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The Impact of COVID-19 on Crime: a Systematic Review

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Abstract

COVID-19 caused a great burden on the healthcare system and led to lockdown measures across the globe. These measures are likely to influence crime rates, but a comprehensive overview on the impact of COVID-19 on crime rates is lacking. The aim of the current study was to systematically review evidence on the impact of COVID-19 measures on crime rates across the globe. We conducted a systematic search in several databases to identify eligible studies up until 6–12-2021. A total of 46 studies were identified, reporting on 99 crime rates about robberies ($n=12$), property crime ($n=15$), drug crime ($n=5$), fraud ($n=5$), physical violence ($n=15$), sexual violence ($n=11$), homicides ($n=12$), cybercrime ($n=3$), domestic violence ($n=3$), intimate partner violence ($n=14$), and other crimes ($n=4$). Overall, studies showed that most types of crime temporarily declined during COVID-19 measures. Homicides and cybercrime were an exception to this rule and did not show significant changes following COVID-19 restrictions. Studies on domestic violence often found increased crime rates, and this was particularly true for studies based on call data rather than crime records. Studies on intimate partner violence reported mixed results. We found an immediate impact of COVID-19 restrictions on almost all crime rates except for homicides, cybercrimes and intimate partner violence.

Keywords COVID-19 · Crime · Violence · Robberies · Homicides · Fraud

Introduction

In the spring of 2020, the Coronavirus Disease-2019 (COVID-19) reached most countries across the globe and caused a great burden on society, in particular on the healthcare system and economy. To reduce the spread of the virus and its strain on the healthcare system, many governments quickly imposed (lockdown) measures including stay-at-home orders, travel bans, physical distancing, closed schools, and restricted private and public gatherings. These measures proved to be effective in

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slowing down the virus (Talic et al., 2021), but also had a huge impact on daily life (Helsingen et al., 2020; Marroquin et al., 2020; O'Donnell & Greene, 2021; Olff et al., 2021; Tull et al., 2020; Zhang et al., 2022).

Early on, reviews suggested that COVID-19 measures could increase specific crime rates such as domestic violence and intimate partner violence (e.g., Bradbury-Jones & Isham, 2020; Ertan et al., 2020; Kaukinen, 2020). The COVID-19 pandemic and restrictions heightened risk factors for domestic violence and intimate partner violence such as unemployment, financial insecurity, and stress (Bradbury-Jones & Isham, 2020; Morgan & Boxall, 2020). Moreover, since people were confined to their home, it might be difficult to seek help or for others to notice the abuse taking place. These heightened risk factors are also known to influence crimes such as property crime (Lin, 2008; Speziale, 2014). On the other hand, the COVID-19 restrictions have been shown to reduce daily movement and increase time spent at home (e.g., Borkowski et al., 2021; Cheung & Gunby, 2022), both potentially lowering the opportunity for crimes such as theft and robbery (Caminha et al., 2017; Cheung & Gunby, 2022).

There are at least three crime related theories that are relevant in the context of COVID-19. Firstly, *routine activities theory* explains crimes by a motivated offender, suitable target and lack of capable guardianship and stresses that crime is influenced by routine activities such as work, family and social life (Cohen & Felson, 1979). Since COVID-19 restrictions limit (social) interactions thereby reducing capable guardianship in a family setting, one might expect an increase in crimes committed in family settings while crimes in public settings might decrease related to the reduced interactions in public settings.. Moreover, since COVID-19 restrictions reduce mobility and increase the use of online communication, suitable targets are increasingly found online rather than offline and one might expect an increase in online and a decrease in offline crimes.. Secondly, *rational choice theory* explains crimes by information which leads to beliefs about opportunities and outcomes of crimes, resulting in a rational choice to commit crimes (Karstedt, 1994). According to this theory, crimes with a high reward and low perceived risk and effort such as non-residential burglaries (i.e. burglaries of buildings not used for people to live in) will increase during COVID-19 restrictions. Moreover, the social restriction measures might have led to a lower perceived risk of domestic violence since it was more difficult for the victim to seek help without the perpetrator knowing. This might result in increased domestic violence.

Thirdly, the general strain theory posits that people commit crimes to alleviate strain and stress (Agnew, 1992). It distinguishes objective strain (generally experienced as stressful such hospitalization due to COVID-19) from subjective strain (personally stressful such as stay-at-home orders which might be extremely stressful for some but less stressful for others). General strain theory also distinguishes three types of events eliciting strain: introduction of negative stimuli, removal of positive stimuli and inability to attain one's goals. It emphasizes the role of coping with strain (where criminal behaviour can be considered a behavioural maladaptive coping strategy) and similar to rational choice theory the role of costs of crime. Following this theory, one would expect that COVID-19 and COVID-19 restrictions (e.g., lockdowns) lead to increased strain especially

related to inability to attain goals (e.g., a bartender might not be able to attain his/her goal of supporting his/her family due to loss of work) and reduced coping capabilities (e.g., less social support due to lockdown) and therefore increased crime specifically crime with low perceived costs such as theft, non-residential burglaries and domestic violence. (Eriksson & Mazerolle, 2013). Generally, routine activities theory and – to some extend—rational choice theory stress the importance of *opportunity* to commit crimes which is reduced for most crimes due to COVID-19 restrictions, while general strain theory emphasises individual predictors (strain) of crime which are likely increased due to COVID-19 (restrictions). Hence, based on routine activities and rational choice theory COVID-19 restrictions are expected to reduce most crime rates except for online crimes and domestic violence which might both increase due to increased opportunity. Based on general strain theory, we expect an increase in crime rates with low costs such as domestic violence driven by increased strain.

Many studies across the globe have evaluated the impact of COVID-19 (measures) including lockdowns, social distancing, stay-at-home orders, working from home orders and restricted gatherings on crime rates and patterns. Moreover, several reviews on the impact of COVID-19 on specific crime rates have been published (Kourti et al., 2023; McNeil et al., 2023; Regalado et al., 2022). These reviews increased awareness into the potential impact of COVID-19 measures on crime rates. However, they often did not include systematic search strategies and only focused on a small subset of studies (e.g., at the start of the pandemic or one specific crime rate). Hence, most crime rates have not been systematically reviewed, precluding overall conclusions about crime rates and patterns. Moreover, it has not been evaluated whether change in crime rates due to COVID-19 differs based on study characteristics such as country or data source. If COVID-19 measures truly impact crime rates for example by reducing daily movements, we would expect a larger impact on crime rates in countries with more stringent COVID-19 measures (and thus more reduced daily movement) compared to countries with less stringent measures. Additionally, some data sources like police records might be influenced by limited resources to record crime rates due to the enforcement of (lockdown) measures and therefore underrepresent crime rates (White & Fradella, 2020). Other data sources like hospital data usually assess trauma as a proportion of all trauma cases in a specific period and might overrepresent crime rates since overall trauma cases seem to have been decreased during COVID-19 (Pikoulis et al., 2020).

