

Executive Summary

FIN 550: Problem Set #2

I. Overview and Objectives

Getting a driver's license is one of the first big "adult" milestones for teens, but it does come with some big risks. Motor vehicle accidents are the leading causes of death for Americans under the age of 25, resulting in 40,000 deaths per year. This analysis questions whether becoming a licensed driver causes higher mortality rates among teens, using data from 1983 to 2014 and analyzing this data by using regression discontinuity methods. The main question we are trying to answer is: Does reaching the minimum legal driving age increase the chance that a teenager dies? We have to address several things before answering the question. First, comparing licensed drivers to non-licensed drivers does not work because teens who choose to get their driver's license might be more likely to take more risks or engage in dangerous behaviors. Second, it is difficult to compare states with different driving laws because states may have enforced stricter driving laws due to teen mortality rates. We can isolate the causal effect because individuals who are slightly above or below the MLDA are nearly identical, except for driving eligibility, since teenagers cannot change their age.

Analysis and Results

Question 1: Mean Comparison

Teens who are 1-24 months older than the MLDA have noticeably higher mortality rates than teens 1-24 months younger. The group of teens 1-24 months above the MLDA has a mortality rate of 80.15 deaths compared to 68.99 deaths for teens 1-24 months below the MLDA. But this age difference does not tell us the causal effect of driving. Teens that are two years apart could differ in a

wide range of factors such as maturity, independence, risk-taking, and more. Because this age gap is significant, this comparison is biased. To get an actual causal estimate, we need to compare teens who are closer in age to each other and who are right around the MLDA cutoff.

Question 2: Scatter Plot

When we plot mortality rates +/- 24 months around the MLDA, there's a noticeable increase in mortality rates for both all-cause and motor-vehicle mortality rates. More specifically, motor vehicle deaths increase from 10 to 20 deaths per 100,000 and all-cause mortality also increases from 65 to 75 deaths per 100,000. The graph shows that being able to drive causes more teen deaths, with motor vehicle accidents being the leading cause of this increase.

Question 3: Non-Parametric Estimates

The non-parametric estimate shows a significant increase in both all-cause and motor mortality right when teens reach the MLDA. The effect is stronger for motor-vehicle deaths, which makes sense because driving eligibility is the main factor that changes at the cutoff. We ran a simple regression where the Mortality Rate = $\beta_0 + \beta_1(\text{Treatment}) + \varepsilon$, where Treatment is 1 if you're above the MLDA and 0 if you are below. The coefficient β_1 tells us the causal effect. This is a 'donut' RD because we exclude agemo_mda==0 (the partially-treated month). Our results show that reaching the MLDA leads to approximately 7.5-10.7 additional deaths per 100,000, with car accidents accounting for approximately 5-7.7 of those deaths. As we look at teenagers who are closer to the MLDA cutoff, the estimates generally get larger, due to the fact that we're isolating the immediate effect of driving. However, our estimates also get less precise with smaller samples, which is why the 6-month bandwidth has a somewhat lower estimate than the 12-month one.

Bandwidth	RD (all-cause)	RD (MVA)
48	7.519	4.972
24	9.805	6.961

12	10.654	7.724
6	9.166	6.633

Question 4: Parametric RD Estimates

The parametric model is Mortality Rate = $\beta_0 + \beta_1(\text{Treatment}) + \beta_2(\text{Age from MLDA}) + \beta_3(\text{Treatment} \times \text{Age from MLDA}) + \epsilon$. This controls for linear age trends on both sides of the cutoff while β_1 captures the causal jump. Unlike non-parametric, these decrease as bandwidth narrows because in small windows controlling for age trend matters more. At narrow bandwidths, the point estimates are lower for the parametric than the nonparametric estimate (5.8 vs. 9.2 at 6 months), implying that part of the raw discontinuity reflects natural age trends rather than pure driving. Under both methods MVA accounts for 60-70% of the mortality increase.

Bandwidth	RD (all-cause)	RD (MVA)
48	7.519	6.541
24	9.805	5.445
12	7.085	5.074
6	5.776	3.907

II. Conclusion

The overall analysis indicates that once teens hit the driving-age cutoff leads to a sharp increase in teen mortality. Deaths increase by about 6-11 per 100,000 teens per year, a 9-16% increase compared to teens just below the threshold. Most of that rise is due to motor-vehicle accidents. Because the RD design compares almost identical teens on either side of the eligibility line, the results are able to identify a causal effect. The sharp increase shows that inexperience is the primary factor of risk. This helps support the need for stricter graduated licensing policies such as nighttime driving restrictions, limits on teen passengers per car, longer supervised learning periods, and better training around risky and distracted driving. The spike occurs exactly when teens first get their driver's license and even small improvements in early-driver safety could prevent a meaningful number of annual deaths.