



A

Report On

**Alzheimer's Disease and Healthy Aging Data
Analysis**

For Subject

Visual Analytics

Submitted to

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Chapter 1: Introduction

1.1 Overview of Alzheimer's disease and Aging Population Health Trends

The U.S. population is experiencing a demographic shift, with a significant increase in the proportion of older adults. This trend has major implications for healthcare systems, caregivers, and society as a whole. One of the most critical concerns associated with aging populations is the rising prevalence of Alzheimer's Disease and other forms of dementia, which affect millions of Americans and are expected to increase further in the coming decades. Alzheimer's Disease is characterized by progressive cognitive decline, memory loss, and behavioral changes, often leading to loss of independence and increased need for long-term care.

In addition to cognitive issues, aging populations face a variety of other health challenges, including mental distress, chronic physical conditions, and functional limitations. Mental health issues such as depression and anxiety are prevalent among older adults due to factors like isolation, loss of loved ones, and declining physical health. Chronic conditions like diabetes, hypertension, and arthritis are common, affecting mobility, quality of life, and increasing healthcare needs. Understanding these trends and the associated demographic and geographic patterns is crucial for planning effective public health interventions and allocating resources where they are most needed.

The Alzheimer's Disease and Healthy Aging Data, sourced from the Centers for Disease Control and Prevention (CDC), provides a comprehensive view of the health status of older adults in the United States. By analyzing this dataset, we can uncover critical insights into aging-related health issues and identify high-risk populations, track changes over time, and explore geographic variations. This analysis aims to inform policymakers, healthcare providers, and community organizations to address the unique health needs of the aging population.

1.2 Role of Visual Analytics in Understanding Aging and Health Data

Visual analytics plays a pivotal role in making complex datasets accessible and insightful. In this analysis, Tableau is used to transform raw data into visual representations that highlight key trends, disparities, and correlations within the dataset. Visualizations allow stakeholders to gain an immediate understanding of the data, revealing patterns that might be difficult to identify in raw numerical form.

For instance, geographic heatmaps can pinpoint states or regions with high levels of health risks, enabling targeted interventions. Trend analysis over multiple years reveals changes in health conditions, while demographic comparisons uncover disparities between age groups, genders, and ethnicities. By presenting the data visually, Tableau enables stakeholders to interpret aging-related health metrics with greater clarity and precision. Additionally, the

interactive nature of Tableau dashboards allows users to explore specific metrics, filter data by demographics or regions, and focus on areas of particular concern.

Visual analytics not only makes data more accessible to non-technical audiences but also empowers decision-makers to respond to insights quickly. Whether for identifying areas with high mental distress or understanding chronic disease patterns, visual analytics facilitates data-driven decisions, ultimately supporting public health initiatives that can improve the quality of life for older adults.

1.3 Objectives of the Aging and Health Data Analysis

The analysis of the Alzheimer's disease and Healthy Aging Data is structured around the following key objectives:

- **Identify Trends Over Time:** By examining data across multiple years, we aim to track trends in health metrics, such as increases or decreases in mental distress or chronic disease prevalence among older adults.
- **Map Geographic Disparities:** Geographic analysis helps identify regions where older adults are more vulnerable to health issues, enabling targeted interventions in high-risk areas.
- **Analyze Demographic Disparities:** Health issues often vary by age group, gender, and race/ethnicity. This analysis seeks to explore these differences, highlighting demographic groups with higher health risks.
- **Provide Stakeholder Insights:** The findings are intended to guide healthcare providers, policymakers, and public health researchers in their efforts to allocate resources, develop targeted interventions, and plan supportive programs for aging populations.

By achieving these objectives, this analysis supports a better understanding of aging-related health issues and assists in shaping healthcare policies that are responsive to the needs of older adults.

1.4 Scope of the Study

The scope of this study includes an in-depth analysis of aging-related health metrics in the United States. The dataset provides state-level data across multiple years, allowing for a detailed examination of health trends over time and by location. The study focuses on core health indicators, including mental health, cognitive health, chronic diseases, functional limitations, and preventive health measures, which collectively represent the primary health concerns faced by older adults.

Demographic information such as age, gender, and race/ethnicity is also included, enabling a more granular analysis of health disparities within the aging population. This study is limited to data available in the Alzheimer's Disease and Healthy Aging Data from the CDC, which means that it focuses primarily on the United States and does not cover global aging trends.

Additionally, while the dataset includes several key health indicators, it does not cover every possible health issue associated with aging, making it a representative but not exhaustive analysis of aging-related health issues.

1.5 Importance for Stakeholders

The findings from this analysis are valuable to various stakeholders, each of whom can benefit from the insights generated:

- **Healthcare Providers:** By identifying prevalent health issues among older adults, providers can adjust care models and develop personalized treatment plans that address the unique needs of this population.
- **Policymakers:** With data-driven insights, policymakers can allocate resources more effectively, prioritize public health funding, and design policies that address specific health challenges in aging populations.
- **Public Health Researchers:** Researchers can use the data to validate existing theories on aging, propose new studies on identified health trends, and support research-based interventions that enhance the health and well-being of older adults.
- **Community Organizations:** Non-profits and community-based organizations can leverage these findings to create targeted health programs and support services that address the local needs of older adults, particularly in high-risk areas.

The Alzheimer's Disease and Healthy Aging Data offers stakeholders an invaluable resource for understanding and addressing the challenges associated with an aging population, ultimately contributing to the improvement of health outcomes and quality of life for older adults.

Chapter 2: Dataset Description

2.1 Dataset Overview

The Alzheimer's Disease and Healthy Aging Data provides critical information on health indicators relevant to the aging population in the United States. Collected by the CDC, this dataset is a robust source of data that spans multiple years and covers various health topics such as mental distress, cognitive impairment, chronic disease prevalence, and demographic factors. Each record includes information on the geographic region, time of data collection, and specific health metrics, allowing for a multidimensional analysis of aging-related health trends.

Key topics covered in the dataset include:

- **Mental Health:** Data on mental health indicators like frequent mental distress, depressive symptoms, and anxiety. Mental health challenges are particularly concerning in older adults, as they affect quality of life, increase the risk of physical health problems, and may contribute to social isolation.
- **Cognitive Health:** Cognitive impairment and Alzheimer's Disease are critical areas of focus, given their impact on memory, independence, and daily functioning. The dataset provides information on memory loss, cognitive decline, and other aspects of mental function.
- **Chronic Diseases:** Chronic conditions such as diabetes, hypertension, and arthritis are prevalent among older adults. These conditions can lead to disability, reduced mobility, and a significant impact on overall well-being.
- **Functional Limitations:** Functional limitations in activities of daily living (ADLs) and instrumental activities of daily living (IADLs) are indicators of an older adult's ability to live independently. These limitations are often tied to physical and cognitive health.
- **Preventive Health Measures:** The dataset includes data on preventive health measures, such as flu vaccinations and screenings for cancer and other conditions. Preventive health behaviors are essential for reducing disease burden and maintaining health among older adults.
- **Demographic Information:** Age, gender, and race/ethnicity data allow for demographic analysis, helping to identify disparities in health status and access to care among different population groups.

