

## **Section 1**

**Title:** Association of stroke and traumatic brain injury with healthcare access and utilization

**Abstract:** NA

## **Section 2**

### **Introduction (rough draft):**

Traumatic Brain Injury (TBI) and stroke are two extremely serious neurological conditions that affect millions of individuals in the U.S. TBI is characterized by a relatively strong external force to the head that could include a bump, blow, or jolt. Common causes include falls and car crashes. TBIs generally range in severity from mild concussions to permanent brain damage and cognitive impairment. In 2021, nearly 70,000 people died due to TBI-related incidents with many more enduring the long term effects.

Stroke is defined by a lack of blood flow to the brain that deprives the brain of oxygen and can lead to death and disability. The two major types of stroke include ischemic which is caused by a blood clot, and hemorrhagic, which is caused by the rupture of a blood vessel in the brain. Both conditions can cause severe brain damage that could lead to cognitive impairment and disability depending on severity. In the United States, around 800,000 people suffer from strokes every year with ischemic accounting for the majority of them.

Patients with stroke and TBI require adequate long-term care and healthcare access to ensure improved outcomes. Patients who lack healthcare coverage altogether or have no place to go for routine healthcare may be even more at risk of their condition worsening. Access to care could also depend on the type of insurance plan a patient has. Understanding how TBI and Stroke affect a patient's access to care is crucial in ensuring equitable healthcare. Inadequate access could hinder recovery and positive outcomes.

This study investigates whether or not individuals with a history of TBI or stroke face difficulties in healthcare access. This will be done by utilizing data from the National Health and Nutrition Examination Survey (NHANES). NHANES provides data regarding different healthcare access factors such as type insurance coverage and place of routine visit. NHANES data from 2011-2014 will be used as those years' surveys inquired about an individual's history of TBI and Stroke. We hypothesize that patients who have experienced TBI are less likely to have proper healthcare access/utilization, whereas people with stroke are more likely to have more adequate healthcare access/utilization.

<https://www.cdc.gov/stroke/data-research/facts-stats/index.html>

<https://www.cdc.gov/traumatic-brain-injury/data-research/facts-stats/index.html>

### **Section 3**

**Research Question:** What is the association between prior stroke and prior TBI on healthcare access and utilization?

**Hypothesis:** We hypothesize that patients who have experienced TBI are less likely to have proper healthcare access/utilization, whereas people with stroke are more likely to have more adequate healthcare access/utilization.

- Certain subgroups of patients with TBI/stroke have less/poor access to healthcare (maybe younger individuals, less educated)

**Objectives:**

- To investigate how patients of different neurological conditions (TBI and Stroke) utilize healthcare options
- To investigate the levels of access these patients have to healthcare overall
- To examine if varying demographics are impacted differently

**Generalization Target:**

- Findings will apply to all U.S. residents (supposed to represent the general population, non-institutionalized civilian population)
- Findings will NOT apply to institutionalized individuals, active duty military personnel, homeless individuals

### **Section 4**

**Inclusion/exclusion criteria:** NHANES is a comprehensive survey that collects health and healthcare data for thousands of participants. NHANES selects a sample of individuals that is nationally representative of the US population. All participants are interviewed about their health and diet. Physical examination and laboratory data is also collected. For this study, data from the 2011-2012 and 2013-2014 surveys will be combined as these were the years that both TBI and stroke data were collected. TBI questions were asked to adults of age 40 and above, while questions related to Stroke were asked to adults aged 20 and above. Healthcare data was collected on all participants of all ages, with a proxy response for kids under the age of 16.

