A COVID-19 Public Health Silver Lining? Reductions in Driving under the Influence Arrests and Crashes in Miami-Dade County

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ABSTRACT
The health crisis that began in early 2020 has generated a large amount of interest in the effect of COVID-19 on public health. The majority of this work has centered around trying to better understand how the virus spreads, where it spreads, who is at risk and when, in order to provide evidence-based guidance to the public, and stop the pandemic. The Centers for Disease Control has continued to report the largely somber findings; however, there are silver linings. The temporary reduction in daily global CO₂ emissions was one of these, but there are others. In this case study on Miami-Dade County, Fl, a regression discontinuity model is used to highlight reductions in both drunk driving crashes and driving under the influence arrests. While we observed immediate reductions in both crashes and arrests as a result of the March 2020 lockdown, more importantly over the duration of the year since the lockdown we observed a staggering reduction of over 800 fewer driving under the influence arrests and almost 150 alcohol-related motor-vehicle crashes.

Introduction
As of September 10, 2021, the Centers for Disease Control and Prevention (2021) estimates almost 41 million cases and over 654,000 deaths as a result of the novel coronavirus. Around the globe, the case and death tolls are exponentially higher. The spread of the novel virus, especially at the outset of the pandemic, resulted in public health and government officials ushering in a range of mitigation policies with the most restrictive being stay-at-home or lockdown orders in order to reduce cases and deaths (Piquero and Kurland 2021), which resulted in the closing of most businesses (except for grocery stores and gas stations), alterations to the mode of education instruction to an online platform, and cessation of most of the travel industry.

Not unsurprisingly, medical scholars have engaged in over a year’s worth of research trying to understand the many health-related facets and outcomes of the virus, from spread, to treatment, to the development of vaccinations (as cataloged by the World Health Organization, see https://clinicaltrials.gov/ct2/who_table, accessed June 30, 2021). Concurrently, social scientists have explored how people have been dealing with the virus and associated lockdowns. Some of this early research showed increases in stress, anxiety, and depression (Ettman et al. 2020; Salari et al. 2020), certain types of criminal activities such as domestic violence (Piquero et al. 2021), aggravated assault and homicide (Rosenfeld, Abt, and Lopez 2021), alcohol use (Pollard, Tucker, and Green 2020), and even reports of a large number of excess deaths that were indirectly tied to COVID-19 but not a direct result of the virus itself (Woolf et al. 2020). In short, and unsurprisingly, the virus and some policy efforts have had a wide range of adverse effects on people and society more generally.
Is it possible, however, that there may have been some potential ‘positive’ outcomes that may have been related to some policies? Early research indicated that because fewer people were driving there were, in turn, fewer traffic crashes (Saladie, Bustamante, and Gutiérrez 2020; Shilling and Waetjen 2020), while others reported large decreases in crashes involving injury, distracted drivers, and ambulances (see Barnes et al. 2020).1 These findings are not entirely surprising as many businesses pivoted to work-from-home operations as a result of the forced lockdown orders keeping many people off the roadways. What remains unclear is whether these early reductions in automobile crashes was sustained – especially with respect to crashes involving alcohol, as liquor sales reportedly increased, especially with the reopening of restaurants and bars during the latter half of 2020 and into early 2021.

Accordingly, this paper uses data from Miami-Dade County, Florida, with a population of over 2.7 million residents, to examine changes in alcohol-related crashes and driving under the influence arrests from January 2016 through March 2021 in order to examine how the pandemic lockdown and the subsequent reopening potentially changed the course of this persistent pernicious infliction. According to the National Highway Traffic Safety Administration, in 2019 alone there were over 10,000 drinking-related deaths in the United States (“Drunk Driving | NHTSA,” n.d.).

