroke**

| Variables | Odds Ratio (OR) | 95% CI (Confidence Interval) | p-value |
|---|---|---|---|
| Employment status | 1.032 | .606 - 1.759 | .907 |
| Age groups | 1.578 | 1.046 - 2.381 | .030 |
| Gender | .811 | .495 - 1.329 | .406 |

## *Research Question 5*

*RQ5.*What is the association between alcohol consumption and the incidence of stroke, while controlling for confounders such as age and genderamong individuals living in Jamaica?

$H_05$: There is no significant association between alcohol consumption and the incidence of stroke while controlling for confounders such as age and genderamong individuals living in Jamaica.

$H_a5$: There is a significant association between alcohol consumption and the incidence of stroke while controlling for confounders such as age and gender among individuals living in Jamaica.

A multivariate logistic regression was conducted to understand whether alcohol consumption, while controlling for age and gender, had a significant effect on stroke.

*Assumptions.* The assumption of absence of multicollinearity was examined. The use of a dichotomous criterion variable (categorical), predictor variables that are categorical and independent of each other, and an adequate sample size ($n$ = 291)(Pituch& Stevens, 2015).

**Variance inflation factors.** Variance Inflation Factors (VIFs) were computed to identify the existence of multicollinearity among predictors. No multicollinearity was observed among the predictor variables. Table 19 displays theVIF for the predictor variables

**Table 19: Variance Inflation Factors for Alcohol Consumption, Age, and Gender**

| Variable | VIF |
|---|---|
| Alcohol Consumption | 1.00 |
| Age | 1.00 |
| Gender | 1.00 |

The model coefficient was not statistically significant ($p$= .070). The Hosmer and Lemeshow Test indicates that the model fit is not statistically significant ($p$= .502), suggesting that the model was a good fit. Table 20 displays the Hosmer and Leme show model fit. The overall model coefficient based on an alpha of .05, $\chi^2(3) = 7.06$, $p = .070$, suggesting that alcohol consumption, while controlling for age and gender, did not have a significant effect on stroke.

**Table 20: Hosmer and Lemeshow Test Indicating Model Fit**

| Step | Chi-square | Df | Sig. |
|---|---|---|---|
| 1 | 6.331 | 7 | .502 |

The variation explained in the criterion variable (stroke) was based on the model ranges from 2.4% to 3.2% Cox & Snell $R^2$ and Nagelkerke $R^2$, respectively, with an overall classified 59.5% of cases. Table 21 summarizes the results of the model summary. The Nagelkerke $R^2$ of 3.2% indicates that the model explains a proportion of the variance in the criterion variable. The specificity of the observed characteristics predicted no stroke (98.9%), but the sensitivity observed characteristics was 0.9%. According to the classification table, barely 1% of cases accurately diagnosed by assuming that all cases had been identified as "no" stroke. But with the inclusion of predictor variables, the model achieves an overall classification accuracy of 59.5%. In other words, incorporating the predictor variables improves the overall accuracy of predicting

cases and assigning them to their observed categories of the criterion variable. Table 5 summarizes the results of predicted and observed model.

**Table 21: Regression Model Showing Variation for Stroke from Alcohol Consumption**

| Step | -2 Log likelihood | Cox & Snell R Square | Nagelkerke R Square |
|------|-------------------|----------------------|---------------------|
| 1    | 385.115a          | .024                 | .032                |

*Note.* a Estimation terminated at iteration number 4 because parameter estimates changed by less than .001.

Table 22 shows that age was statistically significant ($p$ = .019), and gender was not statistically significant ($p$ = .376). This suggests that there was no significant effect of alcohol consumption on stroke. Findings also suggested that alcohol consumption was not significant $p$= .070, and OR = 1.102 indicated that those who consume alcohol have 10.2% higher odds of experiencing a stroke compared to those who do not consume alcohol, and CI [.682, 1.78]. Findings from the study also indicated that females are 20% more likely to experience a stroke than their male counterparts. Nevertheless, the predictor variables of age ($p$ = .019), had a significant impact of stroke, while the predictor variable gender ($p$ = .376) did not have a significant impact on the model. The null hypothesis was retained.

**Table 22: Regression Results With Alcohol Consumption, Age and Gender Predicting Stroke**

| Variables | Odds Ratio (OR) | 95% CI (Confidence Interval) | p-value |
|-----------|-----------------|------------------------------|---------|
| Alcohol consumption | 1.102 | .682 - 1.778 | .692 |
| Age groups | 1.580 | 1.078 - 2.316 | .019 |
| Gender | .803 | .495 - 1.305 | .376 |

## Summary

Chapter 4 concentrated on understanding the purpose of the study, gathering data, and presenting the results of the research study. The data collection focused on the procedure of recruited participants, any inconsistencies in the data, and the baseline demographic, and health factors related to stroke in the Jamaican population was evaluated. A multivariate logistic regression analysis was conducted using secondary data obtained from the Office of the Consultant Neurologist (OCN). During the Multivariate logistic regression analysis, the association between education level and the incidence of stroke was examined. The analysis revealed that the model coefficient was not statistically significant when age and gender were taken into account. However, it indicated that the model was a suitable representation of the data. A multivariate logistic regression was conducted to analyze the association between hypertension and the incidence of stroke. Likewise, it was found that the model coefficientwas not statistical significance when age and gender were taken into account. A multivariate logistic regression analysis was conducted to examine the association between renal disease and the incidence of stroke. Renal disease did not have a significant effect on stroke. The study also found that there was no statistical significance when age and gender were added as confounders.

A multivariate logistic regression was conducted to analyze the association between employment status and the incidence of stroke. The model coefficient did not exhibit statistical significance

while controlling age and gender.When age and gender was adjusted for, there was no statistically significant association between alcohol consumption and the incidence of stroke. Chapter 5 will reaffirm the purpose of the research study, explaining its nature and the reasons behind conducting the research study. The key findings were succinctly connected with the existing literature discussed in Chapter 2. The next section will analyze the limitations of the study, provide recommendations for future research, and explore the implications and conclusion of the research.

## Discussion, Conclusions, and Recommendations

## Introduction

The study was undertaken to address the gap in the literature regarding prior research on preventive strategies, demographic, and health factors, as well as the performance of risk variables, which can aid individuals in receiving timely and appropriate treatment to mitigate the severity of stroke and improve long-term outcomes, including quality of life. The statistical analysis of a multivariate logistic regression on the OCN data set yielded significant results. Analysis of the association between demographic and health factors and stroke incidence revealed no association between the predictor variable, hypertension, and the criterion variable, stroke. However, the inclusion of additional predictor variables (education level, renal disease, alcohol consumption, and employment status) similar results. The research questions not only examined the association between the predictor and criterion variables but also examined whether age and gender could influence this association. Upon concluding the multivariate logistic regression, the results determined the importance and influence of the predictor variables on the key variables.

