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Juvenile delinquency and COVID-19: the effect of social distancing restrictions on juvenile crime rates in Israel

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Introduction

The ongoing COVID-19 pandemic is undeniably one of the most critical events in the history of the world in recent decades. The lockdown policy that aimed to curb the pandemic has had a powerful impact on global society in many areas, including the social sphere (Singh & Singh, 2020), the political (Tisdell, 2020), economic (Hevia & Neumeyer, 2020; Tisdell, 2020; Yamin, 2020), and health systems (Driggin et al., 2020), as well as on social mobility (Kraemer 2020). Moreover, the pandemic caused widespread harm, emotional distress, and depression among millions of people around the world (Pfefferbaum and Noerth 2020; Shanahan et al., 2020; Usher et al., 2020).

Periods of extraordinary events such as wars, terror, pandemics, and natural disasters can also lead to changes in criminal behavior patterns (Barton, 1969; Drabek, 1986a, 1986b). Recent studies found that the COVID-19 pandemic affected crime rates differently in terms of crime type and location. While a significant decrease was found in rates of robbery, burglary, assault-battery, and shoplifting offenses (Ashby 2020a; Andresen 2020; Campedelli et al., 2020; Hodgkinson & Andresen, 2020; Mohler et al., 2020; Shayegh & Malpede, 2020), there was an increase in domestic violence (Leslie & Wilson, 2020; Mohler et al., 2020) and in cybercrime opportunities (Buil-Gil et al. 2020; Collier et al., 2020; Hawdon et al., 2020; Payne, 2020; Payne et al. 2020).

Stay-at-home restrictions may have also impacted juvenile delinquency patterns, as social interaction plays an essential role in juvenile behavior (Gottfredson and Hirschi 1990; Haynie & Osgood, 2005; Reiss, 1988; Warr, 2002). Furthermore,

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periods of crisis may also arouse social concern about the younger generation and lead to increased social control. As a result, there may be an increased tendency to open criminal files despite an overall drop in juvenile criminal activity (Bernard, 1992; Boman & Gallupe, 2020a, 2020b). Thus, the COVID-19 pandemic provides a unique opportunity to conduct a natural experiment regarding the impact of stay-at-home social restrictions on juvenile crime rates.

Most studies to date have focused on the impact of social distancing restrictions on adult crime. The current study draws on routine activity approach theory (Cohen & Felson, 1979; Cohen and Felson 2003) to explore the effect of the two lockdown periods in Israel on juvenile crime rates. Specifically, ARIMA models were used to examine trends in weekly juvenile crime rates based on official police records between January 2019 and December 2020.

Literature review

Lockdown and social distancing measures in Israel

At the beginning of March 2020, the Israeli government imposed gradual social distancing measures to curb the spread of the pandemic, banning social events with more than 100 people. On March 14, 2020, schools and academic institutions were closed. In addition, culture and leisure events were canceled, shopping centers and restaurants shut down, and social gatherings prohibited. The first lockdown period was between March 25 and May 4, 2020 (Braun-Lewensohn et al. 2020; Bruijn et al. 2020) and the second between September 25 and October 17, 2020. Social restrictions on gatherings continued between the two lockdown periods. In addition, the prevention policy changed from social restrictions imposed uniformly on the entire country to differential restrictions based on morbidity rates, mainly in localities with a high COVID-19 infection rate (Finkelstein 2020). The compliance level among the various social sectors, however, was not uniform. Moreover, police enforcement of the regulations was ineffective in localities with high pandemic morbidity rates and was also inconsistent (Israel State Comptroller Report 2021).

Theoretical framework

Routine activity theory (Cohen & Felson, 1979; Cohen and Felson, 2003) suggests that lifestyle and routine activity play a key role in the likelihood of criminal activity occurrence and can therefore provide a theoretical perspective for understanding the effect of exceptional events on crime rates. Cohen and Felson (1979) identified three core elements that must be present for patterns of criminal offending to take place: an accessible target, a motivated offender, and the absence of a capable guardian. Accordingly, the convergence of these elements at a specific time and place may explain the possible occurrence of crime and victimization (Cohen & Felson, 1979; Felson, 1995; Cohen and Felson, 2003).

Changes taking place in society may lead to changes in routine activities and, as such, in the opportunity structure. Thus, in times of exceptional events such as a

natural disaster or pandemic, structural changes in routine activities in a society may increase or decrease opportunities for crime and can affect the capable guardians (Cohen and Felson, 2003; Leither et al. 2011). Nonetheless, the shift in crime rates may be temporary, and if the opportunity structure returns to its pre-event status, then in the long run, crime rates are expected to return to pre-event levels (Zahnow et al., 2017).

Exceptional events and crime rates

As noted, the occurrence of exceptional events such as natural disasters, terror, or pandemics commonly leads to considerable change in the social order and in human behavior, causing social stress that may affect criminal behavior (Hodgkinson & Andresen, 2020). For example, following Hurricane Katrina in Louisiana (Leither et al. 2011) and Texas (Leither and Helbich 2011) in 2005, crime rates decreased in areas where people were evacuated as a result of the storm's destruction (Leitner et al., 2011). In another example, a significant increase in property crimes occurred during the flood in Brisbane, Australia, in 2011, with crime rates returning to their previous levels after the flood subsided (Zahnow et al., 2017).

