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The great crime recovery: Crimes against women during, and after, the COVID-19 lockdown in Mexico☆

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ABSTRACT

This paper considers whether the COVID-19 stay-at-home order affected crimes targeting women. To answer this question, we use national municipal-level crime data from Mexico's *National Public Security System*. The NPSS reports sexual crimes, lapses in alimony, domestic violence, and femicides. Using the NPSS, we track monthly changes in crimes targeting women using an event-study design. Our results show that lapses in alimony, sexual crimes, and domestic violence follow a U-shaped trend. Each crime declined during the stay-at-home order, and then rose back to pre-COVID levels by October. Then, we analyze potential mechanisms for the reduction in crimes against women. We find that infection risk, victim-criminal match, and banning the sale of alcohol are related to higher declines in crime.

1. Introduction

The onset of the COVID-19 pandemic immediately prompted worldwide economic and social activity to cease. Governments imposed stay-at-home orders, non-essential businesses shuttered, travel became difficult, and individuals avoided social gatherings. These changes in the economic and social landscape may also affect non-market activities, including crime. While recent studies have evaluated the connection between the COVID-19 pandemic and domestic violence,[1] fewer studies have considered the broader effects on violence against women, including rape, sexual assault, and gender-motivated homicides.

In this paper, we study the effects of the COVID-19 pandemic on crimes that target women in Mexico. Mexico is a high-crime Latin American country, where the study of violence against women is especially relevant. In Mexico, 25% of women are victims of domestic violence every year. Women also experience high levels of sexual crime in Mexico. For instance, in 2017, there were 60 cases of sexual abuse every 24 h (Angel, 2017). Murders that target women due to gender issues, better known as femicides, have also risen in Mexico. Femicides have more than doubled over the past four years, rising from 411 instances in 2015 to 983 cases in 2019 (Lezama, 2020).

To explore how the COVID-19 pandemic affects violence against women, we use data from Mexico's *National Public Security System* (NPSS), a national repository for all municipality-level crime reports in Mexico. The NPSS data reports violence and crimes against women, including failure to pay alimony, sexual crimes (rape and sexual assault), domestic violence, and femicides. We

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[1] Poblete-Cazenave (2020), Bullinger et al. (2020a, 2020b), Leslie and Wilson (2020a), Silverio-Murillo et al. (2020), Mohler et al. (2020), Perez-Vincent and Carreras (2020).

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combine the NPSS reported crimes with population counts to create monthly crime rates over 2019–2020. Using an event-study design, we exploit the inter-temporal variation in these crimes from January to October of 2020 and compare these changes to 2019.

Our findings show two dominant patterns. First, lapses in alimony, sexual crimes, and domestic violence follow a U-shaped trend. These crimes decrease during the lockdown, reach a minimum, and then begin to return to their pre-COVID levels. During the stay-at-home period, March through May, overall crimes against women decline by 24%. Domestic violence falls by 20%, lapses in alimony by 59%, and sexual crimes by 28%. However, by month four of our series, all crimes start to rise back to original levels. Second, the most violent crime against women, femicides, remain relatively constant during the pandemic.

Our findings are consistent across a difference-in-differences approach, unweighted estimates, excluding Mexico City, a bounding methodology, additional time-varying controls, additional years and months, and alternative event-study specifications. We then propose potential mechanisms behind the reduction in reported crimes against women. Ideally, we would like to determine why we are observing these declines in crime levels.

First, we test whether the victim-criminal match influences the drop in reported crime. To accomplish this, we split municipalities by population size and whether they contain a large city. Our results suggest that the most considerable crime reductions occur in the most populous areas with major urban centers. The importance of population size indicates that the change in the likelihood of a victim-criminal match may play a role in the decline in crime (Cohen and Felson, 1979).

Second, infection risk also appears to be essential for crime reporting and criminal activity. We show more significant reductions in crime in municipalities with higher confirmed cases and deaths per capita. This mechanism suggests that both criminals and victims change their behavior in response to the infection risk. Third, we examine whether an alcohol sales ban explains the reductions in crime. Out of 31 states, 25 had at least one municipality that passed an alcohol sales ban during March through May of 2020. Using the timing of the alcohol sales ban, compared to the pandemic effect alone, we find that the alcohol sales ban explains a portion of the decline in violent crime. Non-violent crime, measured by failure to pay alimony, does not decline in municipalities that banned alcohol sales.

Fourth, some economic models predict that the effect on domestic violence depends on the income distribution within the household (Aizer, 2010). Despite the expected impact on within-household crime, only femicides respond to reductions in men's employment. Fifth, state-level Human Development Index (HDI) is related to higher reductions in crime, indicating a link with state-level income. Finally, in additional tests, we find no differential effects for other available mechanisms, including mobility changes, state-level public support during the pandemic, and the availability of public services, including women's shelters, state-level public safety personnel, and state-level public safety expenditures.

The findings from this study make several contributions to the literature surrounding crime and COVID-19. First, to our knowledge, this paper is one of the few studies that explore the broader effects of a pandemic on crimes against women outside of domestic violence (see also Poblete-Cazenave, 2020; Calderon-Anyosa and Kaufman, 2020). Second, we explore a battery of mechanisms, using a variety of data sources. Our findings indicate that several potential mechanisms may interact with crime rates, including income, infection risk, and alcohol. Third, our paper is one of the few studies to consider municipality-level national crime data (as opposed to city-level studies), with a notable exception in Calderon-Anyosa and Kaufman (2020). This municipality-level data adds to existing city-level studies, as our study is national in scope and reflective of crime patterns for the entirety of Mexico.

The remainder of this paper proceeds as follows. In Section 2, we review the related literature. Section 3 presents the Mexican context during the COVID-19 pandemic. Section 4 describes the crime data from the NPSS. Section 5 outlines the event-study specification. Section 6 presents the main findings from the event study as well as the difference-in-differences results. Section 7 shows a series of robustness tests, and Section 8 tests the mechanisms behind the observed reduction in the crime. Section 9 concludes.

2. Related literature

Effects of the COVID-19 Pandemic on Crime Restrictions on mobility from attempted containment of COVID-19 may affect criminal activity throughout the world. We anticipate that the pandemic will reduce general crime due to a reduction in economic and social activity (Cohen and Felson, 1979). Still, despite the potential decline, rising alcohol consumption and unemployment may also lead to subsequent increases in criminal activity (Foran and O'Leary, 2008). We anticipate that crimes targeting women (outside the household), including rape, sexual assault, and femicides, will be impacted through these three main channels. First, through a lower likelihood of a victim-criminal match, second, a reduction in criminal activity due to pro-social behavior, and third, a potential increase in crime due to rising alcohol consumption.

The primary reason that the COVID-19 pandemic, especially the lockdown, will impact crime is reducing the likelihood of a victim-criminal match. The COVID-19 pandemic lockdown resulted in a substantial decrease in economic and social activity outside of the household, with a 70% mobility decline (Apple, 2020). This decline in activity lowers the opportunity for victim-to-criminal interactions (Cohen and Felson, 1979). Further, depending on the infection risk, criminals may cease their criminal activities even beyond restrictions imposed by strict lockdowns.

A second reason that criminal activity may shift is the pro-social behavior of criminals. These pro-social theories predict a drop in crime after a catastrophic event due to the altruistic behavior of criminals (Fritz, 1996). Pro-social criminal behavior engenders "therapeutic community" and promotes social cohesion across classes (Fritz, 1996). If the therapeutic-community effect occurs during the pandemic, there will be increased social cohesion and pro-social behavior, and crime will fall.

The third reason for changes in the crime rate is pandemic-related changes in alcohol consumption. Foran and O'Leary (2008) suggests that alcohol consumption increases individuals' aggressive behavior, which may affect violence both within and outside of the household. Despite this theory, the empirical evidence is mixed. In the United States, Durrance et al. (2011) demonstrates a lack of relationship between alcohol taxes and female homicide rates. By contrast, in Brazil's Diadema, Duailibi et al. (2007) shows that restrictions on drinking hours decrease femicide rates but had no robust effect on assaults against women.

Initial studies on the COVID-19 pandemic across several contexts suggest a general reduction in reported crimes (Stickle and Felson, 2020). In Bihar, India, Poblete-Cazenave (2020) finds a 60% decrease in crime, which includes a measure of crimes against women. In the U.K., Halford et al. (2020) finds a reduction in aggregate crime by 41%, with a 45% reduction in reported domestic violence crimes. In Mexico City, de la Miyar et al. (2020) finds a large dip in conventional crime, but no changes in organized crime

(including homicides).[2] In 25 U.S. cities, Abrams (2020) shows a decrease in crime that precedes the local stay-at-home order, but the authors document no change in homicides and shootings. Finally, in Indianapolis and Los Angeles, Mohler et al. (2020) finds a decrease in robbery and burglary but no effect on assault-battery.

Effects of the COVID-19 pandemic on within-household crime In addition to measures of crime outside of the household, we also expect COVID-19 to affect within-household crime, including failure to pay alimony and domestic violence (Peterman et al., 2020). Within-household crime may be impacted differently during the pandemic than out-of-household crimes for several reasons. First, we would expect the incidence of domestic violence to rise after the start of the COVID-19 pandemic and lockdown due to confinement of partners at home (Peterman et al., 2020). Second, social isolation and alcohol consumption may exacerbate domestic violence within the household. Third, rising unemployment levels may substantially impact the failure to pay alimony and domestic violence.

First, from the literature, social isolation has negative consequences in terms of domestic violence. This fact has been demonstrated both empirically and theoretically (Gelles and Straus, 1979; Beland et al., 2020b). The theoretical models of social isolation show that confinement may increase the likelihood of household violence (Gelles and Straus, 1979). This theory holds up in practice, where Beland et al. (2020b) finds that women's inability to maintain social ties is positively correlated with domestic violence in Canada.

Second, similar to the discussion above for all measures of crime, we may expect alcohol to affect crime within the household. Increases in alcohol consumption will elevate domestic violence due to changes in aggressive behavior (Foran and O'Leary, 2008). This relationship between alcohol and domestic violence has been demonstrated in the United States. Markowitz (2000) finds that a one-percent increase in the price of alcohol causes a three-percent reduction in IPV. Despite the observed effect in the United States, Silverio-Murillo et al. (2020) specifically studies the COVID-19 pandemic in Mexico City and finds less evidence that alcohol sales bans affect call-center calls related to domestic violence.

Third, the economic repercussions of COVID-19 may increase both failure to pay alimony and domestic violence. Households in Mexico were severely affected by the recession. In the first three months of the pandemic, individuals in Mexico lost one-third of their income, and nearly 20% of individuals lost employment (Hoehn-Velasco et al., 2020). Due to this income loss, the COVID-19 pandemic should affect within-household crime through higher unemployment. In particular, we anticipate that alimony payments will fall. However, if women know that their partners cannot pay alimony, we may observe a decline in reporting. Higher unemployment levels could also change women's relative bargaining power in the household, which will affect domestic violence. Aizer (2010) shows that lowering the wage gap between men and women reduces violence against women. If COVID-19 causes men's relative income to decline, then violence against women may decrease. Hoehn-Velasco et al. (2020) shows that men and women's wages fell by similar amounts in Mexico, so we do not expect the change in bargaining power to be the main channel for effect.

Still, the literature shows that unemployment may be particularly important. Using data from thirty-one developing countries, Bhalotra et al. (2019) finds that an increase in men's unemployment is associated with an increase in violence against women. However, the effect was the opposite for female unemployment, where an increase in women's unemployment is associated with a decrease in domestic violence. This result suggests that the incidence of domestic violence depends on the relative unemployment within the household. In Mexico, men experienced slightly higher employment losses than women in the initial months of the pandemic, but employment rebounds at a faster rate for men relative to women (Hoehn-Velasco et al., 2020). Thus, the net effect may depend on the relative standing in the household, as well as other factors such as the family structure of the household (Tur-Prats, 2019, 2017).

During the COVID-19 lockdown, the literature has confirmed the expected increase in domestic violence using police calls in the United States. In 14 cities throughout the United States, Leslie and Wilson (2020b) tests police calls for service in March through May of 2020. Leslie and Wilson (2020b) finds an increase in domestic violence calls during the first five weeks of the lockdown. Similarly, using data from multiple cities in the United States, Sanga and McCrary (2020) demonstrates an increase in police calls for domestic violence by 12%. Sanga and McCrary (2020) further shows that first-time domestic violence (by neighborhood) increased by 16%, indicating that new households were committing violence. Ashby (2020) finds more mixed findings in seven U.S. cities. Ashby (2020) finds an increase in police calls for domestic violence in three out of seven cities, with a decrease in one city, and three cities remaining the same. In Dallas, Piquero et al. (2020) shows a short-term spike in the two weeks after the lockdown and a decrease thereafter. Finally, in Los Angeles and Indianapolis, Mohler et al. (2020) finds a similar increase in domestic violence police calls during the stay-at-home order.

An important question from work studying police calls is whether the observed increase in police calls for service translates into official crime reports. Bullinger et al. (2020b), using data from Chicago, finds that while domestic violence police calls increased, the officer-initiated crime reports decreased. In Indiana, Bullinger et al. (2020a) shows a reduction in child maltreatment reports, however, relative to areas that had less stay-at-home activity, areas with more stay-at-home activity had higher reports and confirmed cases of maltreatment. In another related study Silverio-Murillo et al. (2020) using data from Mexico City, finds that while call-center calls for domestic violence were stable after the lockdown (no decline), crime reports of domestic violence declined.[3] Overall, these findings suggest that crime reports decline during the pandemic, despite a rise in police calls and stable domestic violence call-center calls.

A partial explanation for the difference between police calls for service and crime reports is the distinction between physical and psychological violence. Related work has suggested that domestic violence during COVID-19 shifted towards psychological violence and away from physical violence. Psychological violence may be less likely to be reported in an official crime report than physical violence. In Spain, Arenas-Arroyo (2020) shows that the pandemic increases the likelihood of suffering psychological violence but not physical violence. Perez-Vincent and Carreras (2020), using call-center data from Buenos Aires, documents an increase in psychological violence but not physical violence. Mohler et al. (2020) notes that most of the increase in calls for police service may be due to non-violence domestic violence calls. This collection of studies suggest that psychological violence may be particularly important in the within-household measures of violence during the pandemic.

The COVID-19 Pandemic and Mental Health Mental health is expected to deteriorate during the COVID-19 pandemic due to

[2] Note that de la Miyar et al. (2020) focuses on Mexico City, whereas this present paper is national.

