

# Crime and Gender Segregation: Evidence from the Bogota “Pico y Genero” Lockdown

Brian Knight, Maria Mercedes Ponce de Leon, and Ana Tribin

## Abstract

The city of Bogota implemented a lockdown during the pandemic under which only men were allowed out on odd days and only women were allowed out on even days. Crime rates in Bogota increased, relative to a synthetic Bogota and relative to the pre-period, during this gender-based lockdown. Moreover, this increase is driven by more crime on men-only days and, more specifically, more robberies with male victims on men-only days. There is no evidence that higher crime rates on men-only days are offset by lower crime rates on women-only days. In fact, there is evidence of some increases in crimes with female victims on women-only days. In particular, there was an increase in robberies involving female victims on women-only days during the second half of the lockdown, when some restrictions were eased and more men, and thus more potential perpetrators, were on the streets. Overall, the gender-based lockdown, if anything, increased crime.

JEL classification: I18, J12, K14

Keywords: COVID-19, gender, lockdown, crime, Colombia

## 1. Introduction

This research is motivated by the fact that men are generally more prone to crime than women. That is, men commit significantly more offenses compared to women, and they are also the majority of victims for most crimes, with the exception of domestic and sexual violence (Smith 2014; Steffensmeier et al. 2005; Buzawa, Buzawa, and Stark 2015). This paper analyzes crime through this gender-focused lens via an examination of crime patterns in the city of Bogota, Colombia during the gender-based COVID lockdown in the spring of 2020. Under the policy, coined *Pico y Genero* (peak and gender), only men were allowed to leave their homes on odd-numbered days, while women were permitted to do so on even-numbered days. Using incident-level crime data and comparing Bogota to other large municipalities in Colombia via synthetic control methods, this study investigates overall crime rates during this period and crime rates on men-only days, relative to women-only days. In this way, this experiment examines whether the gender-

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based lockdown increases or decreases crime by analyzing differences between women-only days and men-only days, differences between crimes involving male victims and crimes involving female victims, and differences across types of crimes.

The paper begins by documenting that the gender-based lockdown mattered, in the sense that there is evidence consistent with more females outside their homes on women-only days and more males outside on men-only days. Building upon this, the study then investigates patterns of crime on men-only days versus women-only days. The key finding is that crime rates are much higher on men-only days in Bogota, relative to the time period without a gender-based lockdown and relative to a synthetic Bogota comprised of municipalities that did not experience a gender-based lockdown. Moreover, this increase is not offset by a reduction in crimes on women-only days, meaning that crime tended to be higher overall as a result of the gender-based lockdown. The increase in crime on men-only days is driven by an increase in crimes with male victims. Also, there is no evidence of a reduction in crimes against females resulting from this gender-based lockdown; if anything, crimes with female victims tend to increase during the policy. Investigating the types of crimes, the findings reveal increases in robberies with male victims on men-only days and in robberies with female victims on women-only days.

Two potential limitations of this analysis are then acknowledged and addressed. First, it is difficult to separate the role of gender segregation associated with this lockdown from the lower overall mobility on women-only days, relative to men-only days. Second, the analysis is based upon reported crimes, which may differ from actual crimes due to differences in reporting by victims and differences in policing patterns.

The paper proceeds as follows. First, the relevant literature is reviewed, followed by a more detailed overview of the setting. The empirical approach and data are then described. After presenting the empirical results, potential limitations of the analysis are discussed. The final section concludes.

## 2. Related Literature

This paper comes at the intersection of two literatures, one on crime and gender and another on crime and COVID lockdowns. On the latter, recent literature finds that crime rates generally decreased as a result of lockdowns (see [Abrams 2021](#); [Boman and Gallupe 2020](#); [Estevez-Soto 2021](#)) Other studies have shown that quarantine led to a reduction in crimes that are committed on the street ([Ashby 2020](#); [Campedelli, Aziani, and Favarin 2020](#); [Mohler et al. 2020](#); [Payne, Morgan, and Piquero 2022](#); [Cheung and Gunby 2022](#)) but an increase in those that occur within the home, such as domestic violence.<sup>1</sup> The link between the increase in domestic violence and subsequent arrests has not been clear. [Miller, Segal, and Spencer \(2020\)](#), using data from Los Angeles, find that, while domestic violence calls for service increased after the city first went into lockdown, arrests for this crime decreased during that same time. [Bullinger, Carr, and Packham \(2020\)](#) find similar results for Illinois, where, even with domestic violence calls on the increase following the stay-at-home order, reported crimes and arrests for this particular crime fell considerably. During the pandemic, the police force had to take on new responsibilities to ensure public safety while working with limited resources. These papers highlight some possible unintended consequences of policing priorities having to shift in order to enforce the new COVID-related measures. This paper builds on them by both contributing to the understanding of how lockdowns can affect crime, while also studying a new dimension involving gender-based lockdowns.

Concerning the link between gender and crime, the literature has documented a gender gap in crime, by which men commit more crimes than women ([Steffensmeier and Allan 1996](#)). More recently, researchers

1 On domestic violence, see [Agüero \(2020\)](#) for Peru, [Perez-Vincent et al. \(2020\)](#) for Argentina, [Leslie and Wilson \(2020\)](#) and [Chalfin, Danagoulian and Deza \(2021\)](#) for the United States, [Ravindran and Shah \(2023\)](#) for India, and [Mohler et al. \(2020\)](#) for Los Angeles and Indianapolis.

have studied the evolution of this gender gap. [Lauritsen, Heimer, and Lynch \(2009\)](#) document that the gap for aggravated assault, robbery, and simple assault has narrowed as a result of male crime rates decreasing more quickly than female crime rates. [De Coster and Cornell \(2010\)](#), using survey data from the United States, provide evidence that depression seemed to exacerbate the effect of anger over committing a crime, but for males only. Using data from Colombia, [Khanna et al. \(2021\)](#) find that the probability of getting arrested increases after mass layoffs but only for men. [Chetty et al. \(2016\)](#) document that boys growing up in high-crime neighborhoods tend to work less than girls growing up in comparable neighborhoods. [Couttenier et al. \(2019\)](#) show that male adult asylum seekers exposed to civil conflict during childhood have a higher probability of committing violent crimes, while this effect is absent for women. [Damm and Dustmann \(2014\)](#) provide evidence that early exposure to neighborhood crime increases the probability of subsequent criminal convictions for males but not for females. This paper contributes to this literature by studying the gender gap in crime during a gender-based lockdown, with men allowed out on some days and women out on others. This setting offers a unique perspective through which to study the relationship between gender, segregation by gender, and patterns of crime.