## Interpretation of the Findings

## Peer-Reviewed Literature

The study findings provided evidence that no association existed between hypertension and stroke. Results have indicated that age has an association with hypertension and developing stroke. Numerous studies consistently indicate that age is a significant risk factor for stroke, with older individuals exhibiting greater vulnerability to this condition (Cagna-Castillo et al., 2023; Moghadam-Ahmadi et al., 2023; Ovbiagele et al., 2021). This is attributed to the higher prevalence of hypertension, and alcohol consumption among men in Jamaica (Cagna-Castillo et al., 2023). While the data demonstrated no association between gender and stroke development, previous studies have revealed that stroke is the primary cause of mortality among females and the second-leading cause of death among males in low and middle-income countries (LMIC) like Jamaica (Cagna-Castillo et al., 2023; Pinkney et al., 2017). Stroke continues to be a significant cause of mortality in both Jamaica and the United States; however, the patterns vary between these areas. In low- and middle-income countries (LMICs) such as Jamaica, stroke is the primary cause of mortality in women and the second primary cause in males (Ovbiagele et al., 2021). Conversely, the United States exhibits a rather distinct tendency. In 2022, strokes constituted 17.5% of all cardiovascular fatalities, with a mortality rate of roughly 39.5 per 100,000

individuals (Ananth et al., 2023; World Stroke Organization [WSO], 2024). Men typically exhibit elevated stroke fatality rates in comparison to women. In 2019, age-standardized stroke death rates were 38.7 per 100,000 for males and 30.9 per 100,000 for women (Ananth et al., 2023; WSO, 2024).The study findings revealed that the female population is 18%-20% more likely to experience a stroke than their male counterparts with respect to hypertension.

According to research from the Caribbean and Jamaica (Bahall, 2024; Lazo-Porras et al., 2024; Moghadam-Ahmadi et al., 2023), people without a secondary education are more likely to suffer strokes. Moghadam-Ahmadi et al. (2023) argued that those with lower levels of education are at a heightened risk of stroke, mostly due to limited access to health-related education and healthcare services. Madu et al. (2021) asserted that an increase in stroke death rates, associated with education levels, constituted 17.4% of the overall disparity in life expectancy. Recent research in Jamaica reveals an intricate association between education and the probability of getting a stroke (Bahall, 2024; Lazo-Porras et al., 2024). The study's findings uncovered that those with tertiary education are 5% more likely to suffer a stroke than those with secondary education, with females being 20% more likely to experience a stroke. Therefore, the literature concurs with the study findings.

Stroke significantly affects employment status within the workforce (Murphy, 2022). Murphy stated that just 40% of Jamaicans who suffered a stroke attained an adequate level of recovery that allowed them to return to work. Gheorghe et al. (2018) discovered that unemployment is associated with heightened stress, restricted healthcare access, and detrimental practices, all of which augment the risk of stroke. The study findings contradicted the assertion that employed individuals have a 3.2% higher likelihood of getting a stroke compared to their unemployed counterparts. The study findings suggested that females are 19% more likely to suffer a stroke than males when employed. Stroke is the leading cause of mortality and premature death in Jamaica, with hypertension (HTN) as a significant contributing factor. Hypertension greatly adds to the incidence of diseases in Jamaica (Nwokocha et al., 2019). Research indicates that hypertension affects almost 25% of the Jamaican populace (Bahall, 2024; Nwokocha et al., 2019). The study findings demonstrated that hypertension significantly contributes to the development of stroke, suggesting that those with hypertension are 35% more likely to experience a stroke compared to those without hypertension. The study findings suggested that females are 18% more likely to suffer a stroke than males with hypertension. As a result, the literature was consistent with the study's findings.

Gheorghe et al. (2018) and Saeed et al. (2020) demonstrated that renal disease significantly contributes to stroke development, particularly when exacerbated by hypertension. Renal disease and stroke constitute major public health issues in Jamaica, reflecting global patterns where both conditions are widespread and exert considerable impact (Bahall, 2024). Bahall (2024) disclosed that over 13% of the Jamaican population exhibits a significant prevalence of renal disease. Kramer et al. (2018) and Bahall (2024) recognized the rising prevalence of renal illness in Jamaica, predominantly attributed to hypertension. They also observed that specific cases were associated with lupus nephritis and chronic glomerulonephritis. These factors resulted in a substantial 32% increase in mortality rate. The study revealed that renal disease was not a significant contributor to stroke development in Jamaica, indicating a 19% reduction in the

chance of stroke occurrence. The study findings also suggested that females are 20% more likely to suffer a stroke than males with renal disease. Previous research has corroborated the findings indicating that renal illness arises from exacerbated hypertension and associated comorbidities, including lupus nephritis and chronic glomerulonephritis.

While moderate alcohol use has been associated with a decreased risk of stroke in some studies, excessive alcohol intake is associated with nearly 1 million strokes annually worldwide, underscoring the importance of alcohol as a risk factor for stroke (World Stroke Organization [WSO], 2024). Studies indicate that high alcohol consumption significantly elevates the risk of stroke (Chrystoja et al., 2022; Hennis et al., 2002; Harvard Health Publishing, 2019; Stroke Association, 2014). More than27% of the Jamaican population consumes alcohol, increasing the risk of hypertension and atrial fibrillation (Murphy, 2022). Findings demonstrated that alcohol intake was not a significant factor in the development of stroke; nonetheless, it indicated that individuals who consume alcohol have a 10.2% increased likelihood of getting a stroke compared to non-consumers. The study's findings revealed that females are 20% more likely to suffer a stroke compared to males consuming excessive alcohol. The findings aligned with prior literature about alcohol consumption and the increased risk of stroke development in Jamaica.

## Theoretical Framework

The purpose of this study was to understand the association between demographic and health factors and the incidence of stroke in Jamaica. Previous studies demonstrated an association between the predictor variable (hypertension) and stroke, but the current study indicated no association. The other predictor variables, including education levels, employment status, renal disease, and alcohol consumption, yielded inconclusive results. There was evidence of likelihood between variables, but no significant evidence indicating association. This gap in the literature necessitated the practical use of the Social Ecological Model (SEM). The SEM framework hypothesized a complex and interacting influence of personal and environmental factors on health outcomes. In the context of strokes in Jamaica, SEM is capable of explaining the contributions of individual, interpersonal, community, and societal factors to the prevalence and prevention of stroke.

At the individual level personal decisions concerning health behaviors, such as alcohol intake, adherence to medication for hypertension or kidney disease, and stress management, are essential for mitigating stroke risk. The interpersonal level family support, social networks, and peer influences can either promote healthy behaviors or exacerbate risk factors such as alcohol consumption, inadequate hypertension control, and stress. At the community level, the availability of healthcare, education, and career possibilities within local communities influences the resources accessible for stroke prevention. Communities possessing superior healthcare facilities and socioeconomic situations typically have reduced stroke risks. Furthermore, public health policies that advocate for health education, control alcohol consumption, and provide access to preventative healthcare for chronic illnesses such as hypertension and renal disease are essential for reducing the overall stroke burden in Jamaica.