This dataset serves as a powerful tool for analyzing and understanding the health of older adults in the U.S., helping stakeholders make data-driven decisions to support this population.

2.2 Data Source and Integrity

The Alzheimer's Disease and Healthy Aging Data was sourced from the [Data.gov](https://data.gov) portal, which is the U.S. government's central repository for open data. Managed by the CDC, this dataset is part of the CDC's larger initiative to monitor and improve the health and well-being of older

Americans. Data.gov hosts data collected from federal, state, and local government agencies, ensuring that it is accurate, reliable, and up-to-date.

The CDC's rigorous data collection, validation, and storage practices ensure the dataset's integrity. Standardized data collection methodologies across all states allow for meaningful comparisons between states and over time. Additionally, data quality checks are performed to minimize errors and ensure that the data is complete and consistent. The CDC utilizes tools such as the Behavioral Risk Factor Surveillance System (BRFSS), which gathers health data from a representative sample of the population, to compile reliable, high-quality data.

The dataset is anonymized to protect individual privacy and only includes aggregate data at the state level. This approach complies with ethical standards for handling health data, ensuring that personal information is safeguarded. As a result, the dataset is a trusted and credible resource for conducting analyses that can shape policies, inform public health interventions, and support research on aging-related health issues.

2.3 Description of Columns

Each column in the dataset has been carefully structured to capture different aspects of aging-related health. The table below summarizes each column, its purpose, and relevance for analysis.

Table 1. Description of Columns

| Column Name | Description | Data Type |
|-------------|--|-------------|
| State | Full name of the U.S. state where the data was collected. | Categorical |
| Region | U.S. Census region classification for each state, enabling geographic analysis. | Categorical |
| YearStart | The starting year of data collection for this record, facilitating trend analysis. | Numeric |
| YearEnd | The ending year of data collection for this record, useful for multi-year analyses. | Numeric |
| Age Group | Age demographic (e.g., 65+, 45-64), allowing analysis by age to identify at-risk groups. | Categorical |
| Gender | Gender of the population subset (Male/Female), useful for gender-based comparisons. | Categorical |

| Column Name | Description | Data Type |
|----------------------------------|---|------------------|
| Race/Ethnicity | Racial or ethnic group (e.g., Black, non-Hispanic; Asian/Pacific Islander), supporting demographic analyses. | Categorical |
| Health Metric Value | Core health metric (e.g., percentage or rate of people experiencing mental distress), the primary indicator for analysis. | Numeric |
| Low Confidence Limit | Lower bound of the confidence interval for the Health Metric Value, indicating data precision. | Numeric |
| High Confidence Limit | Upper bound of the confidence interval, contributing to reliability assessments of the data. | Numeric |
| Confidence Interval Width | The width of the confidence interval, calculated as the difference between High and Low Confidence Limits. This measures the variability or reliability of the Health Metric Value. | Numeric |
| Health Risk Index | Composite index that combines the Health Metric Value and Confidence Interval Width, providing a single metric for comparative analysis of health risks. | Numeric |
| Topic | General health topic associated with the metric (e.g., mental health, chronic disease), allowing grouping and filtering by health category. | Categorical |
| Question | Specific survey question or indicator that generated the Health Metric Value, adding clarity to the health metric context. | Categorical |

Chapter 3: Preprocessing

To ensure high-quality analysis, a series of data cleaning and preprocessing steps were applied to the dataset. These steps included the removal of unnecessary columns, splitting geolocation data, handling missing values, and creating additional features for enhanced analytical insights. Below is a detailed description of each preprocessing step:

1. **Removing Unnecessary Columns:** Columns such as RowId, Datasource, ClassID, TopicID, QuestionID, and LocationID were removed. These identifiers and metadata did not add value to the analysis and only added unnecessary complexity.
2. **Splitting Geolocation into Latitude and Longitude:** The original Geolocation column contained both latitude and longitude coordinates in a single string. This data was split into two separate columns, Latitude and Longitude, enabling geographic visualization in Tableau.
3. **Handling Missing Values:**
 - **Numerical Columns:** Missing values in numerical columns like Health Metric Value, Low Confidence Limit, and High Confidence Limit were replaced with the median value to ensure a robust central tendency without the influence of outliers.
 - **Categorical Columns:** For categorical variables such as Age Group, Gender, and Race/Ethnicity, missing values were filled using the mode (most frequently occurring value) for each respective column.
4. **Calculating Confidence Interval Width:** A new column, Confidence Interval Width, was created by calculating the difference between High Confidence Limit and Low Confidence Limit. This metric helps gauge the reliability of each Health Metric Value by indicating the range within which the true value likely falls.
5. **Creating a Health Risk Index:** A composite Health Risk Index was developed by averaging the Health Metric Value and Confidence Interval Width. This index provides a single measure to compare health risk levels across states and demographics.
6. **Extracting Demographic Information:** Demographic data was extracted from the Stratification1 and Stratification2 columns:
 - Age Group was taken from Stratification1.
 - Gender was identified as "Male" or "Female" from Stratification2.
 - Race/Ethnicity was extracted from Stratification2 if it contained categories like "Black, non-Hispanic" or "Asian/Pacific Islander."
7. **Creating a Region Column:** A Region column was created based on state abbreviations (LocationAbbr) to assign each state to one of the four U.S. Census regions: Northeast, Midwest, South, and West.
8. **Final Column Selection and Renaming:** After preprocessing, the final columns were selected for clarity and analytical value:
 - **State:** Full state name.
 - **Abbreviation:** State abbreviation.
 - **Region:** U.S. Census region.
 - **YearStart** and **YearEnd:** Time period of data collection.

- **Age Group, Gender, Race/Ethnicity:** Demographic categories.
- **Health Metric Value, Type, and Unit:** Core health indicator and its measurement context.
- **Low and High Confidence Limits:** Bounds for data precision.
- **Confidence Interval Width:** Reliability measure.
- **Health Risk Index:** Composite index for health risk.
- **Topic and Question:** Contextual information on the health metric.

After completing these steps, the dataset was structured for optimal use in visual analysis. Each variable is now consistent, clear, and ready for exploration.