More generally, this paper relates to a literature on mobility restrictions by gender in developing countries. As argued in [Jayachandran \(2021\)](#), mobility restrictions, whether due to fear of insecurity or due to social norms, have implications for human capital accumulation ([Jacoby and Mansuri 2015](#); [Cheema et al. 2020](#); [Borker 2018](#)), professional advancement ([Field, Jayachandran, and Pande 2010, 2016](#)), and labor-force participation ([Chakraborty et al. 2018](#)). This paper explores the effects of mobility restrictions by gender on another outcome, crime, and documents that mobility restrictions can increase, rather than decrease, crime. Given this, mobility restrictions by gender can potentially reinforce stereotypes as they increase insecurity for women, further limiting their economic opportunities and increasing the link between masculinity and violence.

### 3. Background

The coronavirus outbreak officially started in Colombia on March 6, 2020, when the first case of COVID-19 was diagnosed in Bogota, the capital city. In the span of several days, between March 12 and March 17, all public events were banned, airports and all transportation stations were closed until further notice, and the president of Colombia declared a national state of emergency. Bogota's mayor then implemented a voluntary lockdown from March 20 to March 23. This initiative was followed by the president issuing a national shelter-in-place order on March 24. While this was initially in place until April 13, it was subsequently extended but with a re-opening of the manufacturing and construction sectors starting on April 27. This was followed by a further loosening of restrictions on May 11, when even more areas of commerce started to operate.

In Bogota specifically, the city was under lockdown from March 20 to April 13. Starting on April 13, there was an extension of the quarantine, but Bogota also implemented a gender-based restriction on mobility called “pico y genero.”<sup>2</sup> Under this policy, women could go outside for critical needs (i.e. banking, grocery shopping, medical appointments) on even-numbered calendar days, while men were permitted to go outside on odd-numbered calendar days. The objective of the gender-based restriction was to reduce mobility and to thus reduce the spread of COVID-19. Anyone caught breaking the rule was subject to a fine of USD 240, roughly the minimum monthly salary in Colombia. Violators must pay half the fine within five days or face an appearance in court.

There were exemptions from the gender-based lockdown for people working in critical industries, such as food service and health care. Given these exemptions, the policy did not lead to complete gender

2 The measure was inspired by the Colombian capital “pico y placa” program, a policy designed to reduce traffic congestion.

segregation, with some women allowed out on men-only days and, likewise, some men allowed out on women-only days, all for work-related purposes. Importantly, females were thus still potentially threatened by male perpetrators on women-only days.

On April 27, as noted above, the president mandated a loosening of restrictions to restart some economic activity. The construction sector, which is highly male, was re-opened. Thus, adding to the original exemptions, there were even more males out on women-only days during the second half of *pico y genero*, relative to women-only days during the first two weeks of *pico y genero*. Family courts also re-opened, allowing victims of domestic violence to report crimes. On May 11, even more sectors were allowed to re-open and, on the same day, the mayor of Bogota ended the *pico y genero* policy, noting that it was now impossible to enforce gender-based mobility.

During this period, and following the guidance of the central government, almost all city-level mobility restrictions outside Bogota were based on national identity card numbers.<sup>3</sup> To the best of our knowledge, the only other city to implement a gender-based system was Cartagena. However, the Cartagena restriction was also based upon identity card numbers and only covered the time period from 6 a.m. to 4 p.m.<sup>4</sup>

To summarize, on March 20, the country moved to voluntary quarantine followed by mandatory national quarantine on March 23. The city of Bogota started the gender-based lockdown policy on April 13, and some sectors, such as construction, began re-opening on April 27. Finally, Bogota ended *pico y genero* on May 11.

#### 4. Data

The crime data are based upon administrative incident-level records from the National Police of Colombia.<sup>5</sup> For the purposes of this analysis, information on the city in which the crime occurred, the exact date on which the crime occurred, and the gender of the victim is utilized. Initially, these data are collapsed to the city-date level. Then, measures of per capita daily crimes, based upon population estimates from the National Administrative Department of Statistics (DANE) as of 2020 are created.<sup>6</sup> Logs were taken of this per capita crime measure as the key outcome.<sup>7</sup> Thus, all of the results should be interpreted in terms of percentage changes.

In terms of constructing the sample period, the *pico y genero* policy lasted 28 days, with the first day on April 13 and the last day on May 10. Thus, there are 14 women-only days and 14 men-only days. As a comparison period, the focus is directed towards the three weeks before the policy, from March 23 until April 12, and the three weeks after the policy, from May 11 until May 31. Thus, in total, the sample period consists of 70 days.

Mobility data from Google are utilized to investigate whether *pico y genero* mattered. In terms of geography, these data on mobility in Colombia are available at the department level, which is more aggregated than cities, but also for the city of Bogota specifically. These data also provide information on mobility day by day and separately for six place categories: grocery and pharmacy, parks, transit stations, retail and recreation, residential, and workplaces. Mobility measures are constructed with respect to a baseline, defined by Google as the median value for each specific day of the week during the pre-lockdown period, covering January 3, 2020 until February 6, 2020.

3 See [https://colombia.as.com/colombia/2020/04/02/actualidad/1585784591\\_367487.html](https://colombia.as.com/colombia/2020/04/02/actualidad/1585784591_367487.html) and <https://www.portafolio.co/economia/las-restricciones-que-rigen-desde-hoy-por-el-nuevo-pico-de-la-pandemia-550634>.

4 See <https://www.eltiempo.com/colombia/otras-ciudades/pico-y-cedula-pico-y-genero-conozca-la-restriccion-en-cada-ciudad-de-colombia-484516>.

5 These data were provided through a right of petition.

6 Given some zeros in these data, a 1 was added to all daily crime counts.

7 A per capita measure was used for comparability with other municipalities, given that Bogota is the largest city in Colombia. However, the paper includes population as one of the covariates when creating the synthetic control group.