In a similar vein, preliminary findings indicate that the stay-at-home restrictions during the COVID-19 pandemic affected crime trends, with different effects by type of crime and location (Ashby 2020a; Boman & Gallupe, 2020a, 2020b; Kim & Leung, 2020; Kirchmaier & Villa-Llera, 2020; Shayegh & Malpede, 2020; Stickle & Felson, 2020). An examination of citizen telephone calls to the police in ten big cities in the USA showed that assault calls dropped significantly in Baltimore, Cincinnati, and Seattle, whereas no significant change was observed in other cities. In contrast, burglary calls decreased significantly in New Orleans, Seattle, and St. Petersburg, with no considerable change in other cities (Ashby 2020a). Shayegh and Malpede (2020) found a 43% decline in crime rates and a 10% drop in city-wide burglary rates in San Francisco, yet no decline in domestic violence rates (Pietrawska et al., 2020a). In Los Angeles, a significant decrease was found in robbery, shoplifting, and theft rates; however, burglary and homicide rates did not change significantly (Campedelli et al., 2020). In Chicago, crime rates at restaurants declined by 74%, along with a 35% decrease in city-wide crime (Pietrawska et al., 2020b, 2020c). Boman and Galop (2020) have noted that the decline in the US crime rates is largely in minor offenses commonly committed in peer groups, while major crimes that are usually committed with no co-offenders (e.g., homicide and intimate partner violence) have remained stable or increased. In Australia, a significant decrease was found in rates of common, serious, and sexual assault (Payne et al. 2020) crimes. Hodgkinson and Andresen (2020) found a significant reduction in most types of crime in Vancouver, Canada. However, crime rates increased once the lockdown restrictions had been lifted. Moreover, findings indicate an increase in domestic violence calls to the police during the first weeks of the social distancing restrictions (Leslie & Wilson, 2020; Mohler et al., 2020). One of the most comprehensive analyses is Nivette and colleagues' (2021) study. This study investigated the effect of the stay-at-home restrictions on crime rates in 27 countries across the world

(e.g., Americas, Europe, Asia, and the Middle East) on police-recorded crime in six offenses (theft, vehicle theft, assault, burglary, robbery, and homicide). In addition, the study examined whether more strictness of stay-at-home restrictions was related to larger decline of crime rates. The findings show an overall crime decrease of 37% worldwide subsequent to the stay-at-home orders. However, homicide crime rates were relatively unaffected. Furthermore, the extent of the effect of the restrictions was widely dependent on location. That is, in cities where strict policies have been applied to maintain the guidelines during the lockdowns, crime rates decreased more than in cities where lockdown restrictions were less strict.

Boman and Mowen (2021) note that the data in Nivette et al.'s (2021) study tend to over-represent towns in the Americas, Europe, and Asia, while cities in other geographical locations such as Africa and the Middle East are underrepresented. Therefore, there is a need for further research expansion to a wider range of countries and cities. Furthermore, although stay-at-home orders were removed, other social restrictions (e.g., restricted social gatherings, work from home) still exist, which may have an impact on crime rates.

As for cybercrime, findings indicate that this type of crime increased during the strict lockdown periods in the UK (Buil-Gil et al. 2020) as well as in China (Lallie et al. 2020), with the most significant increases found in the number of frauds associated with online shopping and the hacking of social media. The rise in cyber-dependent crimes was primarily directed at individual victims, while a downward trend was found in cybercrime against organizations (Buil-Gil et al. 2020).

COVID-19 and juvenile delinquency

School closures as part of the effort to curb the spread of the coronavirus have had emotional and mental consequences for youth in general, and for youth at risk in particular. For example, youth at risk suffered increased anxiety and depression during the lockdown periods (Golberstein et al., 2020; Rundle et al., 2020). Many out-of-home care facilities and social services for youth at risk were closed, and they were sent home. It is important to note that at-risk youth commonly have a background of family abuse and neglect, and returning home without receiving treatment increases their distress (Arazi & Sabag, 2020; Coker, 2021). Therefore, some chose not to remain at home despite the lockdown, hiding in abandoned houses. This absence of social services, treatment, and structured activity may increase emotional distress and delinquent behavior (Rundle et al., 2020).

Social restrictions during the COVID-19 pandemic may have had a major impact on youth participation in crime and delinquency, as the criminal behavior of minors commonly occurs in small groups and as part of their social activities (Gottfredson and Hirschi 1990; Haynie & Osgood, 2005; Reiss, 1988; Warr, 2002). Furthermore, for adolescents, criminal activity as part of a group seems to be easier and more rewarding than acting alone (Osgood et al., 1996). During the stay-at-home and social distancing restrictions, peer dynamics and social patterns have undergone changes leading to a decrease in offence rates. Thus, when adolescents have

no access to their peer groups, the context in which most juvenile behavior occurs is removed (Boman and Galop, 2020).

Youth criminal activity may have also been impacted by reduced opportunities to commit traditional crimes due to business closures and increased police enforcement of COVID-19-related restriction compliance (Buchanan 2020). The result was decreased detention rates of minors during the period of social restrictions in the USA (January-April 2020) compared to the corresponding period in previous years (Buchanan 2020).

In summary, studies provide mixed evidence of decreased crime rates during the lockdown restriction periods. Reduced rates were observed in robbery, burglary, assault-battery, and shoplifting offenses, while domestic violence rates were not found to have declined. Furthermore, an increase in cybercrime was observed during the first lockdown period. Although the effect of COVID-19 on crime rates has recently attracted growing attention, most studies focused on adult crime, while little is known about the effect of lockdowns on juvenile crime. The present study attempts to fill this gap by analyzing whether youth crime rates in Israel declined during the pandemic, particularly during the lockdown periods.

Methodology

Data

Data on weekly juvenile crime files were obtained from the official statistics of the Israel Police for the period between January 2019 and December 2020. Weekly crime rates were measured based on six offense categories: murder and manslaughter (including attempted murder, attempted manslaughter), armed robbery, assault (all other offenses directed against the human body), sexual assault, property-related crime (including criminal damage), and drug-related crime (including possession and use). Perpetrator ages ranged between 12 and 18 years old, according to the minimum age of criminal responsibility in Israeli law. Crime rates were calculated in relation to rates among the adolescent population for the study period. Data on the total population were obtained from the Israel Central Bureau of Statistics.