| State | Region | YearStart | YearEnd | Age Group | Gender | Race/Eth | Health Metric | Low Conf | High Conf | Confidence | Health Risk | Topic | Question |
|---------------|-----------|-----------|---------|-------------|--------|---------------------|---------------|----------|-----------|------------|-------------|-------------|---|
| Pennsylvania | Northeast | 2022 | 2022 | 50-64 years | Female | Native American | 32.8 | 27 | 38.9 | 11.9 | 22.35 | Frequent | Percentage of older adults who are experiencing frequent mental distress |
| South Dakota | Midwest | 2022 | 2022 | 65 years | Female | Asian/Pacific | 32.8 | 27 | 38.9 | 11.9 | 22.35 | Frequent | Percentage of older adults who are experiencing frequent mental distress |
| Idaho | West | 2022 | 2022 | 65 years | Female | Black, non-Hispanic | 32.8 | 27 | 38.9 | 11.9 | 22.35 | Frequent | Percentage of older adults who are experiencing frequent mental distress |
| Maryland | South | 2022 | 2022 | 65 years | Female | Black, non-Hispanic | 9 | 6.5 | 12.3 | 5.8 | 7.4 | Frequent | Percentage of older adults who are experiencing frequent mental distress |
| Wisconsin | Midwest | 2022 | 2022 | 65 years | Male | White, non-Hispanic | 5.6 | 4.4 | 7.2 | 2.8 | 4.2 | Frequent | Percentage of older adults who are experiencing frequent mental distress |
| Iowa | Midwest | 2022 | 2022 | Overall | Female | Asian/Pacific | 32.8 | 27 | 38.9 | 11.9 | 22.35 | Frequent | Percentage of older adults who are experiencing frequent mental distress |
| Oklahoma | South | 2022 | 2022 | Overall | Female | Native American | 21.5 | 15.4 | 29.2 | 13.8 | 17.65 | Frequent | Percentage of older adults who are experiencing frequent mental distress |
| Pennsylvania | Northeast | 2022 | 2022 | Overall | Female | White, non-Hispanic | 10 | 8.3 | 12.1 | 3.8 | 6.9 | Frequent | Percentage of older adults who are experiencing frequent mental distress |
| Arizona | West | 2022 | 2022 | 65 years | Female | White, non-Hispanic | 6.1 | 5.4 | 6.7 | 1.3 | 3.7 | Recent | Mean number of days with activity limitations in the past month |
| Ohio | Midwest | 2022 | 2022 | 50-64 years | Male | White, non-Hispanic | 14.5 | 12 | 17.5 | 5.5 | 10 | Expect to | Percentage of older adults currently not providing care who expect to provide care for |
| South | Other | 2022 | 2022 | 65 years | Female | Hispanic | 32.7 | 26.8 | 39.1 | 12.3 | 22.5 | Obesity | Percentage of older adults who are currently obese, with a body mass index (BMI) of 3 |
| Nevada | West | 2022 | 2022 | Overall | Female | White, non-Hispanic | 72.9 | 69.8 | 75.7 | 5.9 | 39.4 | Self-rated | Percentage of older adults who self-reported that their health is "good", "very good", |
| Georgia | South | 2022 | 2022 | Overall | Female | Black, non-Hispanic | 70.5 | 66.7 | 74 | 7.3 | 38.9 | Self-rated | Percentage of older adults who self-reported that their health is "good", "very good", |
| Idaho | West | 2022 | 2022 | 65 years | Female | Hispanic | 42.7 | 28.6 | 58.2 | 29.6 | 36.15 | Arthritis | Percentage of older adults ever told they have arthritis |
| Northeast | Other | 2022 | 2022 | 50-64 years | Female | Asian/Pacific | 69.4 | 56.7 | 79.7 | 23 | 46.2 | Mammogram | Percentage of older adult women who have received a mammogram within the past 2 |
| Colorado | West | 2022 | 2022 | 50-64 years | Female | White, non-Hispanic | 5.2 | 4.5 | 5.8 | 1.3 | 3.25 | Recent | Mean number of days with activity limitations in the past month |
| South | Other | 2022 | 2022 | Overall | Female | Hispanic | 41.3 | 37.8 | 44.9 | 7.1 | 24.2 | Obesity | Percentage of older adults who are currently obese, with a body mass index (BMI) of 3 |
| Northeast | Other | 2022 | 2022 | 50-64 years | Female | White, non-Hispanic | 89.3 | 86.8 | 91.4 | 4.6 | 46.95 | Diabetes | Percentage of older adults without diabetes who reported a blood sugar or diabetes |
| Oregon | West | 2022 | 2022 | 65 years | Female | Black, non-Hispanic | 32.8 | 27 | 38.9 | 11.9 | 22.35 | Duration | Percentage of older adults who provided care to a friend or family member for six mo |
| Pennsylvania | Northeast | 2022 | 2022 | Overall | Female | White, non-Hispanic | 39.9 | 35.6 | 44.4 | 8.8 | 24.35 | Disability | Percentage of older adults who report having a disability (includes limitations relate |
| Arkansas | South | 2022 | 2022 | Overall | Female | Native American | 61.9 | 45.9 | 75.6 | 29.7 | 45.8 | Disability | Percentage of older adults who report having a disability (includes limitations relate |
| Maryland | South | 2022 | 2022 | 65 years | Female | Asian/Pacific | 71.5 | 50 | 86.3 | 36.3 | 53.9 | Oral health | Percentage of older adults who report having lost 5 or fewer teeth due to decay or gun |
| New York | Northeast | 2022 | 2022 | 65 years | Female | Asian/Pacific | 73.9 | 60.4 | 84 | 23.6 | 48.75 | Oral health | Percentage of older adults who report having lost 5 or fewer teeth due to decay or gun |
| Arizona | West | 2022 | 2022 | 65 years | Female | Hispanic | 64.3 | 56.4 | 71.6 | 15.2 | 39.75 | Oral health | Percentage of older adults who report having lost 5 or fewer teeth due to decay or gun |
| South Dakota | Midwest | 2022 | 2022 | 65 years | Female | Native American | 52.6 | 28.9 | 75.1 | 46.2 | 49.4 | Oral health | Percentage of older adults who report having lost 5 or fewer teeth due to decay or gun |
| United States | Other | 2022 | 2022 | 65 years | Female | Black, non-Hispanic | 10.8 | 9.5 | 12.2 | 2.7 | 6.75 | Frequent | Percentage of older adults who are experiencing frequent mental distress |
| Puerto Rico | Other | 2022 | 2022 | 50-64 years | Female | White, non-Hispanic | 12 | 9.8 | 14.5 | 4.7 | 8.35 | Current | Percentage of older adults who have smoked at least 100 cigarettes in their entire life |

Fig. 1. Dataset

Chapter 4: Visualization and Insights

Part A: Harini

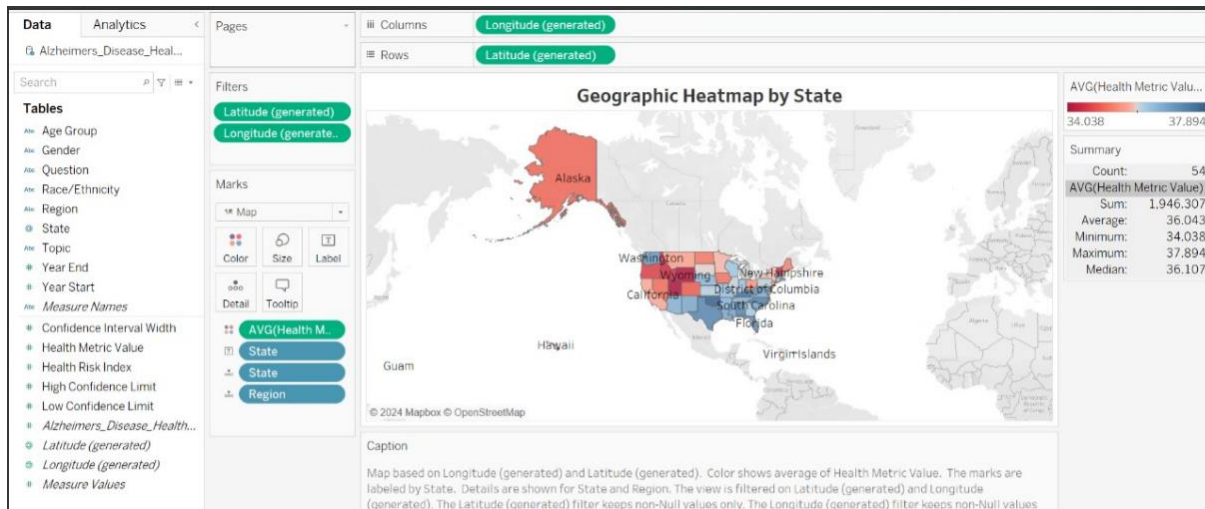


Fig. 2. Geographic Heatmap by State

Key Insights:

- **Regional Disparities:** States like **Florida** and **Manhattan** show higher Health Metric Values, suggesting these areas face greater aging-related health risks. In contrast, parts of the Northeast and Midwest have lower values, potentially due to better healthcare access and support systems.
- **Healthcare Access and Socioeconomic Factors:** High-risk states may struggle with limited healthcare resources or socioeconomic challenges that affect health outcomes among older adults. Lower-risk states may benefit from stronger healthcare infrastructure and preventive care initiatives.
- **Resource Allocation:** These insights highlight the need for targeted healthcare investments in high-metric states. Initiatives like expanding access to dementia care, chronic disease management, and preventive services could help address disparities.
- **Preventive Health and Education:** States with higher values might benefit from increased awareness programs and preventive care, focusing on early detection and lifestyle interventions to manage chronic diseases and mental health.

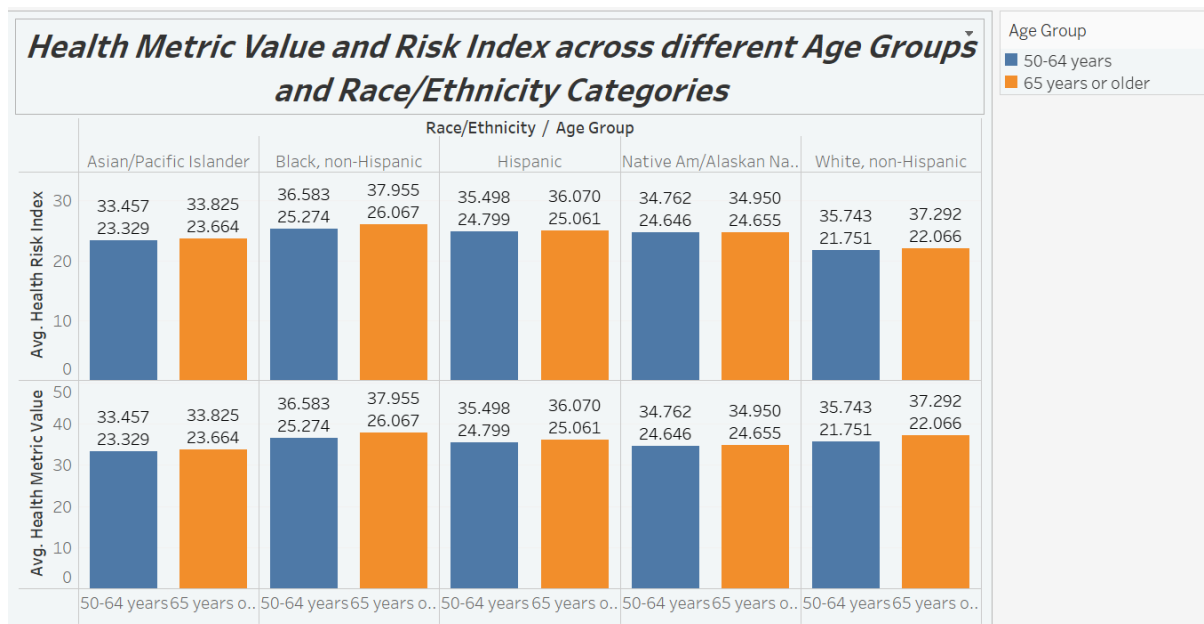


Fig. 3. Health Metric Value and Risk Index across different Age group and Race/ Ethnicity Categories

Insights:

- Higher Health Metrics in Older Age Group:**
 - Across all racial/ethnic groups, individuals aged 65 years and older consistently show higher Health Metric Values and Health Risk Index scores compared to the 50-64 age group. This aligns with expectations, as aging typically increases health risks, especially for conditions like Alzheimer's and other chronic diseases.
- Disparities Among Racial/Ethnic Groups:**
 - White, non-Hispanic** individuals in both age groups have significantly higher Health Metric Values and Risk Index scores compared to other racial/ethnic groups, indicating a higher prevalence of health issues among older White, non-Hispanic adults.
 - Other racial groups, such as **Asian/Pacific Islander** and **Native American/Alaskan Native**, have lower Health Metric Values and Health Risk Index scores. This could reflect either lower reported prevalence or differences in access to healthcare, preventive care, or health-seeking behavior.
- Implications for Healthcare Interventions:**
 - The disparities highlighted here suggest a need for targeted healthcare interventions, particularly for White, non-Hispanic populations who appear to be at higher risk. Understanding the underlying causes—whether socioeconomic factors, healthcare access, or lifestyle factors—can help in designing effective health programs.

- For other racial groups with lower scores, interventions might focus on preventive care and health education to maintain these lower risk levels as individuals age.

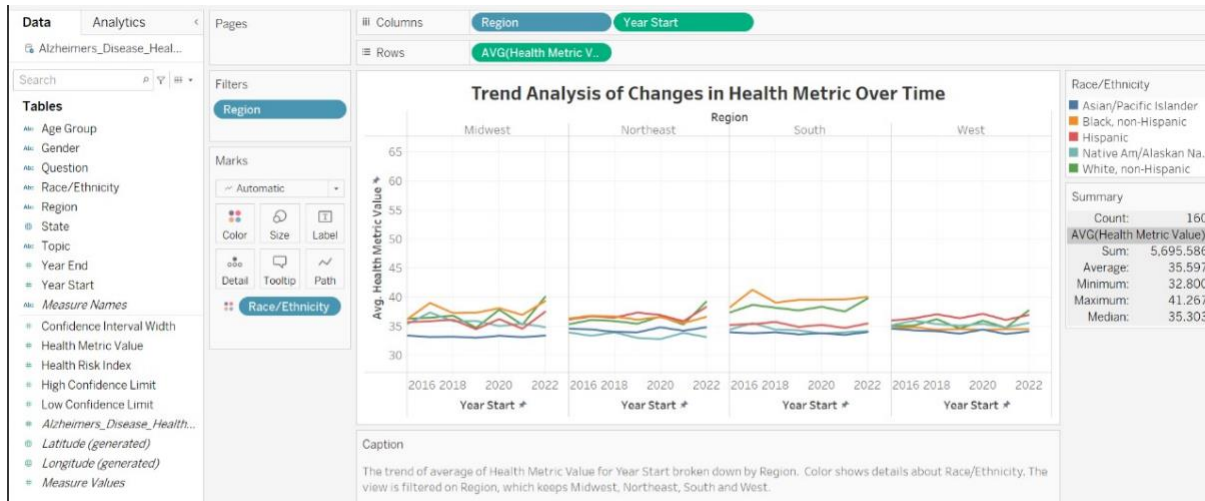


Fig. 4. Trend Analysis of Changes in Health Metric Over Time

Insights:

- **Regional Stability:** Health metrics have remained relatively stable across regions, with only minor fluctuations. However, the South and Northeast tend to show slightly higher average values.
- **Slight Increase:** The chart shows a gradual upward trend in health metric values in recent years, indicating a slight increase in health issues among older adults.
- **Race/Ethnicity Impact:** Different racial/ethnic groups display varied levels of health metrics, suggesting underlying disparities that may be due to socioeconomic, environmental, or healthcare access factors.

