The Impact of the COVID-19 Pandemic on Conflict and Health System–Related Violent Events in Libya: An Interrupted Time Series Analysis

Tracy Kuo Lin (tracy.lin@ucsf.edu)
University of California, San Francisco

Kalin Werner
University of California, San Francisco

Mariam Hamza
The World Bank

Christopher Herbst
The World Bank

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Abstract

Background

As a response to the COVID-19 pandemic, the United Nations Security Council passed resolution S/RES2532 (2020), requesting the cessation of hostilities. Despite initiatives for a ceasefire, descriptive evidence suggests that both conflict and violent events have remained unabated—and, in some cases, escalated during the first months of the pandemic. This study incorporates a longer time frame than previous studies to examine the impact of the COVID-19 pandemic on violent and non-violent political events—including health system-related violence—in Libya, which has been experiencing a protracted conflict since 2014.

Methods

We analyze data on violent and non-violent political events that took place from 1 January 2015 to 31 August 2021 in Libya. The study conducts descriptive statistics on event counts, using a Chi-square test and a Kruskal-Wallis H test. We use an interrupted time series analysis to evaluate the impact of the pandemic—both short and long term—on the incidence of violent and non-violent political events in Libya.

Results

We find a reduction of approximately 21 battles ($p < 0.001$) during only the first month of the pandemic. However, overall, throughout the pandemic, there was an increase of roughly one battle per month ($p < 0.001$). The pandemic is associated with a reduction in the number of riots (− 0.29, $p < 0.05$) and strategic developments (− 0.72, $p < 0.05$). In the first year of the pandemic, the number of overall fatalities per month dropped significantly (− 31.67, $p < 0.05$). Nevertheless, during the second year of the pandemic, this trend reverted to an increase of approximately 42 fatalities per month ($p < 0.05$). The violence that affected healthcare workers decreased during the first year of the pandemic ($p < 0.001$), but by the second year the reduction in healthcare worker–related violence had dissipated.

Conclusions

There is an immediate decline in battles and fatalities during the earlier period of the pandemic; however, these declines do not last long. This pattern is a troubling one, particularly since it is observed while there is an international agreement for a ceasefire in place and a specific peace agreement occurring in Libya.

Background

The response of governments and organizations worldwide to the SARS-COV-2 virus and the resulting SARS-COV-2 (COVID-19) pandemic has called attention to the nexus between the pandemic and armed conflict and political and violent events [1–2]. In March 2020, the United Nations Secretary-General proposed the Appeal for Global Ceasefire [3]. In June 2020, 172 United Nations (UN) Member States signed a non-binding statement in support of the Appeal, and in July 2020, the UN Security Council passed resolution S/RES2532 (2020), demanding a general and immediate cessation of hostilities in all situations [4].

Despite initiatives for a ceasefire, descriptive evidence suggests that the incidence of conflict and violent events was unabated—and, in some cases, it even escalated during the first months of the pandemic [5]. Some studies document that the incidence of conflict and violent events eventually decreased in some states [1, 6], but it is unclear whether these changes in conflict and violent events resulted from underlying root causes of the ongoing conflict, the exploitation of the crisis by governments, or the social unrest and lockdowns associated with the pandemic [7]. A critical question is: did the initial change in the pattern of conflict—both violent and non-violent political events—continue throughout the pandemic?

The short-term trends provided by timely studies [1–2, 5, 8] underline the need for continuing analyses that incorporate a longer time frame for evaluating trends and drawing a more comprehensive pattern of conflict and violent events. Analyses of changes in the incidence of conflict and both violent and non-violent political events throughout the pandemic are sparse. Critically, there is no analysis of how the pandemic is associated with changes in varying violent events and health system–related violent events, which is a crucial component to mitigating pandemic-related mortality and morbidity.