[3] Note that Silverio-Murillo et al. (2020) considers only Mexico City, whereas this present paper is national.

excess stress, financial losses, and isolation due to home-confinement (Pfefferbaum and North, 2020). We anticipate that these changes in mental health will, directly and indirectly, affect criminal behavior. The literature has consistently demonstrated the short-term adverse effects of the pandemic on mental health. Related work has shown the adverse mental health impacts using several different sources of data, including Google Trends (Brodeur et al., 2020; Knipe et al., 2020; Rodriguez et al., 2020), call-center data (Brulhart and Lalive, 2020; Armbruster and Klotzbucher, 2020; Silverio-Murillo et al., 2021), and survey data (Yamamura and Tsutsui, 2020; Wang et al., 2020; Beland et al., 2020a).

Three related studies use Google Trends data to track changes in search patterns as a proxy for mental health. These studies find negative consequences of the pandemic across different dimensions (Brodeur et al., 2020; Knipe et al., 2020; Rodriguez et al., 2020). Brodeur et al. (2020) tracks Google search terms in the United States and Western Europe during the initial COVID-19 lockdown. Brodeur et al. (2020) documents deleterious effects on mental health, with an increase in search terms for boredom, sadness, worry, and loneliness. Knipe et al. (2020) tests Google Trends data for Italy, Spain, USA, U.K., and Worldwide. Knipe et al. (2020) finds an increase in worry over finances and employment, elevated concerns over education and access to medications, and an overall rise in fear. Rodriguez et al. (2020) uses a similar design throughout Latin America in a country-by-county analysis. Rodriguez et al. (2020) shows an increase in insomnia, anxiety, stress, and sadness.

Several papers have also charted changes in helpline call volume to examine the mental health effects of the pandemic (Brulhart and Lalive, 2020; Armbruster and Klotzbucher, 2020; Silverio-Murillo et al., 2021). Brulhart and Lalive (2020) considers helpline calls in Switzerland and finds an increase in suicide calls during the initial phase of the lockdown, which plateaued and returned to their 2019 levels. In Germany, Armbruster and Klotzbucher (2020) finds that helpline calls related to suicidal ideation increase after the lockdown but flattened out in the following weeks. Finally, in Mexico City, Silverio-Murillo et al. (2021) shows an increase in call-center calls for anxiety, but no effect for depression.[4]

Studies have confirmed the observed deleterious effects on mental health using more direct survey data sources (Yamamura and Tsutsui, 2020; Wang et al., 2020; Beland et al., 2020a). In Japan, using internet surveys, Yamamura and Tsutsui (2020) shows that the COVID-19 pandemic increased anxiety levels. In 194 cities in China, Wang et al. (2020) finds that 28.8% reported moderate to severe anxiety and 16.5% moderate to severe depressive symptoms. In Canada, using the *Canadian Perspective Survey*, Beland et al. (2020) shows that the COVID -19 pandemic lowered mental health due to concern over employment and financial obligations. In the United States, Adams-Prassl et al. (2020) finds that mental health fell by 0.85 standard deviations, with women more affected than men. Adams-Prassl et al. (2020) confirms that the gender gap in mental health increased by 66% during the lockdown.

3. Background: The Mexican context

Timeline of COVID-19 Events in Mexico The majority of pandemic-related events occurred in March of 2020. These events include the start of the pandemic, the closure of schools, the drop in mobility, and the stay-at-home order (or lockdown). Due to the overlap of major events in a single month, we use the terms pandemic, stay-at-home order, and lockdown interchangeably throughout the text.

For the specific sequence of events, the pandemic began on March 11th, 2020, when the World Health Organization (WHO, 2020) officially declared COVID-19 a worldwide pandemic. On March 15th, Mexico's Education Minister notified the closure of all public schools in Mexico (SEP, 2020). This closure of schools started a marked drop in mobility throughout Mexico (Apple, 2020). The official *national* stay-at-home order was announced in the subsequent week by Mexico's Council of General Health (CSG, 2020a). This stay-at-home order immediately began as it was posted, and went into effect on March 23rd. This nationwide lockdown continued until May 30th, when Mexico began a transition back to normal (CSG, 2020b). Beginning in June, every state had to apply a traffic-light methodology of reopening, meant to ease the restrictions imposed during the confinement. Many businesses started to reopen, even though most schools and social clubs remained closed in Mexico.

For the spread of COVID-19 throughout Mexico, the first COVID-19 cases were announced on February 28th. COVID-19 then spread throughout Mexico, with steady growth throughout the stay-at-home order. Fig. 1 demonstrates the growth of the new monthly cases and deaths per 100,000 in the first panel. After the first cases appeared in March, the number of cases per 100,000 rises linearly through July. Starting in July, the number of cases and deaths begin to decline until the end of the data series in October.

Mexico's Public Policies During the Pandemic During the COVID-19 pandemic, Mexico offered no new safety nets for households. The lack of income support for individuals throughout Mexico differed from the majority of other countries throughout Latin America, Europe, and the United States (Hale et al., 2020). Instead of passing direct aid, Mexico's government provided two alternative options for support. Neither of the alternatives involved a new direct transfer to households (Lustig et al., 2020).

The first household-focused public policy allowed individuals to apply for a two-month advance payment from the non-contributory pension system (Lustig et al., 2020). A second policy, targeted towards businesses, distributed credit to small and medium-sized enterprise, but were capped at 25,000 MXN (1100 USD). In total, these policies accounted for 0.1–0.2% of Mexican GDP (Evalúa, 2020).

Mexico's Central Bank (Banco de México) also attempted to mitigate the macroeconomic exposure by adding bond swaps and changing the minimum deposits requirements for commercial banks (Campos-Vazquez et al., 2020). The Central Bank and other federal regulators also allowed banks to give payment extensions to their customers on mortgages, credit cards, and commercial loans, waving interest rates and fees for four months, beginning in April of 2020.

Violence Against Women in Mexico Reported crime rates against women, and reported crime in general, have been on the rise in Mexico since 2007, with the start of the Mexican Drug War (Women, 2017). Outside-the-household reported crimes against women (e.g., homicides, femicides, and rape) have been the main drivers of this increase in reported violence against women (Women, 2017).

Similarly, inside-the-household reported crimes against women have been on the rise, even though domestic violence is decreasing, according to the latest specialized household surveys. Namely, there seems to be a downward trend from 2003 to 2016 in emotional, economic, physical, and sexual domestic violence (Women, 2017; Fernández et al., 2020). However, victimized women are now more willing to report domestic violence to the police than previously. Partly, this is because Mexico started from a very thin base of reports of domestic violence to the police with roughly 20% of victimization being reported, compared to 60% in

[4] Silverio-Murillo et al. (2021)'s results were focused on women. The findings also extended to include pregnancy and abortion calls as well as women's mental health. Abortion calls declined, but pregnancy calls did not.

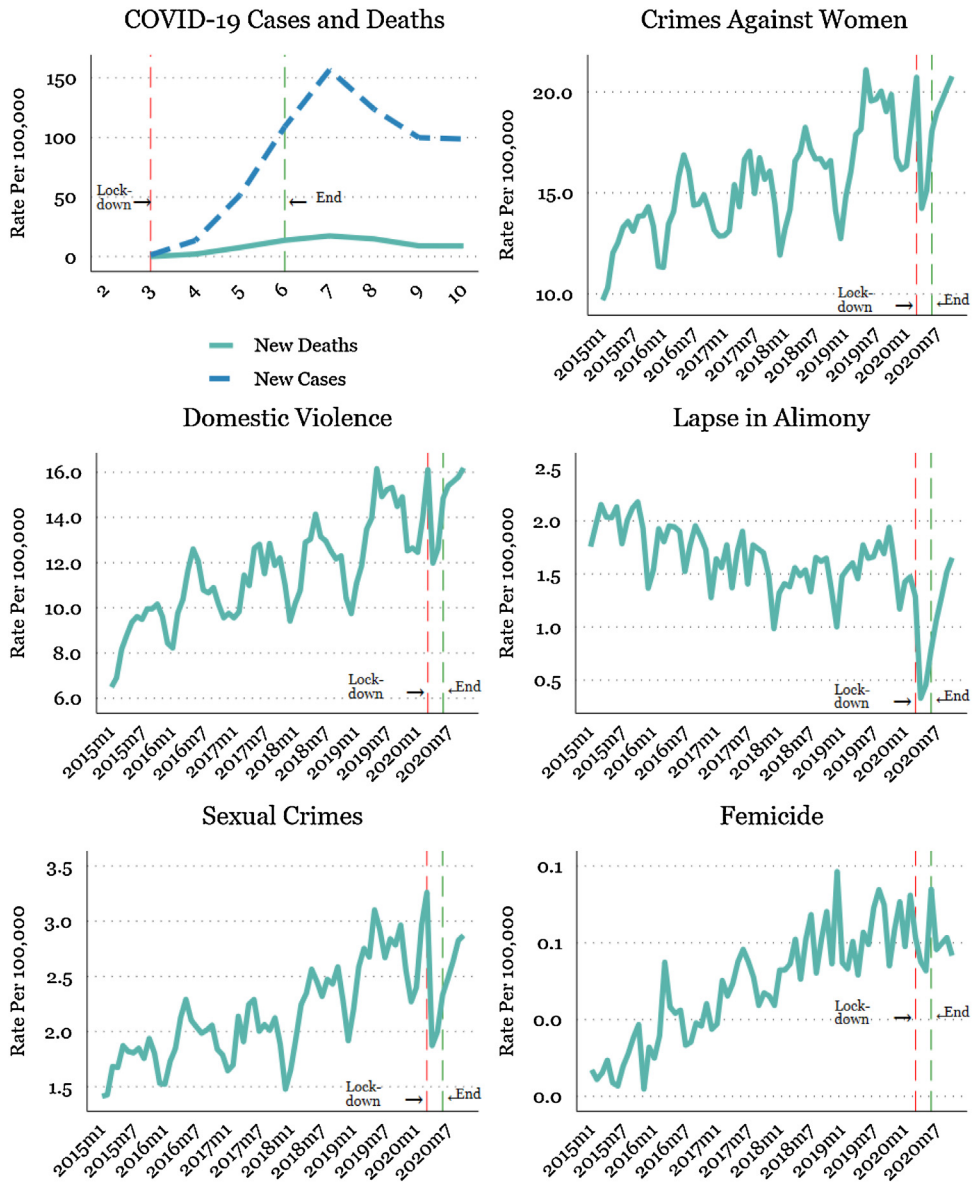

Fig. 1. COVID-19 Cases, COVID-19 Deaths, and Crime Rates Over Time. SOURCE: COVID-19 rates from CONACYT (2020). Crime rates are from *Mexico's National Public Security System* (*Secretariado Ejecutivo del Sistema Nacional de Seguridad Pública*).

the United States (de la Miyar, 2018). Other reasons for the change include new trends in women empowerment due to the expansion of social programs (de la Miyar, 2018), more women as head of households (Fernández et al., 2020), and new specialized prosecutors on crime against women as well as fewer procedural hazards, through Mexico's reform on the criminal law system, moving from an inquisitorial to accusatory legal system.

Fig. 1 shows the trends in the aggregate crime rates over time from 2015 through 2020. Aligned with the police-reported crime trends mentioned above, all measures of violence against women increased from 2015 to 2020. The only crime that declines rather than increases is the failure to pay alimony, which has been on a general downward trend.[5] The graphs also illustrate the drop in crime rates that occurred during the lockdown period of the pandemic. The red line presents the start of the lockdown, and the green line shows the month that the stay-at-home order was lifted. All crimes appear to jump back to their original trend after the conclusion of the lockdown, except for sexual crimes.

4. Data

To consider the effects of the COVID-19 pandemic on crimes against women, we use municipal-level crime incidents throughout Mexico for 2019 and 2020. This data comes from the *National Public Security System* (*Secretariado Ejecutivo del Sistema Nacional de Seguridad Pública*, or NPSS). The reported information covers crimes against women, including failure to pay alimony, sexual crimes, domestic violence, and femicides.

Crimes in Mexico's NPSS are prosecuted and trailed at the state level, and the definition varies according to each state's criminal law. The exception to state-level tracking is for femicides, which are a federal crime. Each month, individual states and the Federal

[5] The downward trend on failure to pay alimony partly has to do with the passage of no-fault unilateral divorce laws, which dramatically increased divorce rates, while lowering the frequency of spousal alimony payment (Hoehn-Velasco and Penglase, 2019).

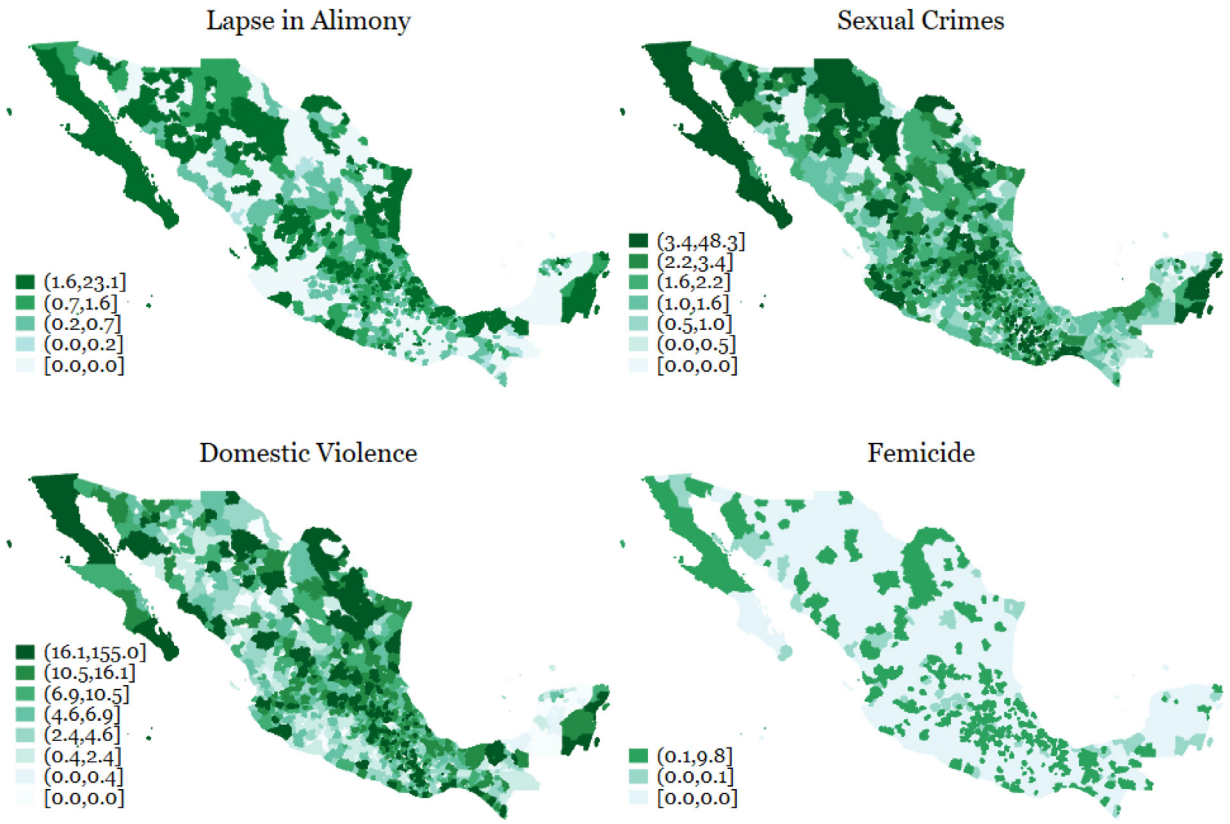

Fig. 2. Crime Rates by Municipality for 2020. Source: *Mexico's National Public Security System* (*Secretariado Ejecutivo del Sistema Nacional de Seguridad Pública*). Notes:Graph shows the average for all of 2020.