## 5. Hypotheses and Methods

This paper examines the effects of *pico y genero* on total crimes, crimes with female victims, crimes with male victims, and types of crimes. Hypotheses are motivated by the fact that crimes are disproportionately committed by men. However, as will be demonstrated below and across all types of crimes, roughly one-half of victims are female in Bogota, and roughly one-half are male. Given this, crimes with male victims should increase on men-only days. This hypothesis is driven by the fact that there are both more potential offenders and more potential male victims on these days. In terms of crimes with female victims, predictions are less clear. On men-only days, there are more potential perpetrators but fewer potential female victims. Thus, crimes with female victims could either increase or decrease on men-only days. Likewise, on women-only days, there are fewer potential perpetrators but more potential female victims, leading again to an ambiguous prediction. An additional complicating factor is that females out on women-only days might be more susceptible to crimes by male strangers, since they cannot have male companions. This lack of male companions could increase crimes against females on women-only days. In terms of overall crimes, when considering both male and female victims, it is hypothesized that crime rates should be higher on men-only days since the number of potential victims is similar but there are more potential perpetrators. Conversely, for women-only days, a clear prediction is elusive. While there are fewer potential perpetrators, females who are outside might be more susceptible to crime for the reasons described above.

A synthetic control analysis is implemented to investigate these hypotheses. This approach is based on the idea that a combination of control units (in this case municipalities) would provide a better counterfactual than any one unaffected unit alone. Thus, a synthetic control group is created as a weighted average of control units in a donor pool of other Colombian municipalities. The weight that each municipality in the donor pool is assigned is chosen so as to match as closely as possible averages of the pre-intervention outcomes and covariates of the treated units. Since this process is data-driven, the *synthetic control* satisfies, by construction, the parallel trends assumption.

As outlined in [Abadie \(2021\)](#), the risk of bias due to over-fitting that can arise with this methodology can be exacerbated if a large number of control units are considered in the donor pool. Given this, the donor pool should be chosen with care and units that are considered to be very different to the treatment unit should be excluded. Following this recommendation, and given that Bogota is the municipality with the largest population in the country, the donor pool is restricted to be comprised of only municipalities in Colombia with a population exceeding 200,000 as of 2020 (based upon estimates from the National Administrative Department of Statistics (DANE)). This resulted in a final donor pool comprised of the largest 29 municipalities in terms of population, which is considered to be the most comparable to Bogota.

Data on the covariates used for the calculations of the weights of each donor pool were taken mainly from the observatorio municipal, a panel data set published by the Universidad de los Andes, and from the Departamento Nacional de Planeacion. The observatorio municipal provided information on a rural index, total public expenditure of the municipality over total public income, and a sanitation index, all measured as of 2016. The rural index ranges from 0 to 100 and measures the percentage of the total population in the municipality living in rural areas. The sanitation index also ranges from 0 to 100 and measures the proportion of the municipality that is covered by the public service of municipal waste collection, tree pruning, and grass cutting. Distance from the municipality to the department's capital city, the unsatisfied basic needs index as measured in 2011, and the child mortality index from 2013 are also included, which all came from Departamento Nacional de Planeacion, and night lights from the municipality in the year 2013, which captures the level of economic activity and came from NOAA's National Geophysical Data Center Earth Observation Group. As further controls, population and two averages of the pre-intervention log crime rate per capita are included, one for the pre-intervention odd

days and another for the pre-intervention even days. The choice is made to use average pre-intervention crime rates as opposed to using the crime rate in each one of the pre-intervention days. As shown in [Kaul et al. \(2015\)](#), using each lagged value as an outcome renders all other possible covariates irrelevant in the calculation of the weights.

The  $p$ -values were calculated based on the permutation distribution of the ratio between the pre-intervention root-mean squared percentage error (RMSPE) and the RMSPE of the intervention period; this approach follows [Abadie, Diamond, and Hainmueller \(2010\)](#) and accounts for the quality of the pre-intervention fit. Note that, given that pre-intervention (i.e. lagged) outcomes are included when choosing control units, the composition of synthetic Bogota municipalities may differ slightly across different outcomes, such as crimes involving male victims and crimes involving female victims.

## 6. Did the Lockdown Matter?

Before investigating the effects of the lockdown on patterns of crime, the effects of the lockdown on mobility and gender segregation are investigated. Despite the absence of formal data on mobility by gender during *pico y genero*, three pieces of evidence are presented that are consistent with either enforcement of *pico y genero* or changes in gender-based mobility on men-only days versus women-only days.

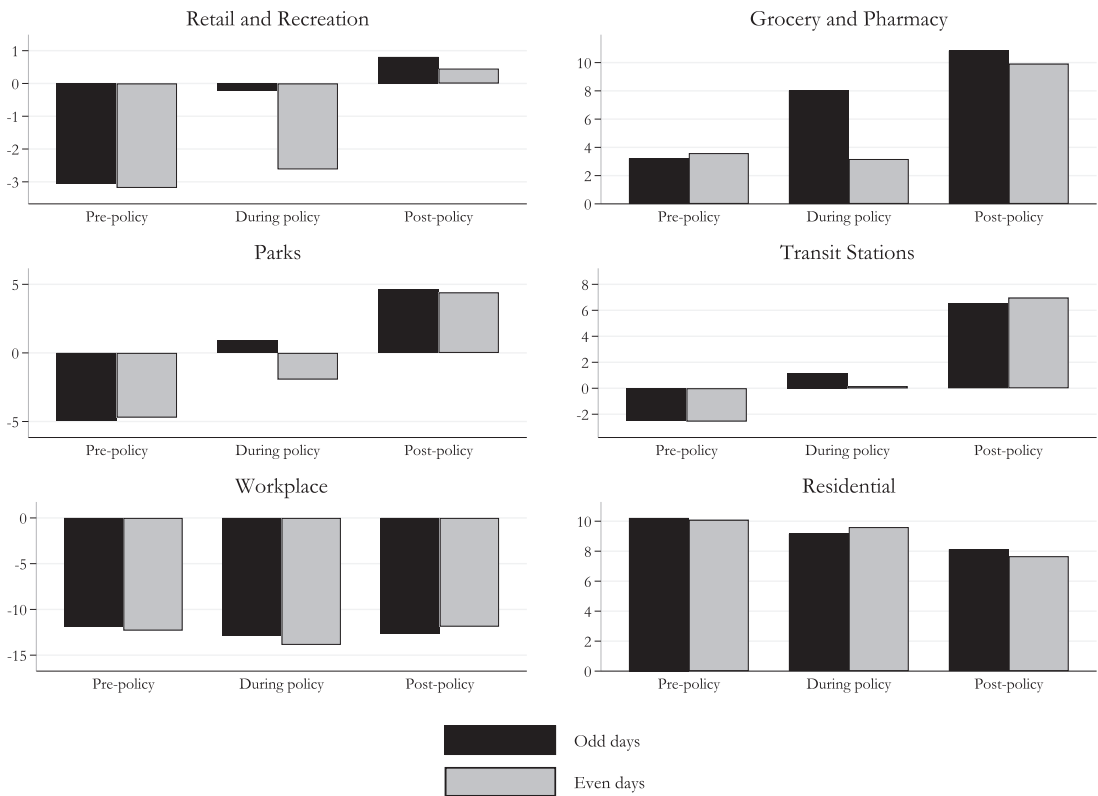
First, according to anecdotal evidence, the measure was heavily enforced. In particular, during the first two days of *pico y genero*, police sanctioned 104 women and 610 men in Bogota for violating the gender-based mobility guidelines.<sup>8</sup> Moreover, as mentioned above, the fine of USD 240 was significant, representing the minimum monthly salary in Colombia at present. Thus, there were strong incentives to follow the gender-based lockdown policy.