The objective of this study is to examine the impact of the COVID-19 pandemic on different categories of violent and non-violent political events—including health system–related violence in which health systems and healthcare workers are targeted and harmed—in the State of Libya (hereafter Libya), which has been experiencing a protracted conflict since 2014. This study aims to use a longer time frame than previous studies, which provided a timely and rapid snapshot of the immediate impact of the pandemic on the incidence of violent and non-violent political events but did not capture the long-term trend. The longer time frame covered by this study serves to generate a more comprehensive pattern of violent and non-violent political events in Libya.

Pandemic and conflict

A pandemic may increase the propensity for conflict in two ways: (1) *indirectly* by decreasing state capacity [9–11] and (2) *directly* by creating conditions for disagreements and dissatisfaction in resource allocation.

Pandemics may undermine state capacity in two ways: by both lowering the states' ability to supply resources and provide human capital to help fight public health problems and simultaneously increasing the demands on the state to do so (Box 1). First, infectious diseases reduce the resources available to a state. Both economic productivity and public contributions to state resources are known to decrease in times of public health crises. Furthermore, disease prevalence leads to poor health, which reduces both human capital and the associated economic productivity and bureaucratic efficiency of the state by hindering the population's ability to work, damaging the labor force, and decreasing productivity [12]. A reduction in a state's productivity leads to lower economic development [13]—therefore lower productivity decreases not only the available resources for use in a state but also export opportunities and the nation's net income. In addition, external investors, witnessing the lack of efficient labor and potential contamination by diseases, decrease foreign direct investment [14]. Reduced productivity, export, and foreign direct investment all contribute to reduced tax revenue and lower state resources, further diminishing the state's ability to carry out its duties.

Box 1. Relationship of pandemics to increased propensity for conflict

Source: Original figure produced by this study.

Second, pandemics increase the demands on the state. Governments need to divert attention and resources from other national security concerns to cope with and resolve public health issues. Significant resources are required to cope with the public health consequences of pandemics and the spread of diseases, including rising healthcare costs. In addition, the prevalence of diseases drives national expenses by the increasing social costs of providing food to individuals unable to work due to poor health and the costs of supporting orphans whose parents died of the illness. States will need to reallocate resources, which may or may not be available, to treat their citizens and alleviate the effects of the pandemic. The increased demand for health specialists, governmental personnel, and capital to cope with diseases along with the associated resource reduction can decrease government efficiency and effectiveness.

By undermining state capacity, diseases also *indirectly* increase the propensity for conflict by creating opportunities and motives for citizens to engage in violence. Groups consider the ability of the government before engaging in violence [11]. Thus, a reduction in state capacity provides groups in opposition to the government with a window to launch violence against the state. During a pandemic, if a state does not have the ability to accommodate the grievances of their citizens by providing goods or appeasing dissident movements, then the propensity of violence may be high. When infectious diseases impede state capacity, groups will have more incentive to engage in violence while the state will face more difficulty preventing violence.

Furthermore, infectious diseases can *directly* increase the propensity for violence by fueling citizen distrust and dissatisfaction with the government. Diseases can create or exacerbate existing public discontent with the government. Correspondingly, an epidemic or pandemic can lead to fear and societal panic, making it necessary for governments to stabilize the state by various means. If the state obtains the capacity to accommodate grievances by providing goods, incorporating dissident movements within the party system, and repressing uprisings and violence, then the propensity of violence will decrease. However, if the state is incapable of coping with contagions and restoring stability, it can breed distrust and worsen governance issues [15]. Severe discontent can lead to incentives for violence.

Conversely, the pandemic may decrease the propensity for violence. During a pandemic, state actors and rebel groups are likely to encounter challenges in sourcing adequate food and weapons as well as mobilizing fighters to fight despite facing higher infection risks [1] In particular, state actors may experience a shortage of resources – human or otherwise – and may need to divert available resources away from violence to cope with health emergencies and may divert resources away from violence [1, 16].