Attorney Generals report the number of cases open within their respective jurisdiction. The NPSS system centralizes all information and homologates different States' criminal laws (del Sistema, 2018). To publish timely information, the NPSS reports all statistics by state and nationwide within the first 20 days of the following month. If an Attorney General Office does not open a file for a particular crime, then the crime is not part of the NPSS's statistics (del Sistema, 2018). This may occur for two reasons: i) a victim does not report a crime, or ii) an Attorney General dismisses a case because of insufficient elements. The way in which most crime files begin is through a report in a "Public Ministry Office" or, in certain states where the new criminal system fully operates, through in-site reports, remote reports via telephone or internet, or in-person reports at Attorney General's Early Special Units (del Sistema, 2018).

Generally speaking, failure to pay alimony includes transfers for divorced women and underage children. Sexual crimes cover sexual abuse and all types of rapes: outside-of-household rapes and inside-of-household rapes, even though the largest portion of sexual crimes occur outside of the victim's household. Domestic violence comprises intimate partner violence in all of its forms: psychological, economic, sexual, physical. Finally, femicides are all gender-driven homicides. To classify a homicide as femicide, the Mexican Federal Criminal Law (Ch. 10, Art. II-XIX-V) requires evidence of either sexual violence, mutilation, defacement, kidnapping (prior to the homicide), the exhibition of the corpse in a public setting, or a sentimental-link between the victim and the criminal.

We consider the number of crimes per month per 100,000 inhabitants in each municipality. We add municipality-level population data from Mexico's National Population Council (CONAPO). For the analysis, we use data for all Mexican states and municipalities from January to October for 2019, and 2020. Our final data set is comprised of all municipalities in Mexico, including 2457 municipalities over January through October for 2019 and 2020.[6]

We show the distribution of municipality-level crime throughout Mexico for each of our primary measures in Fig. 2. Figure 2 shows the average municipality-level crime rates over 2020. Throughout Mexico, sexual crimes and domestic violence are the most widespread crimes. Lapses in alimony are slightly less prevalent, with fewer municipalities reporting at least some occurrence of failure to pay alimony. Femicides are the least pervasive crime but also the most severe. Femicides only occur only in a few municipalities throughout Mexico.

Table 1 provides summary statistics for 2019 and 2020 crimes against women in Mexico. Each crime measure is shown over each year in the first two months (pre-pandemic), the lockdown, months 3–5, and the post-pandemic period, months 6–10. We display the crime rates for crimes that target women, including lapses in alimony payments, sexual crimes (sexual abuse and rape), domestic violence, and femicides (murders targeting women).[7] The top of Table 1 also presents an aggregate measure of all crimes targeting women, representing the sum of the crime rates used throughout the analysis (labeled 'Crimes Against Women').

[6] There were 2456 municipalities in Mexico in 2010 (Castro, 2019). Yet, there were 2457 municipalities in 2015 due to the creation of the municipality of Bacalar in the state of Quintana Roo (Castro, 2019). The data from the *National Public Security System* started to be collected since 2015 using the 2,457 municipalities existing in 2015 as a reference.

[7] Note that sexual crimes can occur inside the household or outside the household. We do not observe a distinction between reported rapes or sexual abuse that occurred within, or outside, the household.

Table 1
Descriptive statistics: crime rates.

	2020			2019		
	Pre-Months 1-2 Mean	Lockdown Months 3-5 Mean	Pandemic Months 6-10 Mean	Pre-Months 1-2 Mean	Lockdown Months 3-5 Mean	Pandemic Months 6-10 Mean
Crimes against women	17.42	16.70	19.52	15.42	19.05	19.63
Domestic violence	13.22	13.58	15.57	11.46	14.53	14.98
Lapse in alimony	1.45	0.69	1.26	1.51	1.61	1.75
Sexual crimes	2.68	2.38	2.63	2.39	2.84	2.84
Femicide	0.07	0.06	0.06	0.05	0.06	0.07
N	4914	7371	12,285	4914	7371	12,285

Source: *Mexico's National Public Security System* (*Secretariado Ejecutivo del Sistema Nacional de Seguridad Pública*). Notes: Crime rates are measured per 100,000 inhabitants. Weights are applied for the municipality-level population size.

In 2020, the crime rate for crimes targeting women is 17.4 in months one and two. Crimes then decline to 16.7 over the lockdown months 3–5, and rise to 19.5 in the post-lockdown period. Over 2019, the crime rate is consistently higher over the lockdown and post-period, by around four additional crimes per 100,000. The standard increase in crime rates over months March through October reflects the seasonality of crime. Crime rates rise over the summer months and decline throughout the winter. The seasonality of crime exhibited over 2019 demonstrates the importance of accounting for month and year fixed effects in our primary analysis.

The individual measures of crimes against women confer mixed patterns over the pre and post-period of 2020. Domestic violence is the highest reported crime and rises from 13.2 in the pre-period to 13.6 during the lockdown. After the lockdown, domestic violence increases even further to 15.6. This pattern is mimicked over 2019. Lapses in alimony fall from 1.4 in the pre-period of 2020 to 0.69 during the lockdown, and then rise to 1.26 in the post-period of 2020. Sexual crimes decline from 2.68 to 2.38 and then back to 2.63 in 2020. Finally, femicides are reported at the bottom of Table 1. Femicides are relatively stable at 0.07 to 0.06 per 100,000 individuals in 2020.

5. Empirical strategy

To estimate the effect of the COVID-19 pandemic, and its subsequent stay-at-home order, on crimes against women, we use a monthly event-study specification. Our preferred specification appears as:

$$Y_{mty} = \sum_{q=-2}^{7} \beta_q COVID_{mqy} + a_m + \gamma_t + \nu_y + e_{mty} \quad (1)$$

where Y_{mty} is the crime rate of interest for municipality m in month t and year y. $COVID_{mqy}$ is a set of dummy variables that equal one in each month q before and after the start of the pandemic. The pandemic, the stay-at-home order, and the drop in mobility all began in March of 2020 (month three). March is represented by $q = 0$ in the specification above. $q = -2$ corresponds to two months before the pandemic or January of 2020. $q = -1$ represents one month before the pandemic or February of 2020. Our specification continues until $q = 7$, or October of 2020. The full event-study covers January through October, or ten months of 2020.

When we estimate Eq. (1), we exclude the month before the pandemic and lockdown began ($q = -1$) as the baseline period. In the baseline excluded period, we also include all months (January through October) of 2019. Due to the multiple years, we include time fixed effects for the year and month. Above, γ_t represents monthly fixed-effects and ν_y express year fixed effects. a_m are the municipality-fixed effects that control for time-invariant differences across municipalities. e_{mty} is the error term, which we cluster at the municipality level. We also include population weights when we estimate Eq. (1). Adding population weights accounts for the fact that some small municipalities will have large fluctuations in crime rates from month to month, while larger cities will have more stable crime rates.

6. Results

6.1. Event-Study Results

Figs. 3 and 4 show the main results for the event-study specification across our measures of crimes against women. Within-household crimes are shown in the top two panels of Fig. 3. Sexual crimes and femicides appear in the bottom two panels of Fig. 3. We show the total crimes against women in Fig. 4. In each of the graphs, the solid connected lines indicate the point estimates of the changes in the crime rate before and after the COVID-19 pandemic. The dashed lines indicate confidence intervals. The vertical red line indicates the omitted period (-1), the month before the pandemic began. The vertical green line illustrates the first month that the stay-at-home order (or lockdown) ended. The lockdown order concluded in May, which corresponds to period two in the graph.

Figs. 3 and 4 each demonstrate the U-shaped trend of crime rates throughout the COVID-19 pandemic. Crime declines during the lockdown and then rise back to the original levels as the lockdown ends. This pattern does not hold for femicides in the bottom-right graph, which is relatively flat over the post-pandemic period.

The first panel of Fig. 3 presents domestic violence crime rates. Domestic violence crime reports per 100,000 inhabitants sharply decline in months one and two. This decline corresponds to the months of the stay-at-home order throughout Mexico. At the trough, domestic violence declines by five crimes per 100,000, or a 35% reduction. Domestic violence reports then start to return to the baseline levels during months three and four, as the national stay-at-home order lifts. By months six and seven, domestic violence has returned to the baseline levels. This U-shaped pattern suggests a decline in reported domestic violence during the stay-at-home order.

This decline in observed domestic violence reports aligns with a portion of related work. Related work studying reported crime in India (Poblete-Cazenave, 2020) and United Kingdom (Halford et al., 2020) finds a reduction in domestic violence during the pandemic. The focus on crime reporting, as opposed to police calls for service, is a crucial distinction. This distinction explains differences in the present study from findings in other settings. Bullinger et al. (2020b) highlights the different effects during the lockdown for

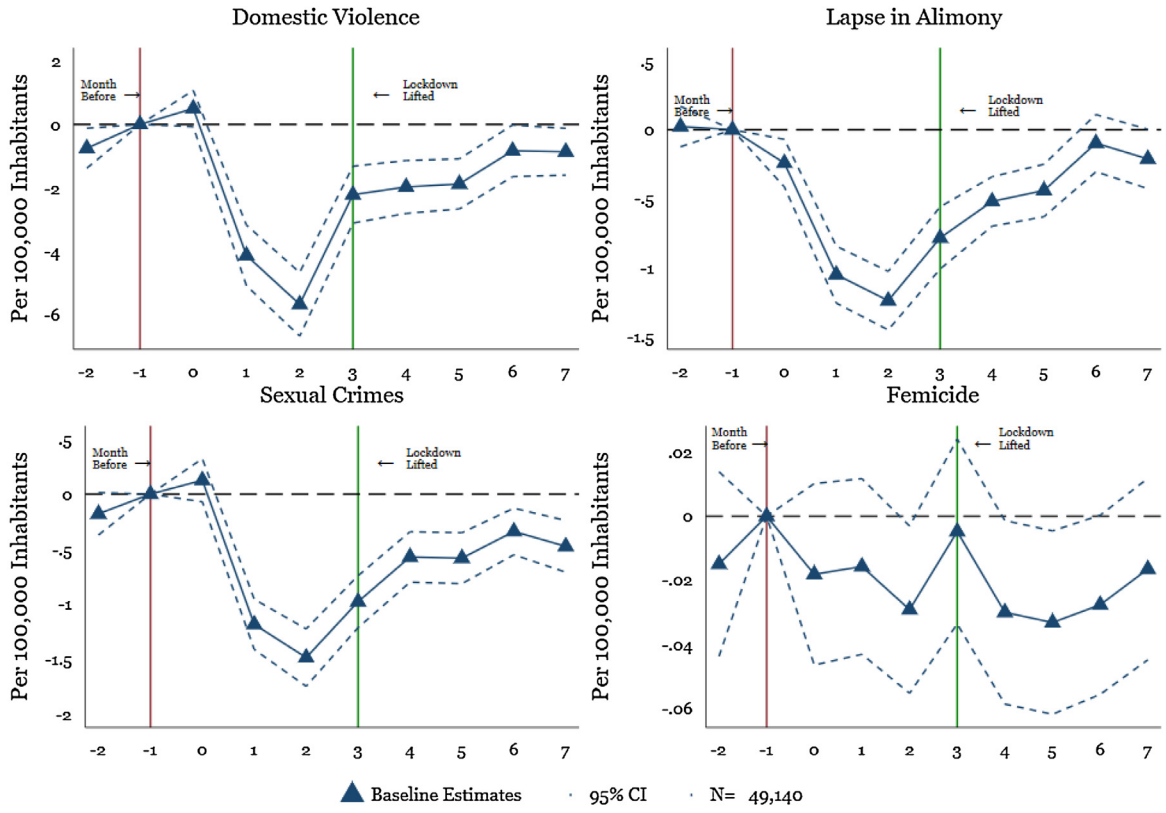

Fig. 3. Event Study: Main Findings. Source: *Mexico's National Public Security System* (*Secretariado Ejecutivo del Sistema Nacional de Seguridad Pública*). Notes: Plotted coefficients are event-study dummy variables, β_q (from Equation (1)). Each plotted point represents the number of months before and after the start of the pandemic in March. Solid lines connected lines represent point estimates. Dashed and dotted lines display the 95 percent confidence intervals. The red vertical line indicates the month before the lockdown (February). The green vertical line shows the month after the lockdown (June). Crimes are measured per 100,000 persons. Baseline fixed effects are included at the municipality, month, and year. The baseline specification is weighted by the muncipality-level population. Estimation includes January through October over 2019-2020. Robust standard errors are clustered at the municipal level.

