Online Appendices for “Breaking the Link Between Legal Access to Alcohol and Motor Vehicle Accidents: Evidence from New South Wales”
Online Appendix A: Additional Balance Figures

Figure A1
Number of Observations in HILDA by Age in Months relative to MLDA

Notes: Data are from the Household, Income and Labour Dynamics in Australia (HILDA) Survey (2001-2011). Frequency counts are shown by age in two-month bins. The column centered around zero corresponds with observations that are not used in our preferred “donut RD” analysis.
Figure A2
Estimated Discontinuities in Population Characteristics
Based on HILDA Survey Data

Panel A: Means
- Female
- Born in Australia
- English is 1st Language

Panel B: Discontinuity Estimates By Bandwidth (In Days)
- Female
- Born in Australia
- English is 1st Language

Notes: Data are from the Household, Income and Labour Dynamics in Australia (HILDA) Survey (2001-2011).
Figure A3
Estimated Discontinuities in Driver Characteristics
Based on Licensing Data

Panel A: Proportions and Counts

<table>
<thead>
<tr>
<th>Proportion with P2 License</th>
<th>Proportion Female</th>
<th>Number of Drivers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Panel B: Discontinuity Estimates By Bandwidth (In Days)

<table>
<thead>
<tr>
<th>Proportion with P2 License</th>
<th>Proportion Female</th>
<th>Number of Drivers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: Data are from the NSW Center for Road Safety (2001-2010).
Online Appendix B: Results from Alternate Drinking Behavior Surveys

In the body of the paper, we show estimated discontinuities around the 18th birthday in self-reported drinking behavior from HILDA, and in alcohol-related emergency hospital presentations using administrative data. Both sources provide evidence of significant discontinuities indicating that legal drinking-age restrictions do affect alcohol use. To our knowledge, HILDA is the only available representative survey data source which allows one to calculate the precise age in days relative to 18th birthday at the time of survey completion. Here, we consider other sources of data on drinking behavior. Nevertheless, we show results here from the National Drug Strategy Household Survey (NDSHS) and we also make comparisons to published results from the Australian Secondary Students Alcohol and Drug Survey (ASSADS).

The NDSHS is a major national survey of drug use, conducted as part of the National Drug Strategy. It has been conducted every 2-3 years since 1985, with the most recent wave in 2013. For consistency with our HILDA analysis, we show results from the 2001, 2004, 2007 and 2010 surveys in a pooled analysis, restricted to respondents from NSW. Over this period, the NDSHS predominantly implemented a “drop and collect” survey mode, also incorporating some computer-assisted telephone interviews (CATI) from 2001 to 2007, and some personal interviews in 2001.

We construct four outcome variables in NDSHS which correspond as closely as possible to those we constructed from HILDA. The first three are defined very similarly to the HILDA measures described in the body of the text: “Ever drinks,” “Drinks regularly” (i.e. at least weekly) and “Proportion of days drinks.” Each were derived from a question on the frequency of drinking. The major difference, however, is that the NDSHS explicitly mentions “the last 12 months” as the reference period for this question, making it poorly suited for analyzing age-based discontinuities (relative to surveys that ask about shorter windows of time). (In HILDA, the reference period is unspecified, the implications of which we discuss in the body of the text.) We also use NDSHS to consider responses to whether an individual ”drank yesterday,” which does not suffer from this limitation.

Table B1 shows means of these outcome variables. For consistency with the HILDA analysis, the sample is limited to respondents aged 16-19 years (at last birthday). Notwithstanding the difference in question wording, these are similar to those from HILDA: 68.0% of the NDSHS
sample reports drinking (68.5% in HILDA) and 26.4% report drinking at least once per week (22.8% in HILDA). The NDSHS sample drinks on an average of 10.7% of days (7.5% in HILDA) and 13.6% reports drinking “yesterday” (HILDA does not have an equivalent question).