The case of Libya

Ten years of political instability, worsened by the concurrent collapse of oil production [17], has deteriorated economic conditions and collapsed public services in Libya. The population faces daily difficulties such as water and fuel shortages [18], extended electricity outages [18], internet and telephone service deterioration [19], corruption [20], insecurity, and an increased cost of living [18]. As a result, citizen distrust and dissatisfaction in Libya were already rife prior to 2020.

The concurrence of the COVID-19 pandemic and ongoing conflict in Libya undoubtedly exacerbated public health challenges in the state, where reports of hospitals hit by shelling continued throughout the pandemic [5, 21]. During the early periods of the pandemic, many hospitals had to suspend services as a result of a shortage of protective gears and infections among the health workforce [22]. By early 2022, Libya has recorded approximately 398,000 cases and 5,900 deaths [23].

Lockdown policies were found to increase the incidence of armed conflict in the Middle East [8]. Studies find descriptive evidence that violence continued in Libya during the first few months of the pandemic [1, 5–6]. The increase in the incidence of conflict and violent events during the pandemic has been attributed to the weakening of state institutions. It is reasoned that weakened institutions with lowered capacity provided incentives

for rebels to intensify military pressure. Furthermore, the reduction in international and public attention allowed the implementation of military operations with less external backlash [1]. The Government of National Accord and the Libyan National Army reached renewed peace negotiations and a permanent ceasefire deal—which may partially explain the decline in violent events in June 2020 [1, 8, 24] and generate expectations for decreasing violence. However, evidence of the long-term impact of the pandemic in the midst of a peace agreement is scarce.

On the other hand, as theorized, there are reasons to hypothesize that the pandemic may also be associated with a reduction in violent and non-violent political events in Libya [1]. The pandemic may limit the capacity of actors to engage in political and violent events. State actors and rebel groups are likely to encounter similar challenges during a pandemic, as both sets of actors require resources—such as food and weapons—and both need to mobilize fighters to fight despite facing higher infection risks [1]. State actors also face additional pressure to cope with a health emergency, which may divert attention and resources from military actions [21].

Libya's protracted conflict and the availability of data across an extended time period allow for a more comprehensive analysis than states with a shorter conflict duration or less data availability. With the data from Libya, this study is able to first describe the historical trend of violent and non-violent political events prior to the COVID-19 pandemic. Then, this study leverages interrupted time series analyses (ITSA) to evaluate the short-term and longer-term impact of the pandemic on the incidence of varying types of events. The findings contribute to insights on the long-term impact of the pandemic on violent and non-violent political events.

Methods

We use the Armed Conflict Location & Event Data (ACLED) Project and adopt its categorization of events into six distinct categories (described in more detail below). We first provide descriptive statistics on event counts by categories, using a Chi-square test and a Kruskal-Wallis H test. This study then leverages an ITSA methodology to evaluate the impact of the pandemic—in both the short term and the long term—on the prevalence of violent and non-violent political events in Libya. We analyzed the data from 1 January 2015 to 31 August 2021. As a secondary data analysis involving no human subjects, no ethical approval was sought.

Data source and measures

We use exported data from the ACLED—a publicly available database [25]—to evaluate the impact of the COVID-19 pandemic on the incidence of different violent and non-violent political events in Libya. The ACLED collects and codes conflict and violent and non-violent political events derived from governmental and non-governmental organization reports as well as from international, national, and local media sources. An *event* is defined as a conflict-related action occurring between specified actors on a given day at a specific location. Events that occurred continuously during multiple days but took place in the same location are documented as separate observations for each day of occurrence [25].