One of the main threats to internal validity in single-group interrupted time series analysis is the possibility that other factors may influence the outcome variable and are not controlled for in the model. This may lead to bias in the results. Accordingly, it is feasible that a change in police procedures regarding the opening of criminal files for juveniles could affect crime rates. This possibility was checked, and no such changes occurred during the study period. Nonetheless, it is important to note that not all juvenile crime cases investigated by the Israel police are included in the criminal statistics data, in accordance with the labeling theory-based policy of non-prosecution (Becker 1964). The policy aims to avoid stigmatizing juveniles involved in minor offences and applies only in case the offender has no previous criminal records. This may raise concern that the rates are skewed towards more serious criminal acts. However, since the policy has not changed during the study

period, this bias is equally distributed between 2 two years, 2019 and 2020. Therefore, apparently, crime rates during the Corona period are not affected by this policy.

In the preliminary analysis, we focused on the temporal patterns of weekly juvenile crime rates between 2019 and 2020. Figures 1, 2, 3, 4, 5, and 6 present crime rate trends for each of the six categories during the abovementioned period, i.e., before the outbreak of COVID-19 and during the two lockdown periods, the first of which was between March 25 and May 4, 2020 and the second between September 25 and October 17, 2020.

Figures 1–6 (except Fig. 4) do not reveal significant trends in most offense categories or seasonal differences, suggesting that trend clean-up or integration is not required. Nevertheless, Fig. 4 shows that drug-related crime rates decreased from the first to the third week, and then flattened. Furthermore, there was a drop in drug-related offenses during the first lockdown period (weeks 13–18 in 2020), which provided an indication of the effect of the COVID-19 pandemic, rather than a constant seasonal effect.

Analytical strategies

The first step of the analysis aimed to assess crime rate differences between the 2 years (2019 and 2020) and the two lockdown periods (the first lockdown between March 25 and May 4, 2020, the second between September 25 and October 17, 2020), and their interactions, by using a generalized linear model (GLM) for each of the offense categories. The GLM procedure enabled us to analyze the murder and manslaughter rates within a logistic regression framework, and predicted marginal means were calculated followed by a post hoc pairwise comparison (with Sidak adjustment for multiple comparisons) to determine in which year routine times differed from lockdown periods, if the interaction effect was found significant. Lockdown periods were coded one for the weeks they were imposed in 2020 as well as for the corresponding weeks in 2019, and zero otherwise. Effects were subject to Wald's χ^2 test, which resembled the F test. Importantly, we could not differentiate between the two lockdown periods (the first and second), as the second lockdown was only imposed during three time points (weeks). Furthermore, the two lockdown periods coincided with Jewish holidays celebrated in Israel (the first with Passover and the second with the High Holidays). This lockdown strategy aimed to prevent social gatherings at these times. However, as mentioned earlier, one of the main threats to the internal validity of most single time-series designs is the possibility that other factors (such as holidays in our example) may influence the dependent variable, namely, crime rates (see Cook and Campbell 1979). This potential problem was evaluated and controlled for by adjusting the holiday periods in 2020 to the holiday periods in the corresponding weeks in 2019. Descriptive statistics of the variables are presented in Table 1 while the results of the generalized linear model are provided in Table 2. Note that actual sub-group means, i.e., lockdowns versus routine times, are presented in Table 5, which clarifies differences if determined in the GLM.

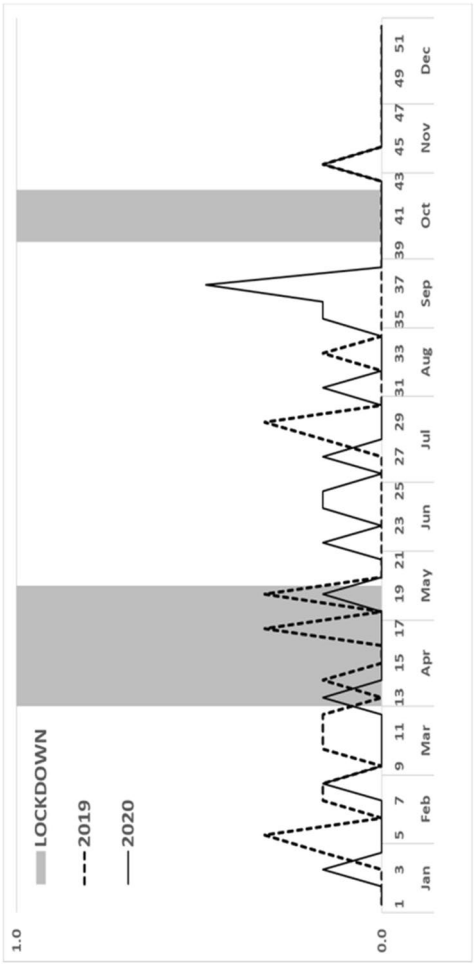

Fig. 1 Weekly murder and manslaughter rates (1:100,000). Shaded bars for lockdown weeks, 1st lockdown (March 25 and May 4, 2020), 2nd lockdown (September 25 and October 17, 2020)