Part B: Anjani

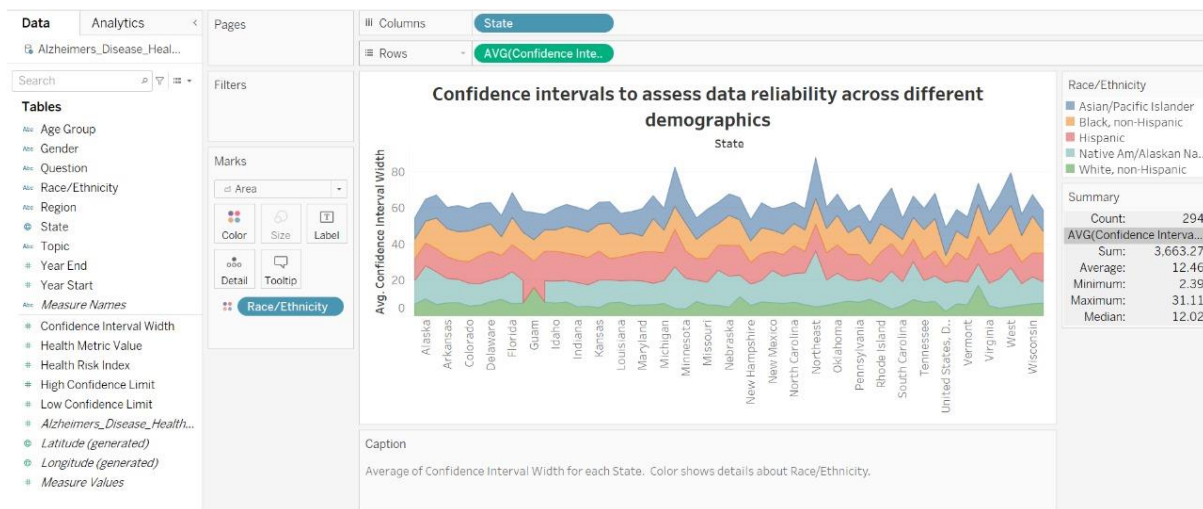


Fig. 5. Confidence intervals to assess data reliability across different demographics

Insights:

- **State-Level Variability:** States such as **Alaska** and **Idaho** show wider confidence intervals, suggesting greater variability and less reliability in the health data for these states. This could be due to smaller sample sizes, regional data collection challenges, or high demographic diversity within these states.
- **Racial/Ethnic Differences:** Different racial/ethnic groups display varying levels of confidence interval width across states. For example, **White, non-Hispanic** and **Black, non-Hispanic** populations generally have more stable data (narrower confidence intervals) compared to **Native American/Alaskan Native** populations, likely reflecting differences in population representation in health studies.
- **Implications for Data Interpretation:** States and demographic groups with higher confidence interval widths should be interpreted cautiously, as the data may be less reliable for these groups. Narrower confidence intervals, on the other hand, suggest more robust data that can be used confidently for analysis and policy decisions.
- **Data Collection and Sampling Issues:** High variability in confidence intervals across certain states and demographic groups highlights potential data collection challenges. Efforts to improve data reliability could focus on increasing sample sizes and enhancing data collection practices in states and populations with broader intervals.

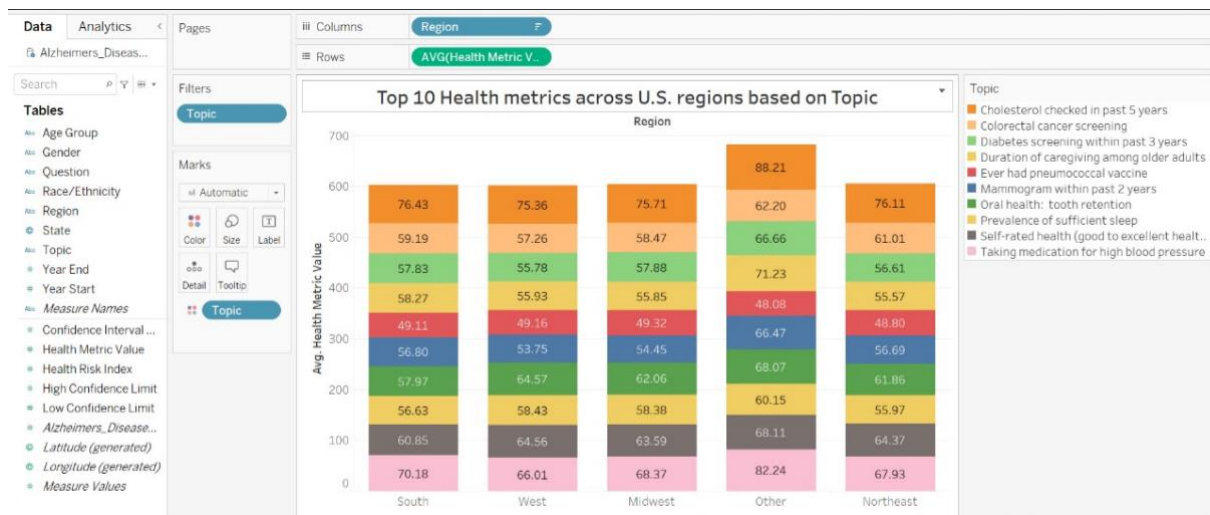


Fig. 7. Top 10 Health metrics across U.S. Regions based on Topic

Insights:

- **Prominent Health Issues:** Topics like "Cholesterol checked in past 5 years" and "Taking medication for high blood pressure" appear consistently across regions, indicating common health concerns among older adults.
- **Regional Differences:** The Northeast region has higher values for specific topics like colorectal cancer screening, suggesting regional variations in health priorities or access to preventive services.
- **Preventive Health:** Topics related to preventive health (e.g., vaccinations, screenings) feature prominently, underscoring the importance of preventive care across regions.