In the current study, we systematically review evidence for the impact of COVID-19 on crime rates. Specifically, we review the impact on robberies, property crime, drug crime, fraud, physical violence, sexual violence, homicides, cybercrime, domestic violence, IPV, COVID-19-related violence, nature crime, elderly abuse, and traffic crime. We evaluate the impact of COVID-19 in three ways. Firstly, we evaluate changes in crime rates during COVID-19 in general compared to pre-COVID times. Secondly, we evaluate changes in crime rates due to imposing restrictions during COVID-19 such as stay-at-home orders, travel bans, social distancing etc. Thirdly, we evaluate changes in crime rates due to relaxing COVID-19 restrictions.

Method

Search Strategies

We conducted systematic searches up to the 6th of December 2021 in PubMed, Embase, Web of Science, Cochrane Library, Emcare, PsycINFO, Academic Search premier, Criminal Justice Abstracts, WHO Covid Database, COVID-19 Evidence, Social Services Abstracts and Sociological Abstracts. The searches were based on (MeSH) terms for: a) crimes, b) COVID-19 and c) COVID-19 measures. See Appendix 1 for the full search strategy. We included both individual studies and reviews, because we adopted a umbrella review approach when multiple reviews were published about a crime rate. Titles and abstracts of identified studies were screened independently by two authors (CH and BW) for inclusion and exclusion criteria using web-tool Rayyan (Ouzzani et al., 2016) until the researchers reached satisfactory agreement (Cohen's Kappa > 0.7). Discrepancies were resolved through discussion. For the first 250 titles and abstracts, interrater reliability was not satisfactory (Cohen's Kappa = 0.67, agreement = 83%). After discussing discrepancies and reaching consensus on the screening procedure, the interrater reliability was satisfactory for the following 500 titles and abstracts (Cohen's Kappa = 0.73, agreement = 90%). The remaining titles and abstracts were screened by one of the two authors. Thereafter, full-texts of eligible studies were screened by two authors with the same procedure. The interrater reliability for the first 90 full-texts was not satisfactory (Cohen's Kappa = 0.69, agreement = 85%), but it was for the next 90 full-texts (Cohen's Kappa = 0.89, agreement = 95%). The remaining full-texts were screened by one of the two authors. The design of this review was pre-registered at Prospero (ID number CRD42021288748).

Inclusion Criteria

We included individual studies, systematic reviews and meta-analyses including individual studies with data collected during COVID-19 which a) measured a change in crime rate during COVID-19 (so included a comparison pre-COVID) b) included at least 25 participants; c) were written in English, Dutch, French, German, or Spanish. When we identified at least two systematic reviews/meta-analyses on a specific crime rate, we excluded individual papers and used an umbrella review approach to summarize the reviews and meta-analyses. We excluded non-systematic reviews and we only included one study per crime rate per data source from a specific city. We first prioritized studies which reported about multiple cities over studies reporting about a single city and secondly we prioritized studies including most recent data.

Data Extraction and Quality Assessment

Data was extracted by one author (BW) and checked by another author (CH). Study quality was assessed by the two authors independently using the NIH risk

of bias tool for observational cohort and cross-sectional studies and the NIH risk of bias tool for systematic reviews and meta-analyses depending on the study design (NIH, 2013). Studies were rated poor, fair, or good. Discrepancies between researchers were resolved through discussion. We extracted information about the study (design, population, location, inclusion and exclusion criteria, data source, sample size, and measurements, whether comparisons pre-post COVID-19 and/or pre-post COVID-19 lockdown were made, period of data collection, and measurements), study sample demographics (gender and age), crime (type of crime) and analysis (type of analysis, covariates, and outcomes). With regard to the data source, we included data from crime-records (usually provided by the police), hospital data about the type of violence which induced the injury (usually based on electronic health records), emergency call data for help (usually to 911, the police or another organization involved in domestic violence), and autopsy reports.

We categorized the outcomes of the analysis into three categories: COVID-19 (measures) led to a significant decrease in crime rates (-), had no significant impact on crime rates (-/+), or led to a significant increase in crime rates (+). We set p-value for significance at $p < 0.05$. When a single study reported on crime rates in multiple cities, we categorized the overall outcome of a study as a significant increase or decrease when at least 50% of the cities show an effect in this direction, and a maximum of 25% of the cities show an effect in the opposite direction. Otherwise, the results were categorized as not having significant impact on crime rates. When a single study reported the impact of COVID-19 (measures) on crime rates for several months into the lockdown separately, we categorized the overall outcome as a significant increase or decrease when at least 50% of the months showed an effect in this direction and a maximum of 25% of the months showed an effect in the opposite direction. Otherwise, the results were categorized as not having significant impact on crime rates. When a single study reported separately about an immediate impact of COVID-19 (measures) followed by a trend over time, we used both types of information and categorized the overall outcome as a significant increase or decrease when at least 50% of the data demonstrated an effect in this direction and a maximum of 25% of the data demonstrated an effect in the opposite direction. Otherwise, the results were categorized as not having significant impact on crime rates.

Results

Study Selection

We identified 4,799 studies (1,726 after removal of duplicates; see Fig. 1 for flow-diagram). We excluded 1,318 records based on title and abstract screening. We could not retrieve 11 reports and thus assessed 397 full-texts for eligibility. Of these, 351 full-texts were excluded because they did not meet the inclusion criteria. The remaining 46 studies were included in this review. For *domestic violence* we found several systematic reviews and therefore we excluded individual studies on domestic violence from the current review. For *physical violence* we found one systematic review

using hospital data and therefore individual studies using hospital data for physical violence were excluded from the current review. For all other types of crimes, we did not identify multiple systematic reviews and therefore reviewed individual studies. See Table 1 for study characteristics and outcomes of all included studies. Note that there is some overlap between crimes (i.e., sexual assault of an intimate partner both meets criteria for intimate partner violence and sexual violence). Figure 2 summarizes the findings on changes in crimes rates after COVID-19 restrictions are imposed.

Robberies

Nine individual studies on robberies (e.g., street robberies, vehicle robberies, robbery against residence), reported on 11 results from seven countries based on crime records, and a large study reported on results from around the world (24 cities). Most studies reported on data from western countries (8 results) and most studies corrected for seasonal components (7 results). The results from all studies showed a significant decrease in robberies due to COVID-19 restrictions ($n = 12$). The global study found that this decrease was related to the stringency of the restrictions. Another study found that relaxing restrictions led to increases in robberies, while one study found no relationship between relaxing restrictions and robberies.

Property Crime

Twelve individual studies on property crime (e.g., burglaries, theft of vehicle, theft from person, shoplifting) reported on 14 results from 10 countries based on crime records, and a large study reported on results from around the world (20 cities). Most studies reported on data from western countries (10 results) and corrected for seasonal components (11 results). Findings on the relationship between COVID-19 in general and property crime were mixed for most studies ($n = 2$) while only one study reported a decrease in property crime. Of the studies that considered property crime in relation to COVID-19 restrictions, the majority reported a decrease in property crime ($n = 9$), while only a few studies reported mixed results ($n = 3$). This decrease was followed by an increase after relaxing restrictions for most studies ($n = 2$), while only one study reported no association. Note that mixed results were related to the type of property crime: residential burglaries generally decreased while non-residential burglaries increased, thus amounting to a mixed result. The global study also found that COVID-19 restrictions were related to a decrease in property crime and that this was related to the stringency of the restrictions.