ACLED events are classified into three broad groups (violent events, demonstrations, and non-violent events) and six event categories, each of which in turn falls into one of the three broad groups. *Violent events* group include battles, instances of violence against civilians, and remote violence (e.g., bombings) [26]. *Battles* include armed clashes, government regains territory, and non-state actor overtakes territory. *Explosions/remote violence* include the use of chemical weapons, air/drone strikes, suicide bombs, shelling/artillery/missile attacks, remote explosives/landmines/IEDs, and grenades. *Violence against civilians* includes sexual violence, attacks, and abductions or forced disappearances. *Demonstrations group* include riots and protests. *Riots* include violent demonstrations and mob violence. *Protests* include peaceful protests, protests with intervention, and excessive force against protesters. And *non-violent events group* include non-violent strategic development actions taken by political actors; these include agreements, arrests, changes to group/activity, disrupted weapon use, the establishment of a headquarters or base, looting/property destruction, non-violent transfer of territory, and others. In the case of Libya, disrupted weapon use constitutes the majority of the strategic development events.

In addition to the date, location, and category of events, ACLED includes attributes such as the type of actors involved, the number of resulting fatalities, the news source, and a brief description of the event [25–26]. Unlike other datasets where fatalities are used as an inclusion criterion (e.g., Uppsala Conflict Data Program/Peace Research Institute Oslo Data on Armed Conflict [24]), ACLED does not restrict event inclusion based on fatalities. Because of this inclusion criterion, it is considered one of the most comprehensive datasets available for conflicts and violent events [25–26].

This study uses data exported on 8 September 2021, containing events that occurred from 1 January 2015 to 31 August 2021. Our analysis includes all categories of events contained in the dataset. We summed the national count of events by category and month of occurrence, resulting in a monthly count of violence against civilians; a daily occurrence of battles; and counts of remote violence, riots, protests, and non-violent/strategic actions during the study time frame. We also summed the number of fatalities by event categories and month of occurrence.

In addition, because our study aimed to evaluate health system–related violence, we used the information provided in the description to code for hospital-related and healthcare worker–related events and fatalities. For example, we characterize event descriptions that include "hospital" and "health clinics" as targeted or damaged as events of hospital-related violence. We include events when the violence is indiscriminate as well as when the violence is targeted toward a health system. Prior to the pandemic these included a broad range of event types. During the COVID-19 pandemic, these events were primarily indiscriminate shelling that damaged hospitals and health clinics as well as deliberate shelling of field hospitals. These events often include shells fired, presumably by the Libyan National Army, that hit hospitals. Similarly, we characterize event descriptions that include "health worker," "ambulance," or "aid worker" being harmed or killed as healthcare worker–related violence. We include events when the violence is

indiscriminate as well as those when the violence is targeted toward healthcare providers and aid workers. These events include violence against healthcare workers, abduction of healthcare providers and aid workers, indiscriminate shelling, and targeting of ambulances resulting in injured paramedics. These events are then summed by event category and month of occurrence. Likewise, fatalities related to these events are characterized and summed by event category and month of occurrence accordingly.

Interrupted time series analysis

This study employs an ITSA method, which has been used to analyze the varying impact of the COVID-19 pandemic on social conditions [28–29]. We adopt a generalized least squares (GLS) method with robust standard errors, where the errors are assumed to follow a first-order autoregressive process [30]. In our analysis, all GLS models include three unique time-based covariates, whose regression coefficients estimate the pre-intervention slope, the change in level at the intervention point, and the change in slope from pre-intervention to post-intervention. The analysis assumes that the pre-intervention trends are linear, that the characteristics of the populations remain unchanged throughout the study period, and that there is no comparator for adjusting the ITSA results for changes that should not be attributed to the intervention [31]. We controlled for the number of other event categories (excluding the event of interest in each model) to ensure there is no substitution effect—where a drop in the number of one event category occurred because other actions in a different event category were employed by the actors as a substitute. Durbin-Watson statistics are used to evaluate autocorrelation in the GLS models. Stata 14 and the command package *itsa* are used for the analysis; *prais* was used under the *itsa* command to specify GLS method for estimating parameters. The unit of analysis is the count of event type per month. A one-month lag was determined by model fit comparison, compared with two-, three-, four-, five-, and six-month lags, and incorporated into the models.