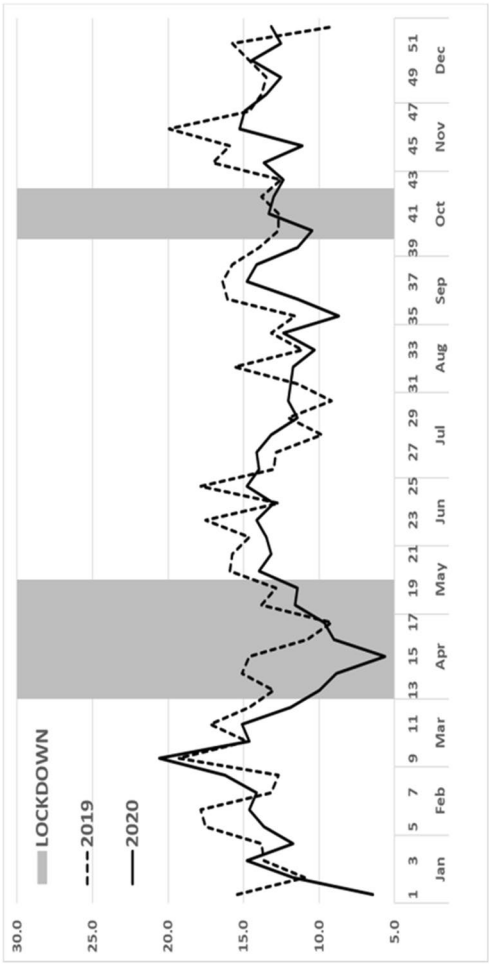

Fig. 2 Weekly assault rates (1:100,000). Shaded bars for lockdown weeks, 1st lockdown (March 25 and May 4, 2020), 2nd lockdown (September 25 and October 17, 2020)

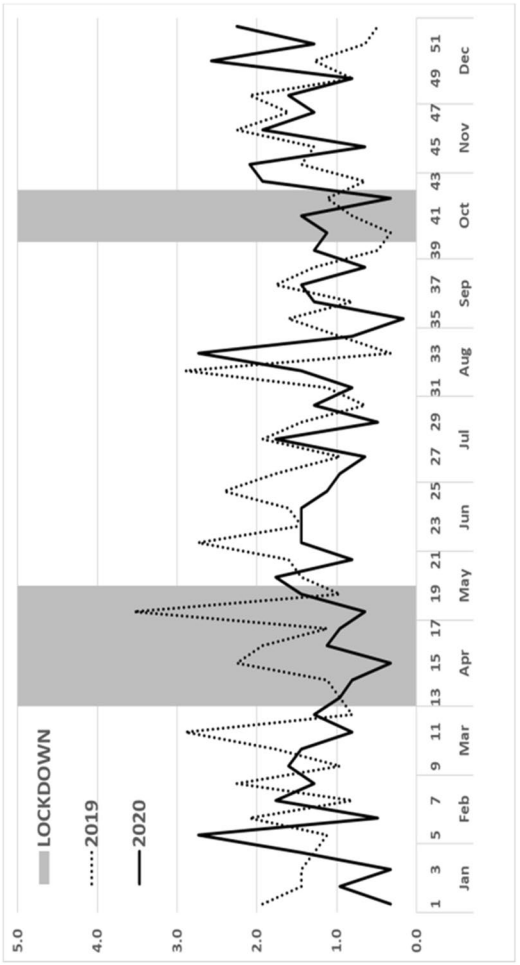

Fig. 3 Weekly sexual assault rates (1:100,000). Shaded bars for lockdown weeks, 1st lockdown (March 25 and May 4, 2020), 2nd lockdown (September 25 and October 17, 2020)

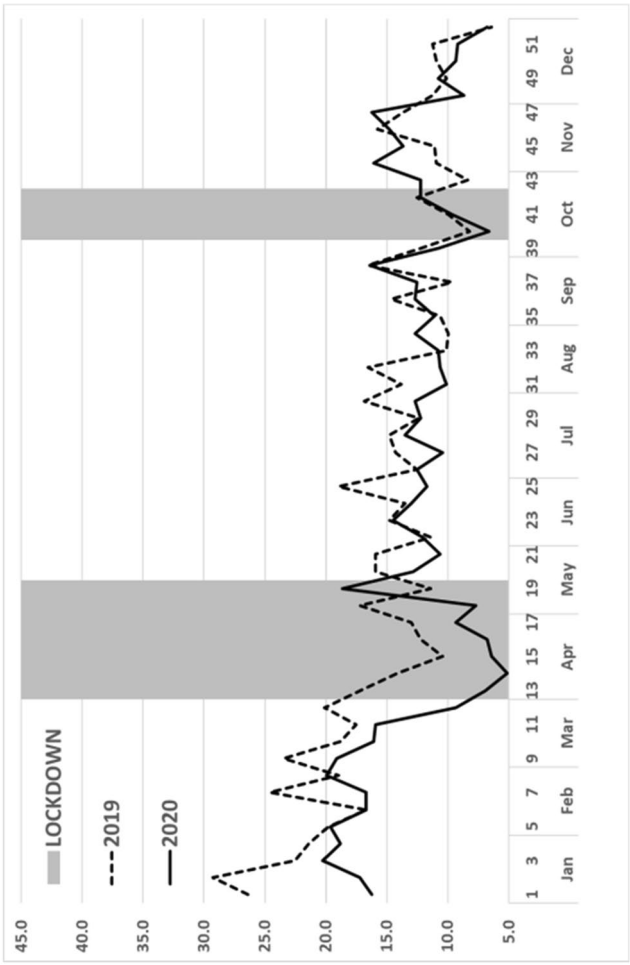

Fig. 4 Weekly drug-related crimes rates (1:100,000) Shaded bars for lockdown weeks, 1st lockdown (March 25 and May 4, 2020), 2nd lockdown (September 25 and October 17, 2020)

