**Read the following passage from a research article. Then answer questions 1-3.**

**Hypotheses and Research Methods**

Given the documented relationship between education and cognition as well as evidence for racial/ethnic disparities in cognitive impairment, a group of researchers aims to investigate if differences in education drive racial/ethnic disparities in cognitive aging. First, they propose to test the relationship between cognitive impairment and education. Then, they will test the relationship between cognitive impairment and race/ethnicity. Moreover, they are interested in testing if the relationship between education and cognitive impairment is moderated by race/ethnicity. The researchers formulate the following hypotheses:

H1: Relative to non-Hispanic whites, non-Hispanic Blacks and Mexican Americans are at greater risk of cognitive impairment.

H2: Increasing years of education is associated with a reduced risk for cognitive impairment for all older adults.

H3: The effect of increasing years of education on reduced risk for cognitive impairment is weaker for Blacks and Mexican Americans than it is for their white peers, particularly at higher levels of education.

Data analyzed for this study were drawn from the 2012 wave of the nationally representative Health and Retirement Study (HRS). The analytic sample consists of respondents who were age 65 and above in 2012 (N= 8,903). Measures included in analyses are the following.

***Dependent Variable***

To construct the variable for *cognitive impairment*, researchers relied on the modified Telephone Interview for Cognitive Status (TICS) which contains several tasks including object naming, serial subtraction, and both immediate and delayed word recall. The scores from the modified TICS range from 0 to 35, with higher scores denoting better cognitive functioning. In accordance with previous research, a cutoff of 9 was used, with those at or below 9 being characterized as cognitively impaired, while those above 9 were characterized as unimpaired. Therefore, the final variable was dichotomized to reflect those who are afflicted with impairment (1) and those who are unimpaired (0).

***Main Independent Variables***

Participants self-reported their completed *years of education* (ranging from 0-17). This variable treated as a continuous measure denoting the respondent’s educational attainment.

*Race* is a binary variable coded ‘1’ for non-Hispanic Blacks, while *ethnicity* is a binary variable coded ‘1’ for Mexican Americans with non-Hispanic whites serving as the reference group for both the race and ethnicity variables. To test the hypothesis that the returns of education vary across race and ethnicity, interaction terms were constructed (race x education; ethnicity x education).

***Additional Covariates***

A number of covariates that have known associations with cognitive health were included in analyses. *Number of health conditions* was treated as a continuous variable and represented the number of self-reported diagnosed diseases (arthritis, cancer, diabetes, heart disease, hypertension, lung disease, and/or stroke. *Psychiatric diagnosis* was a binary variable based on self-report of ever being diagnosed with an emotional, nervous, or psychiatric problem (0=no, 1=yes). The Center for Epidemiologic Studies Depression Scale (CES-D) was used with a cut-off of ≥3 symptoms as indicating *depression* (0=no, 1=yes). *Obesity* was treated as a binary indicator that indicated obese individuals if their BMI ≥ 30 (0=not obese, 1=obese). These measures tap into the overall health of the respondent.

To capture health behaviors, the researchers included indicators for exercise, smoking and drinking. To capture *exercise intensity* the researchers combined two measures of frequency of moderate and vigorous physical activity. We categorized individuals as hardly ever or never (reference), sometimes (once a week or one to three times a month), or frequently (once a week) engaging in either moderate to vigorous physical activity. *Smoking status* was constructed by combing responses to whether respondents never smoked, were former smokers, or current smokers into a single categorical variable (reference = never smoked). D*rinking status* was constructedby examining two questions asked of respondents: whether respondents ever drank an alcoholic beverage, and the number of alcoholic drinks consumed daily. Based on these responses, the researchers generated three categories: those who never drank (coded ‘0’), current moderate drinkers who reported drinking 1-2 drinks on days when drinking alcohol (coded ‘1’), and current heavy drinkers who reported drinking ≥3 drinks per day when drinking alcohol (coded ‘3’).

Sociodemographic controls include *age* (continuous, ranging from 65-102), *married/partnered* (0=no, 1=yes) and *sex* (0=male, 1=female). We also included measures of *household income* and *wealth* reported in US dollars.

Statistical analyses included descriptive statistics for all study variables. These were calculated for the overall sample and then within each race/ethnicity. Means and proportions across race/ethnicity were compared to test for statistically significant differences in study variables by group. Then, logistic regression models were run to test the study hypotheses. Model I examined the direct effect of race and ethnicity on cognitive impairment controlling for sociodemographic and health characteristics. Next, Model II added years of education in addition to the variables included in Model 1. Lastly, Model 3 added the race/ethnicity x education interaction terms to assess whether the effects of education are different across race/ethnicity. The researchers used α =0.05 to detect statistically significant differences in both descriptive and regression analyses.

1. What types of data visualization tools are appropriate to represent the data? In your answer, identify which variables and/or associations and/or statistical methods you think should be represented by those tools.
2. Choose one of the tools identified above. Write a title for the data visualization tool selected. Be sure to include all required components.
3. Create a shell of the data visualization tool you selected in #2. Label/provide information for all required parts (i.e., X and Y axis, legend, row, column, footer).