Second, the mobility data are used to investigate whether the results are consistent with those in [Wolskie and Wenham \(2021\)](#), who study a similar policy in Panama and show that overall mobility was lower on women-only days. That is, an investigation is conducted to determine whether overall mobility in Bogota was lower on women-only days. To accomplish this, Google mobility data is used to compute mobility in Bogota relative to the rest of Colombia.<sup>9</sup> The 70 days in the sample period are aggregated into six categories: odd days pre-policy, even days pre-policy, men-only days (odd) during *pico y genero*, women-only days (even) during *pico y genero*, odd days after the policy, and even days after the policy. As shown in [fig. 1](#), consistent with [Wolskie and Wenham \(2021\)](#), mobility was indeed significantly lower on women-only days, relative to men-only days, during *pico y genero*, relative to the rest of Colombia for three mobility categories: retail and recreation, parks, and grocery and pharmacy. No such differences are found between even days and odd days before the *pico y genero* period started or between even days and odd days after the *pico y genero* policy ended. Lower mobility on women-only days during *pico y genero* is also identified for workplace and transit. These differences are smaller, however, presumably due to exemptions for certain sectors and the lesser degree of discretion associated with employment-related mobility. Finally, an increase in the number of people staying at home, as reflected in the residential category, is observed on women-only days relative to men-only days during *pico y genero*, relative to the rest of Colombia. These differences are also small, however, presumably reflecting the significant amount of time spent at home at baseline. To conclude, mobility was lower on women-only days, relative to men-only days. Although formal evidence on the mechanism is lacking, females may have been hesitant to go

<sup>8</sup> See <https://www.nytimes.com/2020/04/15/world/americas/virus-colombia-bogota-men-women.html>.

<sup>9</sup> These data are available at the department level, with the exception of Bogota, with municipal-level measures available in this one case.

**Figure 1.** Mobility in Bogota versus the Rest of Colombia



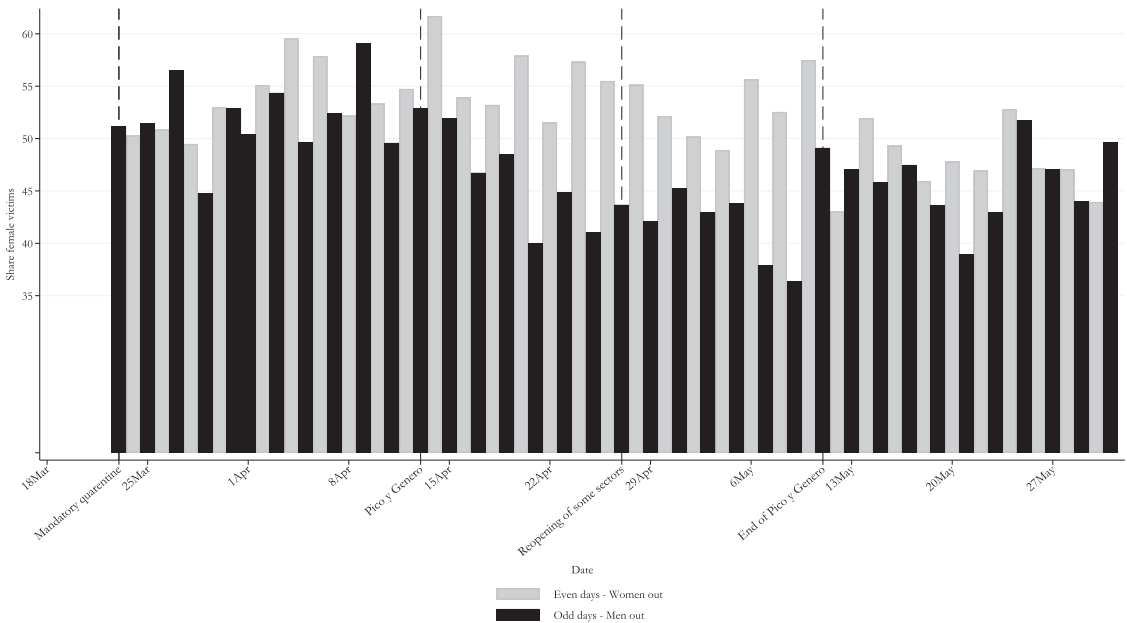
Source: Authors' own calculations based on Google mobility data.

Note: This figure shows the difference in mobility between Bogota and the rest of Colombia. Pre-policy period refers to the days between March 23 and April 12, policy period refers to the days between April 13 and May 10 (when the gendered lockdown was in place in Bogota), and post-policy period refers to the days between May 11 and May 31. Dark grey bars denote the difference in mobility on odd days—i.e. days on which, during the policy period, only men were allowed to go out—while light grey bars indicate the difference on even days—i.e. days on which, during the policy period, only women were allowed to go out.

out alone in Bogota, a high-crime city, and especially so during the lockdown policy, when the streets were relatively deserted.<sup>10</sup>

Third, the data on crime reports, which include information on the gender of the victim, are used to compute the share of female victims in Bogota on each day during the lockdown period. As shown in fig. 2, and as expected, there were no significant differences between odd days and even days prior to *pico y genero* in terms of the fraction of female victims, which averages around one-half. Likewise, after the end of *pico y genero*, there are no obvious differences between odd days and even days in terms of the fraction of female victims. During the *pico y genero* period, however, the fraction of female victims spiked on women-only days, averaging 54.5 percent, while this fraction dropped significantly on men-only days, averaging 44.1 percent. Outside the *pico y genero* period, the share of female victims was similar across odd days and even days, averaging 50.6 percent on even days and 49.1 percent on odd days. Thus, the fraction of females victimized on women-only days was roughly 10 percentage points higher, representing a 20 percent increase, than the corresponding fraction on men-only

10 Consistent with this idea, 40.8 percent of women in Colombia reported in a survey conducted during the pandemic (July 2020) that they never go out alone at night, versus a lower fraction (28.4 percent) of men. See <https://www.dane.gov.co/files/investigaciones/boletines/pulso-social/presentacion-pulso-social-julio-2020.pdf>.