Table B1
Summary Statistics (Means) on Drinking Behaviour from NDSHS

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ever Drinks</td>
<td>0.680</td>
</tr>
<tr>
<td>Drinks at least once a week</td>
<td>0.264</td>
</tr>
<tr>
<td>Proportion of days drinks</td>
<td>0.107</td>
</tr>
<tr>
<td>Drank Yesterday</td>
<td>0.136</td>
</tr>
<tr>
<td>Sample Size (aged 16-19)</td>
<td>2,648</td>
</tr>
</tbody>
</table>


Figure B1 plots the mean of each outcome variable by individual year of age. The sample has been expanded here to included a broader age range (14-21 years). As in the HILDA data, these plots are suggestive of a discontinuity between 17 and 18 year olds, with “ever drinks” being the possible exception. Given the coarse measure of age (in years), it is not appropriate to conduct formal regression-based tests of discontinuities using these data.

We have also considered the Australian Secondary Students Alcohol and Drug Survey (ASSADS) - a triennial survey conducted since 1984 in a self-completed paper and pencil format, administered on school premises. The main limitation of ASSADS for our purposes is that its sample consists only of students, most of whom are aged under 18. It is not representative of the full population of youth, especially of persons aged 18 years or older, since the majority of them do not attend secondary school and are thus out of scope of the survey. We have not attempted to produce a graphical analysis of apparent discontinuities using ASSADS. We are also unable to compare means of drinking behavior from this survey to our HILDA measures, as the two surveys do not contain comparable questions. The best we can do is compare published results
from two ASSADS questions to corresponding NDSHS questions. Generally, the results are similar, though the reported drinking prevalence is slightly higher in ASSADs, perhaps due to the different modes of delivery. For example, ASSADS 2011 suggests that 91% of Australian 17 year old students and 88% of 16 year old students had tried alcohol at least once (White and Bariola, 2012: Table 4.1). The corresponding 2010 NSDHS results are 85% for 17 years olds and 83% for 16 year olds. Similarly, ASSADS 2010 suggests that 81% of Australian 17 year old students and 74% of 16 year old students had at least one alcoholic drink in the past 12 months. The corresponding 2010 NSDHS results are 74% for 17 years olds and 64% for 16 year olds.

Reference:
Figure B1
Drinking Behavior Outcomes from NDSHS: Means by Age

Online Appendix C: Estimates for Night Crashes
Figure C1
Estimated Discontinuities in Serious Motor Vehicle Accidents at Night

Panel A: Means

Accident with Injury or Towed Vehicle
Injured
Killed

Panel B: Discontinuity Estimates By Bandwidth (In Days)

Accident with Injury or Towed Vehicle
Injured
Killed

Notes: See Figure 5 notes
Figure C2
Estimated Discontinuities in Motor Vehicle Accidents at Night Weighted by Fatality Risk

Panel A: Means
Fatality-Weighted Accidents
High Fatality Risk Accidents (> 0.05)
Very High Fatality Risk Accidents (> 0.10)

Panel B: Discontinuity Estimates By Bandwidth (In Days)
Fatality-Weighted Accidents
High Fatality Risk Accidents (> 0.05)
Very High Fatality Risk Accidents (> 0.10)

Notes: See Figure 5 notes and Figure 6 notes
Online Appendix D: Effect of MLDA on Mortality from External Causes

This appendix shows estimated discontinuities in mortality from external causes in NSW, following the approach used throughout the paper. Data were obtained from the AIHW National Mortality Database for deaths occurring between 1994 and 2010. Due to privacy regulations, the data were provided as counts by age at death relative to 18th birthday, in 28-day bins, and causes are classified in only two categories (MVA and other external). Deaths on 18th birthday and one day either side were excluded.

The results (Figure D1) show no evidence of discontinuities in MVA fatalities or in deaths from other external causes. The point-estimates are close to zero at all bandwidths, and the confidence intervals are reasonably tight. Using the optimal bandwidth, the 95% CIs rule out a 25% increase in MVA fatalities and a 20% increase in all externally caused mortality.