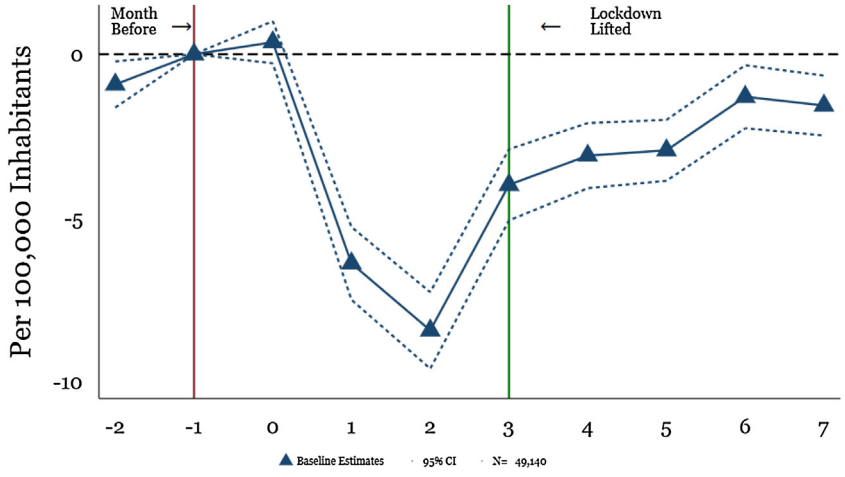

Fig. 4. Event Study: All Crimes Targeting Women. Source: *Mexico's National Public Security System* (*Secretariado Ejecutivo del Sistema Nacional de Seguridad Pública*). Notes: Plotted coefficients are event-study dummy variables, β_q (from Eq. (1)). Each plotted point represents the number of months before and after the start of the pandemic in March. Solid lines connected lines represent point estimates. Dashed and dotted lines display the 95 percent confidence intervals. The red vertical line indicates the month before the lockdown (February). The green vertical line shows the month after the lockdown (June). Crimes are measured per 100,000 persons. Baseline fixed effects are included at the municipality, month, and year. The baseline specification is weighted by the muncipality-level population. Estimation includes January through October over 2019-2020. Robust standard errors are clustered at the municipal level.

police calls for service and domestic violence crime reports. Bullinger et al. (2020b) finds that police calls for services increase, but domestic violence crime reports decline. This key differential finding in (Bullinger et al., 2020b) helps to reconcile the decrease in observed domestic violence in this study. Other related work that focuses on police calls has documented increases in domestic violence during the pandemic (Leslie and Wilson, 2020b; Sanga and McCrary, 2020; Ashby, 2020; Piquero et al., 2020; Mohler et al., 2020). A portion of the difference between calls for service and the crime reports may also be explained by a rise in pandemic-related psychological violence, but not physical violence (Arenas-Arroyo, 2020; Perez-Vincent and Carreras, 2020; Mohler et al., 2020). Psychological violence may be less likely to translate into a police crime report but still result in a police call.

Next, we consider failure to pay alimony, another within-household crime. Directly after the pandemic begins, the reported instances of failure to pay alimony plummet. At the bottom of the series in May, failure to pay alimony is almost 80% below the pre-pandemic mean. Similar to domestic violence, over months three and four, failure to pay alimony starts to rise back to the baseline levels. In months six and seven, failure to pay alimony is completely back to original levels. This decline in failure to pay alimony is surprising. Growing unemployment and economic hardship should increase non-alimony payments. However, our results indicate the opposite conclusion from our expectations. A potential explanation for this effect is that women do not report the lapsed alimony because their former-husbands may be unemployed. Thus, women do not initiate the legal process to collect lapsed payments from their former spouse as they perceive collecting alimony to be unlikely.

In the third panel, we show sexual crimes, which include sexual assault and rape. Sexual offenses decline during the lockdown, and begin to rise after the stay-at-home order lifts. Still, unlike the top two panels, sexual crimes remain persistently below original levels by the end of the data series. In month seven, or October, sexual crimes are still 0.5 lower per 100,000 inhabitants. This point estimate reflects a persistent decline in sexual crimes by 20%. The persistent reduction in sexual crimes, as opposed to domestic violence and lapses in alimony, is most likely explained by the reduction in the likelihood of a victim-criminal match (Cohen and Felson, 1979). We explore this potential explanation further in Section 8 and check the robustness of this result in Section 7.

In the fourth panel, we present instances of femicides. Femicides are the most violent crime against women, involving a homicide that is specifically targeted at women. In the last panel of Fig. 3, the point estimates on femicides are slightly negative, but most of them are not statistically significant. Further, femicides do not follow the U-shaped pattern of the other types of crime in the first three panels of Fig. 3.

We conclude by examining the aggregate effect on crimes against women in Fig. 4. In the first month after the start of the pandemic, crimes against women decline by a total of six crimes per 100,000, a one-third drop in crime. By the second month after the start of the pandemic, crimes targeting women fall by eight per 100,000, a 47% drop in crime from pre-pandemic levels. Then in period three, when the lockdown ends, crimes targeting women jump back up to a 22% reduction in crime, or four crimes per 100,000. By periods six and seven, crime rates have nearly recovered to initial levels. Overall, the pandemic's lockdown phase brought a 30–50% drop in crime. Crime then quickly rebounded as the stay-at-home order concludes.

6.2. Difference-in-differences results

To measure the average effect over the post-pandemic period, we turn to a difference-in-differences approach. We choose an event study as our main specification for two reasons. First, the event-study captures the fact that crime rates follow a U-shaped pattern and vary from month to month over the post-period. This time-varying effect is not captured by a difference-in-difference methodology (Wolfers, 2006; Goodman-Bacon, 2018). Instead, the difference-in-difference strategy yields the average effect over the post-period, but it ignores changing treatment effects over time. Considering the mean impact over the post-period can produce inconsistent interpretations of the treatment effect in the literature as the measured impact will heavily depend on the chosen time endpoints (Wolfers, 2006). Second, we view the event-study as beneficial as it allows us to consider pre-trends.

Despite these limitations with a difference-in-differences specification, using a grouped post-period, still may be helpful to quantify the total effect on crime rates over the post-pandemic period of 2020. Therefore, we alter our primary specification, Eq. (1), to include a grouped post period instead of monthly event-study dummy variables. This difference-in-differences strategy appears as:

$$Y_{mty} = \alpha + \beta \text{Post} - \text{COVID}_{ty} + a_m + \phi_m t + \gamma_t + \nu_y + e_{mty} \quad (2)$$

where Y_{mty} is the outcome of interest for municipality m in month t and year y. $\text{Post} - \text{COVID}_{ty}$ is a dummy variable that takes the value of one in March 2020 through October 2020. $\text{Post} - \text{COVID}_{ty}$ will be zero for February 2020, January 2020, and all of 2019. We also add $\phi_m t$, which are monthly municipality-level linear time trends. These trends account for linear growth in crime over time. All other features of Eq. (2) reflect Eq. (1).

We show the results from the difference-in-differences specification (Eq. (2)) in Table 2. Table 2 presents the estimates with linear trends in even columns and without linear trends in odd columns. The difference-in-difference results suggest similar conclusions to the main event study, where all measures of crime decline following the start of the COVID-19 pandemic.

The benefit of the difference-in-difference findings is that the coefficients reflect the average over the post-pandemic period, yielding a more straightforward interpretation of the magnitude of the reduction in crime rates. For all measures of crimes targeting women, in Columns (1)–(2), crimes against women decline by 2.9 per 100,000 during the COVID-19 pandemic (March through October of 2020). This decline reflects a 16% drop from the pre-pandemic mean of 17.4. In Columns (3)–(4), domestic violence falls by relatively less in percentage terms, a 13% drop from the pre-pandemic mean of 13.2. In Columns (5)–(6), failure to pay alimony falls considerably more in percentage terms, a reduction by 40% from the pre-pandemic mean of 1.45. In Columns (7)-(8), sexual crimes decline by 0.6, reflecting a 22% from 2.68 before the pandemic. Finally, in Columns (9)-(10), femicides (weakly) declines by 0.014, a 20% drop from the pre-pandemic mean of 0.07. The effect on femicides is only significant at the 10% level.

Because the magnitudes are much lower in the difference-in-differences than in the event study, we reconcile the results with an alternative grouping of the post-pandemic phases. In Table 3, we group the lockdown phase (months 3–5) and separately group the 'return to normal' stage (months 6-10). Over the lockdown period (or stay-at-home period), the crime reduction is substantial (Table 2). For all crimes, during the lockdown period, crimes against women are 4.3 lower, a 24% decrease in crime. For domestic violence, the reduction is 20%, lapses in alimony fall by 59%, and sexual crimes declines by 28%. Femicides do not decline during the lockdown period, but do decline in the post-lockdown period by 20%. During the return to normal phase, the reduction in crime is roughly half of what it was during the lockdown phase, indicating that crimes also were rising back to normal. Thus, the majority of the drop in domestic violence occurs during the stay-at-home

Table 2
Difference-in-differences specification.

	All crime		Domestic violence		Lapsed alimony		Sexual crimes		Femicide	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1(Post-COVID-19)	−2.952***	−2.953***	−1.755***	−1.756***	−0.586***	−0.586***	−0.596***	−0.597***	−0.014*	−0.014*
	(0.349)	(0.358)	(0.288)	(0.295)	(0.068)	(0.070)	(0.077)	(0.079)	(0.008)	(0.008)
Observations	49,140	49,140	49,140	49,140	49,140	49,140	49,140	49,140	49,140	49,140
Adjusted R^2	0.81	0.83	0.81	0.83	0.58	0.62	0.44	0.45	0.01	0.01
Pre-Lockdown Mean Dep.	17.42	17.42	13.22	13.22	1.45	1.45	2.68	2.68	0.07	0.07
Baseline FE	X	X	X	X	X	X	X	X	X	X
Time Trends		X		X		X		X		X

Source: Mexico's National Public Security System (Secretariado Ejecutivo del Sistema Nacional de Seguridad Pública). Notes: Difference-in-differences estimates from Eq. (2). Estimates show the grouped post-periods (month three of 2020 onward) relative to the pre-pandemic (months one and two of 2020 and all of 2019). Muncipality-level monthly linear time trends are included in primary results. Baseline fixed effects are included at the municipality, month, and year. The baseline specification is weighted by the muncipality-level population. Estimation includes January through October over 2019–2020. Robust standard errors are clustered at the municipal level. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$ Crimes are measured per 100,000 persons.

Table 3
Grouped lockdown and return to normal period.

	All crime	Domestic violence	Lapsed alimony	Sexual crimes	Femicide
	(1)	(2)	(3)	(4)	(5)
1(Lockdown Phase)	−4.352***	−2.723***	−0.857***	−0.758***	−0.014
	(0.381)	(0.325)	(0.082)	(0.085)	(0.009)
1(Return to Normal)	−2.113***	−1.175***	−0.423***	−0.500***	−0.015*
	(0.386)	(0.317)	(0.072)	(0.083)	(0.009)
Observations	49,140	49,140	49,140	49,140	49,140
Adjusted R^2	0.83	0.83	0.62	0.45	0.01
Pre-Lockdown Mean Dep.	17.42	13.22	1.45	2.68	0.07
Baseline FE	X	X	X	X	X
Time Trends	X	X	X	X	X

Source: Mexico's National Public Security System (Secretariado Ejecutivo del Sistema Nacional de Seguridad Pública). Notes: Estimates show the grouped lockdown period (months three to five of 2020) and the return to normal phase (months size to ten of 2020) relative to the pre-pandemic (months one and two of 2020 and all of 2019). Municipality-level monthly linear time trends are included in primary results. Baseline fixed effects are included at the municipality, month, and year. The baseline specification is weighted by the muncipality-level population. Estimation includes January through October over 2019–2020. Robust standard errors are clustered at the municipal level. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$ Crimes are measured per 100,000 persons.

order (or lockdown phase), rather than the entirety of the post-pandemic period.

7. Robustness checks

To verify the robustness of our findings, we test several additional alternative specifications. First, we show the sensitivity of our results using a bounding methodology. Second, we present the results without population weights. Third, we explore the results, excluding Mexico City. Fourth, we add additional time-varying controls. Fifth, we add additional years (2015–2018) and months (November and December) of data. Sixth, we move the pre-period in the specification back to November (2019). Seventh, we test an alternative omitted period along with these additional years and months of data. These tests confirm the central theme of the results and boost confidence in the validity of our main findings.

First, we conduct a bounding approach, proposed by Altonji et al. (2005) and refined by Oster (2017) as a robustness test for omitted variable bias. This robustness strategy implicitly assumes that selection on observables is informative about selection on unobservables. By providing conditions for bounds and identification, Oster (2017) formalizes the bounding approach of Altonji et al. (2005) by setting minimums of expected R-squared for simulated regression with unobservables. If the bounds exclude zero, then the results from the regression are robust to omitted variable biases.[8] Table A.1 contains the results of the bound approach. The intervals in square brackets are the bounds. The bounds confirm the findings from the main results.

Second, we remove the population weights, which may exacerbate crime in larger cities. The results are shown in Fig. A.1 in light blue diamonds. These points suggest a similar pattern to the main findings, with a slightly lower decline in crime. This smaller crime reduction is due to the importance of large cities for the overall observed effect in Mexico. Third, we exclude Mexico City (the Federal District) from the data. Mexico City diverges in crime levels and economic policies from the remainder of Mexico and could potentially be an outlier in the data. The results excluding Mexico City are presented in navy triangles. Despite the concern, excluding Mexico City has little impact on the findings.

Fourth, we add additional time-varying controls in Fig. A.2. Many of the potential time-varying controls in this context represent "bad controls," where the chosen controls should be outcomes rather than included as independent variables (Angrist and Pischke, 2008). However, we add these time-varying controls to test if they fully explain the reduction in crime. We add controls

[8] Oster applies this methodology to a sample of papers published in the *American Economic Review*, *Quarterly Journal of Economics*, *The Journal of Political Economy*, and *Econometrica* from 2008-2010. She found that using this bounding methodology allowed 90% of the randomized and 50% of the nonrandomized results to continue being statistically significant.