Study period and the impact of the COVID-19 pandemic

This study evaluates the monthly count of and fatalities resulting from battles, violence against civilians, remote violence (e.g., bombings), riots, protests, and non-violent strategic development actions. We use January 2015 as the starting time of the ITSA to ensure that we capture a comprehensive trend of violence of the protracted conflict in Libya prior to the pandemic. We set the pandemic period to start on April 2020, referred to as the "intervention period" in the ITSA literature. We aim to capture both the short-term and long-term impact of the pandemic on fatalities and health system–related violence. Therefore, we set the short-term impact period as the first year of the pandemic—taking place between April 2020 and March 2021—and the long-term impact period as the second year of the pandemic—taking place between April 2021 and August 2021.

Limitations

This study leverages a time series dataset that includes an extended time period before the pandemic, using ITSA, which approximates a quasi-experimental research design with a high degree of internal validity [32]. While we evaluated the pre-intervention trend, tested and corrected for autocorrelation and heteroscedasticity, it is critical to note that ITSA assumes a linear preintervention trend, a fixed change point, and an overarching correlation structure; together these may make it too stringent to capture many other factors that may have impacted the prevalence of violence. The second year of the pandemic only included four months due to the time the analysis was conducted by this study. The results here are considered associative but not causal. As highlighted in previous studies [9, 33], there are various reasons to suspect underreporting of conflict and violent and non-violent political events during the pandemic. It is reasonable to suppose that the pandemic has likely shifted attention away from armed conflict and limited the reporting ability of journalists, who are self-distanced. Because of this shift in reporting, the reduction in reported numbers may not result from a decrease in violent events but rather a reduced reporting capacity. Nevertheless, ACLED is considered one of the most comprehensive datasets on political and violent events, and with the use of ITSA, it may provide an overview of discerning patterns between the COVID-19 pandemic and various violent and non-violent political events.

Results

The total count of events by categories during the entire study time frame is summarized in Table 1, indicating that the highest count of events was remote violence (n = 2,648), followed by battles (n = 2,353). The total number of conflict-related fatalities is 12,779. There is naturally a higher absolute number of events observed before the pandemic because the pre-pandemic observation period is longer than the during-pandemic observation period included in the dataset. To provide insight into the difference in violent and non-violent political events before and during the pandemic, we use descriptive statistics for the monthly count of events by categories in Table 2. This table indicates that the median count (interquartile range) for all event types was lower during the pandemic than before it. There is a statistically significant difference (as evaluated by a Kruskal-Wallis H test) in the median monthly count (with the interquartile range presented in paratheses) of battle, which dropped from 31 (23–40) to 6 (1–23); remote violence, which dropped from 34 (22–45) to 5 (1–28); and violence against civilians, which dropped from 11 (6–18) to 4 (2–7). The median monthly count of fatalities decreased from 188 (97–279) to 21 (5–127) per month ($p < 0.05$). The median monthly count of health system–related violence decreased from 1 (1–3) to 0 (0–1) during the pandemic ($p < 0.05$).

Table 1
Total count of events by type, before and during the COVID-19 pandemic

General	Event type	Total count	Before the COVID-19 pandemic: Count (%)	During the COVID-19 pandemic: Count (%)
Violent events	Battle*	2,353	1,944 (82.6%)	409 (17.4%)
	Explosions/Remote violence*	2,648	1,990 (75.2%)	658 (24.9%)
	Violence against civilians*	801	678 (84.6%)	123 (15.4%)
Demonstrations	Protests	29	20 (69.0%)	9 (31.0%)
	Riots*	125	88 (70.4%)	37 (29.6%)
Non-violent actions	Strategic developments*	510	363 (71.2%)	147 (28.8%)
Fatalities	Not applicable	12,779	10,527 (82.4%)	2,252 (17.6%)

Note: Percentages may not sum up to 100% because of rounding.

∗ $p < 0.05$ using a Chi-square test.