**Figure 2.** Share of Female Victims in Bogota

Source: Authors' own calculations based on data from the National Police of Colombia from the year 2020.

Note: This figure shows the share of victims in Bogota who were female between March 23 to May 31. Dark grey bars correspond to odd days—i.e. days on which, during the policy period, only men were allowed to go out—while light grey bars indicate even days—i.e. days on which, during the policy period, only women were allowed to go out.

days, and there is no evidence of differences between odd days and even days outside the pico y genero policy.

## 7. Crime Results

Having established that the lockdown mattered for gender mobility, the next step is to investigate whether or not this gender-based lockdown increased crime incidents, whether crime was higher on men-only days, how the distribution of the gender of the victims shifts, and how the results vary across different types of crimes. Figure S1.1 begins by reporting the total number of crimes by day in Bogota during the three weeks leading up to this gender-based lockdown, the four weeks of pico y genero, and the three weeks after the policy ended. As shown, crime incidents were relatively low during the period prior to the gender-based lockdown, and there were no significant differences between odd days and even days. Starting on April 13, by contrast, there is a large spike in crime incidents, and this is clearly driven by increases on men-only odd days. When some sectors re-opened on April 27, the differences between men-only days and women-only days remain but the sizes of these differences shrink, presumably reflecting the fact that many males were out on women-only days due to employment-related mobility. Overall, crime incidents rose during the pico y genero period relative to the period prior to the pico period. Following the end of this gender-based lockdown, crime rates were flat for the subsequent three weeks and, again, there are no obvious differences between men-only odd days and women-only even days.

To formally investigate these patterns, the results from the synthetic control analysis are examined next. Consistent with the results in fig. S1.1, table 1 documents that, during the policy, crime in Bogota was higher on men-only days relative to odd days both before and after the gender-based lockdown



**Table 1.** Results for Crime in Bogota

	Policy period		Post-policy period	
	Estimate	<i>p</i> -value	Estimate	<i>p</i> -value
<b>Panel A: Total crime</b>				
Odd (men only) days	0.3087**	0.03	0.3256**	0.03
Even (women only) days	0.1128	0.21	0.3319**	0.03
<b>Panel B: Total crime—female victims</b>				
Odd (men only) days	0.0609	0.79	0.1434	0.66
Even (women only) days	0.0603	0.97	0.1656	0.72
<b>Panel C: Total crime—male victims</b>				
Odd (men only) days	0.4220**	0.03	0.3261**	0.03
Even (women only) days	0.0871	0.34	0.3209*	0.07

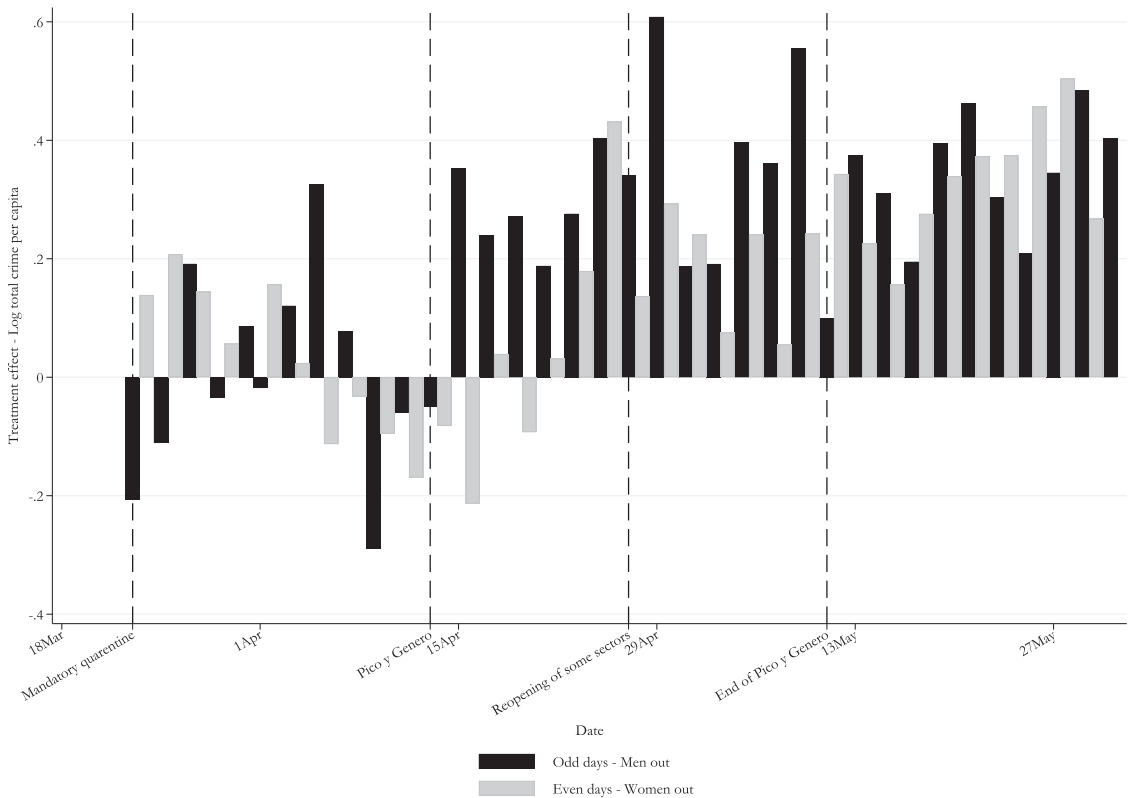
*Source:* Authors' own calculations based on data from the National Police of Colombia from the year 2020 and the National Administrative Department of Statistics (DANE).