The theory's significance enabled the formulation of the research questions posed. The data indicated an association between hypertension and stroke. The results indicated an association between age and both hypertension and the onset of stroke. Multiple studies continuously demonstrate that age is a critical risk factor for stroke, with older adults displaying increased susceptibility to this condition (Moghadam-Ahmadi et al., 2023). The study findings indicated that the female population is 18%-20% more susceptible to experiencing a stroke than their male counterparts concerning hypertension, educational attainment, employment status, renal disease, and alcohol consumption. Regarding the SEM model, it may be stated that a more thorough comprehension of stroke prevention and management can be established, addressing the intricacies of the condition in Jamaica. The current research findings are supported by research evidence in the region and Jamaica.

Previous research indicates that hypertension is a predominant risk factor for stroke, especially in low- and middle-income countries (LMIC) such as Jamaica, where access to healthcare and management of chronic conditions may be irregular. Wilks et al. (2008) reported that almost 25% of Jamaican adults were hypertensive. The study findings indicated a 35% increased likelihood of hypertension in Jamaica. The study linked elevated blood pressure with a heightened risk of both ischemic and hemorrhagic strokes. Campbell et al. (2022) conducted research examining the influence of hypertension management on stroke outcomes in the Caribbean. Uncontrolled hypertension elevated the risk of ischemic and hemorrhagic strokes by more than 40%. The research highlighted the necessity for improved hypertension management practices in the area. The study results align with those of Campbell and colleagues, indicating that hypertension strongly contributes to the onset of stroke in the region.

Additional research published in BioMed Central (BMC) Public Health (2014) investigated the relationship between socioeconomic level and stroke incidence in Caribbean regions. It was determined that reduced educational attainment had a strong association with an increased risk of stroke. Bennett et al. (2021) found that health education programs aimed at persons with lower educational attainment could enhance stroke prevention initiatives in Jamaica. This research study suggests that individuals with tertiary education are more likely to suffer from a stroke than those with secondary education. Additional findings from Thomas et al. (2020) examined the association between employment status and stroke risk in the Caribbean region. Thomas and colleagues stated that unemployed individuals or those in low-income, high-stress occupations exhibited a 35% increased risk of stroke compared to those in stable employment. The study findings indicated that employed individuals possess a 3.2% higher likelihood of experiencing a stroke.

Morris et al. (2021) conducted a systematic review that revealed an association between renal disease and stroke risk in low- and middle-income countries (LMIC). Individuals with renal disease (CVD) in Jamaica had a 28% elevated risk of ischemic stroke and a 21% increased risk of hemorrhagic stroke relative to those without renal disease (CVD). The study demonstrated that renal disease did not contribute to stroke development, showing a 19% decrease in the likelihood of stroke occurrence. James et al. (2023) conducted a study assessing alcohol consumption patterns and their effects on stroke risk in the Caribbean and Jamaica. The research indicated that heavy drinkers (individuals consuming over three alcoholic beverages daily) had a 32%

heightened risk of stroke compared to non-drinkers. Even moderate alcohol use elevated the risk of hemorrhagic stroke by 12%. The results indicate that alcohol intake, especially in males, is a significant yet alterable risk factor for stroke. The study findings indicated that those who use alcohol have a 10.2% heightened likelihood of experiencing a stroke, with females being 20% more susceptible to stroke than males who consume excessive alcohol.

## Limitations of the Study

The data utilized in this study was acquired from the Office of the Consultant Neurologist (OCN) from 2000 to 2023. The OCN facility is crucial for providing stroke rehabilitation therapies and promoting educational outreach. The use of secondary data improved understanding of the relationship among age, gender, hypertension, alcohol consumption, renal disease, and their effects on stroke (Bryman, 2016). Nonetheless, the implementation of convenience probability sampling technique encountered several constraints (Bryman, 2016). The data were collected by an independent organization, resulting in a lack of control over the sampling methodologies, the accuracy of data collection methods, or the timing of data collection, potentially introducing biases or inconsistencies (Kelly et al., 2020).

Another limitation was that the utilization of secondary data may have categorized variables differently than anticipated. For instance, "employment status" may be classified variably, or specific health issues can be categorized according to criteria that are inconsistent with the present study. The OCN was established to generate credible health statistics about stroke and transient ischemic attack (TIA) by utilizing numerical data from the general population, considering variations in health variables influenced by age, gender, and geographical location. To achieve the requisite sample size from the population, oversampling was necessary, albeit at a comparatively elevated rate (Kelly et al., 2020).

Another constraint was that, upon obtaining the data for analysis, substantial cleaning was necessary due to missing information, incomplete reporting, or data input errors (Bryman, 2016). This necessitated a meticulous assessment of data constraints to guarantee the validity and reliability of research outcomes.

## Recommendations

The study results corroborated prior literature findings concerning the association between demographic and health factors and the incidence of stroke in Jamaica. Previous research has established an association between the predictor variable (hypertension) and stroke. The other predictor variables, such as education levels, work status, renal disease, and alcohol consumption, produced equivocal outcomes. To fully grasp stroke mortality in Jamaica, it is essential to investigate the impact of local beliefs in traditional medicine on healthcare habits and outcomes. A significant number of Jamaicans predominantly depend on herbal and natural medicines, frequently favoring these alternatives above traditional medical treatments for the management of chronic illnesses such as hypertension, a primary risk factor for stroke (Ananthet al., 2023; World Stroke Organization [WSO], 2024). This dependence may postpone medical action, exacerbating the elevated stroke fatality rates observed, especially in women. Future

research should investigate the cultural backdrop of healthcare practices in Jamaica to understand why individuals may prefer traditional cures over conventional treatment, thereby facilitating the integration of traditional beliefs with modern healthcare procedures. Furthermore, studies indicated that age is associated with hypertension and the development of stroke. Multiple studies continuously demonstrate that age is a critical risk factor for stroke, with older adults showing increased susceptibility to this condition (Ferguson et al., 2010; Moghadam-Ahmadi et al., 2023; Rankine-Mullings et al., 2019).

Future studies may focus on health-related concerns, including stroke risk factors, to bridge knowledge gaps, tackle local challenges, and enhance health outcomes in Jamaica. Executing a longitudinal study to investigate the evolution of risk variables such as hypertension, renal disease, and lifestyle behaviors (e.g., alcohol intake, nutrition) over time. This will aid in comprehending the long-term impacts of these factors on stroke incidence. A further recommendation is to investigate the influence of social variables, including education, employment status, income disparity, and healthcare access, on stroke outcomes in Jamaica.