Part C: Drashti



Fig. 8. Health Risk Analysis

Insights:

- **Cluster Grouping:**
 - **Cluster 1** (Yellow) and **Cluster 2** (Red) represent data points with lower Health Risk Index and Health Metric Values. These clusters likely indicate health topics with lower associated risks or better management and preventive measures.
 - **Cluster 3** (Orange) and **Cluster 4** (Blue) contain points with higher Health Risk Index and Health Metric Values, representing more severe health challenges that may require increased attention and resources.
- **Correlation Between Health Risk Index and Metric Value:**
 - There is a strong positive correlation between the Health Risk Index and Health Metric Value across clusters, as indicated by the linear trend. This suggests that as the health risk increases, so does the impact on health outcomes, highlighting the need for intervention in high-risk areas.
- **High-Risk Topics:**
 - Data points in Clusters 3 and 4 correspond to topics with higher health risks, such as arthritis and cholesterol management among older adults. These areas may benefit from targeted public health strategies to reduce the associated risk and improve health outcomes.
- **Strategic Intervention Based on Clusters:**
 - Clusters can be used to prioritize healthcare interventions. Topics in Clusters 1 and 2 may require standard preventive care, while Clusters 3 and 4 represent areas that could benefit from additional healthcare resources, specialized programs, and policy adjustments.

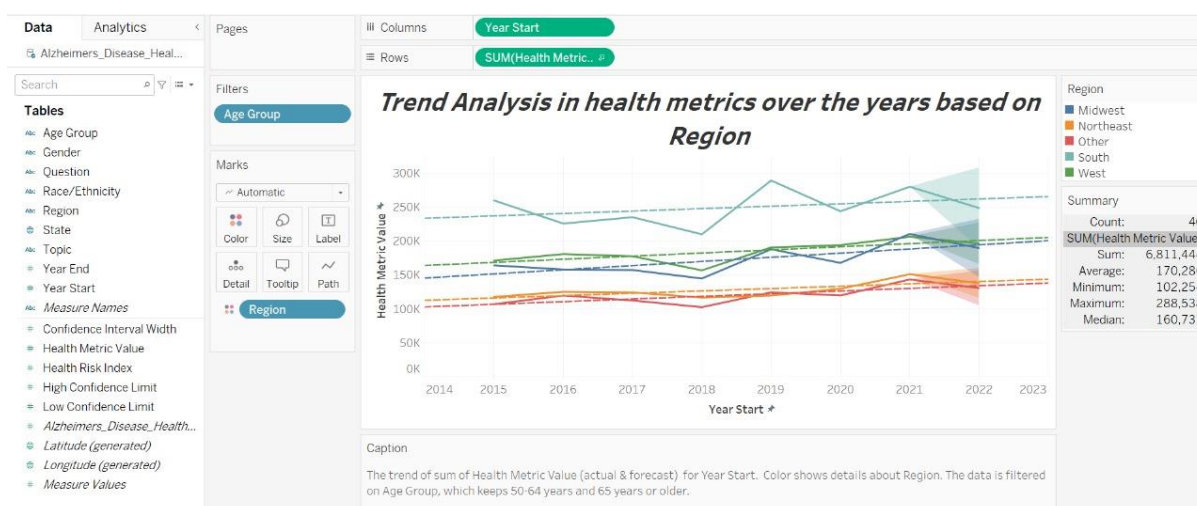


Fig. 9. Trend Analysis in health metrics over the years based in region

Insights:

- **Regional Differences in Trends:**
 - The **South** and **West** regions show a gradual increase in health metric values over time, indicating that health-related issues among older adults might be rising in these areas.
 - The **Midwest** and **Northeast** regions, while generally lower in health metric values, show more stability over the years with minor fluctuations, suggesting relatively steady health outcomes.
- **Consistent Rise in Specific Regions:**
 - The trend line for the **West** indicates a noticeable upward trajectory, potentially forecasting higher health metric values in the coming years. This could imply growing health challenges that may need proactive intervention.
 - The **South** region also has a positive trend, indicating a gradual increase. This sustained rise might be due to factors such as limited access to healthcare, higher prevalence of chronic conditions, or socioeconomic challenges.
- **Forecast Implications:**
 - If these trends continue, the West and South could face increasing demands on their healthcare systems to address aging-related health concerns. This could require additional resources, policy adjustments, and targeted health programs to manage the anticipated rise in health metric values.
- **Public Health Focus:**

- The observed trends underscore the importance of focusing public health efforts in regions with upward trajectories. Early intervention strategies in the South and West may help mitigate some of the anticipated challenges, while the more stable trends in the Midwest and Northeast suggest that current health policies in those areas are relatively effective.

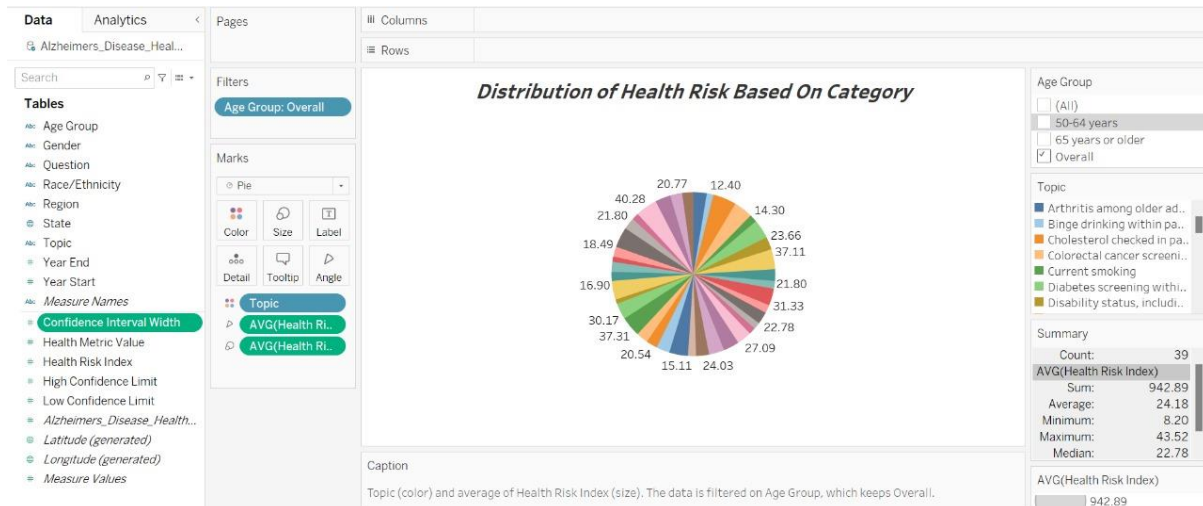


Fig. 10. Distribution of Health Risk Based On Category

Insights:

- **Top Health Risks:** Health topics with larger slices, such as Cholesterol and high blood pressure indicate that these are high-risk areas. These topics likely represent significant health challenges that adults frequently face.
- **Preventive Measures:** Topics like diabetes screening and colorectal cancer screening have smaller slices, suggesting that preventive measures in these areas might be effectively managing risk levels. However, the importance of regular screenings cannot be underestimated.
- **Lifestyle and Chronic Conditions:** Topics like smoking and binge drinking, which are lifestyle-related, also appear on the chart, highlighting the ongoing risks that unhealthy behaviors pose to the aging population.