- Our study is limited by age

### **Section 5**

#### **Study Outcomes**

**Exposures:**

- TBI: Have you ever had a loss of consciousness because of a head injury? (Yes/No)
- Stroke: Have you ever told you had a stroke? (Yes/No)

- (FROM NHANES)

**Primary Outcome (choose 1):**

- Whether individual has routine place to go for healthcare (Yes/No)
- Whether individual has access to healthcare coverage (Yes/No)

**Secondary:**

- Type of insurance plan individual has (government/private)
- Type of place individual goes to for healthcare related services
- How long since last healthcare visit
- Socioeconomic/demographics

**Marginal Distributions:** From NHANES website

- For TBI, stroke, and primary outcomes (add across years), make a plot for it varies from year to year
- Look at stroke paper

**Connection to Study:** The exposures determine if a participant has experienced TBI or Stroke. The goal of the outcomes is to assess different aspects surrounding healthcare access. A routine place to go for healthcare is likely the most crucial factor for patients recovering from TBI and Stroke. Other relevant aspects surrounding access to healthcare are whether or not the patient is insured, the type of insurance plan, and frequency of visits. All of these could be impacted by suffering from TBI and stroke.

[https://www.cdc.gov/Nchs/Data/Nhanes/Public/2013/DataFiles/HUQ\\_H.htm](https://www.cdc.gov/Nchs/Data/Nhanes/Public/2013/DataFiles/HUQ_H.htm)

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## Section 6

**Primary Feature:** This study uses NHANES data, which provides nationally representative estimates based on a complex, multistage sampling design. This allows for analysis of associations between self-reported traumatic brain injury and stroke history as well as healthcare access and utilization factors in the non-institutionalized U.S. population.

- **Secondary Feature:** The availability of demographic and socioeconomic data which could help control for confounding variables.

**Covariates/Effect Modifiers:** Likely, will be demographic and socioeconomic factors such as **age, sex, income, education, race/ethnicity.**

**Covariate Selection:** All demographics data is provided by NHANES and may be helpful in explaining differences in healthcare outcomes. Perhaps there are demographic-specific findings

that are relevant and provide insight into how TBI and stroke affect different groups within the realm of healthcare.

**Generizability:** Since NHANES is nationally representative, the results of our study regarding the association between stroke and traumatic brain injury with healthcare access and utilization can be generalized to the noninstitutionalized U.S. population.

### **Section 7** (shell tables)

#### **Demographics (TBI)**

Characteristic	Total Overall	TBI	No TBI
Age			
Sex			
Race/Ethnicity			
Income to poverty ratio			
Insurance coverage			
Education level			
Alcohol Consumption			
Hypertension			
Diabetes			
Sleep			
Stroke History			

#### **Demographics (Stroke)**

Characteristic	Total Overall	Stroke	No Stroke
Age			
Sex			
Race/Ethnicity			
Income to poverty ratio			
Insurance coverage			
Education level			

Alcohol Consumption			
Hypertension			
Diabetes			
Sleep			

#### Access/Utilization Indicators for TBI and Stroke

Measure of Access/Utilization	Total Overall	TBI	No TBI
Do you have a routine place? <ul style="list-style-type: none"> <li>If yes, what is the type of place?</li> </ul>			
Insurance Coverage <ul style="list-style-type: none"> <li>Government</li> <li>Private</li> </ul>			
What type of place most often go for healthcare?			
How long since your last healthcare visit?			
Have you seen a mental health professional in the past year?			
How many overnight stays in the hospital?			
In the past year, was there any time when you did not have any health insurance coverage?			
Does your healthcare plan cover prescriptions?			

Measure of Access/Utilization	Total Overall	Stroke	No Stroke
Do you have a routine place? <ul style="list-style-type: none"> <li>If yes, what is the type of place?</li> </ul>			
Insurance Coverage <ul style="list-style-type: none"> <li>Government</li> <li>Private</li> </ul>			

<b>Ever told you had a stroke?</b> <ul style="list-style-type: none"><li>• If yes, what age and how long ago was your stroke?</li></ul>			
What type of place most often go for healthcare?			
How long since your last healthcare visit?			
Have you seen a mental health professional in the past year?			
How many overnight stays in the hospital?			
In the past year, was there any time when you did not have any health insurance coverage?			
Does your healthcare plan cover prescriptions?			

#### Association of TBI/Stroke with Access/Utilization

Outcome	TBI vs No condition	Significance
Do you have a routine place to go for healthcare?		
Insurance Coverage		
Time since last visit		

Outcome	Stroke vs No condition	Significance
Do you have a routine place to go for healthcare?		
Insurance Coverage		
Time since last visit		