However, we do not emphasize these results for a number of reasons. The analysis shown in the body of the text has emphasized several nuances in studying MLDA effects in NSW. These include the role of motor vehicle licensing, including discrepancies between licensing for motorcycles and for other motor vehicles, as well as gender differences in binge drinking and drunk driving. Due to the paucity of mortality data in NSW (because of its relatively small population), combined with data access restrictions due to privacy, we are unable to explore those nuances using mortality data.

Nevertheless, these results are reassuring. They are consistent with those found using hospital data and with MVA crash data.
Figure D1
Estimated Discontinuities in Mortality Due to External Causes

Panel A: Means

Panel B: Discontinuity Estimates By Bandwidth (In Days)

Notes: Data are from the AIHW National Mortality Database (1994-2010). Only deaths in NSW are included. Panel A reports means in two-month bins. Panel B reports estimates from local linear regressions, using rectangular kernel weights and allowing the slopes to vary on each side of the threshold, for a range of different bandwidths. The textbox within the figure shows the optimal bandwidth selected by the procedure described in Imbens and Kalyanaraman (2012) along with the corresponding point estimate and standard error estimate. In order to mitigate the problem of birthday “celebration effects”, we omit from the analysis observations within 1 day of any birthday. Ideally, we would use a “donut” width that is consistent with the main analysis, but we are restricted by the categories in which the frequency tabulations were provided by the data custodian.
Online Appendix E: Sensitivity of Results to ‘Donut’ Size
### Table E1
Sensitivity of Key Estimates to ‘Donut’ Size