*Note:* Panel A reports the difference in the logarithm of per capita total crime between the real Bogota and the synthetic Bogota, while panels B and C report the difference in the logarithm of per capita crime involving female victims and male victims respectively. "Policy period" refers to the days between April 13 and May 10, when the gendered lockdown was in place in Bogota. "Post-policy period" refers to the days between May 11 and May 31. The *p*-values were generated based on the permutation distribution of  $RMSPE^{post}/RMSPE^{pre}$ . The pre-RMSPE is the root-mean squared percentage error of the pre-policy period for the *p*-values of the policy period and the post-policy period. The post-RMSPE consists of the root-mean squared percentage error of the policy period and the only post-policy period respectively. \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

policy.<sup>11</sup> In particular, crime incidents increased by 31 percent on these men-only days, relative to the period prior to pico, and this difference is statistically significant at conventional levels, with a *p*-value of 3 percent. As shown in the second row, there is no evidence that this higher crime on men-only days was offset by lower crime on women-only days, as crime is actually 11 percent higher, a difference that is not statistically different from zero.<sup>12</sup> Crime is also higher overall during the post-pico period, relative to the pre-pico period, a result that is consistent with crime being artificially low in Bogota during the early days of the lockdown. But, importantly, there is no evidence of differences in crime between odd days and even days during this post-pico period, when gender-based mobility restrictions had been lifted.

To investigate the timing of these patterns more systematically, [fig. 3](#) compares log crime rates in Bogota to those in synthetic Bogota on a day-by-day basis. As shown, crime tends to be depressed in Bogota, relative to synthetic Bogota, prior to pico. Importantly, however, there are no differences between odd days and even days prior to pico and also no evidence of pre-trends during the time period leading up to pico. With the introduction of pico, crime spikes in Bogota, relative to synthetic Bogota, on men-only days, relative to women-only days. These differences between men-only days and women-only days are more pronounced during the first half of the policy relative to the second half, when re-opening of some sectors led to more men out on women-only days. Following the end of pico, there are no such patterns on odd days, relative to even days.<sup>13</sup>

- 11 Results in panel A were calculated using a synthetic control that placed a weight of 0.751 on Medellin and 0.249 on Barranquilla, the second and fourth largest municipalities in Colombia. While the synthetic control results in panels B and C were based upon the same municipalities, the weight placed on Medellin was slightly higher (almost 0.79).
- 12 As shown in [table S1.2](#), these results are robust to dropping all covariates that were measured in earlier periods (2011 and 2013) from the calculation of the weights for synthetic Bogota; these include unsatisfied basic needs, child mortality, and night lights.
- 13 Likewise, [fig. S1.3](#) reports the log of per capita crime in Bogota, relative to synthetic Bogota, as represented by the line. Patterns are similar here, with spikes in crime on men-only days during the pico period, relative to women-only days, and no such differences during the post-pico period.

**Figure 3.** Treatment Effect—Log Crime per Capita in Bogota

Source: Authors' own calculations based on data from the National Police of Colombia from the year 2020 and the National Administrative Department of Statistics (DANE).

Note: This figure depicts the difference in the logarithm of total crime per capita between the synthetic Bogota and the real Bogota. The dashed line labeled "Pico y Genero" corresponds to the day the gendered lockdown started. Dark grey bars correspond to odd days—i.e. days on which, during the policy period, only men were allowed to go out—while light grey bars indicate even days—i.e. days on which, during the policy period, only women were allowed to go out.

Next, crime patterns are investigated according to the gender of the victim. As shown in panel C of table 1, the increase in overall crimes on men-only days documented in panel A is driven by male victims, as hypothesized above. In particular, crimes involving male victims increase by 42 percent on men-only days, a result that is statistically significant at conventional levels. While crimes involving male victims are also higher during the post-pico period, relative to the pre-pico period, there is no difference between odd days and even days after the gender-based restrictions had been lifted. Finally, as shown in panel B, there are no clear patterns for crimes involving female victims, which tend to go up by 6 percent on both men-only and women-only days, although neither of these increases is statistically significant at conventional levels. As noted above, there are opposing forces when studying crimes involving female victims, as crime could increase on women-only days, due to more potential female victims, or on men-only days, due to more potential male offenders. Results are similar during the post-pico period, with small increases in crimes involving female victims, although these patterns are again statistically insignificant.

Moving forward, an investigation is conducted to determine which types of crimes are driving the increase in crimes with male victims on men-only days, breaking crimes into the following categories:

**Table 2.** Results for Crime by Category and Gender of the Victim

	Policy period Male victims		Policy period Female victims	
	Estimate	<i>p</i> -value	Estimate	<i>p</i> -value
<b>Robberies—Person, store, or house</b>				
Odd (men only) days	0.6743**	0.03	0.2361	0.55
Even (women only) days	0.1138	0.58	0.4366**	0.03
<b>Intra-family violence</b>				
Odd (men only) days	0.0965	0.93	0.1146	0.97
Even (women only) days	0.1999	0.72	−0.0032	0.90
<b>Sexual crimes</b>				
Odd (men only) days	−0.7907	0.31	−0.2103	0.48
Even (women only) days	−0.4717	0.83	0.1274	0.28
<b>Homicide or injuries</b>				
Odd (men only) days	0.1198	0.97	0.2318	0.79
Even (women only) days	0.1200	0.97	0.1620	0.93
<b>Threats</b>				
Odd (men only) days	0.5804	0.76	0.2425	0.41
Even (women only) days	0.2033	0.83	0.2916	0.69

*Source:* Authors' own calculations based on data from the National Police of Colombia from the year 2020 and the National Administrative Department of Statistics (DANE).

*Note:* This table shows the difference in the logarithm of crime per capita between the real Bogota and the synthetic Bogota for different categories of crime. "Policy period" refers to the days between April 13 and May 10, when the gendered lockdown was in place in Bogota. The *p*-values were generated based on the permutation distribution of  $RMSPE^{post}/RMSPE^{pre}$ . The pre-RMSPE is the root-mean squared percentage error of the pre-policy period for the *p*-values of the policy period and the post-policy period. The post-RMSPE consists of the root-mean squared percentage error of the policy period and the only post-policy period respectively.  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

robberies, intra-family violence, sexual crimes, injuries or homicides, and threats.<sup>14</sup> As shown in the first column of table 2, the increase in crimes with male victims is driven by robberies committed on men-only days. This is a large increase, with 67 percent more of these crimes committed on men-only days during the pico period, relative to the period prior to pico. As noted above, these types of crimes tend to be committed by males, and these findings thus suggest that a men-only environment might lead to more aggression and more crimes involving both male victims and male perpetrators, with a less secure environment overall.

In terms of female victims, the findings suggest an increase in robberies on female-only days. In particular, and as shown in table 2, this is also a large increase, with 44 percent more of these crimes committed on women-only days, relative to the period prior to the gender-based pico policy. Thus, more female potential victims on these days led to increased victimization, despite the fact that there are fewer potential male perpetrators on these days.

