# Shifting Trends in Alzheimer's Disease: Exploring the Rise in Early-Onset Cases in the U.S.

How do state-level patterns of cognitive decline in adults 50+ reflect underlying Alzheimer's risk factors, and what can geographic clustering tell us about socioeconomic contributors to early cognitive symptoms?

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## Research

### What to know

- Early symptoms of Alzheimer's are underdiagnosed. State-level insights help inform policy, outreach, and early intervention.
- Alzheimer's is the most common form of dementia, affecting ~7 million Americans aged 65+.
- Subjective cognitive decline (SCD) may be an early warning sign of Alzheimer's or related dementias.
- Findings can inform early intervention, address health disparities, and guide public health planning.
- Wide variation in cognitive decline exists between states.

### Why It Matters?

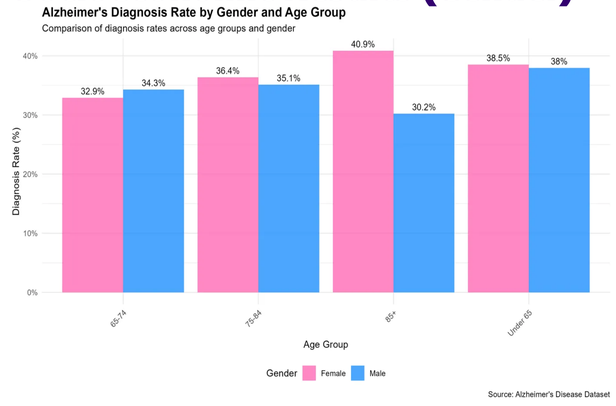
- Public health officials, neurologists, caregivers, advocacy groups, and policymakers.
- This project analyzes geographic and demographic patterns in cognitive decline using CDC survey data.

## Results / Findings

### Key Claims

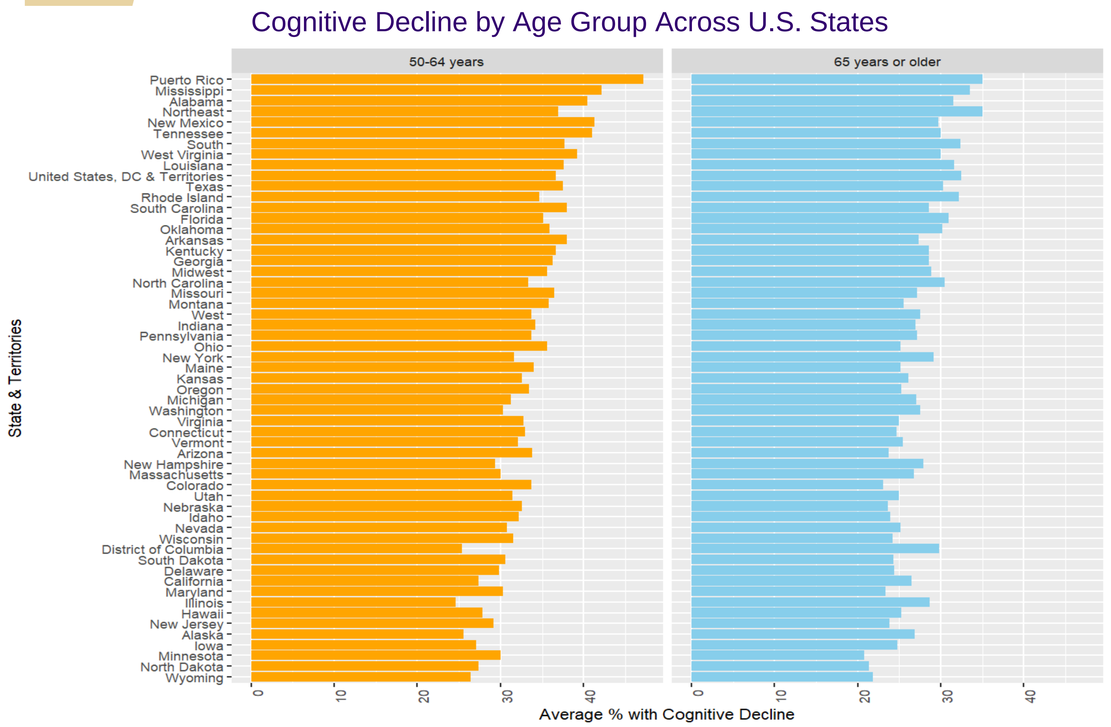
- Wide variation in cognitive decline exists between states.
- Southern and Appalachian states show higher prevalence.
- Disparities by race, age, and education suggest that social determinants of health play a significant role.
- Early symptoms of Alzheimer's are underdiagnosed. Trends in higher Cognitive Decline at early ages suggest higher Alzheimer's diagnosis when older.
- Significant increase in Cognitive Decline in the U.S. for people ages 50-64 compared to 65+