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Donut Size in Days from Each Birthday</th>
<th>1</th>
<th>7</th>
<th>14</th>
<th>30</th>
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<tbody>
<tr>
<td><strong>Drinking Behavior</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ever drinks</td>
<td></td>
<td>0.213***</td>
<td>0.165***</td>
<td>0.150***</td>
<td>0.186***</td>
</tr>
<tr>
<td>bandwidth</td>
<td></td>
<td>(0.051)</td>
<td>(0.039)</td>
<td>(0.049)</td>
<td>(0.052)</td>
</tr>
<tr>
<td>Drinks regularly</td>
<td></td>
<td>0.226***</td>
<td>0.200***</td>
<td>0.182***</td>
<td>0.179***</td>
</tr>
<tr>
<td>bandwidth</td>
<td></td>
<td>(0.036)</td>
<td>(0.048)</td>
<td>(0.052)</td>
<td>(0.064)</td>
</tr>
<tr>
<td>Proportion of days drinks</td>
<td></td>
<td>0.054***</td>
<td>0.045***</td>
<td>0.040***</td>
<td>0.041***</td>
</tr>
<tr>
<td>bandwidth</td>
<td></td>
<td>(0.012)</td>
<td>(0.014)</td>
<td>(0.015)</td>
<td>(0.017)</td>
</tr>
<tr>
<td>Binge drinks regularly</td>
<td></td>
<td>0.186**</td>
<td>0.124</td>
<td>0.203***</td>
<td>0.190*</td>
</tr>
<tr>
<td>bandwidth</td>
<td></td>
<td>(0.073)</td>
<td>(0.082)</td>
<td>(0.078)</td>
<td>(0.106)</td>
</tr>
<tr>
<td>Proportion of days binge drinks</td>
<td></td>
<td>0.033**</td>
<td>0.034*</td>
<td>0.037*</td>
<td>0.044***</td>
</tr>
<tr>
<td>bandwidth</td>
<td></td>
<td>(0.017)</td>
<td>(0.018)</td>
<td>(0.019)</td>
<td>(0.014)</td>
</tr>
<tr>
<td><strong>Motor Vehicle Accidents</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MVAs Involving a Vehicle Being Towed, Injury, or Death</td>
<td>-0.0529</td>
<td>-0.0625</td>
<td>-0.0070</td>
<td>0.1184</td>
<td></td>
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<tr>
<td>bandwidth</td>
<td></td>
<td>(0.1823)</td>
<td>(0.2067)</td>
<td>(0.2000)</td>
<td>(0.2702)</td>
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<tr>
<td>Injuries in MVAs</td>
<td></td>
<td>118</td>
<td>104</td>
<td>110</td>
<td>100</td>
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<tr>
<td>bandwidth</td>
<td></td>
<td>(0.003)</td>
<td>-0.0154</td>
<td>-0.0415</td>
<td>-0.0313</td>
</tr>
<tr>
<td>Deaths in MVAs</td>
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<td>182</td>
<td>128</td>
<td>181</td>
<td>117</td>
</tr>
<tr>
<td>bandwidth</td>
<td></td>
<td>(0.003)</td>
<td>(0.0771)</td>
<td>(0.0655)</td>
<td>(0.1077)</td>
</tr>
<tr>
<td>Mortality-Risk-Weighted MVAs</td>
<td></td>
<td>-0.0809</td>
<td>0.0002</td>
<td>-0.0003</td>
<td>0.0023</td>
</tr>
<tr>
<td>bandwidth</td>
<td></td>
<td>(0.0017)</td>
<td>(0.0018)</td>
<td>(0.0022)</td>
<td>(0.0027)</td>
</tr>
<tr>
<td>MVAs with Mortality Risk &gt; 0.05</td>
<td></td>
<td>207</td>
<td>239</td>
<td>181</td>
<td>184</td>
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<tr>
<td>bandwidth</td>
<td></td>
<td>(0.0139)</td>
<td>(0.0143)</td>
<td>(0.0164)</td>
<td>(0.0145)</td>
</tr>
<tr>
<td>MVAs with Mortality Risk &gt; 0.010</td>
<td></td>
<td>209</td>
<td>218</td>
<td>191</td>
<td>245</td>
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<tr>
<td>bandwidth</td>
<td></td>
<td>(0.0041)</td>
<td>(0.0057)</td>
<td>0.0080</td>
<td>0.0112</td>
</tr>
<tr>
<td><strong>Motor Vehicle Accidents at Night</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MVAs Involving a Vehicle Being Towed, Injury, or Death</td>
<td>-0.1163</td>
<td>-0.0765</td>
<td>0.0215</td>
<td>-0.0014</td>
<td></td>
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<tr>
<td>bandwidth</td>
<td></td>
<td>(0.0945)</td>
<td>(0.0983)</td>
<td>(0.0923)</td>
<td>(0.1489)</td>
</tr>
<tr>
<td>Injuries in MVAs</td>
<td></td>
<td>117</td>
<td>95</td>
<td>113</td>
<td>77</td>
</tr>
<tr>
<td>bandwidth</td>
<td></td>
<td>(0.035)</td>
<td>0.0388</td>
<td>0.0849***</td>
<td>0.0336</td>
</tr>
<tr>
<td>Deaths in MVAs</td>
<td></td>
<td>156</td>
<td>143</td>
<td>288</td>
<td>127</td>
</tr>
<tr>
<td>bandwidth</td>
<td></td>
<td>(0.0035)</td>
<td>(0.0400)</td>
<td>(0.0304)</td>
<td>(0.0559)</td>
</tr>
<tr>
<td>Mortality-Risk-Weighted MVAs</td>
<td></td>
<td>-0.0038</td>
<td>-0.0014</td>
<td>-0.0028</td>
<td>0.0006</td>
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<tr>
<td>bandwidth</td>
<td></td>
<td>(0.0005)</td>
<td>(0.0035)</td>
<td>(0.0041)</td>
<td>(0.0055)</td>
</tr>
<tr>
<td>MVAs with Mortality Risk &gt; 0.05</td>
<td></td>
<td>197</td>
<td>212</td>
<td>181</td>
<td>134</td>
</tr>
<tr>
<td>bandwidth</td>
<td></td>
<td>(0.0012)</td>
<td>(0.0011)</td>
<td>(0.0027)</td>
<td>(0.0023)</td>
</tr>
<tr>
<td>MVAs with Mortality Risk &gt; 0.010</td>
<td></td>
<td>223</td>
<td>287</td>
<td>85</td>
<td>103</td>
</tr>
<tr>
<td>bandwidth</td>
<td></td>
<td>(0.0088)</td>
<td>(0.0085)</td>
<td>(0.0145)</td>
<td>(0.0084)</td>
</tr>
<tr>
<td><strong>Hospitalizations</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alcohol Intoxication/Poisoning</td>
<td></td>
<td>5.339***</td>
<td>4.277***</td>
<td>4.051**</td>
<td>2.390</td>
</tr>
<tr>
<td>bandwidth</td>
<td></td>
<td>(1.513)</td>
<td>(1.498)</td>
<td>(1.726)</td>
<td>(2.035)</td>
</tr>
<tr>
<td>Driver in Motor Vehicle Accident</td>
<td></td>
<td>-1.212</td>
<td>-0.969</td>
<td>-2.587</td>
<td>-4.299***</td>
</tr>
<tr>
<td>bandwidth</td>
<td></td>
<td>(1.753)</td>
<td>(1.766)</td>
<td>(1.752)</td>
<td>(1.433)</td>
</tr>
<tr>
<td>Rider in Motor Cycle Accident</td>
<td></td>
<td>2.928**</td>
<td>2.046</td>
<td>3.640**</td>
<td>2.924*</td>
</tr>
<tr>
<td>bandwidth</td>
<td></td>
<td>(1.380)</td>
<td>(1.383)</td>
<td>(1.538)</td>
<td>(1.605)</td>
</tr>
<tr>
<td>Assault</td>
<td></td>
<td>7.357***</td>
<td>7.144***</td>
<td>6.173***</td>
<td>0.979</td>
</tr>
<tr>
<td>bandwidth</td>
<td></td>
<td>(1.899)</td>
<td>(1.899)</td>
<td>(1.620)</td>
<td>(3.804)</td>
</tr>
<tr>
<td>Any Other External Cause</td>
<td></td>
<td>288</td>
<td>308</td>
<td>458</td>
<td>148</td>
</tr>
<tr>
<td>bandwidth</td>
<td></td>
<td>(3.603)</td>
<td>-0.303</td>
<td>-0.735</td>
<td>-6.220</td>
</tr>
<tr>
<td>Hospitalizations</td>
<td></td>
<td>359</td>
<td>432</td>
<td>488</td>
<td>254</td>
</tr>
</tbody>
</table>