The next step involves investigating gender-based crimes against females, intra-family violence, and sexual crimes, a key focus of the existing literature, as described above. Regarding female victims of sexual crimes, there is a reduction on men-only days and an increase on women-only days.<sup>15</sup> While these results are not statistically significant, the patterns are consistent with more females being victimized on women-only days, a pattern that could be explained by the lack of male companions. Regarding domestic

14 Robberies include robberies against individuals, store robberies, and house robberies. Injuries and homicides are combined into one measure of violent crime.

15 Regarding male victims of sexual crimes, there is a reduction in such crimes and especially so on men-only days, although these results are not statistically significant.

**Table 3.** Results for Crime—Dividing Policy Period

	Policy period first half		Policy period second half		Post-policy period	
	Estimate	<i>p</i> -value	Estimate	<i>p</i> -value	Estimate	<i>p</i> -value
<b>Panel A: Total crime</b>						
Odd (men only) days	0.2403*	0.07	0.3771**	0.03	0.3256**	0.03
Even (women only) days	0.0419	0.17	0.1837	0.21	0.3319**	0.03
<b>Panel B: Total crime—Female victims</b>						
Odd (men only) days	0.1124	0.76	0.0095	0.83	0.1434	0.66
Even (women only) days	0.0931	0.93	0.0276	0.93	0.1656	0.72
<b>Panel C: Total crime—Male victims</b>						
Odd (men only) days	0.3311**	0.03	0.5129**	0.03	0.3261**	0.03
Even (women only) days	−0.0185	0.44	0.1927	0.27	0.3209*	0.07

Source: Authors' own calculations based on data from the National Police of Colombia from the year 2020 and the National Administrative Department of Statistics (DANE).

Note: Panel A reports the difference in the logarithm of per capita total crime between the real Bogota and the synthetic Bogota, while panels B and C report the difference in the logarithm of per capita crime involving female victims and male victims respectively. "Policy period first half" refers to the days between April 13 and April 26, while "policy period second half" refers to the days between April 27 (when certain sectors began re-opening) and May 10. "Post-policy period" refers to the days between May 11 and May 31. The *p*-values were generated based on the permutation distribution of  $RMSPE^{post}/RMSPE^{pre}$ . The pre-RMSPE is the root-mean squared percentage error of the pre-policy period for the *p*-values of the policy period and the post-policy period. The post-RMSPE consists of the root-mean squared percentage error of the policy period and the only post-policy period respectively.  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

violence with female victims, there are no clear patterns, with a small increase on men-only days and no change on women-only days. As noted above, family courts re-opened during the second half of the pico period, providing an additional venue for female victims to report their crimes.<sup>16</sup> Consistent with this fact, as shown in fig. S1.2, there were sizeable increases in reports of domestic violence in Bogota on women-only days during the second-half of the pico period. During the first half of the pico period, by contrast, there are spikes on men-only days, especially during the first week of the pico policy. While the differences are not statistically significant overall, this finding of more domestic violence in the early days of pico y genero suggests that gender segregation outdoors, conversely, might lead to a less secure environment indoors for females given that they were not allowed to escape their partners by leaving their residences on men-only days.

As noted above, Bogota began to relax the lockdown during the second half of the pico lockdown, with some sectors, most notably the male-dominated construction sector, re-opening. This may have led to less gender segregation outdoors, with more men out on women-only days in particular. To comprehensively examine these issues, regression analyses compare crime rates during the first and second halves of the pico lockdown. As shown in panel A of table 3, crime rates were elevated on men-only days during both halves of the lockdown. Moreover, as shown in panels B and C, these higher crime rates on men-only days continue to be driven by crimes with male victims. Tables 4 and 5 present results broken down by both halves of pico as well as by types of crime. As shown in table 5, the results for male victims continue to be driven by robberies on men-only days, and these patterns are present during both the first and the second halves of the pico lockdown. For female victims, by contrast, differences are found between the two halves of the lockdown. In particular, robberies with female victims were elevated during the second half of the pico period, consistent with more males being on the streets, and thus more potential perpetrators of robberies, on these days. Moreover, as noted above, females could not have male companions on women-only days, potentially making them even more vulnerable on women-only days during this second half of the pico period.

16 While the data are based upon the date of crime incidents, intra-family violence might occur repeatedly over time, and it is possible that women only report the most recent incident.

**Table 4.** Results for Crime by Category and Dividing Policy Period—Female Victims

	Policy period first half		Policy period second half		Post-policy period	
	Estimate	<i>p</i> -value	Estimate	<i>p</i> -value	Estimate	<i>p</i> -value
<b>Robberies—Person, store, or house</b>						
Odd (men only) days	0.1425	0.69	0.3298	0.28	0.6227**	0.03
Even (women only) days	0.3160	0.31	0.5572**	0.03	0.6496	0.1
<b>Intra-family violence</b>						
Odd (men only) days	0.1658	0.97	0.0634	0.86	0.0269	0.97
Even (women only) days	0.0383	0.69	−0.0448	1.00	0.1955	0.72
<b>Sexual crimes</b>						
Odd (men only) days	−0.1547	0.45	−0.2660	0.31	−0.1893	0.66
Even (women only) days	0.1656	0.31	0.0892	0.31	−0.3015	0.48
<b>Homicide or injuries</b>						
Odd (men only) days	0.3872	0.52	0.0765	0.97	−0.0187	0.79
Even (women only) days	0.0172	0.72	0.3068	0.90	0.3601	0.62
<b>Threats</b>						
Odd (men only) days	0.1237	0.38	0.3614	0.38	0.4072	0.66
Even (women only) days	0.4078	0.66	0.1753	0.52	0.4584	0.72

*Source:* Authors' own calculations based on data from the National Police of Colombia from the year 2020 and the National Administrative Department of Statistics (DANE).

*Note:* This table shows the difference in the logarithm of crime per capita between the real Bogota and the synthetic Bogota for different categories of crime. “Policy period first half” refers to the days between April 13 and April 26, while “policy period second half” refers to the days between April 27 (when certain sectors began re-opening) and May 10. “Post-policy period” refers to the days between May 11 and May 31. The *p*-values were generated based on the permutation distribution of  $RMSPE^{post}/RMSPE^{pre}$ . The pre-RMSPE is the root-mean squared percentage error of the pre-policy period for the *p*-values of the policy period and the post-policy period. The post-RMSPE consists of the root-mean squared percentage error of the policy period and the only post-policy period respectively.  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

## 8. Limitations

This section discusses two potential limitations of this analysis, one involving how to separate mobility effects from gender segregation effects and one involving reported crimes versus actual crimes.