Table 2
Monthly median (IQR) event count, total and before and during the COVID-19 pandemic

General	Event type	Observations	Monthly median (IQR)	Before the COVID-19 pandemic: Median (IQR)	During the COVID-19 pandemic: Median (IQR)
Violent events	Battle*	80	26 (15–37)	31 (23–40)	6 (1–23)
	Explosions/ Remote violence*	80	28.5 (10–39)	34 (22–45)	5 (1–28)
	Violence against civilians*	80	9 (4.5–14)	11 (6–18)	4 (2–7)
Demonstrations	Protests	80	0 (0–1)	0 (0–1)	0 (0–0)
	Riots	80	0 (0–2)	1 (0–2)	0 (0–2)
Non-violent actions	Strategic Developments	80	5 (3–5)	6 (3–8)	3 (1–10)
Fatalities*	Not applicable	80	122.5 (59–265)	188 (97–279)	21 (5–127)
Hospital-related violence*	Not applicable	80	0 (0–3)	1 (1–3)	0 (0–1)

Note: Percentages may not sum up to 100% because of rounding. IQR = interquartile range.

∗ $p < 0.05$ using a Kruskal-Wallis H test.

Table 3 presents the ITSA results, evaluating the difference in monthly event count, by category, before and during the pandemic. The analysis suggests a statistically significant reduction in the number of battles by approximately 21 battles ($p < 0.001$) during the first month of the pandemic. Nevertheless, the pandemic overall is associated with an increase of approximately one additional battle per month ($p < 0.001$). This pattern is illustrated in Fig. 1, where one can see the apparent drop in the number of battles at the onset of the pandemic and a slow incline upward following the initial drop.

Table 3
Interrupted time series analysis by event type

General	Event Type	Overall monthly trend	First month of the pandemic	Impact of the pandemic	Other events	Constant
Violent events	Battle	−0.07	−20.94**	1.25**	0.44**	12.48**
		(− 0.28,0.14)	(− 32.59, − 9.30)	0.36,2.14)	(0.36,0.52)	(4.15,20.81)
	Explosions/ Remote violence*	0.68**	33.26	−4.45	0.97**	−40.85**
		(0.22,1.14)	(− 21.54, 88.05)	(− 9.18,0.28)	(0.62,1.31)	(− 70.25, − 11.45)
	Violence against civilians*	−0.25**	−1.97	0.37	−0.01	19.47
		(− 0.34,−0.15)	(− 6.61,2.67)	(− 0.10,0.84)	(− 0.01, 0.04)	(15.16,23.78)
Demonstrations	Protests	−0.01	1.26	−0.12	−0.00	0.84**
		(− 0.02,−0.00)	(− 0.42,2.93)	(− 0.27,0.03)	(− 0.01, 0.00)	(0.32,1.37)
	Riots	−0.02	3.14	−0.29*	−0.01	2.80**
		(− 0.04,0.01)	(− 1.39,7.66)	(− 0.69,−0.10)	(− 0.02,0.00)	(1.20,4.42)
Non-violent actions	Strategic developments	-0.00	6.28	−0.72*	0.03	3.77
		(− 0.09,0.08)	(− 1.40,13.96)	(− 1.30, − 0.14)	(− 0.00, 0.07)	(− 0.39,7.94)
	Observations	73	73	73	73	73

Note: ** $p < 0.001$, * $p < 0.05$

The trend before the pandemic suggests that, prior to the pandemic, there was a statistically significant downward trend in the monthly number of explosions/remote violence, with approximately 0.68 fewer explosions/remote violence incidents per month ($p < 0.001$); however, the pandemic had no statistically significant impact on the number of explosions/remote violence. Similarly, there is a statistically significant downward trend for violence against civilians before the pandemic (− 0.25, $p < 0.001$), but the pandemic had no impact on the number of violence against civilians–related events.

On the other hand, the analysis finds that the pandemic is associated with a reduction in the number of riots (− 0.29, $p < 0.05$) and strategic developments (− 0.72, $p < 0.05$)—despite not having any statistically significant downward trend before the pandemic. Figure 2 illustrates the trend for riots, and Fig. 3 shows the pattern for strategic developments.