Methods
Weekly, alcohol-induced motor-vehicle crash counts as well as driving under the influence arrest data for Miami-Dade County from January 2016 through March 2021 were utilized for a Regression Discontinuity in Time (RDiT) model. Interrupted time series (ITS) approaches, such as RDiT, are considered to be the strongest quasi-experimental design for evaluating the longitudinal effects of interventions, which in this case was the lockdown and associated stringencies (Cook and Campbell 1979). This approach allows us to assess, in statistical terms, how the lockdown changed both alcohol-induced motor-vehicle crashes and driving under the influence arrests, immediately and over time, and whether factors other than the intervention could explain the change (Wagner et al. 2002).

To implement the RDiT model, the entire time series was first split into the pre-lockdown period, all weeks up and including the week of March 22, 2020 (168 weeks), and the after lockdown period that began the week of March 29, 2020 and lasted until the week of March 28, 2021 (53 weeks). The start of this latter period was selected because it was the first full week after the executive emergency order issued by the Miami-Dade County Mayor (on March 19) and Florida Governor (on March 30) in which all parks, beaches, recreational facilities, and all non-essential retail and commercial establishments were closed. After segmentation, each respective series for both the crash and arrest data was deseasonalized using Seasonal Decomposition and Trend using Loess, a procedure critical to the successful implementation of the RDiT (Cleveland et al. 1990; Svoronos 2016). Additional harmonic components, fixed effects (i.e., week of the year, month, and year), as well as weekly temperature and precipitation data from the National Oceanic and Atmospheric Administration (NOAA) to control for factors other than the lockdown that might explain some of the associated variance in both alcohol-related vehicular crashes and driving under the influence arrests. A linear model was then created for both segments, and the fitted values from each model were used for the RDiT.2

1 In one assessment, The Economist reported that which lockdowns led to less driving, deaths on the road increased (https://www.economist.com/graphic-detail/2021/04/03/americans-are-driving-less-but-more-are-dying-in-accidents; accessed June 30, 2021).
2 An anonymous reviewer raised some concern over the use of too many observations away from the discontinuity in the RDiT estimation (i.e., data points in 2016 are not really suitable in an RDIT setting where the discontinuity occurred in March 2020). This is a valid observation, had we not adopted an approach that included harmonic components, fixed effects, and a series of meteorological factors to directly control for potential confounders. Of course, no RDIT is perfect, but we do believe that given this, unless there was some policy around driving we were all unaware of, then we remain less concerned about some other effect that we have not considered. Importantly, in the only recent review/simulation study we are aware (see Hausman and Rapson 2018), the findings suggest that our approach is not only in line with others, but that global polynomial approaches, which are very much in line with our own, perform slightly better than local linear approaches that only consider for example the period immediately before and after. Also, it is important to keep in mind we binned the data into weekly counts and so it is not unduly imbalanced. We have roughly three times the number of weeks for the pre-lockdown period to after the lockdown period, which is not uncommon in this area of work (see Davis 2008).
Results

Results from the RDiT of both alcohol-related vehicular crashes and driving under the influence arrest suggest a significant impact immediately at the start of the lockdown period for both related categories, but also for the year following the start of the public health measures implemented in Miami-Dade County, Florida. Figure 1 provides a clear illustration of the difference between the period before and after the lockdown and the fitted values and trends for both series.

As can be seen from Figure 2, there was an immediate reduction in weekly arrests for driving under the influence of alcohol of −26 (−25.62, 95% CI: [−3.39, −0.09]). Similarly, −4 (−4.17, 95% CI: [−2.71, −5.64]) fewer alcohol-induced motor-vehicle crashes occurred in Miami-Dade County. Over the duration of the year since the lockdown a staggering reduction of approximately 810 fewer driving under the influence arrests occurred (−809.75, 95% CI: [−349.09, −1270.48]), while approximately 147 alcohol-related motor-vehicle crashes were averted (−146.26, 95% CI: [−7.16, −285.37]).

