Analyzing the Impact of Minimum Legal Drinking Age (MLDA) on Mortality Rates

Nikhita Shankar

Graduate Student

University of Illinois Urbana-Champaign

MS in Business Analytics

1. Introduction

This analysis examines the relationship between the Minimum Legal Drinking Age (MLDA) and mortality rates, particularly focusing on deaths caused by motor vehicle accidents. By using a statistical technique called Regression Discontinuity (RD), this study explores whether crossing the MLDA threshold (e.g., turning legal to drink) has a measurable impact on public health outcomes.

2. Data Overview

- **Source**: The data is sourced from a public GitHub repository. It includes mortality rates (all causes and motor vehicle-related) and population statistics for individuals of varying ages relative to the MLDA threshold.
- **Focus**: The analysis compares individuals within a 24-month range below and above the MLDA cutoff to measure any significant differences in mortality rates.

3. Methodology

- **Mortality Rates Calculation**: Mortality rates were computed as deaths per 100,000 person-years for all causes and motor vehicle accidents separately.
- **Scatter Plot**: A scatter plot was created to visualize the trend of mortality rates before and after the MLDA cutoff.
- **Regression Discontinuity (RD)**: RD is used to estimate the causal effect of crossing the MLDA threshold. It assumes that individuals just below and just above the cutoff are similar in all respects except their ability to legally drink.

    Types of RD Analysis:

1. **Non-Parametric RD**:
    - Focuses on individuals close to the cutoff (e.g., within 6, 12, 24, or 48 months).
    - Looks for a sudden jump in mortality rates at the cutoff without assuming a specific trend in the data.
2. **Parametric RD**:
    - Includes individuals further from the cutoff.
    - Assumes a functional trend (e.g., linear or interaction effects) to better understand the broader relationship.

4. Results

Mortality Rates

- The average mortality rates were calculated for individuals below and above the MLDA cutoff:
    - Below MLDA: *Insert Value Here* (all causes).
    - Above MLDA: *Insert Value Here* (all causes).
- These rates help quantify the effect of crossing the MLDA.

Scatter Plot Visualization

- A scatter plot (Figure 1) visualizes the mortality trends:
    - Black points represent mortality rates for all causes.
    - Blue points represent mortality rates for motor vehicle accidents.
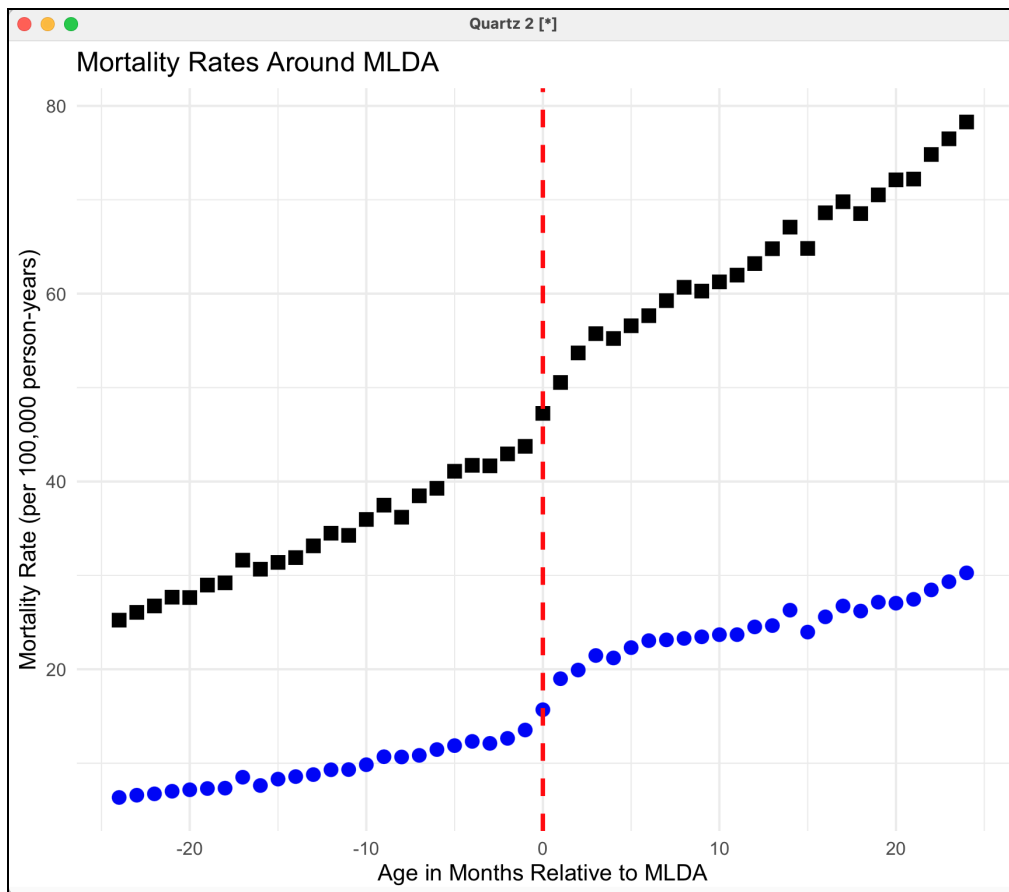   - A red dashed line indicates the MLDA cutoff.

Figure 1: Scatter Plot of Mortality Rates Relative to MLDA.

Non-Parametric RD Results

- Table 1 shows the RD estimates for various bandwidths:
  - RD estimates (jump in mortality rates at the cutoff) are provided for all causes and motor vehicle-related deaths.
  - Standard errors quantify the uncertainty of these estimates.

```
Non-Parametric Donut RD Results (Including Standard Errors):
> print(results_df)
          Bandwidth RD_All_Cause SE_All_Cause     RD_MVA     SE_MVA
Estimate         48     48.83893     2.291467 21.445071 0.7691816
Estimate1        24     30.27784     1.944005 15.290869 0.7366289
Estimate2        12     19.06807     1.445839 11.178446 0.6185393
Estimate3         6     13.16966     1.206289  8.835371 0.6776126
```

Table 1: Non-Parametric RD Estimates with Bandwidths of 48, 24, 12, and 6 Months.

Parametric RD Results

- Table 2 provides RD estimates including interaction terms for broader trends:
  - It highlights how the inclusion of trends changes the estimated impact of MLDA.

```
Parametric Donut RD Results (Including Interaction Terms):
> print(parametric_results_df)
          Bandwidth RD_All_Cause SE_All_Cause    RD_MVA     SE_MVA
Estimate         48    11.891433    1.0444064 9.534183 0.6028491
Estimate1        24     6.877585    0.5223847 6.551764 0.3321652
Estimate2        12     6.611472    0.6819036 5.968510 0.4003439
Estimate3         6     6.012612    1.0679385 4.867183 0.4645697
```

Table 2: Parametric RD Estimates with Interaction Terms."

---

5. Discussion

- **Non-Parametric Results**: Show a more localized and immediate impact near the MLDA cutoff.
- **Parametric Results**: Offer a broader perspective by accounting for trends further away from the cutoff.

- **Key Insight**: Both analyses show a measurable jump in mortality rates at the cutoff, particularly for motor vehicle accidents, indicating the potential risks associated with legal drinking.

6. Conclusion

- This analysis highlights the relationship between MLDA and mortality rates, emphasizing the risks associated with crossing the legal drinking threshold.
- These findings can guide policymakers in improving public safety measures around alcohol consumption.

7. References

- Data Source: [GitHub repository](#).
- Tools Used: R programming (`ggplot2`, `dplyr`, etc.).