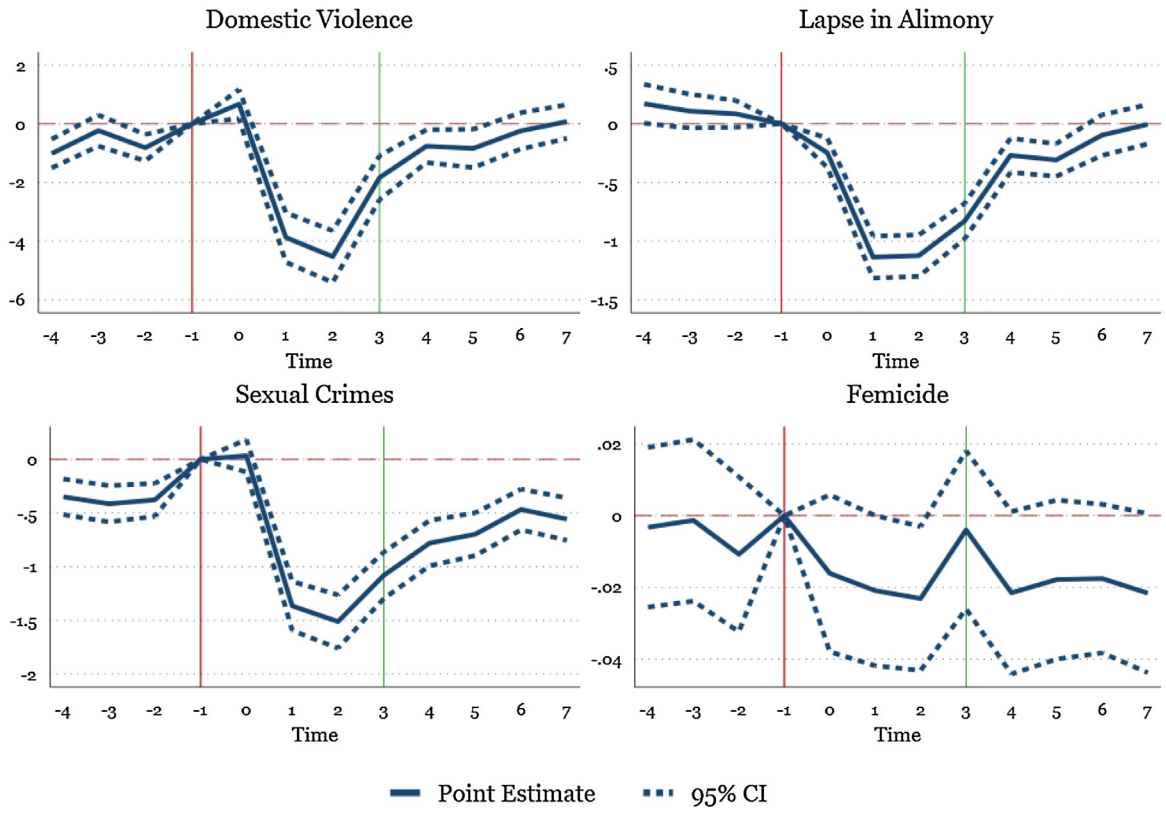

Fig. 5. Event Study: Additional Years (2015-2018) and Months (November and December). Source: *Mexico's National Public Security System* (*Secretariado Ejecutivo del Sistema Nacional de Seguridad Pública*). Notes: Plotted coefficients are event-study dummy variables, β_q (from Equation (1)). Each plotted point represents the number of months before and after the start of the pandemic in March. Solid lines connected lines represent point estimates. Dashed and dotted lines display the 95 percent confidence intervals. The red vertical line indicates the month before the lockdown (February). The green vertical line shows the month after the lockdown (June). Crimes are measured per 100,000 persons. Baseline fixed effects are included at the municipality, month, and year. The baseline specification is weighted by the muncipality-level population. Estimation includes January through October over 2019-2020. Additional years and months are added for the above specification including 2015-2018 and November and December of all years. The additional years of data are included in the omitted period. The additional months are represented by -4 (November) and -3 (December). Robust standard errors are clustered at the municipal level.

over two specifications. First, we add population as a control (rather than as a weight) in the light blue specification. Adding population as a control does temper the main crime reduction. As with the specification that removes weights in Fig. A.1, the smaller observed effect is likely due to the higher crime reductions in cities, which we explore further in Section 8. Second, the plotted points in purple show the specification, including controls for the COVID-19 case rate per 100,000, the death rate per 100,000, whether the municipality had implemented an alcohol ban in month t, and a binary variable for whether the municipality has a demonstrations against gender-based violence in month t.[9] The results plotted in purple with these additional controls reflect the baseline findings. Finally, in the red specification, we exclude protests that were related to abortion. The results completely overlap with the purple specification, suggesting that protests explain little of the variation in crime rates.

Fifth, we adjust the baseline event study to add additional years and months of data. We add additional years, 2015–2018, to the omitted period and test whether the additional information affects the interpretation of the results. Within the additional years of data, we also add December and November to the data series (for all years). These additional months allow us to extend the pre-pandemic period back to November (period -4), and observe a longer pre-trend before the pandemic began. Fig. 5 shows the results moving the pre-period back to November and including 2015-2019 in the omitted baseline period. The longer pre-period gives us more information about the trend in crime rates going into the COVID-19 pandemic. Across all measures of crime, there does not appear to be a pre-trend in the data. Upon the occurrence of the COVID-19 pandemic there is a clear break in the data in April, which continues through May. The only exception is for sexual crimes, which does appear to be lower pre-pandemic, but still there is a clear break in the data after March (period 1).

Due to the fact that sexual crimes were lower pre-pandemic, we also show the event-study in Fig. 5 excluding January instead of February. If there were changes in the crime rates in February, excluding January would reveal a clearer pattern in the data. Fig. A.3 omits January instead of February. For consistency, the red line still indicates the month before the lockdown (February, rather than the omitted period), and the green line still displays the end of the lockdown. There is a clear increase in crime rates for all measures (except alimony payments) over February and March in these graphs. Then beginning in April, crime drops precipitously and returns to baseline levels by September. Even sexual crimes have returned to the baseline levels.

Overall, these additional checks bolster confidence in the attribution of the drop in crime to the national lockdown measures and the onset of the COVID-19 pandemic. Although our findings consistently show a drop in crime in April through May of 2020, we

[9] The information for the protests comes from the Armed Conflict Location and Event Data (Raleigh et al., 2010). From the period of analysis, we identify 73 demonstrations (11 in 2019 and 62 in 2020).

Table 4
Mechanism (1) Victim-criminal match, high infection risk, and alcohol sales ban.

	All crime (1)	Domestic violence (2)	Lapsed alimony (3)	Sexual crimes (4)	Femicide (5)
Panel A: 1(Large City within the Municipality)					
1(Post-COVID-19) x 1(Large City in Municipality)	−2.468***	−1.516***	−0.380***	−0.574***	0.001
	(0.229)	(0.195)	(0.057)	(0.073)	(0.013)
1(Post-COVID-19)	−1.350***	−0.771***	−0.339***	−0.224***	−0.015
	(0.202)	(0.172)	(0.050)	(0.064)	(0.011)
Panel B: 1(Above Median Per Capita Deaths, March-October)					
1(Post-COVID-19) x 1(High P.C. Deaths)	−2.937***	−1.777***	−0.666***	−0.506***	0.011
	(0.302)	(0.257)	(0.075)	(0.096)	(0.017)
1(Post-COVID-19)	−0.469	−0.253	−0.023	−0.169*	−0.024
	(0.290)	(0.247)	(0.072)	(0.092)	(0.016)
Panel C: 1(Above Median Per Capita Cases, March-October)					
1(Post-COVID-19) x 1(High P.C. Cases)	−3.095***	−1.785***	−0.782***	−0.536***	0.008
	(0.306)	(0.260)	(0.076)	(0.097)	(0.017)
1(Post-COVID-19)	−0.322	−0.238	0.079	−0.141	−0.022
	(0.294)	(0.250)	(0.073)	(0.093)	(0.016)
Panel D: By Municipality-Alcohol Sales Ban (Post-Implementation)					
1(Post-COVID-19) x 1(Post-Alcohol Sales Ban)	−2.738***	−2.078***	−0.143	−0.511***	−0.007
	(0.689)	(0.580)	(0.119)	(0.143)	(0.012)
1(Post-COVID-19)	−2.245***	−1.219***	−0.549***	−0.465***	−0.013
	(0.388)	(0.312)	(0.079)	(0.090)	(0.009)
Observations	49,140	49,140	49,140	49,140	49,140
Pre-Lockdown Mean Dependent	17.42	13.22	1.45	2.68	0.07
Baseline FE	X	X	X	X	X
Time Trends	X	X	X	X	X

Source: Mexico's National Public Security System (Secretariado Ejecutivo del Sistema Nacional de Seguridad Pública). See Appendix B for data sources used for the mechanisms. Notes: Difference-in-differences-differences estimates from Equation (3). Estimates show the grouped post-periods (month three 2020 onward) relative to the pre-pandemic (month three and before). The interacted estimate shows the post-period interacted with the mechanism of interest. Monthly linear time trends are included. Baseline fixed effects are included at the municipality, month, and year. The baseline specification is weighted by the muncipality-level population. Estimation includes January through October over 2019–2020. Robust standard errors are clustered at the municipal level. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$ Crimes are measured per 100,000 persons. Alternative specification with continuous measures shown in Table B.3.

caveat our conclusions by recognizing that we can not determine with certainty whether the pandemic lockdown *caused* the drop in crime. The drop in crime may have been caused by a third factor, which was correlated with the timing of the COVID-19 pandemic and lockdown. This outside (unobserved) factor could have been the causal mechanism for the drop in crime over April through May of 2020. Still, this unobserved change would have to be perfectly correlated with the lockdown to cause the pattern observed in the data. Therefore, we view the national stay-at-home order as the most likely cause of the drop in crime over April through May. The fast return of crime to the baseline levels after the stay-at-home order lifts further supports this claim. However, as we explore next, the infection rates may have produced the observed decline in crime rather than the lockdown itself.

8. Mechanisms

We next turn to heterogeneities within Mexico to better understand potential mechanisms for the reduction in crimes against women. We test several of the hypotheses proposed by the literature, including changes in alcohol consumption, the victim-criminal match, infection risk, changes in unemployment, and public services available in the state. To test these potential mechanisms, we modify our difference-in-differences specification as:

$$Y_{mty} = \alpha + \beta_1 \text{Post} - \text{COVID}_{ty} + \beta_2(\text{Post} - \text{COVID}_{ty} \times \text{Mechanism}_m) + a_m + \phi_m t + \gamma_t + \nu_y + e_{mty} \quad (3)$$

where Mechanism_m is a dummy variable that takes the value of one in cases where our proposed mechanism occurs in municipality m. For instance, in the case of a high (above median) COVID-19 death rate, Mechanism_m will be equal to one.[10] We interact each of the proposed mechanisms for municipality m with the indicator for the post-pandemic period, $\text{Post} - \text{COVID}_{ty}$, where the post indicator takes the value of one beginning in March 2020. All other aspects of Eq. (3) reflect Equation (2).[11]

In cases where municipality-level data is available, we use the municipality-level crime rates. Municipality-level data is available for population size, COVID-19 cases and deaths, and the alcohol sales bans. Due to limited data at the municipality level, we also consider several state-level mechanisms, where we aggregate the data to the state level s instead of municipality m. These state-level mechanisms include unemployment, income, mobility, state-level spending during the pandemic, and state-level public services.

For the main results, we show the binary indicators for high and low for the continuous values of the proposed mechanism. Because most measures are continuous, we show additional specifications that include the interaction of each continuous measure (rather than binary) in the appendix. For the majority of cases, the results are similar across continuous and binary measures of the mechanisms. In cases of divergence, we note the differences in the text. For more details on the data sources used throughout this section, see Appendix B. Appendix B includes summary statistics for the data used throughout the mechanisms in Table B.1.

[10] In the majority of cases, above median value of the proposed mechanisms, Mechanism_m will be equal to one. However, for some cases such as the alcohol ban, the mechanism is a binary indicator for implementation. We also show the continuous measures for all mechanisms in the Appendix.

[11] Note that we do not include the un-interacted value of Mechanism_m because it is time-invariant and absorbed by the municipality fixed effect.

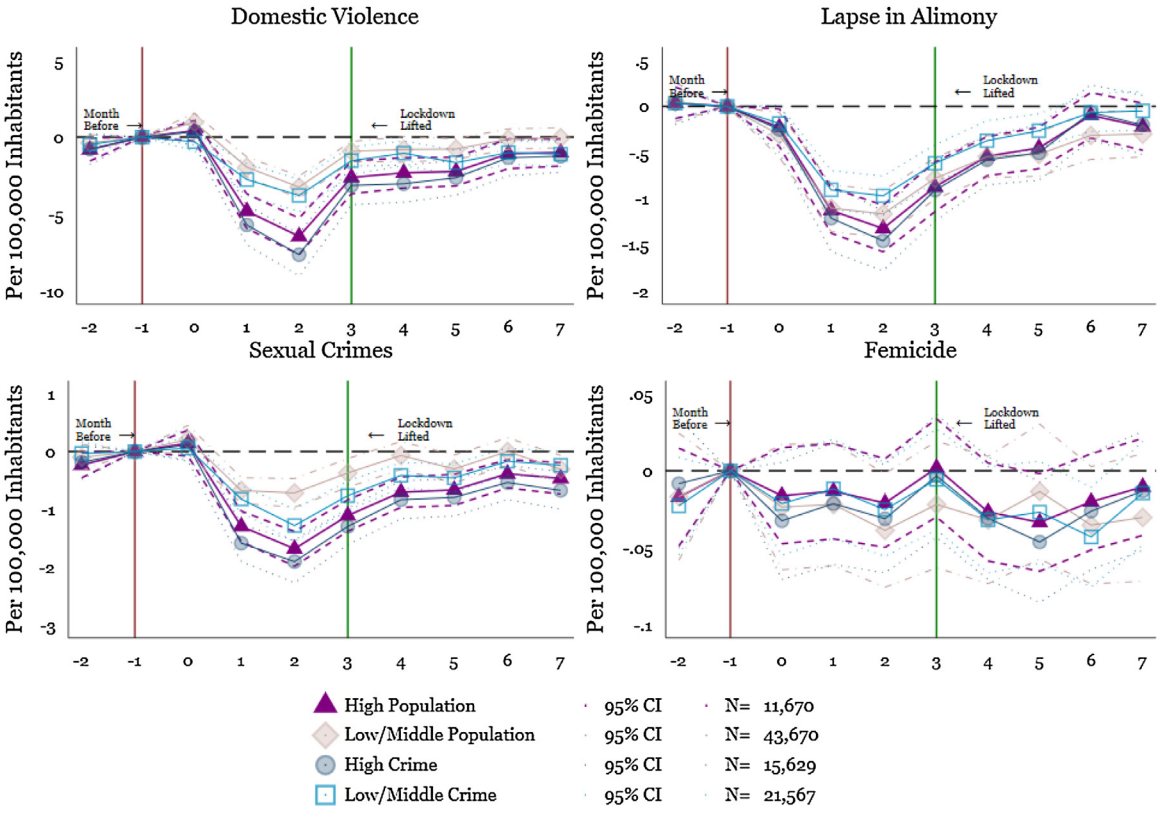

Fig. 6. Mechanism (1): Victim Criminal Match, Heterogeneity by Population and Crime Levels. SOURCE: *Mexico's National Public Security System* (*Secretariado Ejecutivo del Sistema Nacional de Seguridad Pública*). NOTES: Plotted coefficients are event-study dummy variables, β_q (from Equation (1)). Each plotted point represents the number of months before and after the start of the pandemic in March. Solid lines connected lines represent point estimates. Dashed and dotted lines display the 95 percent confidence intervals. The red vertical line indicates the month before the lockdown (February). The green vertical line shows the month after the lockdown (June). Crimes are measured per 100,000 persons. Baseline fixed effects are included at the municipality, month, and year. The baseline specification is weighted by the muncipality-level population. Estimation includes January through October over 2019-2020. Robust standard errors are clustered at the municipal level.