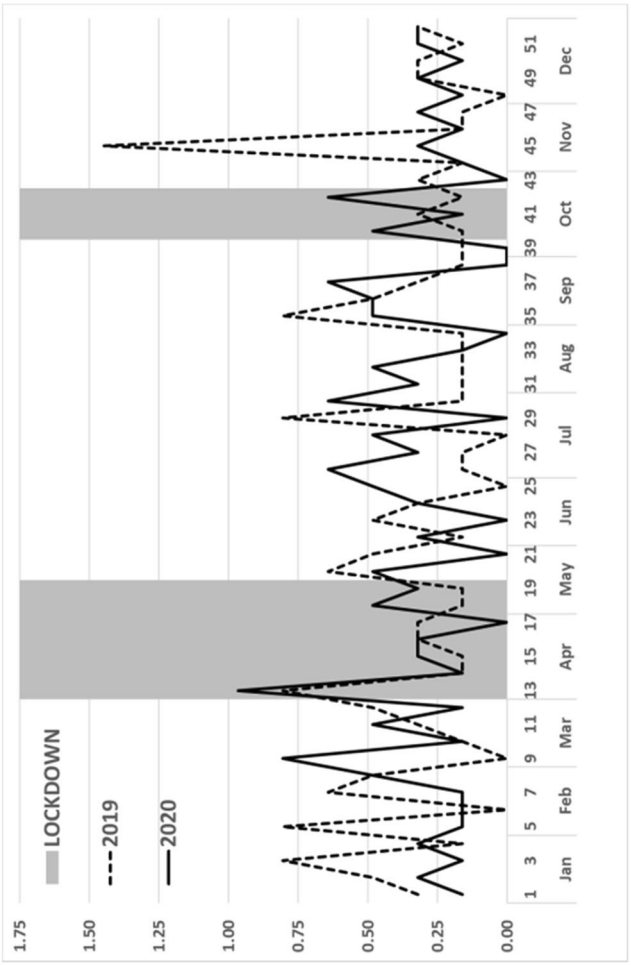

Fig. 5 Weekly robbery crime rates (1:100,000). Shaded bars for lockdown weeks, 1st lockdown (March 25 and May 4, 2020), 2nd lockdown (September 25 and October 17, 2020)

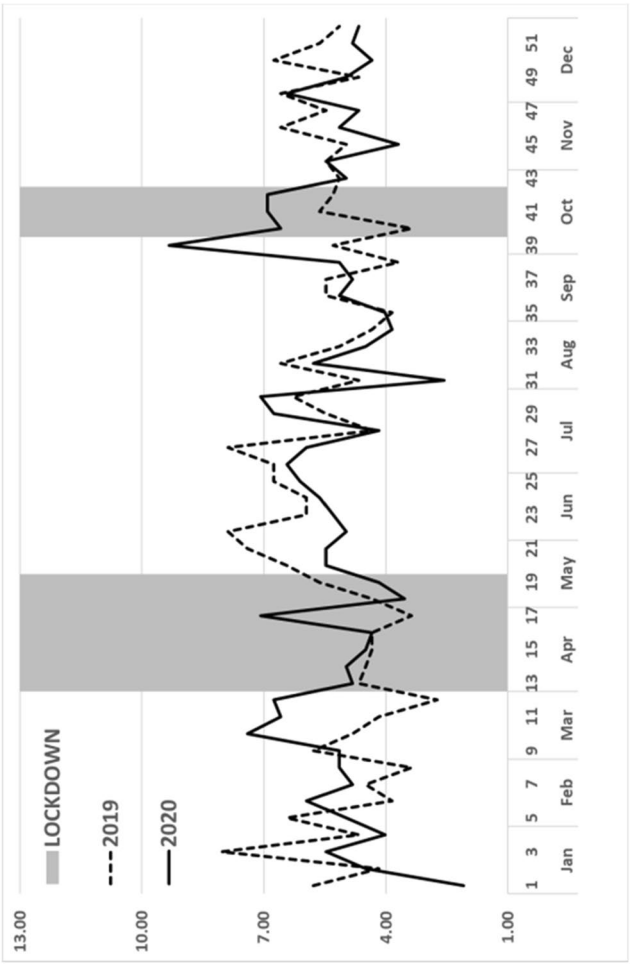

Fig. 6 Weekly property-related crimes rates (1:100,000). Shaded bars for lockdown weeks, 1st lockdown (March 25 and May 4, 2020), 2nd lockdown (September 25 and October 17, 2020)

Table 1 Descriptive statistics for crime rates by year and crime type (1:100,000)

		Stat	
Crime type	Stat. moment	2019	2020
Murder and manslaughter	Mean	0.06	0.05
	95.0% lower CI	0.03	0.02
	95.0% upper CI	0.08	0.07
	S.D	0.10	0.09
	Total crime files (*n*)	18	15
Assault	Mean	13.91	12.44
	95.0% lower CI	13.23	11.78
	95.0% upper CI	14.60	13.11
	S.D	2.47	2.42
	Total crime files (*n*)	4,498	4,100
Sexual Assault	Mean	1.44	1.22
	95.0% lower CI	1.24	1.05
	95.0% upper CI	1.63	1.39
	S.D	0.70	0.61
	Total crime files (*n*)	465	401
Drug-related crimes	Mean	14.84	12.55
	95.0% lower CI	13.49	11.47
	95.0% upper CI	1.19	13.63
	S.D	4.84	3.92
	Total crime files (*n*)	4,797	4,135
Robbery	Mean	0.322	0.325
	95.0% lower CI	0.24	0.25
	95.0% upper CI	0.40	0.40
	S.D	0.28	0.26
	Total crime files (*n*)	104	107
Property-related crimes	Mean	5.31	5.27
	95.0% lower CI	4.97	4.92
	95.0% upper CI	5.65	5.61
	S.D	1.23	1.26
	Total crime files (*n*)	1,716	1,736