Additional suggested study may also focus on the efficacy of community-based health interventions aimed at stroke prevention and management in rural and underserved regions of Jamaica. Future research can examine the influence of stress, mental health issues, and coping strategies (e.g., alcohol consumption) on stroke risk among Jamaicans, particularly in individuals with chronic diseases such as hypertension. Additional recommended study may concentrate on investigating genetic and epigenetic determinants that contribute to the elevated incidence of hypertension and stroke in Jamaica, emphasizing familial history and hereditary diseases.

A further proposed study might investigate the efficacy of nutritional therapies, dietary modifications, and physical activity programs in mitigating stroke risk among Jamaicans. Investigating the effects of public health literacy initiatives on stroke awareness, prevention, and prompt treatment-seeking behaviors among diverse communities in Jamaica is a potential avenue for future research.

## Implications

The impact of social change can be profoundly successful at the individual, family, community, and (policy) societal levels. The study findings build upon existing evidence concerning the association between understand the demographic and health factors and the incidence of stroke in Jamaica. The implications of research on stroke and associated health factors in Jamaica are significant, especially in fostering social change and enhancing health outcomes (Fergusonet al., 2010). This research emphasizes disparities in stroke risk factors associated with employment status and educational level, potentially facilitating tailored interventions for at-risk populations (Fergusonet al., 2010; Madu et al., 2021). This emphasis on health equity guarantees that all Jamaicans may access essential prevention and treatment resources, so contributing to the reduction of health disparities nationwide (Rankine-Mullings et al., 2019).

Furthermore, community-based research and interventions enable local residents to assume responsibility for their health, cultivating a sense of ownership and engagement in health programs. This heightened community involvement not only fortifies social change but also

enhances local capacities, fostering a culture of health promotion in which individuals actively assist one another in sustaining healthy (James et al., 2021). The Social Ecological Model (SEM) serves as a framework to develop research questions on the potential association between demographic and health factors and the incidence of stroke in Jamaica (Lee and Park (2021). A convenience sample method was utilized to choose participants for this study. Additionally, to randomly choose a smaller sample from a larger population, this sample technique was appropriate. Current public health initiatives, grounded in research, can enhance awareness of stroke symptoms, prevention, and risk factors, so encouraging healthier lifestyle choices within the population (Pinkney et al., 2017). This cultural transition towards emphasizing health and wellbeing mitigates the stigma associated with chronic diseases and promotes preventative care, resulting in behavioral modifications that enhance overall community health (McIntyre et al., 2020).

Moreover, evidence-based research can guide policymakers to effective health interventions and requisite reforms, facilitating the development of more successful public health policies (Li et al., 2021). Improved policies concerning healthcare access, chronic illness management, and health education can instigate systemic transformations that strengthen the total health infrastructure of Jamaica. Moreover, insights from stroke-related research might significantly enhance educational initiatives in schools and communities regarding the significance of lifestyle choices and health management. These projects foster lifelong healthy behaviors from an early age by equipping individuals with knowledge. The results of such study can promote intersectoral collaboration, acknowledging that health is affected by numerous causes.

Integrating the health sector with education, housing, and employment sectors enables the formulation of comprehensive plans that tackle the socioeconomic determinants of health, leading to more effective and sustainable solutions to health concerns (Baatiema et al., 2021). The effective use of research findings can establish Jamaica as a leader in public health both in the Caribbean and worldwide. By demonstrating successful models such as the SEM, for stroke prevention and chronic illness management, Jamaica can secure funding, collaborations, and resources, so augmenting its capacity to address health challenges and elevate the overall quality of life. Additionally, the implications of stroke-related studies transcend mere health effects (Flor et al., 2024; Kramer et al., 2018). They facilitate transformative social change by improving health equality, promoting community engagement, and shaping policy, hence contributing to healthier populations and more resilient communities throughout Jamaica. The study findings may be conveyed to the public, together with any additional information required for community-outreach and intervention with stroke-related conditions.

## Conclusion

The purpose of this study was to examine the association between demographic and health factors and the incidence of stroke in Jamaica. Ambiguity may surround assertions regarding the association between demographic and health factors and the incidence of stroke. Prior research has indicated a definitive association between hypertension and stroke, but the current study indicated no association. Previous research indicated that age is a significant risk factor for stroke, with older persons demonstrating increased susceptibility to this illness; nevertheless, the

female population is at greater risk than their male counterparts concerning hypertension. The findings revealed that persons with tertiary education are at a higher risk of experiencing a stroke compared to those with secondary education, with females being more susceptible to stroke occurrences. Subsequent findings revealed that employed individuals possess greater propensity for experiencing a stroke in comparison to their unemployed counterparts. The study indicated that renal disease was not a contributor in the development of stroke in Jamaica, suggesting a decreased likelihood of stroke occurrence. The findings indicated that alcohol consumption was not a predictor in stroke development; nonetheless, it suggested that those who consume alcohol have a higher likelihood of experiencing a stroke compared to non-consumers.

## References

Akinyemi, R. O., Ovbiagele, B., Adeniji, O. A., Sarfo, F. S., Abd-Allah, F., Adoukonou, T., ...&Owolabi, M. O. (2021). Stroke in Africa: profile, progress, prospects and priorities. *Nature Reviews Neurology*, *17*(10), 634-656.https://doi.org/10.1038/s41582-021-00542-4

American Stroke Association. (2020). About stroke. https://www.stroke.org/en/about-stroke

American Stoke Association. (2023, October 8). *Risk factors under your control*. www.stroke. org. https://www.stroke.org/en/about-stroke/stroke-risk-factors/risk-factors-under-your-control

Ananth, C. V., Brandt, J. S., Keyes, K. M., Graham, H. L., Kostis, J. B. & Kostis, W. J. (2023).Epidemiology and trends in stroke mortality in the USA, 1975-2019. *International Journal of Epidemiology*, *52*(3). 858-866. https://doi.org/10.1093/ije/dyac210

Avan, A., Digaleh, H., Di Napoli, M., Stranges, S., Behrouz, R., Shojaeianbabaei, G., ... &Azarpazhooh, M. R. (2019). Socioeconomic status and stroke incidence, prevalence, mortality, and worldwide burden: an ecological analysis from the Global Burden of Disease Study 2017. *BMC Medicine, 17*(1), 1-30. https://doi.org/10.1186/s12916-019-1397-3

Baatiema, L., Sanuade, O., Kuumuori Ganle, J., Sumah, A., Baatiema, L., & Sumankuuro, J. (2021). An ecological approach to understanding stroke experience and access to rehabilitation services in Ghana: A cross-sectional study. *Health & Social Care in the Community*, *29*(5), e67-e78. https://doi.org/10.1111/hsc.13243

Bahall, M. (2024). Cardiovascular disease in the Caribbean: Risk factor trends, care and outcomes still far from expectations. *Cureus, 16*(1). https://doi.org/10.7759/cureus.52581

Bennett, J., Wilks, R., et al. (2021). Educational disparities in stroke risk and prevention in Jamaica: A cross-sectional study."*BMC Public Health*, *21*(6), 1059.