8.1. Municipality-level data: victim-criminal match, infection risk, and the alcohol ban

First, we consider the municipality-level victim-criminal match. We measure the victim-criminal match with the population size, and whether the municipality contains a large city. Areas with larger populations may experience more considerable reductions in crime due to a significant reduction in the opportunity for victim-to-criminal interactions (Cohen and Felson, 1979). In Panel A of Table 4, municipalities containing a large city (more than 100,000) experience higher crime reductions than the pandemic indicator alone. All crimes decline by 2.47 per 100,000 in large cities (post-pandemic) relative to a magnitude of 1.35 for the post-pandemic indicator alone.

To demonstrate the importance of the population size clearly, Fig. 6 shows the event-study findings excluding the largest and smallest municipalities (top 5% and bottom 5%), as well as the largest municipalities with the highest crime rates (top 25% of the distribution). Across these exclusions, the most evident crime reduction effects are for areas with the largest population and highest crime rates. Overall, these results support the hypothesis of the importance of the interaction between potential victims and offenders for crime to occur (Cohen and Felson, 1979). However, the same finding does not hold over the state-level change in mobility presented in Panel A of Table 5, suggesting that the population size matters more than the mobility changes.

Second, we consider whether the infection risk affects the observed reduction in crime. Related work has considered whether the lockdowns or the infection risk matter more for reducing economic activity (Aum et al., 2020; Chetty et al., 2020). In Table 4 Panels B and C, we consider two measures of COVID-19 prevalence, confirmed infections and deaths. In municipalities with higher than median infection risks, the overall crime reduction is higher than the post-pandemic period alone. All measures of crime (aside from femicides) decline in the areas with high COVID-19 prevalence (rather than the pandemic indicator). These results suggest that individuals may change their behavior in response to COVID-19 prevalence, similar to overall economic activity.

The magnitude of the coefficients on the COVID-19 infection risk indicates that the infection risk affects crime rates more than the pandemic period alone. Victims and criminals weigh the risks of venturing out when the risk of infection is high. Victims may reduce their activity and crime reporting behavior. Criminals may reduce their crimes by more in high-infection areas. These findings align with results in Aum et al. (2020), Chetty et al. (2020), and together suggests a link between the infection risk and individuals' economic and social activity.[12]

Third, we show the post-pandemic indicator alongside an indicator for whether the municipality banned alcohol sales in Panel D. This specification tests whether the municipality-level alcohol sales ban was partially responsible for the crime reduction. In Mexico, seven states prohibited alcohol sales (out of 31), and an

[12] These results also hold over the interacted effect with continuous measures in Table B.3.

Table 5
Mechanism (2): state-level changes in mobility, changes in employment, and income levels.

	All crime (1)	Domestic violence (2)	Lapsed alimony (3)	Sexual crimes (4)	Femicide (5)
Panel A: 1(Higher than median change in mobility)					
1(Post-COVID-19) x 1(High Change Mobility)	1.605	0.924	0.661**	0.005	0.015
	(1.323)	(1.037)	(0.318)	(0.263)	(0.014)
1(Post-COVID-19)	−3.867***	−2.282***	−0.963***	−0.600***	−0.023**
	(0.996)	(0.708)	(0.240)	(0.203)	(0.012)
Panel B: 1(Higher than Median Increase in Men's Unemployment)					
1(Post-COVID-19) x 1((High Men's Unemployment)	−1.241	−1.101	0.052	−0.156	−0.035***
	(1.282)	(1.001)	(0.335)	(0.257)	(0.012)
1(Post-COVID-19)	−2.338**	−1.210	−0.611***	−0.520***	0.003
	(1.078)	(0.834)	(0.220)	(0.170)	(0.009)
Panel C: 1(Higher than Median Increase in Women's Unemployment)					
1(Post-COVID-19) x 1(High Women's Unemployment)	−1.026	−0.917	−0.117	0.015	−0.007
	(1.331)	(1.042)	(0.326)	(0.261)	(0.013)
1(Post-COVID-19)	−2.415**	−1.275	−0.525***	−0.605***	−0.011
	(1.187)	(0.959)	(0.175)	(0.185)	(0.007)
Panel D: 1(Higher than Median Increase in Men's Unemployment Relative to Women's Unemployment)					
1(Post-COVID-19) x 1(High Relative Δ - Men to Women)	−0.870	−0.696	−0.079	−0.070	−0.025*
	(1.366)	(1.066)	(0.336)	(0.265)	(0.013)
1(Post-COVID-19)	−2.606**	−1.478	−0.554***	−0.569***	−0.005
	(1.084)	(0.911)	(0.177)	(0.174)	(0.009)
Panel E: 1(Above Median State-level Support During the Pandemic)					
1(Post-COVID-19) x 1(High P.C. Support)	−1.650	−1.352	−0.099	−0.212	0.013
	(1.416)	(1.066)	(0.357)	(0.309)	(0.014)
1(Post-COVID-19)	−2.297***	−1.218*	−0.547***	−0.513***	−0.020**
	(0.856)	(0.736)	(0.158)	(0.086)	(0.010)
Panel F: 1(High Human Development Index - State Higher than Mexico's HDI)					
1(Post-COVID-19) x 1(High HDI)	−3.104**	−2.156**	−0.399	−0.521*	−0.027*
	(1.304)	(0.972)	(0.390)	(0.294)	(0.016)
1(Post-COVID-19)	−1.747**	−0.918	−0.431***	−0.395***	−0.004
	(0.756)	(0.688)	(0.149)	(0.072)	(0.010)
Observations	640	640	640	640	640
Pre-Lockdown Mean Dependent	17.42	13.22	1.45	2.68	0.07
Baseline FE	X	X	X	X	X
Time Trends	X	X	X	X	X

Source: Mexico's National Public Security System (Secretariado Ejecutivo del Sistema Nacional de Seguridad Pública). See Appendix B for data sources used for the mechanisms. Notes: Difference-in-differences-differences estimates from Equation (3). Estimates show the grouped post-periods (month three 2020 onward) relative to the pre-pandemic (month three and before). The interacted estimate shows the post-period interacted with the mechanism of interest. Monthly linear time trends are included. State-level aggregate crime rates shown. Baseline fixed effects are included at the state, month, and year. The specification is weighted by the state-level population. Estimation includes January through October over 2019–2020. Robust standard errors are clustered at the state level. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$ Crimes are measured per 100,000 persons. Alternative specification with continuous measures shown in Table B.4.

additional eighteen states had at least one municipality that passed an alcohol sale prohibition (see Table B.2). In Panel D, we include an indicator that equals one for the months beginning after the municipality (or state) passed the ban on alcohol sales. The earliest ban passed in March, with additional bans passed in April and May of 2020.[13]

In Table 4 Panel D, crime declines in municipalities that passed the alcohol sales ban more than the pandemic indicator alone. For all crimes, the pandemic produces a reduction in crime by 2.2 per 100,000, while the alcohol sales ban coincides with an additional reduction in crime by 2.7 per 100,000. For domestic violence, the alcohol sales ban reduces crime by 2.1 per 100,000, while the pandemic produces a decline of 1.2 per 100,000. For sexual crimes, the pandemic's effect is a decline in sexual offenses by 0.5 crimes per 100,000, while the alcohol sales ban is related to an additional reduction by 0.5 crimes per 100,000. The alcohol ban does not affect femicides or non-violent lapses in alimony payments.

8.2. State-level mechanisms: unemployment and income

To test whether the effect varies over unemployment and income, we test heterogeneity in crime reduction for state-level unemployment, state-level spending on household support during the pandemic, and the state-level Human Development Index (HDI) (as a proxy for income). Table 5 shows the results.

Of the mechanisms explored, only income shows a consistent link with crime reduction. There are more considerable reductions in all violent crimes in states with a high HDI (Panel F). By contrast, state-level financial pandemic assistance, in Panel E, shows no relationship with crime declines. These results suggest that areas with higher overall income levels experience reductions in crime post-pandemic, but state-level policies to provide support to households show no remediating effects.

For unemployment in Table 5, there is a link between lower femicides for areas with higher reductions in men's employment. Across both states with higher employment losses for men and higher relative employment losses for men (as compared to women), femicides are lower post-pandemic. There is no heterogeneity across women's employment losses.

8.3. State-level mechanisms: public services

We conclude by considering the effect of preexisting public services on the reduction in crime in Table 6. These state-level public services include whether the state has a higher number of violence shelters for women and children (more than one per state), an above-median number of public safety employees, above-median public safety expenditures, and whether the state is

[13] The indicator for the municipality passing an alcohol sales ban is absorbed by the municipality level fixed effects.

Table 6
Mechanism (3): State-level public services.

	All crime (1)	Domestic violence (2)	Lapsed alimony (3)	Sexual crimes (4)	Femicide (5)
Panel A: 1(More than One Violence Shelter in the State)					
1(Post-COVID-19) x 1(High # Violence Shelters)	0.135	0.063	0.261	−0.190	0.000
	(1.479)	(1.190)	(0.394)	(0.231)	(0.017)
1(Post-COVID-19)	−3.050***	−1.801*	−0.775**	−0.459***	−0.015
	(1.167)	(0.961)	(0.334)	(0.150)	(0.015)
Panel B: 1(Higher than Median Per Capita Safety Expenditures)					
1(Post-COVID-19) x 1(High Public Safety P.C. Expenditure)	−0.812	−1.120	0.302	0.010	−0.003
	(1.327)	(1.023)	(0.326)	(0.271)	(0.014)
1(Post-COVID-19)	−2.590**	−1.255*	−0.721***	−0.601***	−0.013
	(1.007)	(0.754)	(0.233)	(0.163)	(0.013)
Panel C: 1(Higher than Median Public Safety Employees)					
1(Post-COVID-19) x 1(High P.C. Safety Personnel)	−1.530	−1.455	0.088	−0.156	−0.007
	(1.410)	(1.133)	(0.341)	(0.256)	(0.014)
1(Post-COVID-19)	−2.158***	−0.999*	−0.632**	−0.516***	−0.011
	(0.834)	(0.602)	(0.253)	(0.184)	(0.014)
Panel D: 1(MORENA Political Affiliation)					
1(Post-COVID-19) x 1(MORENA)	−2.127	−2.035	0.444	−0.519	−0.017
	(1.719)	(1.262)	(0.318)	(0.365)	(0.013)
1(Post-COVID-19)	−2.327***	−1.157*	−0.716***	−0.444***	−0.009
	(0.768)	(0.642)	(0.176)	(0.070)	(0.009)
Observations	640	640	640	640	640
Pre-Lockdown Mean Dependent	17.42	13.22	1.45	2.68	0.07
Baseline FE	X	X	X	X	X
Time Trends	X	X	X	X	X

Source: Mexico's National Public Security System (Secretariado Ejecutivo del Sistema Nacional de Seguridad Pública). See Appendix B for data sources used for the mechanisms. Notes: Difference-in-differences-differences estimates from Equation (3). Estimates show the grouped post-periods (month three 2020 onward) relative to the pre-pandemic (month three and before). The interacted estimate shows the post-period interacted with the mechanism of interest. Monthly linear time trends are included. State-level aggregate crime rates shown. Baseline fixed effects are included at the state, month, and year. The specification is weighted by the state-level population. Estimation includes January through October over 2019–2020. Robust standard errors are clustered at the state level. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$ Crimes are measured per 100,000 persons. Alternative specification with continuous measures shown in Table B.5.

affiliated with the MORENA political party.[14] None of the public services show differential impacts on crime. This failure to establish a differential effect on crime is consistent across the binary measures (Table 6) and the continuous measures of public services (Table B.5).

9. Conclusion

This paper analyzes the effects of the COVID-19 stay-at-home order on crimes against women in Mexico. Our results suggest that severe but non-murderous crimes follow a U-shape trend. These crimes, including lapses in alimony, sexual crimes, and domestic violence, decreased, reached a minimum, and then began to return to their pre-COVID levels. The most severe crime, femicides, show no robust decline.

We then examine the mechanisms behind the observed crime reduction. Domestic violence, a within-household crime, has several potential explanations. One plausible hypothesis is a change in alcohol consumption during the pandemic. We exploit the fact that certain municipalities passed an alcohol sales ban during the stay-at-home order. The alcohol sales ban does appear to be related to declines in domestic violence. Domestic violence falls by more after municipalities passed the alcohol sales ban as compared with the lockdown alone. In addition to the alcohol ban, we also find that domestic violence declines in areas with higher COVID-19 prevalence, suggesting that fear of infection may limit domestic violence crime reporting.

For failure to pay alimony, we expected that pandemic-related unemployment would increase non-alimony payments. However, the results suggest a decline in reported failure to pay alimony, which is higher in areas with high infection risk, but lower in areas with a greater mobility change. For the decrease in reported sexual crimes, the reduction in sexual offenses is attributable to a lower likelihood of a victim-criminal match, and higher infection risk. We also find a higher decrease in sexual assault and rape in municipalities that passed a ban on alcohol sales. For femicides, the only robust decline in femicides occurs in states with higher male employment losses.

Overall, these findings contribute to the literature by adding suggestive evidence on the mechanisms for the observed decline in crime reporting (Leslie and Wilson, 2020b; Sanga and McCrary, 2020; Ashby, 2020; Piquero et al., 2020; Mohler et al., 2020; Poblete-Cazenave, 2020; Halford et al., 2020; Bullinger et al., 2020b). The results suggest higher crime reductions in wealthier, more populous areas, with higher COVID-19 infection risk. We also show that the alcohol sales ban may be related to higher declines in violent crime against women.

Last, our results hint at future policies to lower the burden of violence against women in Mexico. Despite the reforms underway in Mexico, such as the establishment of parity in political positions and empowering women through specific state-sponsored social programs (e.g., conditional cash transfers), much remains to be accomplished. First, Mexico has powerful social norms that undermine the rule of law. Corruption and the lack of resources for safety and justice offer ample opportunities for further criminal justice reform. Second, Mexico could benefit from social programs that have shown to be advantageous, such as public childcare, women's shelters, and conditional cash transfer programs. These

[14] MORENA is the current ruling party in the federal government of Mexico. In addition, MORENA governs in 7 of 32 states.

programs have been demonstrated to further empower women in Mexico (Ángeles et al., 2011; Díaz, 2013; Calderon, 2014; de la Miyar, 2018; Hughes, 2019), as they offer economic opportunities outside of the household. Instead, the federal administration canceled social programs such as "Progresa-Oportunidades-Prospera" under austerity grounds. However, if these pending policies take too much time to realize, social unrest and gender division may worsen, as indicated by the recent rise in women's protests (Calderon et al., 2017).

