Executive Summary

I. Overview of the Case and Objectives

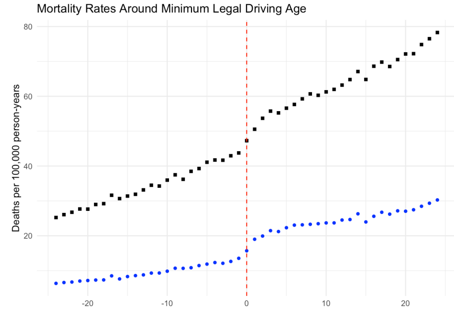
This case examines the causal effect of reaching the Minimum Legal Driving Age (MLDA) on mortality rates. The objective is to analyze mortality due to any cause and motor vehicle accidents within various timeframes around the MLDA. Using regression discontinuity (RD) methods, both non-parametric and parametric, we estimate the impact of driving eligibility on mortality rates, focusing on causal inference by comparing trends on either side of the MLDA threshold while addressing potential biases.

II. Answers to Questions

1. Mortality Rates Comparison (1–24 months above/below MLDA)

The mortality rates for individuals 1–24 months above and below the MLDA are 64.3 and 34.1 deaths per 100,000 person-years, respectively, with a difference of 30.2. However, this difference does not plausibly describe the causal effect of reaching the MLDA. Factors such as age-related behavior, non-random assignment, and heterogeneity in individuals' actions (e.g., delayed driving) introduce confounding. Moreover, a broader comparison dilutes causal inference as it includes individuals further from the MLDA threshold. A regression discontinuity design (RD) focusing on individuals closer to the MLDA would provide a more valid estimate of the causal effect by minimizing these biases

2. Scatter Plot of Mortality Rates



The scatter plot displays mortality rates due to (a) any cause (black squares) and (b) motor vehicle accidents (blue circles) for individuals within two years of the MLDA. The x-axis represents months from the MLDA, while the y-axis shows deaths per 100,000 person-years. A dashed red vertical line marks the MLDA threshold, indicating when driving eligibility begins. The plot reveals a noticeable increase in mortality rates, particularly for motor vehicle accidents, immediately after the MLDA, reflecting behavioral shifts associated with driving access. This visualization effectively highlights trends in mortality near the driving eligibility age.

3. Non-Parametric "Donut" RD Estimates

The "donut" RD estimates the effect of driving on mortality rates using four bandwidths (48, 24, 12, 6 months) while omitting agemo_mda == 0. The regression equation is:

$$mortality = \beta_0 + \beta_1 \times agemo\_mda + \beta_2 \times treated + \epsilon$$

where treated indicates being above the MLDA.

```
##   Bandwidth All_Cause       MVA
## 1        48  48.83893 21.445071
## 2        24  30.27784 15.290869
## 3        12  19.06807 11.178446
## 4         6  13.16966  8.835371
```

As the bandwidth narrows, point estimates decrease, reflecting reduced bias but increased variance, reducing precision. Smaller bandwidths focus on closer-to-threshold individuals for causal inference.

4. Parametric "Donut" RD Estimates

The parametric "donut" RD estimates the effect of driving on mortality using linear trends on both sides of the MLDA cutoff, omitting agemo_mda == 0. The regression equation is:

$$mortality = \beta_0 + \beta_1 \cdot agemo\_mda + \beta_2 \cdot treated + \beta_3 \cdot agemo\_mda \cdot treated + \epsilon$$

```
##   Bandwidth All_Cause      MVA
## 1        48 11.891433 9.534183
## 2        24  6.877585 6.551764
## 3        12  6.611472 5.968510
## 4         6  6.012612 4.867183
```

As bandwidth narrows, point estimates decrease, focusing on closer-to-threshold individuals, but precision declines. Parametric estimates are generally smaller than non-parametric ones, reflecting potential model smoothing and reduced bias.

III. Conclusion

The analysis highlights a significant increase in mortality, particularly from motor vehicle accidents, immediately after reaching the MLDA. Policymakers should consider implementing stricter graduated licensing programs and targeted safety interventions for new drivers. Enhanced education on responsible driving and stricter enforcement of traffic laws could mitigate risks. Stakeholders, including parents and schools, should collaborate to raise awareness about these dangers, fostering safer driving behaviors and reducing preventable fatalities among young drivers.