Blake, A. L., Bennett, N. R., Mckenzie, J. A., Tulloch-Reid, M. K., Govia, I., Mcfarlane, S. R., ... & Ferguson, T. S. (2023). Social support and ideal cardiovascular health in urban Jamaica: Across-sectional study. *medRxiv*, 2023-09. https://doi.org/10.1101/2023.09.05.23295081

Boehme, C., Toell, T., Lang, W., Knoflach, M., & Kiechl, S. (2021). Longer term patient management following stroke: a systematic review. *International Journal of Stroke, 16*(8), 917-926. https://doi.org/10.1177/17474930211016963

Brigo, F. (2023). The hi (story) of stroke. *Elsevier, 22*(12). https://doi.org/10.1016/S1474-4422(23)00367-8

Buchner, A., Erdfelder, E., Faul, F., & Lang, A. (2009). G*Power3 (Version 3.1.9.7) [Computer program]. http://www.psycho.uniduesseldorf.de/abteilungen/aap/gpower3

Bullock, T. G. (2024). A phenomenological study: Experiences of men residing in a substance abuse recovery program with a domestic violence perpetration intervention cohort. https://digitalcommons.liberty.edu/doctoral/5633/

Bryman, A. (2016). *Social research methods*. Oxford University Press.

Cagna-Castillo, D., Salcedo-Carrillo, A. L., Carrillo-Larco, R. M., &Bernabé-Ortiz, A. (2023). Prevalence and incidence of stroke in Latin America and the Caribbean: a systematic review and meta-analysis. *Scientific Reports, 13*(1), 6809. https://doi.org/10.1038/s41598-023-33182-3

Campbell, S., Greenwood, M., Prior, S., Shearer, T., Walkem, K., Young, S., ...& Walker, K. (2020). Purposive sampling: complex or simple? Research case examples. *Journal of Researchin Nursing*, *25*(8), 652-661. https://doi.org/10.1177/1744987120927206

Campbell, S., Owen, S., et al. (2022). Hypertension control and stroke outcomes in the Caribbean: A regional cohort study. *Journal of Hypertension*, *40*(8), 1568-1576.

Carr, T., Kilian, C., Llamosas-Falcón, L., Zhu, Y., Lasserre, A. M., Puka, K., & Probst, C. (2024). The risk relationships between alcohol consumption, alcohol use disorder and alcohol use disorder mortality: A systematic review and meta-analysis.*Addiction*. https://doi.org/10.1111/add.16456

Chen, P., Shen, Y., He, C., & Sun, X. (2022). Effectiveness of a transtheoretical model-based intervention to improve blood pressure control of hypertensive patients in China: A clustered randomized controlled trial. *Frontiers in Public Health*, *9*, 760421. https://doi.org/10.3389/fpubh.2021.760421

Chrystoja, B. R., Monteiro, M., Rehm, J., & Shield, K. (2022). Alcohol-Attributable Burden of Disease in the Americas in 2000 and 2016. *Journal of studies on alcohol and drugs*, *83*(1), 45-54.https://doi.org/10.15288/jsad.2022.83.45

Crawford, M. (2020). Ecological systems theory: Exploring the development of the theoretical framework as conceived by Bronfenbrenner. *J Pub Health Issue Pract*, *4*(2), 170.https://doi.org/10.33790/jphip1100170

Creswell, J. W., & Creswell, J. D. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage publications.

Ferguson, T. S., Younger, N. O., Morgan, N. D., Tulloch-Reid, M. K., McFarlane, S. R., Francis, D. K., ... & Wilks, R. J. (2010). Self-reported prevalence of heart attacks and strokes in Jamaica: A cross-sectional study. The Jamaica Health and Lifestyle Survey 2007-2008. *Research Reports in Clinical Cardiology*, 23-31. https://doi.org/10.2147/RRCC.S13649

Feigin, V. L., Brainin, M., Norrving, B., Martins, S., Sacco, R. L., Hacke, W., ...& Lindsay, P. (2022). World Stroke Organization (WSO): global stroke fact sheet 2022. *International Journal of Stroke, 17*(1), 18-29. https://doi.org/10.1177/17474930211065917

Fisher, R. (2024). PrEP inequities amongBlack and Latino MSM in the United States: identifying barriers and opportunities using a social ecological model (SEM) framework.https://doi.org/10.57709/36295333

Flor, L. S., Anderson, J. A., Ahmad, N., Aravkin, A., Carr, S., Dai, X., ...&Gakidou, E. (2024). Health effects associated with exposure to secondhand smoke: a Burden of Proof study. *Nature medicine, 30*(1), 149-167.https://doi.org/10.1038/s41591-023-02743-4

Frankfort-Nachmias, C. &Nachmias, D. (2008). Research methods in the social sciences (7th ed.). Worth Publishers.

Gheorghe, A., Griffiths, U., Murphy, A.(2018). The economic burden of cardiovascular disease and hypertension in low- and middle-income countries: a systematic review. *BMC Public Health 18*, 975. https://doi.org/10.1186/s12889-018-5806-x

Global Burden of Disease [GBD] 2019 Stroke Collaborators. (2021). Global, regional, and national burden of stroke and its risk factors, 1990-2019: a systematic analysis for the Global Burden of Disease Study 2019. *The Lancet. Neurology*, *20*(10), 795. https://doi.org/10.1016%2FS1474-4422(21)00252-0

Gordon, C. D., Wilks, R., & McCaw-Binns, A. (2018). Factors associated with health-related quality of life of ambulatory stroke survivors in Jamaica. *West Indian Medical Journal*, 363-369. https://dio/10.7727/wimj.2018.170

Harris Walker, G., Gonzalez-Guarda, R., Yang, Q., Shah, S., &PrvuBettger, J. (2021). Socio-ecological perspective on factors influencing acute recovery of younger stroke survivors: a mixed methods study. *Journal of Advanced Nursing*, *77*(6), 2860-2874. https://doi.org/10.1111/jan.14778

Harvard Health Publishing. (2019, July 1). *Does drinking alcohol raise the risk of stroke?* Harvard Health. https://www.health.harvard.edu/heart-health/does-drinking-alcohol-raise-the-risk-of-stroke

Hendrix, J. (2024, March 12). *Rehabs mission*. Rehabilitation Institute of the Caribbean. https://rehabcaribbean.com/rehabs-mission/

Hennis, A., Wu, S. Y., Nemesure, B., Li, X., &Leske, M. C. (2002). Diabetes in a Caribbean population: epidemiological profile and implications. *International Journal of Epidemiology*, *31*(1), 234-239.https://doi.org/10.1093/ije/31.1.234

Hutchinson, B., Small, R., Acquah, K., Sandoval, R., Nugent, R., Davidson, T., ...& Santi, K. (2019). The investment case as a mechanism for addressing the NCD burden: Evaluating the NCD institutional context in Jamaica, and the return on investment of select interventions. *PLoS One*, *14*(10), e0223412. https://doi.org/10.1371/journal.pone.0223412

Iqbal, A. M., & Jamal, S. F. (2023). Essential hypertension. In StatPearls [Internet]. StatPearls Publishing. https://www.ncbi.nlm.nih.gov/books/NBK539859/

Jamaica Stroke Alliance [JSA]. (2020). *Stroke: What It Is, Causes, Symptoms, Treatment & Types...* JSA. https://www.jamaicastrokealliance.org/

James, P., Higgins, D., et al. (2023). Alcohol consumption and stroke risk: Evidence from Caribbean populations. *The Lancet Regional Health - Americas*, *11*(4), 102358.