Declaration of Competing Interest

The authors report no declarations of interest.

Appendix A

A.1 Additional tables and figures

Table A.1
Figures A.1–A.3

Table A.1
Oster's bounding methodology.

	Lapse in- Alimony (1)	Sexual- Crimes (2)	Domestic- Violence (5)	Femicide (6)
Week 0	[−1.16,−0.16]	[−3.51, 0.44]	[−2.47, 1.21]	[−0.15,−0.01]
Week 1	[−1.09,−0.51]	[−3.85,−0.96]	[−7.68,−3.27]	[−0.08,−0.01]
Week 2	[−3.16,−1.08]	[−6.91,−0.99]	[−13.75,−3.66]	[−0.17,−0.01]
Week 3	[−1.86,−0.69]	[−5.32,−0.58]	[−8.03,−0.79]	[−0.13, 0.01]
Week 4	[−1.77,−0.41]	[−3.26,−0.33]	[−8.50,−0.36]	[−0.22,−0.01]
Week 5	[−2.69,−0.23]	[−4.43,−0.23]	[−8.61,−0.21]	[−0.25,−0.01]
Week 6	[−1.70, 0.04]	[−3.90,−0.01]	[−5.88, 0.39]	[−0.22,−0.01]
Week 7	[−3.41, 0.08]	[−5.18,−0.04]	[−6.83, 0.59]	[−0.10,−0.01]
Baseline FE	Yes	Yes	Yes	Yes
Observations	49,140	49,140	49,140	49,140
R^2	0.61	0.48	0.82	0.06

Source: *Mexico's National Public Security System* (*Secretariado Ejecutivo del Sistema Nacional de Seguridad Pública*). Notes: Baseline fixed effects are included at the municipality, month, and year. The baseline specification is weighted by the muncipality-level population. Estimation includes January through October over 2019–2020. Intervals in squares brackets are the bounds.

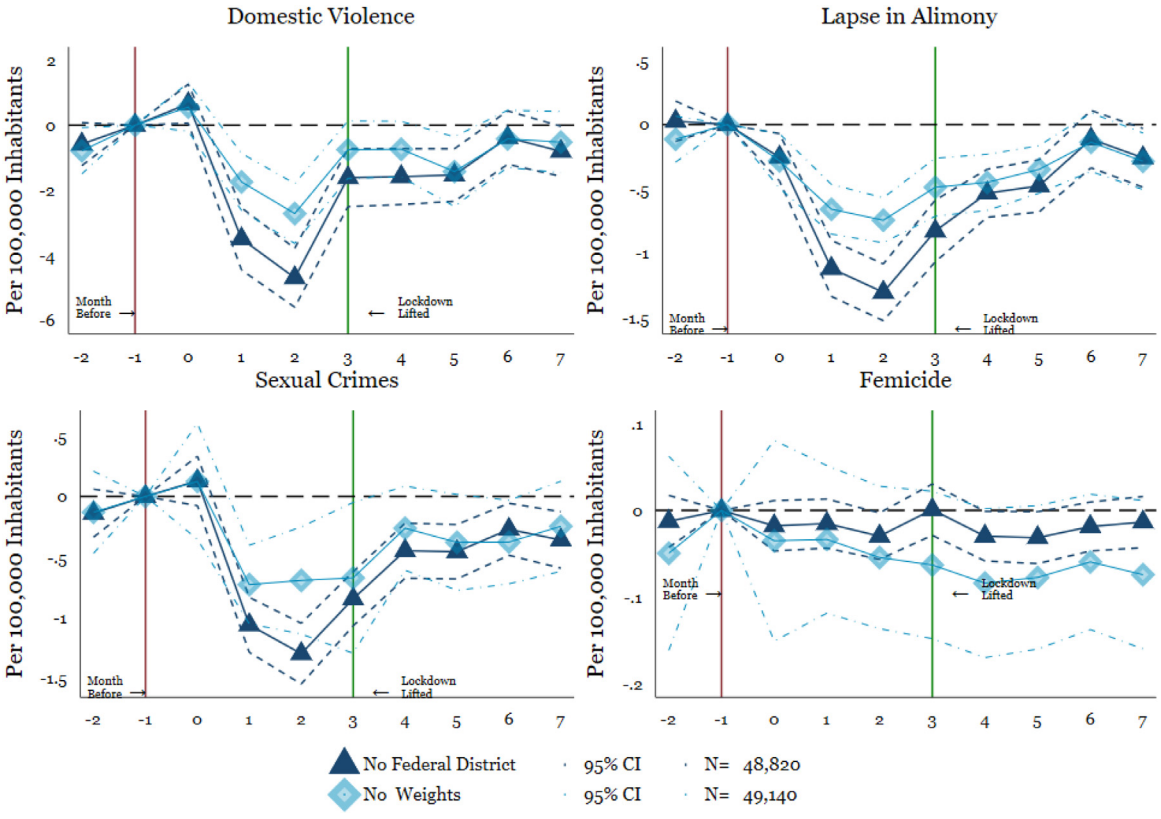

Fig. A.1. Event Study: Robustness. Source: *Mexico's National Public Security System* (*Secretariado Ejecutivo del Sistema Nacional de Seguridad Pública*). Notes: Plotted coefficients are event-study dummy variables, β_q (from Equation (1)). Each plotted point represents the number of months before and after the start of the pandemic in March. Solid lines connected lines represent point estimates. Dashed and dotted lines display the 95 percent confidence intervals. The red vertical line indicates the month before the lockdown (February). The green vertical line shows the month after the lockdown (June). Crimes are measured per 100,000 persons. Baseline fixed effects are included at the municipality, month, and year. The baseline specification is weighted by the muncipality-level population. Estimation includes January through October over 2019–2020. Robust standard errors are clustered at the municipal level.

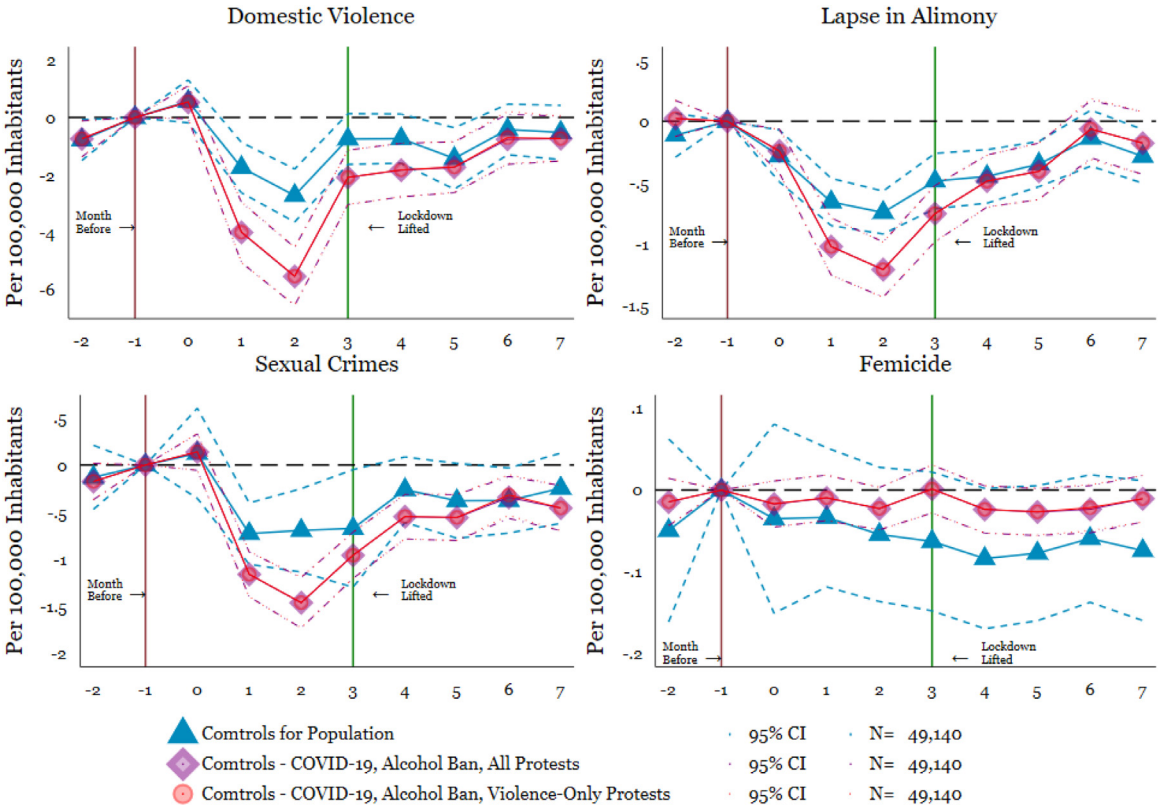

Fig. A.2. Event Study: Additional Controls. Source: *Mexico's National Public Security System* (*Secretariado Ejecutivo del Sistema Nacional de Seguridad Pública*). Notes: Plotted coefficients are event-study dummy variables, β_q (from Eq. (1)). Each plotted point represents the number of months before and after the start of the pandemic in March. Solid lines connected lines represent point estimates. Dashed and dotted lines display the 95 percent confidence intervals. The red vertical line indicates the month before the lockdown (February). The green vertical line shows the month after the lockdown (June). Crimes are measured per 100,000 persons. Baseline fixed effects are included at the municipality, month, and year. The baseline specification is weighted by the muncipality-level population. Estimation includes January through October over 2019–2020. Robust standard errors are clustered at the municipal level. Additional controls include the COVID-19 cases and deaths per 100,000, whether the municipality had passed an alcohol ban, and whether the municipality had a demonstration against gender-based violence. The red specification omits demonstrations focused on abortion, and only includes anti-violence protests.

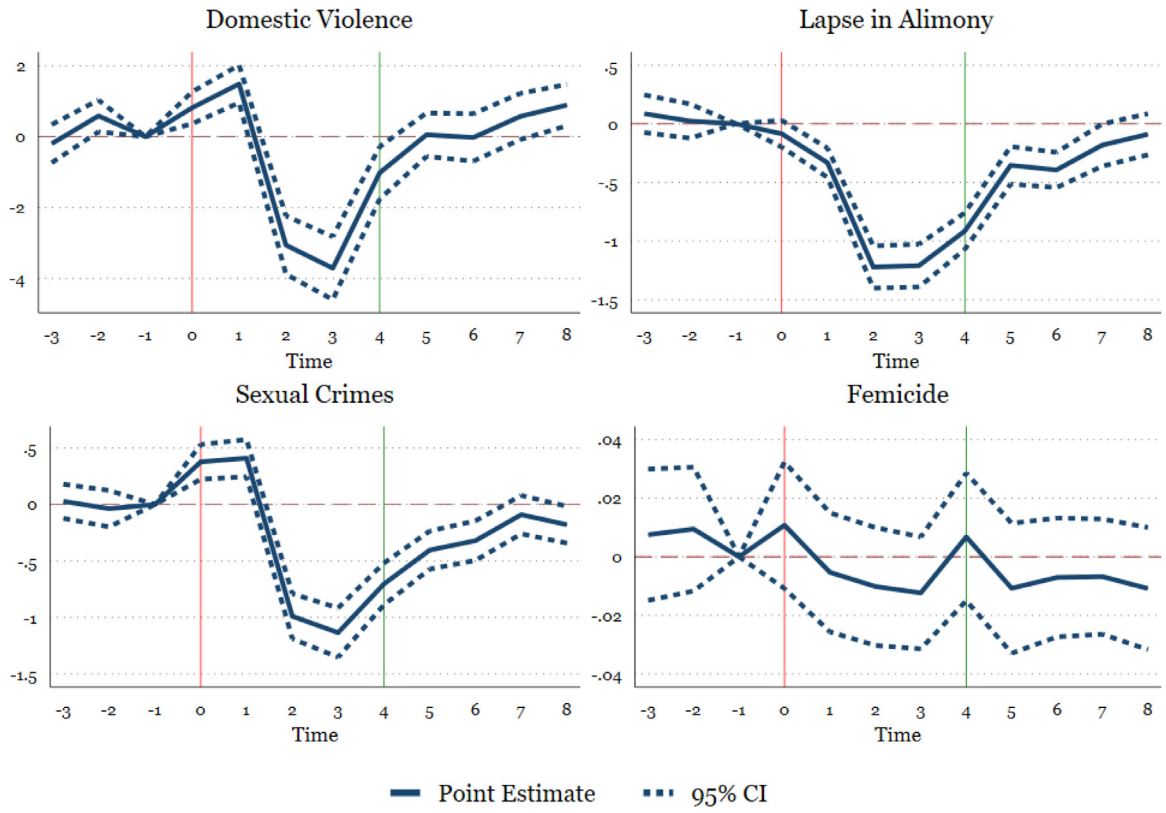

Fig. A.3. Event Study: Additional Years and Months and Omitted Period as January. Source: *Mexico's National Public Security System* (*Secretariado Ejecutivo del Sistema Nacional de Seguridad Pública*). Notes: Plotted coefficients are event-study dummy variables, β_q (from Equation (1)). Each plotted point represents the number of months before and after the start of the pandemic in March. Solid lines connected lines represent point estimates. Dashed and dotted lines display the 95 percent confidence intervals. The red vertical line indicates the month before the lockdown (February). The green vertical line shows the month after the lockdown (June). Crimes are measured per 100,000 persons. Baseline fixed effects are included at the municipality, month, and year. The baseline specification is weighted by the muncipality-level population. Estimation includes January through October over 2019-2020. Additional years and months are added for the above specification including 2015-2020 and November and December of all years. January is omitted in the above series, and is represented by period (-1). Period zero corresponds to February, period one corresponds to March. Period -3 is November and period 8 is October. Robust standard errors are clustered at the municipal level.