Stat. descriptive statistics, *CI* confidence interval

$^{***}p < .001$; $^{**}p < .01$; $^{*}p < .05$

The findings show that year effect was found in three of the six series — assault ($b = -1.15$, $p < 0.001$), sexual assault ($b = -0.14$, $p = 0.054$), and drug-related crimes ($b = -1.84$, $p = 0.002$). These findings indicate that crime rates in all categories, in which the year effect was found as significant, were lower in 2020 as compared to 2019. The results show that assault and drug-related crime rates decreased significantly ($b = -2.72$, $p < 0.001$) during the lockdown periods. Furthermore, an interaction effect was found across property-related crime rates ($b = 1.07$, $p = 0.048$), indicating that the lowest rates (b) were observed during 2019 holiday times

Table 2 Generalized linear model results for crime rates by year and crime type (1:100,000)

Crime type	Effects		
	Year Wald$\chi 2$ ***b*** ***p*** ES	Lock Waldχ^2 ***b*** ***p*** ES	Inter Waldχ^2 ***b*** ***p*** ES
Murder and manslaughter[a]	0.22 0.00 {1.00}	0.02 0.19 {1.21}	0.22 – 0.54 {0.58}
	.642	.889	.642
	.046	.014	.046
Assault	13.51 – 1.15	19.52 – 1.51	1.79 – 1.31
	< .001	< .001	.182
	.360	.433	.131
Sexual assault	3.70 – 0.14	1.54 – 0.03	1.15 – 0.36
	.054	.214	.283
	.189	.122	.105
Drug-related crimes	10.03 – 1.84	17.37 – 2.72	1.13 – 1.86
	.002	< .001	.289
	.311	.409	.104
Robbery	0.33 – 0.46	0.11 – 0.06	1.87 0.16
	.565	.736	.171
	.056	.033	.134
Property-related crimes	1.24 – 0.23	2.19 – 0.94	3.91 1.07
	.266	.139	.048
	.109	.145	.194

Year 2019 — 0, Year 2020 — 1; Lockdown — 1 and 0 — otherwise. This data series was assumed to have the binomial distribution and was linked to the Logit function rather than the normal distribution and the identity link which were set for all the other series. The odds of the Logit coefficients are given in curly brackets. For detailed results, see Table 5

Int. interaction effect, *Lock.* lockdown periods

[a]In each cell for effect we show: Wald's χ^2 with one degree of freedom, the *p*-value of that effect (*p*), and effect size (ES), *b* for the unstandardized regression coefficient

($M = 4.55$, $SE = 0.40$), which differed ($p = 0.014$) from routine times during that year ($M = 5.49$, $SE = 0.19$), while no other pairwise differences were found. Moreover, since the murder and manslaughter rates were relatively low, and significant changes were not observed between the pandemic and pre-pandemic periods, time series analysis was not performed for these offenses.

The second step of the analysis aimed to examine whether the crime time series changed significantly following COVID-19 (March 2020), particularly during the two lockdown periods (weeks 13–18; weeks 40–42). For this objective, ARIMA model procedures were operationalized for each of the five categories of offenses for weekly rates between January 2019 and December 2020. This time-series modeling strategy captures three temporal structures — auto-regression, integrative, and moving average. Prior to deciding on the type of ARIMA models for each of the offense series, the augmented Dickey-Fuller test was used for non-stationarity of each of the criminal offenses. The results showed that the null hypothesis was rejected, meaning that all tested time series were stationary. Furthermore, although *t*-value was above critical

value in assault, drug-related crime, and property-related crime, the additional controls of drift and trend resulted in a clear rejection of the unit root null hypothesis, meaning that means, variances, and covariances were approximately equal with time, i.e., no trend or local differences were expected. Thus, when applying any further ARIMA models, the integration parameter was set to zero unless specifically added. This also means that no gradual change was expected with respect to the pandemic periods compared to earlier periods. However, since lockdowns could affect the mean levels, they were considered an additional independent effect on crime counts.

Subsequently, we extracted the autocorrelation function (ACF) and partial autocorrelation function (PACF) for each crime series to determine the potential of lagging and moving average effects, that is, to decide regarding lagging and moving average parameters (from zero to n, where $n<t$). The analysis included the Box-Ljung test for significance autocorrelation (Ljung & Box, 1978).

Table 3 presents the results of the autocorrelation analyses conducted, that is, autocorrelation function and partial autocorrelation function (ACF, PACF, respectively). The findings show that the sexual assault and robbery time series had almost no time effect, whereas the drug-related crime series was defined as a first-order autocorrelation series — spikes in the first-order autocorrelation. Assault and property-related crimes were defined as first-order difference time series — a combination of first and higher order autocorrelation. The drug-related crimes showed a constant drop in the autocorrelation coefficient from first to third order. Thus, by using an SPSS Modeler procedure, an alternative ARIMA parameter was performed. Except for the assault and property-related crimes, for which the AR (1) and AR (2) were proposed, respectively, no time series were made by the modeler, i.e., the simple case or model with a constant only. However, to assess the effect of the COVID-19 pandemic, we ran the ARIMA procedure first, without the additional lockdown factors, and then again with the lockdown factors. To test the time series effects, we utilized the forecasting procedure in SPSS v.25 for $N=1$ and $t=104$ weeks. Table 4 presents the results of both the unconditional model (Model 1) that only assessed the autoregressive parameter and an expanded model (Model 2) that included the pandemic and lockdown periods as covariates.[1] Beyond the analysis of ACF and PACF shapes, the preference for the final models was based on the BIC rule of the smaller the better.

Results

The results in Table 4 show that, during lockdown, assault rates were lower ($b=-2.48$, $p<0.05$), beyond the autoregressive properties of this series ($b=0.45$, $p<0.001$). A similar first-order autocorrelation model was fitted to drug-related crime

[1] All time series were analyzed as AR(1), and the first-order difference added to the series of assault and property-related crimes, as explained above. Contrary to our expectation, adding the first-order difference did not improve the results when looking at the BIC values (the lower the better). The results for assault rates showed an opposite pandemic effect.