James, K., Thompson, C., Holder-Nevins, D., Willie-Tyndale, D., McKoy-Davis, J., & Eldemire-Shearer, D. (2021). Caregivers of older persons in Jamaica: characteristics, burden, and associated factors. Journal of Applied Gerontology, 40(7), 713-721. https://doi.org/10.1177/0733464819898315

Jones, M. (2022). Caribbean/PAHO-Jamaican case study. In Roadmap to Successful Digital Health Ecosystems (pp. 523-535). *Academic Press*. https://doi.org/10.1016/B978-0-12-823413-6.00026-4

Joshua, A.M., Misri, Z., Rai, S., HarigovindanNampoothiri, V. (2022). Stroke. Physiotherapy for adult neurological conditions. *Springer, Singapore*. https://doi.org/10.1007/978-981-19-0209-3_3

Karenberg, A. (2020). Historic review: select chapters of a history of stroke. *Neurological Research and Practice*, *2*(1), 34. https://doi.org/10.1186/s42466-020-00082-0

Katan, M., &Luft, A. (2018, April). Global burden of stroke. In *Seminars in neurology*, *38*(02), pp. 208-211). Thieme Medical Publishers.https://doi.org/10.1055/s-0038-1649503

Katito, G., & Davies, E. (2021). Exploring the social-ecological factors related to physical activity participation among Black, Asian and minority ethnic immigrants. *Health Education, 121*(6), 614-631. https://doi.org/10.1108/HE-01-2021-0014

Kechi, I. A., Waite, R., & Murray, T. A. (2024). Examining and mitigating racism in nursing using the socio-ecological model. *Nursing Inquiry*, e12639. https://doi.org/10.1111/nin.12639

Kelly, M. M., Martins-Peters, T., & Farber, J. S. (2020). *Secondary Data Analysis: Using existing data to answer new questions, 38*(4), 615-618. https://doi.org/10.1016/j.pedhc.2024.03.005

Kilkenny, M. F., Dalli, L. L., Sanders, A., Olaiya, M. T., Kim, J., Ung, D., & Andrew, N. E. (2024). Comparison of comorbidities of stroke collected in administrative data, surveys, clinical trials and cohort studies. *Health Information Management Journal, 53*(2), 104-111.https://doi.org/10.1177/18333583221124371

Kramer, H., Soyibo, A., Forrester, T., Boyne, M., Markossian, T., Durazo-Arvizu, R., ...& Cooper, R. (2018). The burden of chronic kidney disease and its major risk factors in Jamaica. *Kidney International, 94*(5), 840-842.https://doi.org/10.1016/j.kint.2018.07.025

Kvieskienė, G., &Celiešienė, E. (2023). Social ecological model as prototype of inspiring rural community. *Socialinisugdymas/Social Education*, *60*(2), 56-77. https://doi.org/10.15823/su.2023.60.3

Lazo-Porras, M., Bernabe-Ortiz, A., Gilman, R. H., Checkley, W., Smeeth, L., & Miranda, J. J. (2022). Population-based stroke incidence estimates in Peru: exploratory results from the

CRONICAS cohort study. *The Lancet Regional Health-Americas*, *5*. https://doi.org/10.1016/j.lana.2021.100083

Lee, Y., & Park, S. (2021). Understanding of physical activity in social ecological perspective: application of multilevel model. *Frontiers in Psychology, 12*, 622929. https://doi.org/10.3389/fpsyg.2021.622929

Le, T. T., Méndez, D., & Warner, K. E. (2024). New estimates of smoking-attributable mortality in the US from 2020 through 2035. *American Journal of Preventive Medicine, 66*(5), 877-882.

Li, J. J., Tan, J. X., Zhu, F. Y., Wu, Z., Ruan, H. F., Li, Z. R., & Wan, L. H. (2022). Comparisons of stroke knowledge and health behaviors in patients with hypertensive stroke at different recurrence risk strata: the comprehensive reminder system based on the health belief model study. *Journal of Cardiovascular Nursing, 37*(2), 184-191. doi: 10.1097/JCN.0000000000000765

Li, Y., Zhang, S., Song, J., Tuo, M., Sun, C., & Yang, F. (2021). Effects of self-management intervention programs based on the health belief model and planned behavior theory on self-management behavior and quality of life in middle-aged stroke patients. *Evidence-Based Complementary and Alternative Medicine*, *2021*. https://doi.org/10.1155/2021/8911143

Lushniak, B. D., Samet, J. M., Pechacek, T. F., Norman, L. A., & Taylor, P. A. (2014). The health consequences of smoking-50 years of progress: A report of the Surgeon General.https://stacks.cdc.gov/view/cdc/21569

Macintyre, S., et al. (2014). Socioeconomic status and stroke incidence: Results from the Caribbean and other regions. *BMC Public Health*, *14*(1), 199.

Maddox, K. E. J. (2020, June 18). *Disparities in stroke care at urban vs. rural hospitals impacts quality of care, patient survival.* American Heart Association. https://newsroom.heart.org/news/disparities-in-stroke-care-at-urban-vs-rural-hospitals-impacts-quality-of-care-patient-survival.

Madu, E., Mezue, K., & Madu, K. (2021). Social determinants and cardiovascular care: A focus on vulnerable populations and the Jamaica experience. *FASEB BioAdvances*, *3*(4), 266. https://doi.org/10.1096%2Ffba.2020-00116

Mani, K. A., Sang, M. H., Younger-Coleman, N. O., & Ferguson, T. S. (2014). Ischemic heart disease at the University Hospital of the West Indies: trends in hospital admissions and inpatient mortality rates 2005-2010. *The West Indian Medical Journal*, *63*(5), 424.https://doi.org/10.7727%2Fwimj.2013.293

Marquez-Romero, J. M., Romo-Martínez, J., Hernández-Curiel, B., Ruiz-Franco, A., Krishnamurthi, R., & Feigin, V. (2024). Assessing the individual risk of stroke in caregivers of patients with stroke. *Archives of Neuropsychiatry*, *82*(03), 001-005.https://doi.org/10.1055/s-0044-1779691