Notes: This Table considers sensitivity of the key estimates to alternate “donut” sizes. For each indicator and donut size, it shows the estimated discontinuity, robust standard error, and the bandwidth used, selected by the procedure described in Imbens and Kalyanaraman (2012).
Online Appendix F: Estimated Effects on Across Gender

This appendix shows estimated effects across gender for all of the outcomes considered in the main text.
Figure F1
Ever Drinks

Panel A: Means

<table>
<thead>
<tr>
<th></th>
<th>All</th>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td>Months relative to minimum legal drinking age (18)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proportion</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Panel B: Discontinuity Estimates By Bandwidth (In Days)

<table>
<thead>
<tr>
<th></th>
<th>All</th>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bandwidth</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RD Estimated Effect</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: See Figure 3 notes.
Drinks ≥ Once Per Week

Panel A: Means

Panel B: Discontinuity Estimates By Bandwidth (In Days)

Notes: See Figure 3 notes.
Figure F3
Proportion of Days Drinks

Panel A: Means
- All
- Males
- Females

Panel B: Discontinuity Estimates By Bandwidth (In Days)
- All
- Males
- Females

Notes: See Figure 3 notes.
Figure F4
Binge Drinks ≥ Once Per Week

Panel A: Means

Panel B: Discontinuity Estimates By Bandwidth (In Days)