Drug Crime

Five individual studies on drug crime (e.g., drug trafficking, possession of drugs) reported on five results from four countries based on crime records. All studies reported on data from western countries and corrected for seasonal components.

Table 1. Study characteristics for all included articles

	Authors	Year	Country	City or # of studies	Data Source	Collection Time DD/MM/YYYY	Study Design	Change due to COVID Prevalence	Change due to Restrictions Starting	Change due to Restrictions Lifting	Covariates	Quality Score (Poor, Fair, Good)
Robberies												
1	Buil-Gil et al.	2021	Northern Ireland	n/a	Police Service of Northern Ireland	04/2015 – 05/2021	Crime-record	n/a	-	+/-	Seasonal component	Good
2	Abrams	2021	United States	25 cities	City Police Departments	2015 (7 weeks prior to date of SAH) – 2020 (4 weeks after SAH)	Crime-record	-	-	n/a	Seasonal component	Good
3	Lopez & Rosenfeld	2021	United States	28 cities = max, 13 cities = min	Online Data Portals of City Police Departments	01/2017 – 12/2020	Crime-record	n/a	-	n/a	Seasonal and annual component	Good
4	Monteiro et al.	2021	Brazil	Rio de Janeiro	Public Security Institute (ISP-RJ)	01/2016 – 06/2020	Crime-record	n/a	-	n/a	Seasonal component	Good
5	Wang et al.	2021	Australia	New South Wales	NSW Police Force's Computerized Operational Policing System	02/01/2017 – 28/06/2020	Crime-record	n/a	-	n/a	Seasonal and annual component	Good
6	Andersen & Hodgkinson	2020	Australia	Queensland	Queensland Police Service	03/05/2018 – 02/07/2020	Crime-record	n/a	-	+	Seasonal component	Good
7	Estvez-Soto	2021	Mexico	Mexico City	Mexico City's open data portal; justice and security, and mobility categories	01/01/2017 – 24/05/2020	Crime-record	n/a	-	n/a	Mobility	Good
8	Langton et al.	2021	England and Wales	n/a	42/43 Police Forces across England and Wales	03/2015 – 08/2020	Crime-record	n/a	-	n/a	Seasonal and annual component	Good
9	Ceccato et al.	2022	United States	New York City	New York City Police Department	01/01/2019 – 03/06/2020	Crime-record	n/a	-	n/a	n/a	Good

Table 1. (continued)

	Authors	Year	Country	City or # of studies	Data Source	Collection Time DD/MM/YYYY	Study Design	Change due to COVID Prevalence	Change due to Restrictions Starting	Change due to Restrictions Lifting	Covariates	Quality Score (Poor, Fair, Good)
10	Ceccato et al.	2022	Sweden	Stockholm	RAR of the Police region Stockholm, Swedish Police Authority	01/01/2019 – 03/06/2020	Crime-record	n/a	-	n/a	n/a	Good
11	Ceccato et al.	2022	Brazil	São Paulo	São Paulo's Secretariat of Public Security	01/01/2019 – 03/06/2020	Crime-record	n/a	-	n/a	n/a	Good
12	Nivette et al.	2021	23 countries	n/a	Police data	n/a	Crime-record	n/a	-	n/a	Climate data, yearly population	Fair
Property crime												
13	Buil-Gil et al.	2021	Northern Ireland	n/a	Police Service of Northern Ireland	04/2015 – 05/2021	Crime-record	n/a	+/-	No change	Seasonal component	Good
14	Abrams	2021	United States	25 cities	City Police Departments	2015 (7 weeks prior to date of SAH) – 2020 (4 weeks after SAH)	Crime-record	+/-	-	n/a	Seasonal component	Good
15	Lopez & Rosenfeld	2021	United States	28 cities = max, 13 cities = min	Online Data Portals of City Police Departments	01/2017 – 12/2020	Crime-record	n/a	+/-	n/a	Seasonal and annual component	Good
16	Monteiro et al.	2021	Brazil	Rio de Janeiro	Public Security Institute (ISP-RJ)	01/2016 – 06/2020	Crime-record	n/a	+/-	n/a	Seasonal component	Good
17	de la Miyar et al.	2021	Mexico	Mexican Municipalities	National Public Security System	01/2019 – 10/2020 (same for 2019, 2020)	Crime-record	n/a	-	+	Seasonal-component, municipality-level size, higher/lower men's employment losses	Good
18	Cheung & Gunby	2022	New Zealand	n/a	New Zealand Police	07/2014 – 05/2020	Crime-record	n/a	-	n/a	Seasonal and annual component	Good
19	Andresen & Hodgkinson	2020	Australia	Queensland	Queensland Police Service	03/05/2018 – 02/07/2020	Crime-record	n/a	-	+	Seasonal component	Good
20	Ashby	2020	United States	16 cities	Police-recorded crime data	06/01/2020 – 10/05/2020 *	Crime-record	+/-	n/a	n/a	Seasonal component	Fair

Table 1. (continued)

	Authors	Year	Country	City or # of studies	Data Source	Collection Time DD/MM/YYYY	Study Design	Change due to COVID Prevalence	Change due to Restrictions Starting	Change due to Restrictions Lifting	Covariates	Quality Score (Poor, Fair, Good)
21	Chen et al.	2021	China	Anonymous medium-sized city	Police Bureau and kept in the Computer Aid Dispatch system	01/03/2017 – 31/03/2020	Phone-data	n/a	-	n/a	Seasonal component	Good
22	Langton et al.	2021	England and Wales	n/a	42/43 police forces across England and Wales	03/2015 – 08/2020	Crime-record	n/a	-	n/a	Seasonal and annual component	Fair
23	Shen et al.	2021	Japan	n/a	2018–2020 Crime Statistics (Hanzai Toukei)	01/2020 – 05/2020 (same time for 2018 and 2019)	Crime-record	-	n/a	n/a	Age, monthly and annual components	Good
24	Ceccato et al.	2022	United States	New York City	New York City Police Department	01/01/2019 – 03/06/2020	Crime-record	n/a	-	n/a	n/a	Good
25	Ceccato et al.	2022	Sweden	Stockholm	RAR of the Police region Stockholm, Swedish Police Authority	01/01/2019 – 03/06/2020	Crime-record	n/a	-	n/a	n/a	Good
26	Ceccato et al.	2022	Brazil	São Paulo	São Paulo's Secretariat of Public Security	01/01/2019 – 03/06/2020	Crime-record	n/a	-	n/a	n/a	Good
27	Nivette et al.	2021	23 countries	n/a	Police data	n/a	Crime-record	n/a	-	n/a	Climate data, yearly population	Fair
Drug crime												
28	Buil-Gil et al.	2021	Northern Ireland	n/a	Police Service of Norther Ireland	04/2015 – 05/2021	Crime-record	n/a	-	+	Seasonal component	Good
29	Abrams	2021	United States	25 cities	City Police Departments	2015 (7 weeks prior to date of SAH) – 2020 (4 weeks after SAH)	Crime-record	-	-	n/a	Seasonal component	Good

Table 1. (continued)