Chapter 5: Dashboard and Insights

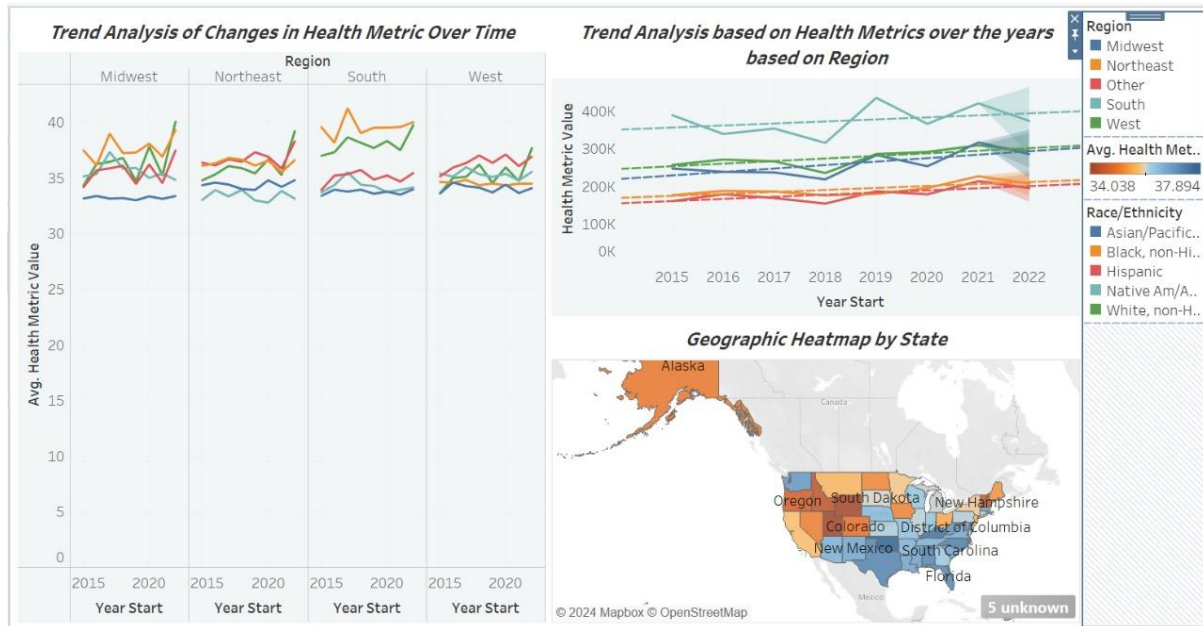


Fig. 11. Dashboard 1

The Geographic Heatmap provides a clear view of the average health metric values for each state, allowing us to pinpoint areas with higher or lower health metrics. The "Trend Analysis of Changes in Health Metric Over Time by Region" chart reveals which racial or ethnic groups exhibit the highest health metrics. When combined with the "Trend Analysis based on Health Metrics over the Years by Region," we gain insights into the regions where these metrics are most concentrated. For example, we can see that the South, particularly in states like Florida and Oklahoma, has a higher representation of Black/non-Hispanic individuals with elevated health metrics.

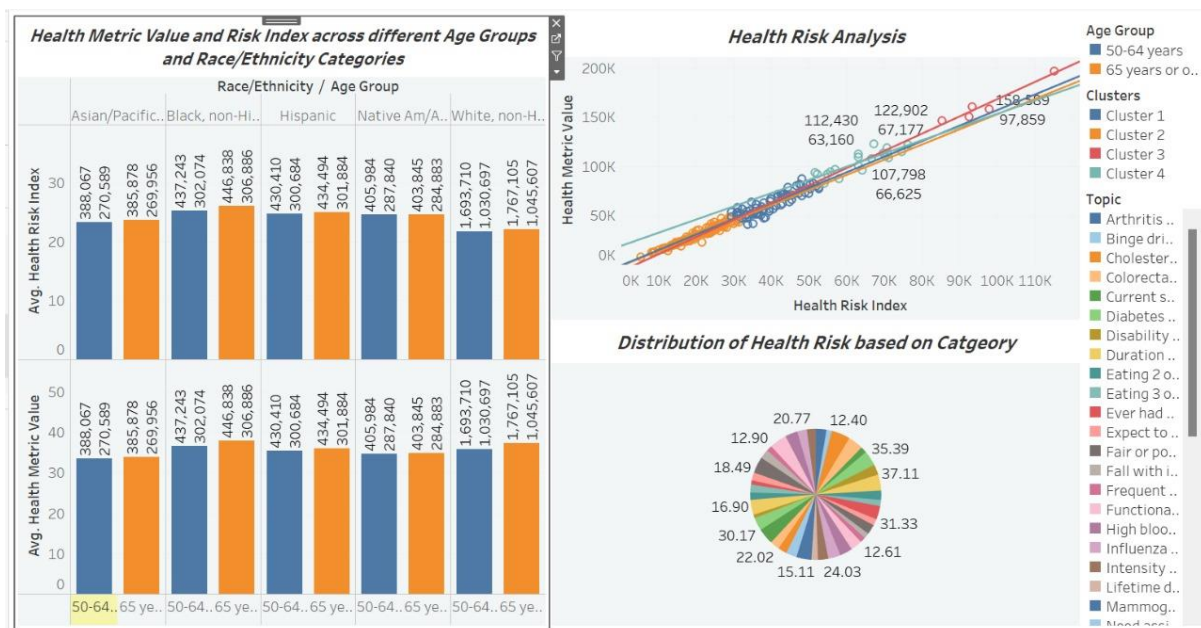


Fig. 12. Dashboard 2

The "Health Metric Value and Risk Index by Race/Ethnicity and Age Group" chart allows us to observe health disparities across different racial and ethnic groups, highlighting that White non-Hispanic individuals, especially those over 65, have notably high health metrics and risk indices. The "Health Risk Analysis" scatter plot reinforces this by showing a positive correlation between health metrics and risk levels, indicating that groups with higher health metrics also face greater associated health risks. The "Distribution of Health Risk by Category" pie chart further provides an understanding of specific prevalent health issues, such as diabetes and cholesterol concerns, across categories. Together, these visualizations reveal that older White non-Hispanic populations are particularly vulnerable to high health risks, likely due to chronic conditions, and emphasize the need for targeted healthcare support in these demographics.