Overall, it is difficult to separate gender segregation effects from mobility effects. In particular, and as shown above, mobility was lower on women-only days, relative to men-only days, and this mobility decline could itself lead to a reduction in crime rates. However, a part of the mechanism that is considered, as outlined above in the hypotheses, involves the mobility response to gender segregation in this lockdown. That is, if gender segregation in this lockdown changes mobility, then the mobility response should be included when considering the effect of gender segregation in this lockdown on crime. In addition and related to this point, even if the analysis cannot measure the effect of gender segregation in this lockdown on crime, holding fixed mobility, the effect of pico on crime can be measured. This has important implications for other policies that change gender segregation directly and mobility indirectly.<sup>17</sup>

Second, as in other studies using administrative data on crimes, the analysis is based upon reported crime, and, for at least two reasons, this could differ in important ways from actual crimes. First, victims may selectively report crimes. Second, policing may differ during pico and in particular between women-only days and men-only days. Note that the results are driven by robberies, as shown in table 2, with an increase in male victims on male-only days and female victims on women-only days. This is consistent with similar reporting by gender and similar policing on women-only and men-only days. In addition, there might be particularly strong economic incentives for reporting robberies if victims need police reports for

17 For example, the United States has witnessed a movement over the past century from single-sex institutions of higher education to co-educational institutions of higher education, and this change might induce a mobility response by women.

**Table 5.** Results for Crime by Category and Dividing Policy Period—Male Victims

	Policy period first half		Policy period second half		Post-policy period	
	Estimate	<i>p</i> -value	Estimate	<i>p</i> -value	Estimate	<i>p</i> -value
<b>Robberies—Person, store, or house</b>						
Odd (men only) days	0.6334**	0.03	0.7153**	0.03	0.5565**	0.03
Even (women only) days	0.0114	0.55	0.2162	0.52	0.5209**	0.03
<b>Intra-family violence</b>						
Odd (men only) days	0.0288	0.83	0.1641	0.93	0.1622	0.97
Even (women only) days	−0.0203	0.97	0.4200	0.45	0.1230	0.83
<b>Sexual crimes</b>						
Odd (men only) days	−0.5913	0.34	−0.8901	0.28	−0.5875	0.69
Even (women only) days	−0.3932	0.83	−0.5502	0.52	−0.6359	0.66
<b>Homicide or injuries</b>						
Odd (men only) days	0.1320	0.90	0.1077	0.97	0.0760	0.93
Even (women only) days	0.0549	0.97	0.1851	1.00	0.1034	0.97
<b>Threats</b>						
Odd (men only) days	0.5378	0.66	0.6230	0.76	0.4749	0.86
Even (women only) days	0.0122	0.55	0.3945	0.83	0.1147	0.93

*Source:* Authors' own calculations based on data from the National Police of Colombia from the year 2020 and the National Administrative Department of Statistics (DANE).

*Note:* This table shows the difference in the logarithm of crime per capita between the real Bogota and the synthetic Bogota for different categories of crime. “Policy period first half” refers to the days between April 13 and April 26, while “policy period second half” refers to the days between April 27 (when certain sectors began re-opening) and May 10. “Post-policy period” refers to the days between May 11 and May 31. The *p*-values were generated based on the permutation distribution of  $RMSPE^{post}/RMSPE^{pre}$ . The pre-RMSPE is the root-mean squared percentage error of the pre-policy period for the *p*-values of the policy period and the post-policy period. The post-RMSPE consists of the root-mean squared percentage error of the policy period and the only post-policy period respectively.  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

insurance purposes and/or want help from the police in recovering stolen items. For these reasons, there is no obvious bias towards increased reporting of crimes on men-only days.

## 9. Conclusion

This paper studies a COVID-related quarantine measure established in Bogota, the capital city of Colombia, in which only women could go out on even days and only men could go out on odd days. This mobility restriction provides a unique lens through which to examine the relationship between gender and crime. If anything, crime tends to be higher under this gender-based lockdown, with higher crimes on men-only days and no corresponding reduction in crime on women-only days. This increase in crimes on men-only days is driven by crimes involving male victims, rather than by crimes involving female victims. Regarding the types of crimes, the increase in crimes on men-only days is driven by robberies. Likewise, there is an increase in robberies involving female victims on women-only days, and this effect is driven by the second-half of the policy, when more men were outside on women-only days. Overall, there is little evidence that this gender-based lockdown reduces crime and, conversely, crimes tend to increase on men-only days, a result driven by crimes involving male victims.

While the findings in this paper are specific to this pico lockdown, Peru adopted a similar policy during April 2020, and, as noted above, the mobility results are consistent with those in a study based upon a similar policy in Panama.<sup>18</sup> Moreover, the results are consistent with some of the findings around

18 <https://www.reuters.com/article/us-health-coronavirus-peru/gender-divide-peru-panama-limit-men-and-women-to-alternate-days-out-to-stall-virus-idUSKBN21K39N>.

gender segregation affecting crime in other settings. For example, many cities, such as Mexico City, have adopted women-only trains and buses to protect women from male harassment. Aguilar, Gutierrez, and Soto (2019) find that the segregation program in Mexico does reduce sexual harassment towards females but increases non-sexual aggression incidents among males, and Kondylis et al. (2020) find that women-only spaces on the subway in Brazil drive the stigmatization of women who ride mixed cars, increasing the social acceptability of harassment. Another example involves gender segregation in schools, and there is evidence from Korea that girls experience less peer victimization in all-girls schools, relative to girls in co-educational schools, and that boys experience more violence in all-boys schools, relative to boys in co-educational schools (Gee and Cho 2014).<sup>19</sup>

Outside these settings, however, evidence regarding the consequences of gender segregation remains scarce. This paper aims to contribute to the study of gender segregation and crime, noting that these insights should be interpreted with caution, given the exceptional nature of this intervention.

Finally, as noted in the literature review, these findings speak to a broader literature on mobility restrictions, the strengthening of gender stereotypes, and economic opportunities for women. In particular, this study sheds light on some of the unintended negative consequences of implicit or explicit norms that encourage gender segregation.

## Data Availability Statement

The data underlying this article will be shared on request to the authors.

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19 Related to this issue of gender segregation in schools, Lavy and Schlosser (2011) study gender peer effects, finding that an increase in the fraction of girls improves cognitive outcomes for both boys and girls, and this is driven by a reduction in classroom disruption and violence.

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