Table 3 Autocorrelation analyses of crime types for 2019 and 2020

Lagged variable	Moment	LAG1	LAG2	LAG3	LAG4	LAG5	LAG6	LAG7	LAG8	LAG9	LAG10
Assault	ACF	0.435	0.278	0.105	0.051	−0.041	−0.206	−0.314	−0.303	−0.114	−0.056
	PACF	0.435	0.109	−0.062	0.000	−0.073	−0.210	−0.191	−0.076	0.146	0.034
Sexual assault	ACF	−0.068	0.072	0.167	0.121	−0.061	−0.043	0.158	−0.079	−0.011	0.184
	PACF	−0.068	0.068	0.178	0.146	−0.068	−0.113	0.116	−0.037	−0.002	0.172
Drug – related crimes	ACF	0.649	0.528	0.377	0.288	0.215	0.167	0.148	0.126	0.079	0.020
	PACF	0.649	0.185	−0.039	0.005	0.004	0.009	0.038	0.009	−0.051	−0.070
Robbery	ACF	−0.148	0.028	−0.215	−0.017	0.071	0.000	−0.035	−0.077	0.036	0.036
	PACF	−0.148	0.007	−0.215	−0.086	0.061	−0.028	−0.065	−0.070	0.015	0.018
Property-related crimes	ACF	0.182	0.225	0.097	0.053	−0.038	−0.066	−0.098	−0.317	−0.136	−0.141
	PACF	0.182	0.199	0.03	−0.010	−0.075	−0.067	−0.064	−0.285	−0.024	0.003

AC the autocorrelation estimate, *SD* standard deviation, *PACF* partial auto correlation function

Table 4 Time series modeling results for weekly events of the five crime types

Crime type	ARIMA	Fit BIC	Model 1 AR	Model 2 AR	Pandemic	Lockdown	Fit BIC
Assault	(1,0,0)	472.25	0.45*** (0.09)	0.34** (0.10)	−0.60 (0.68)	−2.48* (1.01)	474.03
	(0,1,1)	484.31	0.48*** (0.09)				
Sexual Assault	(1,0,0)	217.95	−0.06 (0.10)	−0.90 (0.10)	−0.73 (0.13)	−0.41 (0.22)~	222.06
Drug-related crimes	(1,0,0)	554.51	0.70*** (0.07)	0.62*** (0.08)	−3.42* (1.61)	−1.25 (1.74)	559.09
Robbery	(1,0,0)	11.16	−0.17~(0.10)	−0.16 (0.10)	−0.01 (0.05)	0.07 (0.08)	19.78
	(3,0,0)			−0.16 (0.10) −0.03 (0.10) −0.23* (0.10)	−0.01 (0.04)	0.04 (0.07)	
Property-related crimes	(1,0,0)	344.73	0.18~(0.10)	0.18~(0.10)	−0.13 (0.51)	5.22*** (0.19)	353.65
	(1,1,0)			−0.53*** (0.09)	1.10 (1.21)	−0.62 (0.60)	370.731

Standard errors in parentheses; Model 1 without covariates; Model 2 with pandemic effects

***$p < .001$; **$p < .01$; *$p < .05$; ~$p < .10$

rates, for which the lag effect was 0.70 ($p < 0.001$). The analysis for drug-related crime rates shows that the COVID-19 pandemic period negatively affected drug-related crime rates ($b = -3.42$, $p < 0.05$). However, no significant effect on drug-related crime rates was found for the lockdown periods, which contradicted the preliminary GLM results. This could be the result of the overall pandemic effect that obscured the lockdown effect. Moreover, in the GLM, the lockdown was associated with parallel holiday times, whereas in the time series analyses, the lockdown referred to those weeks in which lockdown was imposed. The results for armed robbery show that the first-order auto-regressive model did not yield any significant results. However, when a higher AR order was applied (ARIMA 3,0,0), which means AR(1), AR(2), and AR(3), only the third order was found to be significant (AR(3) $= -0.23$, $p < 0.05$). No significant effects were found for the COVID-19 pandemic or lockdown periods. Lastly, we fitted first order autocorrelation to the property-related crime series (AR(1) $= 0.18$, $p > 0.10$). Surprisingly, property-related crime rates were significantly higher during lockdowns compared to other periods of time ($b = 5.22$, $p < 0.001$).

Discussion

The COVID-19 pandemic has had a tremendous global impact on all areas of life (Abrams, 2021; Knowles 2021; Ohannessian et al., 2020; Singh & Singh, 2020). Although growing attention has recently been given to the impact of the pandemic period on crime rates (Knowles 2021; Langfield et al. 2021; Langton et al., 2021; Singh & Singh, 2020), its effect on juvenile crime rates has hardly been studied. The present study used ARIMA modeling analysis to examine whether crime rates declined during the lockdown periods, and several findings are particularly noteworthy.

First, the analysis shows a significant decline in assault crime rates during lockdowns. The results are consistent with routine activity theory (Cohen & Felson, 1979), in that changes in routine activity reduced the opportunities for motivated offenders to encounter potential victims. In this context, Brantingham and Brantingham (1993) note that crime patterns are shaped by offender routine activity, when the opportunity arises in an area with which they are familiar. Thus, the substantial changes in routine activities and social networks interrupted adolescents' assault crimes, preventing their occurrence. Notably, adolescents are most susceptible to these changes due to their developmental period and to the important role social interaction with peer group and social activity plays in their life (Polack et al. 2021). Moreover, due to the staying-at-home orders, the opportunities for teenagers and motivated offenders to meet potential victims were reduced, and as a result, violent crime has decreased. As Stickle and Felson (2020), noted, the staying-at-home restrictions have changed daily routine activities and as a result, the violent crime was interrupted. Another aspect is related to greater police presence in the public sphere (capable guardianship), aimed to enforce the social restrictions, which may have also affected the decrease in assault crime rates. Thus, the current findings highlight the key role of routine activities and social interactions with peer group in the occurrence of juvenile crime.