	Authors	Year	Country	City or # of studies	Data Source	Collection Time DD/MM/YYYY	Study Design	Change due to COVID Prevalence	Change due to Restrictions Starting	Change due to Restrictions Lifting	Covariates	Quality Score (Poor, Fair, Good)
30	Lopez & Rosenfeld	2021	United States	28 cities = max, 13 cities = min	City Police Departments	01/2017 – 12/2020	Crime-record	n/a	-	n/a	Seasonal and annual component	Good
31	Andresen & Hodgkinson	2020	Australia	Queensland	Queensland Police Service	03/05/2018 – 02/07/2020	Crime-record	n/a	+	-	Seasonal component	Good
32	Langton et al.	2021	England and Wales	n/a	42/43 Police Forces across England and Wales	03/2015 – 08/2020	Crime-record	n/a	+/-	n/a	Seasonal and annual component	Fair
Fraud												
33	Buil-Gil et al.	2021	Northern Ireland	n/a	Police Service of Northern Ireland	04/2015 – 05/2021	Crime-record	n/a	+/-	+/-	Seasonal-component	Good
34	de la Miyar et al.	2021	Mexico	Mexican Municipalities	National Public Security Service	01/2019 – 10/2019 and 01/2020 – 10/2020	Crime-record	n/a	-	+	Seasonal-component, municipality-level size, higher/lower men's employment losses	Good
35	Andresen & Hodgkinson	2020	Australia	Queensland	Queensland Police Service	03/05/2018 – 02/07/2020	Crime-record	n/a	-	+/-	Seasonal-component	Good
36	Chen et al.	2021	China	Anonymous medium-sized city	Police Bureau and Computer Aid Dispatch system	01/03/2017 – 31/03/2020	Phone-data	n/a	-	n/a	Seasonal-component	Good
37	Kemp et al.	2021	United Kingdom	n/a	Action Fraud	04/2017 – 07/2020	Crime-record	n/a	+	n/a	Seasonal-component	Good
Physical violence												
38	Buil-Gil et al.	2021	Northern Ireland	n/a	Police Service of Northern Ireland	04/2015 – 05/2021	Crime-record	n/a	-	+	Seasonal component	Good
39	Abrams	2021	United States	25 cities	City Police Departments	2015 (7 weeks prior to date of SAH) – 2020 (4 weeks after SAH)	Crime-record	+/-	-	n/a	Seasonal component	Good
40	Lopez & Rosenfeld	2021	United States	28 cities = max, 13 cities = min	Online Data Portals of City Police Departments	01/2017 – 12/2020	Crime-record	n/a	+/-	n/a	Seasonal and annual component	Good

Table 1. (continued)

	Authors	Year	Country	City or # of studies	Data Source	Collection Time DD/MM/YYYY	Study Design	Change due to COVID Prevalence	Change due to Restrictions Starting	Change due to Restrictions Lifting	Covariates	Quality Score (Poor, Fair, Good)
41	Dogan et al.	2021	United States	New Hanover County, North Carolina	911 Call Records	23/03/2020 – 21/07/2020	Phone data	+	+/-	n/a	Seasonal component	Good
42	Monteiro et al.	2021	Brazil	Rio de Janeiro	Public Security Institute (ISP-RJ)	01/2016 – 06/2020	Crime-record	n/a	-	n/a	Seasonal component	Good
43	de la Miyar et al.	2021	Mexico	Mexican Municipalities	National Public Security System	01/2019 – 10/2020 (same for 2019, 2020)	Crime-record	n/a	-	+	Seasonal-component, municipality-level size, higher/lower men's employment losses	Good
44	Andresen & Hodgkinson	2020	Australia	Queensland	QPS	03/05/2018 – 02/07/2020	Crime-record	n/a	-	+	Seasonal component	Good
45	Langton et al.	2021	England and Wales	n/a	42/43 Police Forces across England and Wales	03/2015 – 08/2020	Crime-record	n/a	-	n/a	Seasonal and annual component	Fair
46	Moslehi et al.	2021	Australia	New South Wales and Victoria	Local Government Area	01/2019 – 12/2020	Crime-record	n/a	-	n/a	Seasonal component	Good
47	Ceccato et al.	2022	United States	New York City	New York City Police Departments	01/01/2019 – 06/03/2020	Crime-record	n/a	-	n/a	n/a	Good
48	Ceccato et al.	2022	Sweden	Stockholm	RAR of the Police region Stockholm, Swedish Police Authority	01/01/2019 – 06/03/2020	Crime-record	n/a	+/-	n/a	n/a	Good
49	Ceccato et al.	2022	Brazil	São Paulo	São Paulo's Secretariat of Public Security	01/01/2019 – 06/03/2020	Crime-record	n/a	-	n/a	n/a	Good
50	Ashby*	2020	United States	16 cities*	Police-recorded crime data	06/01/2020 – 10/05/2020 *	Crime-record	+/-	n/a	n/a	Seasonal component	Fair
51	Beiter et al.	2021	12 countries*	44 studies	n/a	n/a	Other record	+/-*	n/a	n/a	n/a	Fair

Table 1. (continued)

	Authors	Year	Country	City or # of studies	Data Source	Collection Time DD/MM/YYYY	Study Design	Change due to COVID Prevalence	Change due to Restrictions Starting	Change due to Restrictions Lifting	Covariates	Quality Score (Poor, Fair, Good)
Sexual violence												
52	Nivette et al.	2021	23 countries	n/a	Police data	n/a	Crime-record	n/a	-	n/a	Climate data, yearly population	Fair
53	Buil-Gil et al.	2021	Northern Ireland	n/a	Police Service of Northern Ireland	04/2015 – 05/2021	Crime-record	n/a	-	+/-	Seasonal component	Good
54	Abrams	2021	United States	25 cities	City Police Departments	2015 (7 weeks prior to date of SAH) – 2020 (4 weeks after SAH)	Crime-record	-	-	n/a	Seasonal component	Good
55	Monteiro et al.	**2021**	Brazil	Rio de Janeiro	Public Security Institute (ISP-RJ)	01/2016 – 06/2020	Crime-record	n/a	+/-	n/a	Seasonal component	Good
56	Muldoon et al.	**2021**	Canada	Ottawa	The Ottawa Hospital	04/03/2020 – 05/05/2020	Hospital data	-	n/a	n/a	Age, sex, police involvement, mental health	Good
57	Hoehn-Velasco et al.	**2021**	Mexico	n/a	National Public Security System	01-/2020 – 10/2020	Crime-record	-	-	n/a	Seasonal, monthly, annual and state components	Good
58	Estvez-Soto	**2021**	Mexico	Mexico City	Mexico City's open data portal; justice and security, and mobility categories	01/01/2017 – 24/05/2020	Crime-record	n/a	-	n/a	Mobility	Good
59	Shen et al.	**2021**	Japan	n/a	2018–2020 Crime Statistics (Hanzai Toukei)	01/2020 – 05/2020 (same time for 2018, 2019)	Crime-record	-	n/a	n/a	Age, month, annual components	Good
60	Payne et al.	**2022**	Australia	Queensland	Queensland Government's Open Data Portal	02/2014 – 04/2020	Crime-record	n/a	-	n/a	Seasonal component	Good
61	Ceccato et al.	**2022**	United States	New York City	New York City Police Department	01/01/2019 – 03/06/2020	Crime-record	n/a	-	n/a	n/a	Good