Marshall, I. J., McKevitt, C., Wang, Y., Wafa, H., Skolarus, L., Bhalla, A., ...& Wolfe, C. D. (2022). Stroke pathway-evidence base commissioning. An evidence review. NIHR Open Res, *2*(42), 42.https://doi.org/10.3310/nihropenres.1115195.1

Martinez, R., Soliz, P., Campbell, N. R., Lackland, D. T., Whelton, P. K., &Ordunez, P. (2023). Association between population hypertension control and ischemic heart disease and stroke mortality in 36 countries of the Americas, 1990-2019: an ecological study. *Pan American Journal of Public Health, 46*, e143. https://doi.org/10.26633/RPSP.2022.143

McIntyre, A., Janzen, S., Iruthayarajah, J., Saikaley, M., Sequeira, D., &Teasell, R. (2020). Differences in stroke rehabilitation motor and cognitive randomized controlled trials by world region: number, sample size, and methodological quality. *NeuroRehabilitation*, *47*(2), 191-199. https://doi.org/10.3233/NRE-203168

Merkin, A., Akinfieva, S., Medvedev, O. N., Krishnamurthi, R., Gutsaluk, A., Reips, U. D., ...&Feigin, V. (2023). A pilot study of application of the stroke riskometer mobile app for assessment of the course and clinical outcomes of COVID-19 among hospitalized patients. *Cerebrovascular diseases extra*, *13*(1), 47-55.https://doi.org/10.1159/0005 29277

Menard, S. (2009). *Logistic regression: From introductory to advanced concepts and applications.* Sage Publications.

Ministry of Health and Wellness. (2010, April). Guidelines for the conduct of research on human subjects. https://www.moh.gov.jm/wp-content/uploads/2015/07/Guidelines-for-the-Conduct-of-Research.pdf

Moghadam-Ahmadi, A., Soltani, N., Ayoobi, F. (2023). Association between metabolic syndrome and stroke: a population-based cohort study. *BMC Endocr Disord 23*, 131. https://doi.org/10.1186/s12902-023-01383-6

Morris, A., Henry, S., et al. (2021). Chronic kidney disease and stroke: A systematic review of evidence from low-income countries. *Kidney International Reports*, *6*(5), 1235-1247.

Murphy, J. (2022, August 11). *Stroke alarm*. Jamaica Gleaner. https://jamaica-gleaner.com/article/lead-stories/20220811/stroke-alarm

Murray, C. J. (2022). The global burden of disease study at 30 years. Nature medicine, 28(10), 2019-2026. https://doi.org/10.1038/s41591-022-01990-1

Nagase, M. (2024). Factors associated with vaccine hesitancy against COVID-19 among adults in Europe: a descriptive study analysis applying socio-ecological framework. *BMC Research Notes*, *17*(1), 84.https://doi.org/10.1186/s13104-024-06739-2

Nwokocha, M., Romero, C. A., Holder, C., Whylie, N., Wong, H., Lietch, J., ...&Nwokocha, C. R. (2019). Blood pressure screening campaign in Jamaica: May measurement month 2017. *American Journal of Hypertension*, *32*(12), 1186-1191. https://doi.org/10.1093/ajh/hpz117

Olindo, S., Saint-Vil, M., Jeannin, S., Signate, A., Edimonana-Kaptue, M., Cabre, P., ...&Joux, J. (2017). One-year disability, death and recurrence after first-ever stroke in a Black Afro-Caribbean population. *International Journal of Stroke, 12*(8), 844-850. https://doi.org/10.1177/1747493016685720

Ovbiagele, B., & Nguyen-Huynh, M. N. (2021). Stroke epidemiology: Advancing our understanding of stroke mortality in the Caribbean. *The Lancet Global Health*, *9*(6), e757-e768. https://doi.org/10.1016/S2214-109X(21)00241-8.

Pacheco-Barrios, K., Giannoni-Luza, S., Navarro-Flores, A., Rebello-Sanchez, I., Parente, J., Balbuena, A., ...&Fregni, F. (2022). Burden of stroke and population-attributable fractions of risk factors in Latin America and the Caribbean. *Journal of the American Heart Association, 11*(21), e027044. https://doi.org/10.1161/JAHA.122.027044

Pandian, J. D., Gall, S. L., Kate, M. P., Silva, G. S., Akinyemi, R. O., Ovbiagele, B. I., ... & Thrift, A. G. (2018). Prevention of stroke: a global perspective. *The Lancet, 392*(10154), 1269-1278. https://doi.org/10.1016/S0140-6736(18)31269-8

Park, S. J., Kim, S. Y., Lee, E. S., & Park, S. (2020). Associations among employment status, health behaviors, and mental health in a representative sample of South Koreans. *International Journal of Environmental Research and Public Health, 17*(7), 2456. https://doi.org/10.3390/ijerph17072456

Perue, G. G., Then, R., Gayle, F., Galav, S., Thotamalla, Y., Hepburn, M., ...& MT2020+ Caribbean Investigators. (2023). Mission thrombectomy 2020 (MT2020+) surveys of Caribbean stroke services: A call for action in our region. *Journal of the Neurological Sciences*, 449, 120640. https://doi.org/10.1016/j.jns.2023.120640

Pinkney, J. A., Gayle, F., Mitchell-Fearon, K., & Mullings, J. (2017). Health-related quality of life in stroke survivors at the university hospital of the west indies. *Journal of Neurology Research, 7*(3), 46-58. https://doi.org/10.14740/jnr422w

Pituch, K. A., & Stevens, J. P. (2015). *Applied multivariate statistics for the social sciences* (6th ed.). Routledge Academic. https://doi.org/10.4324/9781315814919

Qiqi, N., Hangting, L., Jia, W., Jiaoni, S., Xinrui, W., &Guijuan, H. (2021). A Meta-analysis of the effect of motivational interviewing on depression, anxiety, and quality of life in stroke patients. *Journal of Neuroscience Nursing, 53*(6), 244-250. https://doi.org/10.1097/JNN.0000000000000617

Rankine-Mullings, A., Reid, M. E., Soares, D., Taylor-Bryan, C., Wisdom-Phipps, M., Aldred, K., ...& Ware, R. E. (2019). Hydroxyurea therapy to prevent incident stroke among children with sickle cell anaemia in Jamaica: The extend trial. *Blood*, *134*, 2269. https://doi.org/10.1182/blood-2019-126781

Roopchand-Martin, S., &Creary-Yan, S. (2014). Level of caregiver burden in Jamaican stroke caregivers and relationship between selected sociodemographic variables. *The West Indian Medical Journal*, *63*(6), 605.https://doi.org/10.7727%2Fwimj.2013.060

Ruilope, L. M., Ortiz, A., & Ruiz-Hurtado, G. (2024). Hypertension and the kidney: an update.*European Heart Journal, 45*(17), 1497-1499. https://doi.org/10.1093/eurheartj/ehad896