We control for the count of other events (excluding the event of interest) in each of our models to ensure there is no substitution effect. The results from the analysis suggest that there indeed is no substitution effect—the change in one event type is not due to actors engaging in alternative forms of political actions. However, there is a positive association between the count of battles and the count of other events, as well as with the count of explosions/remote violence and the count of other events.

To delineate between the short-term and long-term impact of the pandemic on health system–specific violence and fatalities, we conduct an ITSA including three distinct periods: before the pandemic (January 2015 to March 2020), the first pandemic year (April 2020 to March 2021), and the five months during the second pandemic year (April 2021 to August 2021). See Table 4. The analysis indicates that, prior to the pandemic, there was an overall downward trend in conflict-related fatalities (− 2.26, $p < 0.05$) and hospital-related violence (− 0.04, $p < 0.001$). During the first year of the pandemic, there was a significant reduction in overall fatalities, by approximately 32 fatalities per month ($p < 0.05$). However, during the second year of the pandemic, the trend reverted to increase by about 42 fatalities per month ($p < 0.05$). See Fig. 4 for an illustration of the changes in trends. The violence that affected healthcare workers decreased during the first year of the pandemic, but by the second year, the impact of the pandemic on reducing healthcare worker–related violence had dissipated. See Fig. 5 for the changes in trends.

Table 4
Interrupted time series analysis for overall fatalities and healthcare-specific violence and fatalities

Variable	Overall monthly trend	First month of the pandemic	First pandemic year	Second pandemic year	Constant
Overall fatalities	−2.26*	165.56	−31.67*	42.17*	257.04**
	(− 4.10,−0.42)	(− 64.37,395.50)	(− 60.19,−3.14)	(5.99,78.35)	(201.20, 312.81)
Hospital-related violence	−0.04**	2.53	−0.39	0.42	3.53**
	(− 0.07,−0.02)	(− 1.70,6.75)	(− 0.99,0.20)	(− 0.14,0.97)	(2.31,4.73)
Hospital-related fatalities	−0.14	−1.77	0.04	0.10	11.21**
	(− 0.34,0.06)	(− 8.48,4.95)	(− 0.23,0.31)	(− 0.07,0.27)	(3.36,19.07)
Healthcare worker-related violence	0.01	−0.18	−0.18**	0.26	1.03*
	(− 0.02,0.04)	(− 1.67,1.31)	(− 0.30,−0.06)	(− 0.09,0.61)	(0.06,2.01)
Healthcare worker-related fatalities	−0.06	1.72	−0.05	0.12	3.72
	(− 0.15,−0.03)	(− 1.56,4.99)	(− 0.69, 0.59)	(− 0.51, 0.75)	(0.11,7.55)
Observations	73	73	73	73	73

Note: ** $p < 0.001$, * $p < 0.05$. Second pandemic year only include the first five months – due to time of analysis

Discussion

Earlier studies reported that hospitals were hit by shelling during the pandemic [5]; this account appears to be anecdotal rather than the result of a systematic impact of the pandemic on violence against element of the Libyan health system. Our study finds an overall downward trend in the incidence of hospital-related violence before the pandemic, and no statistically significant change in the number of fatalities associated with hospital-related violence or in the number of fatalities associated with healthcare worker–related violence during the pandemic. Our models also show a reduction in the frequency of healthcare worker–related violence during the first year of the pandemic; however, that trend wanes during the second year of the pandemic. This pattern may be due to the peace agreement as well as to the backlash actors may have received for harming healthcare workers during the initial period of the pandemic, but, as the pandemic continues into its second year, actors may have reverted to their pre-pandemic strategies.

We find congruent evidence with previous studies, indicating that there was indeed an initial drop in the frequency of violent events, namely battles, but this drop occurred only during the first month of the pandemic. In fact, after the first month and throughout the rest of pandemic, there was a monthly increase in the number of battles, albeit a modest one, of approximately one battle per month.