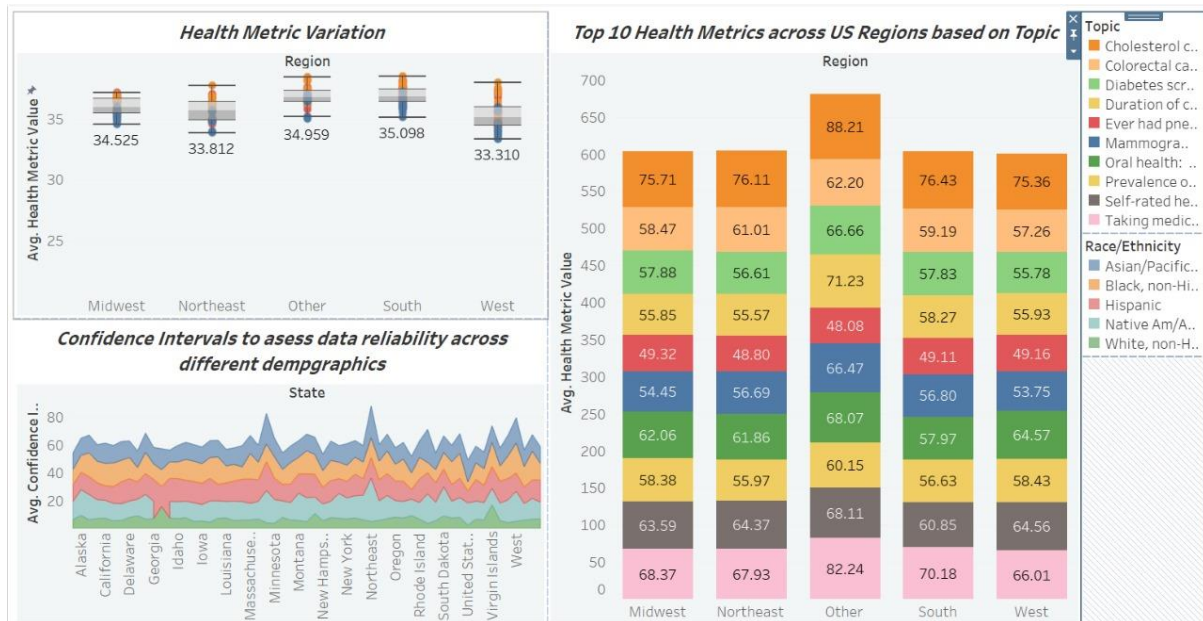


Fig. 13. Dashboard 3

The "Health Metric Variation" box plot across regions illustrates a relatively consistent distribution of average health metrics, with the Midwest and South showing slightly higher central tendencies compared to other regions. The "Top 10 Health Metrics across US Regions by Topic" bar chart reveals specific health topics that dominate in each region; for example, the "Other" region has the highest average health metrics for self-rated health and sufficient sleep, while the "Northeast" scores notably lower in these categories. The "Confidence Intervals to Assess Data Reliability" area chart shows significant variation in confidence intervals across states, with certain states like New Hampshire and Wyoming exhibiting higher confidence interval widths, indicating possible data variability. Together, these visualizations reveal intriguing regional and topic-specific patterns in health metrics. While overall averages remain consistent, certain regions and states stand out with unique health challenges and strengths. For instance, the "Other" region excels in self-rated health and sleep sufficiency, while states like New Hampshire and Wyoming show wider confidence intervals, hinting at potential data variability or unique demographic influences. These insights emphasize the value of tailored public health strategies that address the specific health priorities and challenges of each region, fostering more targeted and effective interventions across diverse communities.

Insights

1. Regional Health Trends and Geographic Disparities

- **Trend Analysis in Health Metrics Over Time and Geographic Heatmap by State:**
 - These visualizations together highlight the persistence and regional concentration of health challenges. The **Trend Analysis** shows a steady increase in health metrics in the **South** and **West** over time, while the

Geographic Heatmap reinforces that states within these regions (like Alaska and certain Southern states) have higher health metrics.

- This correlation suggests that the health challenges in the South and West are not just recent developments but consistent trends likely driven by systemic factors such as limited healthcare access, socioeconomic challenges, or lifestyle differences. These regions could benefit from long-term, sustainable healthcare interventions and policy adjustments.

2. Variability in Health Metrics by Age and Region

- **Spread of Health Metrics Across Regions and Health Metric Value and Risk Index by Age Group and Race/Ethnicity:**

- The **Spread of Health Metrics** chart shows high variability within the South and West, while the **Health Metric and Risk Index** visualization reveals that older age groups and certain racial/ethnic groups (e.g., White, non-Hispanic) consistently have higher health metrics.
- This suggests that health variability in the South and West may be partly due to demographic factors such as a higher concentration of high-risk age groups or certain racial/ethnic populations. Tailoring health interventions for specific demographics within these regions could help manage the variability and improve health outcomes for vulnerable populations.

3. Preventive Health and Chronic Conditions

- **Distribution of Health Risk Based on Category and Health Risk Analysis (Scatter Plot):**

- The **Health Risk Distribution** pie chart highlights that conditions like arthritis, cholesterol, and chronic diseases pose the greatest health risks. The **Health Risk Analysis** scatter plot further reveals a strong positive correlation between health risk and metric values, particularly for chronic and preventive care needs.
- This pairing underscore the importance of prioritizing preventive care and chronic disease management, particularly for conditions with high risk and impact. Investing in early intervention programs for conditions like arthritis and cholesterol control could reduce the health burden in high-risk regions and demographics, potentially slowing the upward trend in health metrics over time.

4. Data Reliability and Regional Health Variability

- **Confidence Interval for Data Reliability by State and Race/Ethnicity and Health Metric Variation Across Regions:**

- The **Confidence Interval** visualization reveals that data reliability varies significantly across states and racial/ethnic groups, with broader confidence intervals in states with high health metric variability. The **Health Metric Variation** box plot also shows greater variability in the South and West regions.

- This correlation suggests that health data for certain regions and demographics may be less reliable, potentially leading to under- or over-estimation of health needs. Addressing data collection and reliability issues, especially in high-variability regions like the South and West, would provide a more accurate foundation for public health planning and targeted interventions.

5. Impact of Age on Regional Health Trends

- **Trend Analysis in Health Metrics Over Time by Region and Health Metric Value and Risk Index by Age Group:**
 - The **Trend Analysis** shows increasing health metric values in certain regions, while the **Health Metric and Risk Index** highlights that older age groups (65+) consistently exhibit higher health metrics and risk indices.
 - The intersection of age and regional trends indicates that the growing elderly population in regions like the South may be contributing to the overall increase in health metrics. This reinforces the need for age-specific healthcare resources and preventive measures in these regions to manage the health risks associated with an aging population.

Chapter 6: Conclusion

The comprehensive analysis of health metrics related to aging populations in the United States reveals significant regional, demographic, and condition-specific insights that underscore the complexities of managing public health for older adults. Key findings indicate that the South and West regions consistently exhibit higher health metrics and increasing trends over time, signaling an urgent need for targeted healthcare interventions. These areas face unique challenges that may stem from a combination of socioeconomic disparities, limited healthcare access, and demographic diversity, all of which contribute to variable health outcomes and increased health risks.

Chronic conditions such as arthritis, cholesterol issues, and diabetes emerge as prominent health concerns, affecting older adults across various regions. Preventive measures and chronic disease management programs focused on these conditions could alleviate the overall health burden. Additionally, age and race/ethnicity play a crucial role in health outcomes, with older adults, particularly those aged 65 and above, and White, non-Hispanic populations exhibiting higher health risks. Tailored interventions for these demographics, alongside region-specific policies, could help address the diverse healthcare needs of the aging population.

The data reliability analysis highlights variability in confidence intervals across different states and racial/ethnic groups, suggesting that data collection and representation may need improvement, especially for minority groups. Ensuring accurate and consistent data is essential for effective health policy formulation and resource allocation.

Overall, this analysis provides a data-driven foundation for guiding public health strategies aimed at improving the quality of life for older adults across the United States. By focusing on high-risk regions, prioritizing chronic disease prevention, and enhancing data reliability, policymakers and healthcare providers can make impactful decisions to support healthier aging. A proactive, regionally tailored approach to healthcare for aging populations is essential to managing the evolving health landscape in an aging America.

Chapter 7: Reference

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