Table 1. (continued)

	Authors	Year	Country	City or # of studies	Data Source	Collection Time DD/MM/YYYY	Study Design	Change due to COVID Prevalence	Change due to Restrictions Starting	Change due to Restrictions Lifting	Covariates	Quality Score (Poor, Fair, Good)
62	Ceccato et al.	**2022**	Sweden	Stockholm	RAR of the Police region Stockholm, Swedish Police Authority	01/01/2019 – 03/06/2020	Crime-record	n/a	-	n/a	n/a	Good
63	Ceccato et al.	**2022**	Brazil	São Paulo	São Paulo's Secretariat of Public Security	01/01/2019 – 03/06/2020	Crime-record	n/a	-	n/a	n/a	Good
Homicide												
64	Abrams	**2021**	United States	25 cities	City Police Department	2015 (7 weeks prior to date of SAH) – 2020 (4 weeks after SAH)	Crime-record	+/-	+/-	n/a	Seasonal-component	Good
65	Sakelliadis et al.	2020	Greece	n/a	Department of Forensic Medicine and Toxicology of the National and Kapodistrian University of Athens	17/03/2020 – 15/04/2020	Other-record (autopsy)	+/-	n/a	n/a	Sex, age, nationality	Fair
66	Lopez & Rosenfeld	2021	United States	28 cities = max, 13 cities = min	Online Data Portals of City Police Departments	01/2017 – 12/2020	Crime-record	n/a	+/-	n/a	Seasonal and annual component	Good
67	Monterio et al.	2021	Brazil	Rio de Janeiro	Public Security Institute (ISP-RJ)	01/2016 – 06/2020	Crime-record	n/a	+/-	n/a	Seasonal-component	Good
68	de la Miyar et al.	2021	Mexico	Mexican Municipalities	National Public Security System	01/2019 – 10/2019 and 01/2020 – 10/2020	Crime-record	n/a	+/-	+/-	Seasonal-component, municipality-level size, higher/lower men's employment losses	Good
69	Calderon-Anyosa & Kaufman	2021	Peru	n/a	Peruvian National Death Information System (SINADEF)	01/01/2017 – 26/09/2020	Other-record (death certificates)	n/a	-	+/-	Seasonal-component	Good

Table 1. (continued)

	Authors	Year	Country	City or # of studies	Data Source	Collection Time DD/MM/YYYY	Study Design	Change due to COVID Prevalence	Change due to Restrictions Starting	Change due to Restrictions Lifting	Covariates	Quality Score (Poor, Fair, Good)
70	Byard	2021	Australia	Adelaide	Forensic Science South Australia	01/2015 – 12/2020	Other-record (autopsy records)	-	n/a	n/a	n/a	Fair
71	Ceccato et al.	2022	United States	New York City	New York City Police Department	01/01/2019 – 03/06/2020	Crime-record	n/a	+/-	n/a	n/a	Good
72	Ceccato et al..	2022	Sweden	Stockholm	Swedish Police Authority, RAR of the Police region Stockholm	01/01/2019 – 03/06/2020	Crime-record	n/a	+/-	n/a	n/a	Good
73	Ceccato et al..	2022	Brazil	São Paulo	São Paulo's Secretariat of Public Security	01/01/2019 – 03/06/2020	Crime-record	n/a	+/-	n/a	n/a	Good
74	Shen et al.	2021	Japan	n/a	2018-2020 Crime Statistics (Hanzai Toukei)	01/2020 – 05/2020 (same for 2018, 2019)	Crime-record	+/-	n/a	n/a	Age, month and annual component	Good
75	Nivette et al.	2021	23 countries	n/a	Police data	n/a	Crime-record	n/a	+/-	n/a	Climate data, yearly population	Fair
Cybercrime												
76	Buil-Gil et al.	2021	Northern Ireland	n/a	Police Service of Northern Ireland	04/2015 – 05/2021	Crime-record	n/a	+/-	+/-	Seasonal component	Good
77	Hawdon et al.	2020	United States	n/a	n/a	24/11/2019 – 30/11/2019 (pre-covid sample)*	Between-subjects	+/-	n/a	n/a	Sex, ed.*, political affil*, unemployment, dark web*	Fair
78	Kemp et al.	2021	United Kingdom	n/a	Action Fraud	04/2017 – 07-2020	Crime-Record	n/a	+	n/a	Seasonal component	Good
Domestic violence												
79	Green et al.	2021	n/a	13 studies	n/a	n/a	All study types	n/a	n/a	n/a	n/a	Poor

Table 1. (continued)

	Authors	Year	Country	City or # of studies	Data Source	Collection Time DD/MM/YYYY	Study Design	Change due to COVID Prevalence	Change due to Restrictions Starting	Change due to Restrictions Lifting	Covariates	Quality Score (Poor, Fair, Good)
IPV												
80	Kourti et al.	2021	n/a	32 studies	n/a	n/a	Case reports, cohort studies, cross sectional, case series, and case-control studies	+/-	More restrictions larger increase	n/a	n/a	Good
81	Piquero et al.	2021	n/a	18	n/a	n/a	All with data	+	n/a	n/a	n/a	Fair
82	Walsh et al.	2022	United States	n/a	n/a	07/2020 – 09/2020	Cross-sectional	+/-	n/a	n/a	n/a	Fair
83	Pattojoshi et al.	2021	India	n/a	n/a	11/05/2020 – 18/05/2020	Cross-sectional	n/a	+	n/a	n/a	Fair
84	Gosangi et al.	2021	United States	n/a	n/a	11/03/2020 – 03/05/2020 (same for 2017, 2018, 2019)	Hospital-data	-	n/a	n/a	n/a	Fair
85	Ebert & Steinert	2021	Germany	n/a	n/a	22/04/2020 – 08/05/2020	Cross-sectional	n/a	+/-	n/a	Age, socioeconomic status	Good
86	Vives-Cases et al.	2021	Spain	n/a	016-Calls, Official Complaints, Protection Orders	01/2015 – 09/2020	Phone data	+/-	n/a	n/a	n/a	Fair
87	Arenas-Arroyo et al.	2021	Spain	n/a	n/a	17/05/2020 - 12/06/2020	Cross-sectional	n/a	+	n/a	Level of abuse before lockdown	Good
88	Campedelli et al.	2021	Unites States	Los Angeles	Los Angeles Police Department	01/2017 – 28/03/2020	Crime-record	n/a	+/-	n/a	Seasonal component	Good
89	Aguero	2021	Peru	n/a	Ministerio de la Mujer y Poblaciones Vulnerables, calls to Linea 100	01/2007 – 07/2020	Phone data	n/a	+	n/a	Seasonal, monthly, annual and state component	Good
90	Mahmood et al.	2022	Iraq	Kurdistan Region	n/a	05/06/2020 – 20/06/2020	Cross-sectional	n/a	+	n/a	n/a	Fair

Table 1. (continued)