Furthermore, it can be assumed that the greater police presence in the public sphere (capable guardianship) in order to enforce the social restrictions may have also resulted in decreased assault crime rates. Another possible explanation for this decrease is expanded routine youth online activity during the pandemic (online learning and games) which may have shifted assault offenses to cyberspace, for example in the form of cyberbullying, due to lack of supervision in this arena (Jain et al. 2020).

The second interesting finding is the significant decline in drug-related crime rates. Based on routine activity theory (Cohen & Felson, 1979), it can be suggested that this decrease is the result of changes in routine activities and the closing of leisure venues such as nightclubs and pubs. A previous study showed that juvenile delinquency is concentrated in places where youth tend to convene and carry out activities (Weisburd et al., 2009). Indeed, a night-time economy area is considered a hotspot for both drug-related crimes, as well as for violent assault (Miller et al. 2016).

It is also possible that increased law enforcement activity in the public sphere during lockdowns resulted in reduced drug trafficking. Nonetheless, it can be assumed that enhanced law enforcement presence in the public domain led to a shift of drug trafficking to cyberspace, where enforcement is very limited.

Another possible explanation is associated with changes in police activity during emergency times such as the COVID-19 period. These changes are reflected in the allocation of police resources away from the intelligence and investigation departments in favor of assignments associated with the pandemic (e.g., demonstrations and enforcement in the public sphere). Thus, when fewer resources are allocated to intelligence and investigation work that is required when dealing with drug-related crimes, their rate falls accordingly.

The above explanations are based on the assumption that the decline in drug-related crime rates resulted from policy changes during the pandemic, and that otherwise drug activity would remain stable. However, it is also entirely possible that the scope of youth engagement in drug crimes decreased during this period. In line with social control theory (Hirschi, 1969), one can assume that the stay-at-home restrictions during the lockdown periods led to increased parental supervision of youth, which reduced the extent of their engagement in drug-related crimes.

Third, the study results raise the question as to why a lockdown period effect was not found in the other crime categories examined — murder and manslaughter, sexual assault, and property-related crimes. In this regard, lack of detailed data in addition to police record data was noted as a difficulty when attempting to provide explanations for the different trends observed (Payne et al. 2020). Therefore, to further examine the effect of the COVID-19 pandemic on juvenile crime rates, additional variables such as economic stress, parental support, parental monitoring, and community resources should be included.

The present study is not without limitations. First, the study used weekly crime rates. However, as shown in the preliminary analyses, the overall differences between 2019 and 2020 most likely obscured other expected differences. The weekly crime data were not sensitive enough to indicate differences and higher resolution. It can be assumed that daily crime data would show more differences between the lockdown periods and the corresponding periods in 2019. Unfortunately, these data were unavailable. In addition, despite the consistent variations in assault and drug-related

crime rates before and during the lockdown periods, it is difficult to attribute all variations solely to the pandemic period. As noted, both compliance and enforcement vary from one locality to another, although in Israel, there is a national police force applying a cross-cutting policy. However, the present study did not examine whether the influence of lockdowns on crime rates might have been conditioned by compliance and enforcement. It is important to note that the Israeli Police does not make public the differences in local law enforcement, and all the more so in relation to juvenile offenses, out of desire to avoid criticism regarding over-policing of different populations. Thus, future research is needed to explore whether the effect of lockdowns on crime rates is conditioned by the effect of the level of compliance and the intensity of enforcement among the various populations.

Conclusion

This research supports prior studies on the effect of the COVID-19 pandemic on adult crime, with changes in crime rates during this period according to crime type and location (Ashby 2020a; Kim and Lung 2020; Kirchmeier and Villa-Lara 2020; Shayegh & Malpede, 2020). Furthermore, the observed reduced rates of assault and drug-related crimes highlights the role of youth social and leisure activities in these offenses. The abovementioned explanations regarding the shift of youth crime to cyberspace clearly indicate that further research is required. Expanding the analysis to other countries and to online juvenile crime activity would provide further insight in this area.

Appendix

Table 5 Descriptive statistics for crime rate series by year and lockdown

	Overall				2019				2020			
					Regular		Lockdown		Regular		Lockdown	
	M	SD	MIN	MAX	M	SD	M	SD	M	SD	M	SD
S1	0.05	0.10	0.00	0.48	0.05	0.09	0.08	0.14	0.05	0.10	0.03	0.07
S2	13.21	2.52	5.47	19.78	14.20	2.55	12.69	1.68	13.06	2.10	10.23	2.25
S3	1.33	0.66	0.16	3.54	1.44	0.65	1.42	0.92	1.30	0.63	0.92	0.40
S4	13.74	4.51	5.15	29.27	15.36	5.08	12.64	2.93	13.52	3.37	8.94	3.98
S5	0.31	0.25	0.00	1.45	0.33	0.29	0.27	0.20	0.29	0.21	0.39	0.28
S6	5.29	1.24	2.09	9.33	5.49	1.25	4.55	0.80	5.25	1.26	5.39	1.34

S1 for murder and manslaughter; S2 for assault; S3 for sexual Assault; S4 for drug offenses; S5 for robbery; S6 for property-related crimes; M for mean, SD for standard deviation, MAX for maximum value, MIN for minimum value

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