Notes: See Figure 3 notes and Figure 4 notes.
Figure F5
Proportion of Days Binge Drinks

Panel A: Means

Panel B: Discontinuity Estimates By Bandwidth (In Days)

Notes: See Figure 3 notes and Figure 4 notes.
Figure F6

All Serious Motor Vehicle Accidents

Panel A: Means

- All Males
- Females

Panel B: Discontinuity Estimates By Bandwidth (In Days)

- All Males
- Females

Notes: See Figure 5 notes.
Figure F7
Injured in a Motor Vehicle Accident

Panel A: Means

Panel B: Discontinuity Estimates By Bandwidth (In Days)

Notes: See Figure 5 notes.
Figure F8
Killed in a Motor Vehicle Accident

Panel A: Means

All Males Females

Panel B: Discontinuity Estimates By Bandwidth (in Days)

All Males Females

Notes: See Figure 5 notes.
Figure F9

Fatality-Risk-Weighted Motor Vehicle Accidents

Panel A: Means

Panel B: Discontinuity Estimates By Bandwidth (In Days)

Notes: See Figure 5 notes and Figure 6 notes.

25
Figure F10
High Fatality Risk Accidents (> 0.05)

Panel A: Means

All Males Females

Panel B: Discontinuity Estimates By Bandwidth (In Days)

All Males Females

Notes: See Figure 5 notes and Figure 6 notes.
Figure F11
Very High Fatality Risk Accidents (> 0.10)

Panel A: Means

Panel B: Discontinuity Estimates By Bandwidth (In Days)

Notes: See Figure 5 notes and Figure 6 notes.
Figure F12
All Serious Motor Vehicle Accidents at Night

Panel A: Means

Panel B: Discontinuity Estimates By Bandwidth (In Days)

Notes: See Figure 5 notes.
Figure F13
Injured in a Motor Vehicle Accident at Night

Panel A: Means

Panel B: Discontinuity Estimates By Bandwidth (In Days)

Notes: See Figure 5 notes.
Figure F14
Killed in a Motor Vehicle Accident at Night

Panel A: Means

Panel B: Discontinuity Estimates By Bandwidth (In Days)

Notes: See Figure 5 notes.
Figure F15
Fatality-Risk-Weighted Motor Vehicle Accidents at Night

Panel A: Means

Panel B: Discontinuity Estimates By Bandwidth (In Days)

Notes: See Figure 5 notes and Figure 6 notes.
Figure F16
High Fatality Risk Accidents (> 0.05) at Night

Panel A: Means

Panel B: Discontinuity Estimates By Bandwidth (In Days)

Notes: See Figure 5 notes and Figure 6 notes.
Figure F17
Very High Fatality Risk Accidents (> 0.10) at Night

Panel A: Means

Panel B: Discontinuity Estimates By Bandwidth (In Days)

Notes: See Figure 5 notes and Figure 6 notes.
Figure F18
Hospitalizations for Alcohol Intoxication/Poisoning

Panel A: Means

Panel B: Discontinuity Estimates By Bandwidth (In Days)

Notes: See Figure 9 notes.
Figure F19
Hospitalizations for Motor Vehicle Accidents

Panel A: Means

All Males Females

Panel B: Discontinuity Estimates By Bandwidth (In Days)

All Males Females

Notes: See Figure 9 notes.
Figure F20
Hospitalizations for Motorcycle Accidents

Panel A: Means

Panel B: Discontinuity Estimates By Bandwidth (In Days)

Notes: See Figure 9 notes.
Figure F21
Hospitalizations for Assaults

Panel A: Means

Panel B: Discontinuity Estimates By Bandwidth (In Days)

Notes: See Figure 9 notes.
Figure F22
Hospitalizations for Other External Causes

Panel A: Means

Panel B: Discontinuity Estimates By Bandwidth (In Days)

Notes: See Figure 9 notes.