Appendix B. Additional mechanism information

B.1 Data used for mechanisms

We use the following data sources for the mechanisms section of the analysis:

1 **Municipality Urban Measure**: To identify urban municipalities we use locality-level data published by CONAPO (Consejo Nacional de Población or Population Council). For localities with a large city, if any locality in the municipality has a city of 100,000 or more, that municipality is coded as having a large city.
2 **COVID-19 Cases and Deaths**: The COVID-19 municipality-level data comes from Gobierno de México, https://datos.covid-19.conacyt.mx/fHDMap/mun.php. We use both the cases and deaths per 100,000 for continuous measures and the above and below median rates for the 'high' municipality-level cutoffs. Throughout the analysis we use municipality-level total cases and deaths per 100,000 from March through October.
3 **Mobility Data**: The change in mobility measures are at the state level and come from Apple mobility data (Apple, 2020). These changes in mobility measure the changes in driving mobility. The index ranges from 0-100, with 0 indicating a larger drop in driving mobility.
4 **Employment Changes**: The changes in employment come from the Mexican Institute of Social Security (Instituto Mexicano del Seguro Social, IMSS). These numbers represent the increase in unemployment in the formal sector at the state level.
5 **State Policies to Mitigate the Economic Effects**: We use data provided by Cejudo et al. (2020) state-level programs with information regarding the budget assigned to support individuals during the lockdown. The total budget for all the state's policies is around 33,740 millions of pesos and represents approximately 0.18% of the GDP. This budget is distributed as follows: credits (58.1%), monetary transfers (31.6%), food support (5.6%), fiscal stimulus (1.4%), and other support such as masks and gloves (3.3%). For those programs with information regarding the budget, there is not detailing information regarding the timing and duration of the implementation to consider effects by month. Thus, we use above and below median support as well as continuous measures of support.
6 **Violence Shelters**: The data for the number of violence shelters is available at the state level and comes from the 2015 Census of Social Assistance Accommodation (Censo de Alojamientos de Asistencia Social). This data is posted on INEGI's website here: https://www.inegi.org.mx/programas/caas/2015//default.html?init=2. We take the state-level number of *Refugio para mujeres,*

sus hijas e hijos en situación de violencia. These data do not disclose the municipality to protect the victims.

7 **Public Safety Expenditures and Employees**: The data for state-level public expenditure and public safety personnel comes from National Census of Government, Public Security and State Penitentiary System 2020 (Censo Nacional de Gobierno, Seguridad Pública y Sistema Penitenciario Estatales 2020). These data are available on INEGI's website at the state level. See https://www.inegi.org.mx/programas/cngspspe/2020/#Tabulados for more information.

8 **Feminist Demonstrations**: The information for the protests comes from the Armed Conflict Location and Event Data (Raleigh et al., 2010). From the period of analysis, we identify 73 demonstrations (11 in 2019 and 62 in 2020). We also perform a robustness check where we eliminate demonstrations that focus on abortion, this yields 39 demonstrations (11 in 2019 and 28 in 2020).

B.2 Tables for continuous values of mechanisms.

Tables B.1

Table B.1
Descriptive statistics: mechanisms.

	Mean	Std. Dev.	50th Pct	Min	Max
Panel A: Municipality-level Mechanisms					
1(Large City in Municipality)	0.09	0.29	0.00	0.00	1.00
Deaths Per 100,000	38.34	42.63	26.89	0.00	623.45
Cases Per 100,000	340.50	406.38	212.20	0.00	4,131.60
Observations	2457				
Panel B: State-level mechanisms					
Mobility					
Change in Mobility	62.30	15.58	63.12	25.59	98.56
Employment/Income					
% Unemployment Δ Men	4.04	4.06	3.35	0.18	23.65
% Unemployment Δ Women	2.44	2.72	1.72	0.19	15.31
% Unemployment Δ - Men to Women	2.30	2.45	1.69	0.14	14.42
P.C. Budget at the State Level	23.53	46.59	11.93	0.00	260.49
HDI (2015)	0.74	0.03	0.74	0.67	0.83
Services					
Number of violence shelters	2.69	2.22	2.00	1.00	9.00
Public safety personnel per 1000	1.21	0.63	1.26	0.19	2.80
State public safety P.C. budget	568.31	334.41	571.13	70.81	1,348.85
Observations	32				

Source: *Mexico's National Public Security System* (*Secretariado Ejecutivo del Sistema Nacional de Seguridad Pública*). Notes: Crime rates are measured per 100,000 inhabitants.

Table B.2
Implementation of alcohol sales prohibition.

tate	Municipality	Ban starts	State	Municipality	Ban starts
Campeche	All	April 5	Guerrero	San Marcos	April 3
Puebla	All	April 17		Iguala	April 17
Quintana Roo	All	April 1		Taxco	May 17
Sinaloa	All	April 13	Jalisco	Mazamitla	March 30
Sonora	All	April 2		Tamazula de Gordiano	March 30
Tabasco	All	April 1	Michoacán	Lázaro Cárdenas	April 18
Yucatán	All	April 10		Zacapú	March 27
Aguascalientes	El llano	April 2	Morelos	Xochitepec	April 15
	Cosío	March 30		Emiliano Zapata	April 15
	Rincón de los Romos	March 30		Cuautla	April 13
	Asientos	March 30		Temixco	April 7
	Pabellón de Arteaga	March 30		Ayala	April 16
Baja California Sur	Mulegé	April 29		Totolapan	April 6
	Loreto	April 8		Cuernavaca	April 3
	Los Cabos	April 6		Zacatepec	April 12
	Comndú	April 3	Nayarit	Tepic	April 14
Chiapas	San Cristóbal de las Casas	April 13		Bahía de Banderas	April 6
	Comalapa	April 13		Rosamorada	April 2
	Tapachula	April 13		Compostela	April 2
	Tuxtla Gutierrez	April 13		Amatlán de Canas	April 4
	Palenque	April 2		Xalisco	April 4
	Yajalón	April 13		Ixtlán del Río	April 4
Mexico City	Milpa Alta	April 7		Santa María del Oro	April 2
	Magdalena Contreras	April 28	Nuevo León	Cadereyta de Jiménez	April 15
	Miguel Hidalgo	May 1	Oaxaca	Oaxaca	March 26
	Xochimilco	April 24		Salina Cruz	April 1
	Coyoacán	April 23		Santiago Jamiltepec	April 1
	Alvaro Obregón	April 17		Juchitán	April 24
	Gustavo Madero	April 23	Querétaro	Pinal de Amolles	April 5
	Cuajimalpa	April 13	San Luis Potosí	Zaragoza	April 7

Table B.2 (*Continued*)

tate	Municipality	Ban starts	State	Municipality	Ban starts
	Tlalpan	April 29		Río Verde	April 23
Durango	Gómez Palacio	March 20		Ciudad Fernández	April 23
	Guadalupe Victoria	April 23		Tamazunchale	April 6
	Pánuco de Coronado	April 23		Xilitla	April 23
Eatado de México	Ecatepec	April 22		Axtla de Terrazas	April 24
	Atizapan de Zaragoza	April 20		Matlapa	April 23
	Nezahualcóyotl	April 11	Veracruz	Minatitlán	April 24
	Valle de Chalco	April 29		Agua Dulce	April 16
	Tenancingo	April 27		Las Choapas	May 6
	San Mateo Atenco	April 14		Ixhuatlán de Sureste	May 6
	Almoloya de Juárez	April 22		Oteapan	May 6
	Chalco	May 1		Pajapan	May 6
	Amecameca	May 1		Nanchital	May6
	Atlautla	May 1		Tatahuicapan	May 6
	Chimalhuacán	May 1		Misantla	April 17
Guanajuato	San Luis de la Paz	April 25		Xalapa	May 10
			Zacatecas	Jerez	March 31
				Tlatenango	April 7
				Rlío Grande	April 6

Source: Own elaboration using the Official Gazette and Google searches.

Table B.3
Mechanisms (2) Municipality-level infection risk, continuous measures.

	All crime (1)	Domestic violence (2)	Lapsed alimony (3)	Sexual crimes (4)	Femicide (5)
Panel A: COVID-19 Deaths Per 100,000					
1(Post-COVID-19) x Deaths Per 100,000	−0.037***	−0.027***	−0.003***	−0.007***	−0.000
	(0.002)	(0.002)	(0.001)	(0.001)	(0.000)
1(Post-COVID-19)	−0.152	0.292	−0.364***	−0.071	−0.008
	(0.230)	(0.196)	(0.057)	(0.073)	(0.013)
Panel B: COVID-19 Confirmed Cases Per 100,000					
1(Post-COVID-19) x Cases Per 100,000	−0.004***	−0.003***	−0.000***	−0.001***	−0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
1(Post-COVID-19)	−0.221	0.250	−0.282***	−0.177***	−0.012
	(0.200)	(0.170)	(0.050)	(0.064)	(0.011)
Observations	49,140	49,140	49,140	49,140	49,140
Pre-Lockdown Mean Dependent	17.42	13.22	1.45	2.68	0.07
Baseline FE	X	X	X	X	X
Time Trends	X	X	X	X	X

Source: Mexico's National Public Security System (Secretariado Ejecutivo del Sistema Nacional de Seguridad Pública). Notes: Difference-in-differences-differences estimates from Equation (3). Estimates show the grouped post-periods (month three 2020 onward) relative to the pre-pandemic (month three and before). The interacted estimate shows the post-period interacted with the mechanism of interest. Monthly linear time trends are included. Baseline fixed effects are included at the municipality, month, and year. The baseline specification is weighted by the muncipality-level population. Estimation includes January through October over 2019–2020. Robust standard errors are clustered at the municipal level. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$ Crimes are measured per 100,000 persons.

Table B.4
Mechanism (2): changes in mobility, state-level income, and increases in unemployment, continuous measures.

	All crime (1)	Domestic violence (2)	Lapsed alimony (3)	Sexual crimes (4)	Femicide (5)
Panel A: mobility reduction in the state					
1(Post-COVID-19) x Change in Mobility	0.006	0.016	−0.019	0.009	−0.000
	(0.046)	(0.033)	(0.014)	(0.009)	(0.000)
1(Post-COVID-19)	−3.311	−2.742	0.598	−1.157*	−0.009
	(3.140)	(2.382)	(0.794)	(0.621)	(0.029)
Panel B: Percent Increase in Unemployment - Men					
1(Post-COVID-19) x % Unemployment Δ Men	−0.117	−0.044	−0.034	−0.035	−0.003**
	(0.166)	(0.125)	(0.033)	(0.026)	(0.001)
1(Post-COVID-19)	−2.554**	−1.605*	−0.468***	−0.478***	−0.003
	(1.118)	(0.905)	(0.171)	(0.166)	(0.010)
Panel C: Percent Increase in Unemployment - Women					
1(Post-COVID-19) x % Unemployment Δ Women	−0.230	−0.129	−0.027	−0.069	−0.004***
	(0.307)	(0.254)	(0.053)	(0.063)	(0.002)
1(Post-COVID-19)	−2.447**	−1.471*	−0.526***	−0.445**	−0.005
	(1.105)	(0.893)	(0.172)	(0.181)	(0.010)
Panel D: Percent Relative Increase in Unemployment - Men to Women					
1(Post-COVID-19) x % Unemployment Δ - Men to Women	−0.029	0.013	−0.053	0.011	0.000
	(0.238)	(0.170)	(0.057)	(0.062)	(0.002)
1(Post-COVID-19)	−2.898***	−1.780**	−0.484***	−0.618***	−0.015
	(1.051)	(0.870)	(0.169)	(0.182)	(0.011)
Panel E: State-level Budget for Support (Per Capita) During the Pandemic					
1(Post-COVID-19) x P.C. Budget at the State Level	0.000	0.003	−0.003	−0.000	0.000***
	(0.008)	(0.008)	(0.002)	(0.002)	(0.000)
1(Post-COVID-19)	−2.960***	−1.825**	−0.523***	−0.590***	−0.023**
	(0.881)	(0.749)	(0.133)	(0.127)	(0.009)
Panel F: State-level Human Development Index					
1(Post-COVID-19) x HDI (2015)	−42.641***	−29.080***	−4.404	−8.841***	−0.316**
	(7.785)	(8.024)	(5.446)	(2.508)	(0.137)
1(Post-COVID-19)	28.626***	19.780***	2.676	5.950***	0.220**
	(5.704)	(5.875)	(3.971)	(1.827)	(0.102)
Observations	640	640	640	640	640
Pre-Lockdown Mean Dependent	17.42	13.22	1.45	2.68	0.07
Baseline FE	X	X	X	X	X
Time Trends	X	X	X	X	X

Source: Mexico's National Public Security System (Secretariado Ejecutivo del Sistema Nacional de Seguridad Pública). Notes: Difference-in-differences-differences estimates from Equation (3). Estimates show the grouped post-periods (month three 2020 onward) relative to the pre-pandemic (month three and before). The interacted estimate shows the post-period interacted with the mechanism of interest. Monthly linear time trends are included. State-level aggregate crime rates shown. Baseline fixed effects are included at the state, month, and year. The specification is weighted by the state-level population. Estimation includes January through October over 2019–2020. Robust standard errors are clustered at the state level. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$ Crimes are measured per 100,000 persons.

Table B.5
Mechanism (3): State-level public services, continuous measures.

	All crime (1)	Domestic violence (2)	Lapsed alimony (3)	Sexual crimes (4)	Femicide (5)
Panel A: number of violence shelters					
1(Post-COVID-19) x Number of Violence Shelters	0.048	0.090	0.020	−0.062	0.001
	(0.296)	(0.220)	(0.049)	(0.056)	(0.002)
1(Post-COVID-19)	−3.133***	−2.093***	−0.660***	−0.362**	−0.018
	(0.980)	(0.773)	(0.237)	(0.147)	(0.013)
Panel B: Public Safety Personnel Per 1,000					
1(Post-COVID-19) x Public Safety Personnel Per 1,000	0.647	−0.041	0.440	0.243	0.005
	(1.422)	(1.060)	(0.305)	(0.226)	(0.010)
1(Post-COVID-19)	−3.297*	−1.338	−1.145***	−0.795**	−0.019
	(1.891)	(1.402)	(0.413)	(0.347)	(0.019)
Panel C: Public Safety Expenditures Per Capita					
1(Post-COVID-19) x State Public Safety P.C. Budget	0.001	−0.000	0.000	0.000	0.000
	(0.002)	(0.002)	(0.001)	(0.000)	(0.000)
1(Post-COVID-19)	−2.783**	−1.189	−0.861*	−0.713**	−0.021
	(1.413)	(0.968)	(0.460)	(0.317)	(0.020)
Observations	640	640	640	640	640
Pre-Lockdown Mean Dependent	17.42	13.22	1.45	2.68	0.07
Baseline FE	X	X	X	X	X
Time Trends	X	X	X	X	X

Source: Mexico's National Public Security System (Secretariado Ejecutivo del Sistema Nacional de Seguridad Pública). Notes: Difference-in-differences-differences estimates from Equation (3). Estimates show the grouped post-periods (month three 2020 onward) relative to the pre-pandemic (month three and before). The interacted estimate shows the post-period interacted with the mechanism of interest. Monthly linear time trends are included. State-level aggregate crime rates shown. Baseline fixed effects are included at the state, month, and year. The specification is weighted by the state-level population. Estimation includes January through October over 2019-2020. Robust standard errors are clustered at the state level. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$ Crimes are measured per 100,000 persons.

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