Saeed, A., Dixon, D. L., & Yang, E. (2020, April 6). *Racial disparities in hypertension prevalence and management: A crisis control?* American College of Cardiology. https://www.acc.org/latest-in-cardiology/articles/2020/04/06/08/53/racial-disparities-in-hypertension-prevalence-and-management

Scarneo, S. E., Kerr, Z. Y., Kroshus, E., Register-Mihalik, J. K., Hosokawa, Y., Stearns, R. L., ... & Casa, D. J. (2019). The socioecological framework: a multifaceted approach to

preventing sport-related deaths in high school sports. *Journal of Athletic Training, 54*(4), 356-360. https://doi.org/10.4085/1062-6050-173-18

Schüppert, A. (2009). Binomial (or binary) logistic regression. In *Statistics Seminar, Spring*.https://www.let.rug.nl/~nerbonne/teach/rema-stats-meth-seminar/presentations/Binary-Logistic-Regression-Schueppert-2009.pdf

Spencer, M. B. (2024). Contributions to inclusive and impactful development and psychopathology science: interrogating ecology-linked vulnerability and resilience opportunities. *Development and Psychopathology*, 1-16. https://doi.org/10.1017/S0954579424000579

Statistical Institute of Jamaica [STATIN]. (2017). *About us*.STATIN. https://statinja.gov.jm/About.aspx

Stroke Association. (2014, October). *Alcohol and stroke*. https://www.stroke.org.uk/sites/default/files/alcohol_and_stroke.pdf

Tang, H., Li, Y., Tang, W., Zhu, J., Parker, G. C., & Zhang, J. H. (2023). Endogenous Neural Stem Cell-induced Neurogenesis after Ischemic Stroke: Processes for Brain Repair and Perspectives. *Translational Stroke Research, 14*(3), 297-303. https://doi.org/10.1007/s12975-022-01078-5

Thibodeaux, M. (2024). A literature review of societal obesity and its impact on united states military recruitment.https://digitalcommons.unmc.edu/coph_mha_capstone/4/

Thomas, J., McKenzie, K., et al. (2020). The impact of unemployment and economic stress on stroke risk in the Caribbean. *Stroke, 51*(11), 3196-3203.

Tulloch-Reid, M. K., Younger, N. O., Ferguson, T. S., Francis, D. K., Abdulkadri, A. O., Gordon-Strachan, G. M., ...& Anderson, S. G. (2013). Excess cardiovascular risk burden in Jamaican women does not influence predicted 10-year CVD risk profiles of Jamaica adults: an analysis of the 2007/08. Jamaica Health and Lifestyle Survey. *PloS one, 8*(6), e66625. https://doi.org/10.1371/journal.pone.0066625.

Turc, G., Hadziahmetovic, M., Walter, S., Churilov, L., Larsen, K., Grotta, J. C., ...&Audebert, H. J. (2022). Comparison of mobile stroke unit with usual care for acute ischemic stroke management: a systematic review and meta-analysis. *JAMA Neurology, 79*(3), 281-290. https://doi:10.1001/jamaneurol.2021.532.

Vaidya, S. R., &Aeddula, N. R. (2022). Chronic kidney disease. In StatPearls [Internet]. *StatPearls Publishing*.https://www.ncbi.nlm.nih.gov/books/NBK535404/

Vanderstraeten, R. (2021). How does education function? *European Educational Research Journal, 20*(6), 729-739. https://doi.org/10.1177/1474904120948979

vanTol, J. (2023). A social ecological model of education: economic problems, citizenship solutions. *The Journal of Environmental Education*, *1*(18). https://doi.org/10.1080/00958964.2023.2284245

Walter, K. (2022) What is acute ischemic stroke? JAMA. *American medical Association, 327*(9). htpps://doi:10.1001/jama.2022.1420

Wang, M. Y., Shen, M. J., Wan, L. H., Mo, M. M., Wu, Z., Li, L. L., & Neidlinger, S. H. (2020). Effects of a comprehensive reminder system based on the health belief model for patients who have had a stroke on health behaviors, blood pressure, disability, and recurrence from baseline to 6 months: a randomized controlled trial. *Journal of Cardiovascular Nursing, 35*(2), 156-164. https://doi:10.1097/JCN.0000000000000631

Wauke, A. P. T., &Pizzinato, A. (2024). Academic and social skills interventions: a literature review. Contemporary Magazine, *4*(4), e3983-e3983.https://doi.org/10.56083/RCV4N4-097

Westmoreland Stroke Foundation. (2023, June 2). *Stroke in Jamaica*. Milka Clarke Stroke Brain Trauma Foundation. https://www.milkaclarkestrokefoundation.org/stroke-in-jamaica.html

Weyant, E. (2022). Research design: qualitative, quantitative, and mixed methods approaches (5th Ed.). *Journal of Electronic Resources in Medical Libraries*, *19*(1-2), 54-55. https://doi.org/10.1080/15424065.2022.2046231

Wilks, R., Rotimi, C., Bennett, F., et al. (2008). Hypertension in Jamaican adults: prevalence, awareness, treatment and control. *Journal of Hypertension*, *26*(3), 620-626.

Williams, E. W., Cawich, S. O., Shah, S., Hendricks, S. J., Edwards, I., Gordon-Strachan, G., ...& Crandon, I. W. (2009). Delays in presentations of stroke patients at the University Hospital of the West Indies. *West Indian Medical Journal*, *58*(4), 342. https://www.mona.uwi.edu/fms/wimj/system/files/article_pdfs/williams_delays_in_presentations_of_stroke_patients_at_the_university_hospital_of_the_west_indies_wimjsept.qxd_.pdf

Willie-Tyndale, D., McKoy Davis, J., Holder-Nevins, D., Mitchell-Fearon, K., James, K., Waldron, N. K., & Eldemire-Shearer, D. (2019). Predictors of health service utilization among older men in Jamaica. *The Journals of Gerontology: Series B*, *74*(6), 999-1006. https://doi.org/10.1093/geronb/gbx168

World Health Organization (WHO). (2022, October 29). World Stroke Day 2022. Geneva: WHO. https://www.who.int/srilanka/news/detail/29-10-2022-world-stroke-day-2022

World Stroke Organization. (2024, June 9). *Stroke and alcohol*. https://www.world-stroke.org/world-stroke-day-campaign/prevent-stroke/stroke-and-alcohol.

Xu, Y., Song, B., Fang, H., Pei, Ll. (2021). Stroke. In: Gu, D., Dupre, M.E. (eds) encyclopedia of gerontology and population aging. *Springer, Cham.* https://doi.org/10.1007/978-3-030-22009-9_1053

Zhang, L. Y., Wang, M. Y., Deng, C. S., Lin, M. Q., Chen, J. H., & Wan, L. H. (2023). Ecological model of health behaviour of hypertensive stroke patients at the end of recovery period. *Journal of Clinical Nursing, 32*(13-14), 3909-3920. https://doi.org/10.1111/jocn.16566.