Discussion

The novel coronavirus has been a daily feature in the lives of every citizen since the early part of 2020. While many adverse effects associated with the pandemic and its lockdowns have been well documented, one could also attempt to grasp for some potential silver lining(s). Some regard the reduction of carbon emissions generated from the reduced use of trains, planes, and automobiles, as one such silver lining (Le Quéré et al. 2020). As people began to work remotely from home, and for many this continues to be the case, most forms of public travel shut down or became severely constrained, thereby reducing carbon emissions. In this study, we examined the extent to which reductions in alcohol-related motor vehicle crashes and driving under the influence arrest could also potentially qualify as a silver lining.

Using data from Miami-Dade County, Florida, we conducted a regression discontinuity design model and found that the impact of the March 2020 lockdown was associated with an immediate reduction in both alcohol-related crashes and driving under the influence arrests and over the course of the entire lockdown an estimated reduction of over 800 arrests and 125 crashes in the county. The many crashes, hospitalizations, and deaths that were potentially saved as a result of the lockdown reducing overall automobile travel in the county certainly helped to keep some people safe, some families intact, and some innocent drivers from being injured. Of course, this is not meant to discount the fact that preventing road collisions represents a significant component of police work (see, e.g., Bates, Soole, and Watson 2012; Prenzler, Manning, and Bates 2015).

This is an altogether more important finding when situated within the broader context of public health outcomes for this past year given the fact that historically alcohol-related motor vehicle crashes represent approximately 35% of the total number of crashes that occur in the United States (Taylor, Miller, and Cox 2002). Further, and importantly, because of the hundreds of billions of dollars borne on the public in the form of monetary costs and quality of life losses a net reduction in alcohol-related crashes (Blincoe et al. 2015), which are both deadlier and more serious than other crashes (cf. Connelly and Supangan 2006), additional effort should be made to estimate the extent to which such a reduction was found across different cities and counties across the nation.3

Whether these ‘averted deaths’ will continue to increase, of course, remains an open question. In fact, some evidence has emerged, nationally, that while people were driving much less (in terms of vehicle miles traveled during the initial lockdowns), the fatality rates were higher in 2020 compared to 2019 (National Center for Statistics and Analysis 2021). Moreover, there is other research to suggest

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3Developing a true estimate of the costs of DUI (and related crashes and fatalities) is difficult given the various types of tangible and intangible costs (wage and productivity losses, health care costs, justice-related costs, motor vehicle damages, employer’s uninsured costs, etc.) are not routine available. Nevertheless, one of the most authoritative analyses on this issue indicates that alcohol-involved crashes cost an estimated $125 billion (Zaloshnja, Miller, and Blincoe 2013). Costs of traffic crash deaths from Florida are available for 2018, and this estimate amounted to $4.4 billion in total costs ($46 million in medical costs + $4.35 Billion in work loss costs) (https://www.cdc.gov/transportationsafety/pdf/statecosts/2020/CDC-Cost-of-Crash-Deaths-Fact-Sheets_Florida.pdf; accessed September 10, 2021).
that those individuals who decided to drive during the lockdown were driving at much higher speeds than before (Business Insider, 2020), and data from a small sample of level 1 trauma centers and medical examiners indicated that drug prevalence (especially for alcohol, cannabinoids (active THC), and opioids) were especially higher among seriously and fatally injured roadway users between March and July 2020 as lockdown orders were instituted and slowly scaled back (Thomas et al. 2020).

To be sure, we are mindful against drawing any long-term implications in an RDiT framework, especially because such results are very specific to what is happening around the discontinuity. As we move forward in time (and away from the discontinuity), it becomes more challenging to make stronger inferences because the “treatment” and “control groups” becoming increasingly less comparable. Nevertheless, while our results are constrained to one large county in the United States and do not include data from adjacent counties nor data from other forms of transportation (such as bicycle crashes), it still represents an important ‘win’ for public health amid a year-long battle with the world’s deadliest virus.
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Disclosure statement

No potential conflict of interest was reported by the author(s).

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