	Authors	Year	Country	City or # of studies	Data Source	Collection Time DD/MM/YYYY	Study Design	Change due to COVID Prevalence	Change due to Restrictions Starting	Change due to Restrictions Lifting	Covariates	Quality Score (Poor, Fair, Good)
91	Ojeahere et al.	2022	Nigeria	n/a	n/a	05/2020	Cross-sectional	n/a	-	n/a	Marital status, number of children	Fair
92	Capinha et al.	2022	Portugal	n/a	Domestic Violence Database	01/2020 – 12/2020 (same time for 2016, 2017, 2018, 2019)	Crime-record	-	-	n/a	n/a	Good
93	El-Nimr	2021	"Arab residents"	n/a	n/a	04/2020 – 06/2020	Cross-sectional	n/a	+	n/a	Region of residence, family income, level of ed.	Fair
94	Plášilová et al.	2021	Czech Republic	n/a	n/a	19/11/2020 – 25/11/2020	Cross-sectional	-	n/a	n/a	n/a	Good
95	Abujilban et al.	2022	Jordan	n/a	n/a	04/2020	Cross-sectional	n/a	-	n/a	n/a	Fair
Traffic												
96	Andresen & Hodgkinson	2020	Australia	Queensland	Queensland Police Service (QPS)	03/05/2018 – 02/07/2020	Crime-record	n/a	-	+/-	Seasonal-component	Good
COVID-specific crime												
97	Doğan	2021	Turkey	Kayseri	n/a	01/09/2020 – 20/10/2020	Cross-sectional	+	n/a	n/a	n/a	Fair
Wildlife crime												
98	Koju et al.	2021	Nepal	n/a	Department of National Park and Wildlife Conservation	07/2020 – 09/2020	Other record (officials and media reports)	n/a	+/-	n/a	n/a	Fair
Elderly abuse												
99	Chang & Levy	2021	United States	n/a	n/a	23/04/2020 – 05/05/2020	Cross-sectional	+	n/a	n/a	Age, sex, ed.*, marital status, living arrange*, self-rated health	Fair

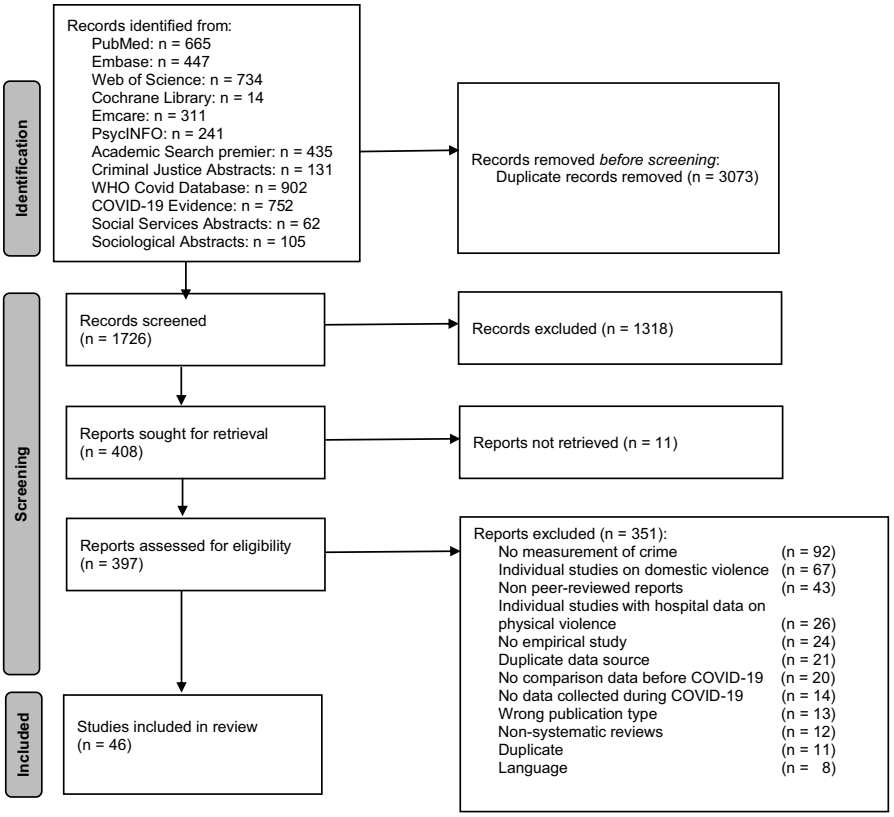

Fig. 1 Flowdiagram of inclusion of studies

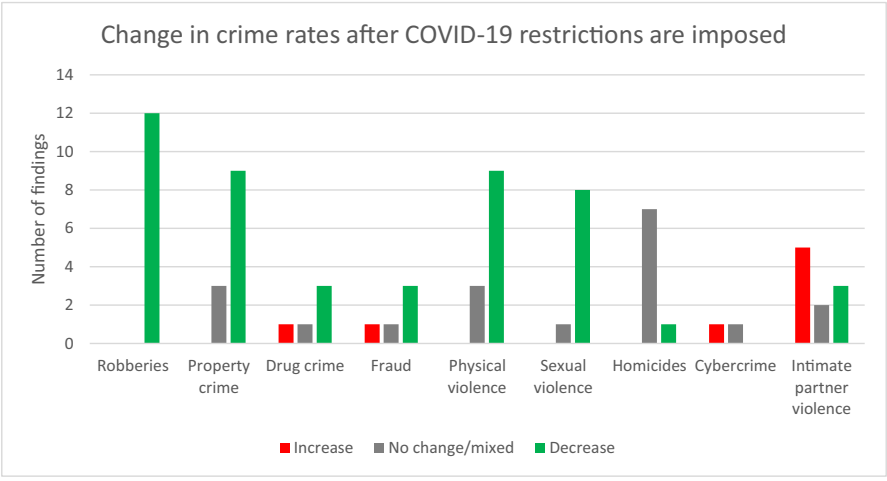

Fig. 2 Number of findings reporting an increase, no change/mixed findings or decrease in a specific crime rate after COVID-19 restrictions are imposed

One study found a decrease in drug crimes during COVID-19. Most studies found a decrease in drug crimes in relation to the introduction of COVID-19 restrictions ($n=3$), while one study found mixed results and one study reported an increase in drug crime. After relaxation of restrictions, drug crime normalized. The study reporting an increase in drug crime included data from 15 districts in Queensland, Australia (Andresen & Hodgkinson, 2020) while the others studies report data from multiple cities from the US and UK. Queensland faced a long and strict lockdown during COVID-19 and many people lost their mining job in this area due to the drop in costs of coal and COVID-19 restrictions placed on mining workers. This might have led to enormous strain in this area and self-medicating behaviours such as drug use. Divergent findings might also be explained by the type of drug crime, since some studies found a decrease in drugs trafficking but not in the possession of drugs. Moreover, some studies found an immediate increase in drugs offenses directly after COVID-19 restrictions were imposed followed by a drop in drug crimes.

Fraud

Five individual studies on fraud (e.g., online fraud, scams, fraud by phone) reported on five results from five countries based on crime records and call data. Three studies reported on data from western countries, one on data from Mexico and one on data from China. All studies corrected for seasonal components. Most studies showed a decrease in fraud in response to COVID-19 restrictions ($n=3$), while one study reported an increase, and one study reported no association. The study reporting an increase included data from the UK (Kemp et al., 2021), while the others studies reported data from China, Mexico and Australia. Kemp et al. (2021) specifically found the increase in fraud for individuals and less so for fraud reported by organizations. Other studies did not report about this distinction. Studies on the relationship between fraud and relaxations in restrictions mostly found no association ($n=2$) while one study reported an increase.