## Socioeconomic Results (Gender)

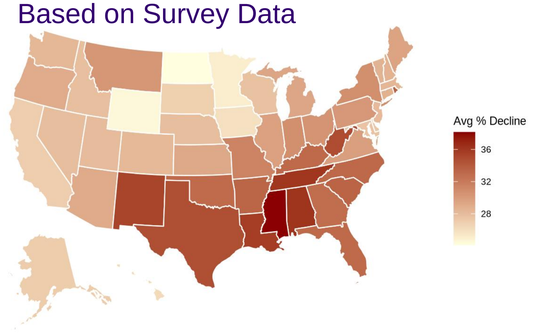



Source: Alzheimer's Disease Dataset

## Cognitive Decline Results

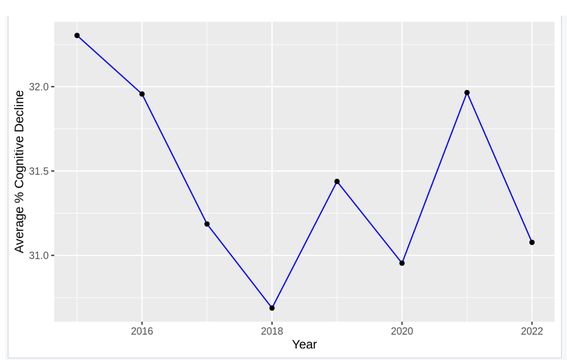



### Average Cognitive Decline by US State Based on Survey Data



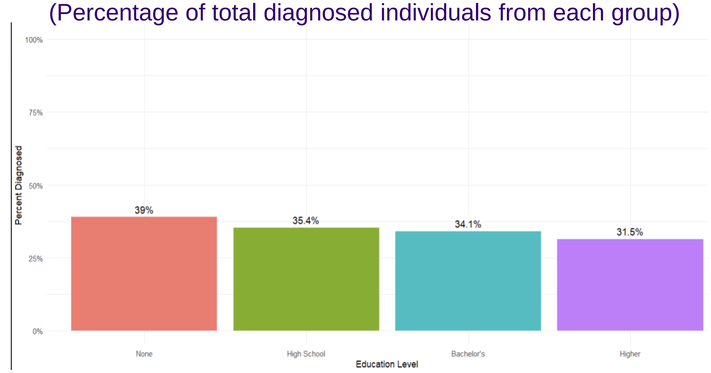

Source: BRFSS Cognitive Decline Dataset

### Trend of Cognitive Decline Over Time




## Socioeconomic Results (Education)

Distribution of Alzheimer's Diagnoses by Education Level
(Percentage of total diagnosed individuals from each group)




## Data & Methods

**Data Sources:**

- This project analyzes geographic and demographic patterns in cognitive decline using CDC survey data.
- Kaggle – Alzheimer's Disease Prediction Dataset: This dataset included clinical and demographic data such as education level and Alzheimer's diagnosis status.

**Methods:**

- **Trend of Cognitive Decline Over Time:**
- From the CDC BRFSS dataset, we extracted year-wise cognitive decline responses.
- We calculated the national average percentage of adults reporting subjective cognitive decline each year.
- A line chart was created using `ggplot2` in R to visualize changes over time from 2011 to 2020.
- **Cognitive Decline by Age Group Across U.S. States**
- Filtered the dataset into two distinct age groups: 50–64 and 65+.
- Grouped responses by state and calculated the average percentage of adults in each age group reporting decline.
- Plotted side-by-side horizontal bar charts to compare prevalence across states for both age groups.
- **Average Cognitive Decline by U.S. State**
- Aggregated BRFSS data at the state level.
- Computed the mean percentage of adults reporting cognitive decline in each state.
- A choropleth map was generated using color gradients to reflect average prevalence levels by state.
- **Alzheimer's Diagnoses by Education Level and Gender**
- Using the Alzheimer's Disease Prediction dataset from Kaggle, we filtered the data to include only individuals with confirmed diagnoses.
- Grouped individuals by education level and calculated the percentage of diagnoses within each group.
- Used a bar chart to illustrate the relative distribution across the four categories (None, High School, Bachelor's, Higher).
- For gender, we analyzed diagnosis rates across age groups and visualized the comparison in a grouped bar chart. The chart shows that women consistently have higher diagnosis rates than men in most age groups.

## Citations

El-Kharoua, Rabie. *Alzheimer's Disease Dataset*. Kaggle, 2023, https://www.kaggle.com/datasets/rabieelkharoua/alzheimers-disease-dataset.
"Catalog." *Centers for Disease Control and Prevention*, Centers for Disease Control and Prevention, data.cdc.gov/browse. Accessed 27 May 2025.
Centers for Disease Control and Prevention. (2024). Alzheimer's Disease and Healthy Aging Data, U.S. Department of Health and Human Services. https://data.cdc.gov/Healthy-Aging/Alzheimer-s-Disease-and-Healthy-Aging-Data/hfr9-rurv