Physical Violence

Eleven individual studies on physical violence (e.g., assault, battery, gun assault, physical abuse) reported on 13 results from seven countries based on crime records and call data. We also included a systematic review summarizing hospital data and one large study reporting on results from around the world (23 cities). The majority of the studies reported on data from western countries (10 results) and corrected for seasonal components (10 results). Individual studies on the change in physical violence during COVID-19 were inconclusive and showed mixed results ($n=2$) or an increase in physical violence ($n=1$). Note that all these studies only included data from the US. Most studies found a decrease in physical violence due to implementation of COVID-19 restrictions ($n=9$) followed by an increase in physical violence after relaxing restrictions ($n=3$). Only a few studies found no association between physical violence and the implementation of COVID-19 restrictions ($n=3$ of which 2 based on data from

the US). The global study reported a decrease in physical violence, but this effect was unrelated to the stringency of the restrictions. In contrast, hospital data did not show an effect of COVID-19 on physical violence. Most studies based on hospital data reported no change ($n=14$), and some studies reported an increase ($n=8$) or decrease ($n=6$) in physical violence. Note that all studies which observed an increase in physical violence based on hospital data reported on data from the US.

Sexual Violence

Eight studies on sexual violence (e.g., rape, sexual assault) reported on 11 results from eight countries based on crime records and hospital data. Most studies reported on data from western countries (7 results) and corrected for seasonal components (6 results). Studies conclusively showed a decrease in sexual violence during COVID-19 in general ($n=4$) and a decrease in sexual violence during COVID-19 restrictions ($n=8$), while only one study reported mixed results.

Homicides

Nine individual studies on homicides (e.g., murder, manslaughter) reported on 11 results from eight countries based on crime records and autopsy reports. Most studies reported on data from western countries (7 results) and corrected for seasonal components (6 results). We also included a large study reporting on results across the globe (21 cities). Most studies reported no relationship between COVID-19 and homicides ($n=3$) while only one study reported a decrease. Similarly, most studies found no significant relationship between the implementation of COVID-19 restrictions and homicides ($n=7$) while only one study reported a decrease. No studies found an association between the relaxation of COVID-19 restrictions and homicides. The global study also found no significant relationship between COVID-19 restrictions and homicides.

Cybercrime

Three individual studies on cybercrime reported on three results from three countries western countries based on crime records. Two of these studies corrected for seasonal components. Study results on the relationship between COVID-19 (restrictions) and cybercrime were inconsistent: two studies found no association while one study reported an increase. One study assessed the relationship between cybercrime and relaxations in COVID-19 restrictions and found no association.

Domestic Violence

We were able to review two out of the three systematic reviews on domestic violence (the third did not allow for a review as it was unclear what data was the basis for the conclusions; Green et al., 2021). Piquero et al. (2021) reported an overall increase

in domestic violence during COVID-19 with a medium effect size ($d = 0.66$) based on 18 studies. The majority of the included studies were based on data from the US, some included data from the same city, and most studies were not published at time of review. Interestingly, all types of data sources were combined in one analysis (e.g., call data, crime records and hospital data). Three out of the four studies who reported the largest increase in domestic violence reported on call data about domestic violence. In the second systematic review, Kourti et al. (2021) reported that calls related to domestic violence had increased during COVID-19 (three studies reported an increase and one a decrease) while data based on crime records was inconclusive (three studies reported an increase, two studies reported a decrease and three studies reported no significant change). Included studies were based on data from countries across the globe (although western countries were overrepresented).

Intimate Partner Violence

Fourteen studies on intimate partner violence (e.g., physical violence against an intimate partner or sexual violence against an intimate partner), reported on 14 results from 11 countries based on crime records, call data, hospital data, or cross-sectional studies. Most studies reported on data from western countries (8 results). Only three studies corrected for seasonal components. In looking at the five studies pertaining to rates of intimate partner violence during COVID-19 in general, most studies reported a decrease ($n = 3$ of which one based on a cross-sectional sample, one based on crime records, and one based on hospital data) while only 1 study reported mixed results (based on phone data) and one study reported no change (based on cross-sectional data). However, studies reporting on the change in intimate partner violence due to the implementation of COVID-19 restrictions were mixed: several studies reported an increase ($n = 5$ of which four based on a (usually small) cross-sectional sample and one based on call data), decrease ($n = 3$ of which two based on a small cross-sectional sample and one based on crime records) or no change ($n = 2$ of which one based on a cross-sectional sample and one based on crime records).

Other Crimes

We included one individual study on COVID-19-related crimes, which found that during COVID-19 the majority of the healthcare workers ($> 70\%$) reported an increase in violence during work. Moreover, we included one individual study on crime related to nature which found no change in wildlife crime after COVID-19 restrictions were imposed. We also included one individual study on elderly abuse which found an increase in elderly abuse during COVID-19. Finally, we included one study on traffic crimes which reported a decrease in traffic crimes after COVID-19 restrictions were imposed. Note that most of these studies (except for traffic crimes) did not correct for seasonal components.

Discussion

The current review aimed to systematically examine studies on the impact of COVID-19 and COVID-19 lockdown measures on crime rates. We identified 46 studies with crime data from cities across the globe. COVID-19 affected almost all types of crimes except for homicides. Most crimes clearly decreased due to COVID-19 (measures) including sexual violence, robberies, property crime, fraud, drug crime, physical violence, and traffic crimes. Usually, a decreased crime rate due to COVID-19 restrictions was followed by an increase when restrictions were released. For cybercrimes and intimate partner violence, results were mixed. For domestic violence, results indicate that there has been an increase during COVID-19 but this seems to be mostly based on call data while evidence from crime records is mixed. We conclude that COVID-19 temporarily decreased crimes in the public domain with homicides as important exception.

We found consistent evidence for the decrease in crimes in the public domain in response to COVID-19 (restrictions). Most studies corrected for seasonal and annual changes in crime rates and the study quality was generally good. Note that for property crimes, residential property crimes decreased while non-residential property crimes often increased. Since COVID-19 measures often included staying at home, non-residential properties were easier targets for criminals. For drug crimes, some studies reported an immediate increase followed by a decrease due to COVID-19 restrictions. Most findings were based on data from western countries, Mexico, and Brazil. Most findings were not clearly different across regions except for physical violence. For physical violence, studies reporting on data from the US often reported an increase in violence or no change while studies reporting on data from other countries consistently reported a decrease in physical violence. This might be related to the racial conflicts and civil unrest related to the presidential elections in the US at that time. Generally, crime rates returned to pre-pandemic states when restrictions were alleviated. Thus, our findings indicate that these crime rates are affected by reduced opportunities due to restrictions that reduce mobility. These findings align with rational choice theory, deterrence theory, and to some extend to routine activities theory (Becker, 1968; Cohen & Felson, 1979; Karstedt, 1994). The reduction in crime rates seems to be specific (e.g., non-residential burglary is not affected by reduced mobility and thus not reduced), fast (immediate effects after lockdown measures were found) and universal (studies across the globe reported similar trends). Furthermore, stringency of lockdown measures and alleviation of restrictions were related to the crime rates pointing towards an effect of reduced opportunity rather than long-lasting changes.

We found an increase in domestic violence during COVID-19, potentially driven by call data rather than crime rates. On the one hand, crime rates might underestimate the incidence of domestic violence during COVID-19 because the COVID-19 lockdown measures might have complicated contact between victims and the police. On the other hand, studies reporting on call data often cannot discriminate domestic violence well from other issues (e.g., mental health issues), and given the impact of COVID-19 on (mental) health, this might also explain the increase in call data (Kourti et al., 2021). Alternatively, COVID-19 might also

have worsened the situation in homes where domestic violence was already present thereby increasing the intensity and/or severity of the violence, leading to more calls but not more reported crimes. Future studies are needed to follow-up on the discrepancy between call data and crime rates. Note that previous meta-analyses generally had low quality, included many unpublished studies, and often it was not clear whether these studies corrected for seasonal effects. Since domestic violence usually increases in spring, ignoring seasonal trends might overestimate the effect of COVID-19 on the domestic violence (Leslie & Wilson, 2020).

We found mixed evidence for changes in intimate partner violence due to COVID-19 (measures). Although many studies have been published about intimate partner violence, the study quality was relatively low, and many studies only included cross-sectional data without corrections for seasonal or annual effects. This finding is in contrast with the general strain theory which posits that COVID-19 would increase strain and thereby also intimate partner violence.

We consistently found no change in homicides due to COVID-19 (measures). Homicides are often committed in the context of organized crime or gang-violence (National Gang Center; Vichi et al., 2020) and it has been suggested that members of such criminal organizations might not adhere to COVID-19 measures. Institutional reports and international media reports indicate that criminal organizations tried to retain or increase their criminal activities during COVID-19 (Aziani et al., 2021). In line with deterrence theory (Becker, 1968) the economic benefit of organized crimes might outweigh the risk of a COVID-19 infection or a fine for violating COVID-19 measures. Note that more than a quarter (~29%) of all homicides are committed by intimate partners or other family members (Cooper & Smith, 2011), so although call data indicated that domestic violence increased, this did not result in more homicides.

We did not observe changes in cybercrimes due to COVID-19 (measures), while routine activities theory suggests that crime would shift from an offline to an online setting. COVID-19 restrictions forced people to stay at home, possibly increasing online activity and increasing opportunities for cybercrimes. A recent study, however, found that online activities related to a high chance of victimization such as online shopping or dark web use were not significantly increased during COVID-19 (Hawdon et al., 2020). Thus, opportunity for cybercrimes might not have been increased. In line, people reported increased use of protection software against cybercrimes during COVID-19 such as virus software which is known to reduce the chance of cybercrimes (Hawdon et al., 2020).

We did not identify significant changes in nature crimes, we found that both elderly abuse and violence against healthcare workers was increased during COVID-19. We only identified a few studies on these crime rates so more research is needed to draw conclusions.

Together, our results clearly show the importance of opportunity for crimes and show that several theories on criminal behaviour are useful for explaining changes in crime rates during COVID-19 such as routine activities, rational choice, and deterrence theory. This has important implications for strategies to reduce criminal behaviour. For example, opportunity to commit crimes might be reduced through nudging (manipulating contextual cues; Sharma & Kilgatton, 2015). In a recent pilot study potential

victims of theft from insecure vehicles were nudged to leave their vehicle more secure (Roach et al., 2017). Moreover, increasing the (perceived) probability of being apprehended and punished for crimes might also be effective in reducing criminal behaviour. For example, random breathing tests have been shown to be highly effective in reducing alcohol-related driver fatalities (Davey & Freeman, 2011). Note that such interventions should have a long duration to avoid a short-term effect followed by a return to normal levels. However, some predictions that can be made based on general crime theories are not supported by the data. Although we found a shift within a similar type of crime (i.e., from residential to non-residential property crimes), we found no shift from offline to online crimes. Previous studies indicated that criminal careers are usually clearly non-specialized (Gottfredson & Hirschi, 2016; Piquero et al., 2012) so it is remarkable that reductions in crime rates in an area with reduced opportunity were not clearly followed by increased crime rates in other areas. This might be (partly) explained by measures governments took to mitigate the impact of COVID-19. For example, in many countries governments launched campaigns to prevent domestic violence including social media campaigns, online support, more funding for alternative accommodations and the use of code words (Brink et al., 2021).

The current study is the first systematic review of changes in a broad range of crime rates during COVID-19. We used a systematic search strategy with two independent raters and we coded the quality of the included studies. This study also has some limitations. Firstly, most included studies reported data from western countries and especially the US has been overrepresented in research on crime rates. This might also relate to the availability of data on crime rates which is generally less in developing countries. Secondly, we were unable to check for publication bias since we did not include pooled effect sizes. Given the large number of studies in response to COVID-19, null findings may not have been published and therefore effects may have been overestimated. Thirdly, we only included published studies until the 6th of December 2021 and therefore we may have missed relevant unpublished literature by this date. Fourthly, most included studies used data from crime records with limited information about potential individual predictors of crimes such as COVID-19 related stressors/strains which might explain increased crime rates on an individual level. We recommend future studies to further examine individual predictors of crime during COVID-19.

Conclusion

COVID-19 has been referred to as the largest criminological experiment in history (Stickle & Felson, 2020). In line with general expectations from routine activities and rational choice theory, most crime rates decreased due to reduced opportunities, but quickly returned to pre-pandemic rates after COVID-19 measures were alleviated. Homicide was an exception, possibly related to the organized nature of the offence. Note that we do not know which COVID-19 measures were most important in reducing crime and how this effect was established since many of the COVID-19 measures might have led to reduced crime in various ways (e.g., closure of shops, home confinement, restrictions on (public) transport etc. might al have contributed to reduced crime via reduced mobility but also via other pathways such as reduced alcohol consumption

in public areas). In contrast to expectations from routine activities theory, deterrence theory, and general strain theory, we did not find evidence for a shift from offline to online crime. Similarly, we did not find clear indications that reduction in crime rates in public places led to consistent increases in crime rates in a private context (intimate partner violence and domestic violence). For both intimate partner violence and domestic violence, more research is needed to (a) determine whether these crime rates were increased due to COVID-19 while correcting for seasonal and annual effects for call data and crime record data separately and (b) further investigate any increase in crime rates with respect to persistency after COVID-19 measures were alleviated. Our findings imply that reducing the opportunity to commit crimes is an effective strategy. In any future situation where restrictions are imposed which reduce mobility, policy makers can overall expect reduced crime rates. However, tailored preventative actions should be considered for crime rates which are potentially increased such as domestic violence (e.g., code words, media campaigns) and non-residential property crimes (e.g., better security measures). To conclude, we found that COVID-19 restrictions had a major impact on most crime rates across the globe. The findings may inform policy and future research on crime rates and assist in the anticipation of the impact of changes in COVID-19 restrictions on crime rates.

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Declarations

Conflicts of Interest The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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