The pandemic was not associated with a reduction in explosions/remote violence or violence against civilians; however, our analysis found a statistically significant downward trend in the monthly number of explosions/remote violence prior to the pandemic. Similarly, a statistically significant downward trend for violence against civilians is evident before the pandemic, and the pandemic has shown no impact on the number of events related to violence against civilians. Results from previous studies that indicate a reduction in violent events (excluding battles) during the earlier months of the pandemic may be capturing the ongoing downward trend that commenced prior to the pandemic's start.

Concomitantly, the pandemic is associated with a reduction in the number of riots but has no statistically significant association with the number of protests. We deduce that pandemic-driven lockdowns should lead to fewer demonstrations (including both riots and protests). The observed pattern could be because individuals are disinclined to engage in riots, which often involve physical contact with others, during a pandemic. In comparison, organized protests may be perceived as more regulated and safer to attend. While one could reason that lockdown may incentivize citizens to engage in protests, our analysis did not focus on the relationship between lockdowns and protests and found no evidence on the relationship between lockdowns and protests in the context of Libya. Future studies should further examine the multifaceted relationship between the pandemic, pandemic-related policies, and conflict.

Overall, our findings suggest that there is an immediate decline in violence and fatalities right after the pandemic began; however, these declines do not last long. For battles, after the decline in number during the first month, the rest of the pandemic averages one additional battle per month—even in the midst of the peace agreement. During the first year of the pandemic, there was a significant reduction in overall fatalities—by approximately 32 fatalities per month—but during the first several months of the second year of the pandemic, the trend reverted to increase by approximately 42 fatalities per month. Similarly, violence that affected healthcare workers decreased during the first year of the pandemic, but by the second year, the impact of the pandemic on reducing healthcare worker–related violence had dissipated.

Conclusions

Timely studies examining the impact of the initial stage of COVID-19 pandemic on the number of violent and non-violent political events found varying results and patterns. The objective of this study is to add to these findings by leveraging an ITSA methodology to examine a longer time frame—one that includes months prior to the pandemic and months past the initial months of the pandemic—to elucidate the trend of different categories of violent and non-violent political events during a protracted conflict in the State of Libya. Our study finds that there is an immediate decline in violent events (e.g., battles), but the decline is short-lived. After the initial decrease, there is an average increase of one battle per month during the pandemic. Similarly, there is a significant reduction in the number of fatalities during the first year of the pandemic; however, as the ongoing pandemic progressed into the second year, the number of fatalities increased dramatically. While healthcare worker–related violence decreased during the first year of the pandemic, this impact disappeared during the second year of the pandemic as individuals may be vaccinated and desensitized to the disease and to the initial shock of the pandemic.

What is alarming is that the pattern in Libya is observed while there is both an ongoing international pandemic-specific agreement for a ceasefire as well as a country-specific peace agreement. Concurring with Ide (2021) [1], the pattern observed suggests a worrisome trend. As the pandemic continues, there is a critical need for improvement in health diplomacy.

Abbreviations

ACLED: Armed Conflict Location & Event Data Project

COVID-19:SARS-COV-2 virus

GLS: Generalized least squares

HCW: Healthcare worker

IQR: Interquartile range

ITSA: Interrupted time series analysis

UN: United Nations

Declarations

Availability of data and materials

The datasets generated and analyzed during the current study are available from the corresponding author upon reasonable request.

Ethics approval and consent to participate

Not applicable

Consent for publication

Not applicable.

Availability of data and materials

The datasets generated and analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

TKL contributed to conceptualization, data cleaning and analysis, manuscript drafting and reviewing. KW contributed to data analysis and review and manuscript drafting and reviewing. MMH contributed to data collection and manuscript drafting and reviewing. CHH contributed to conceptualization and manuscript drafting and reviewing.

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Figures

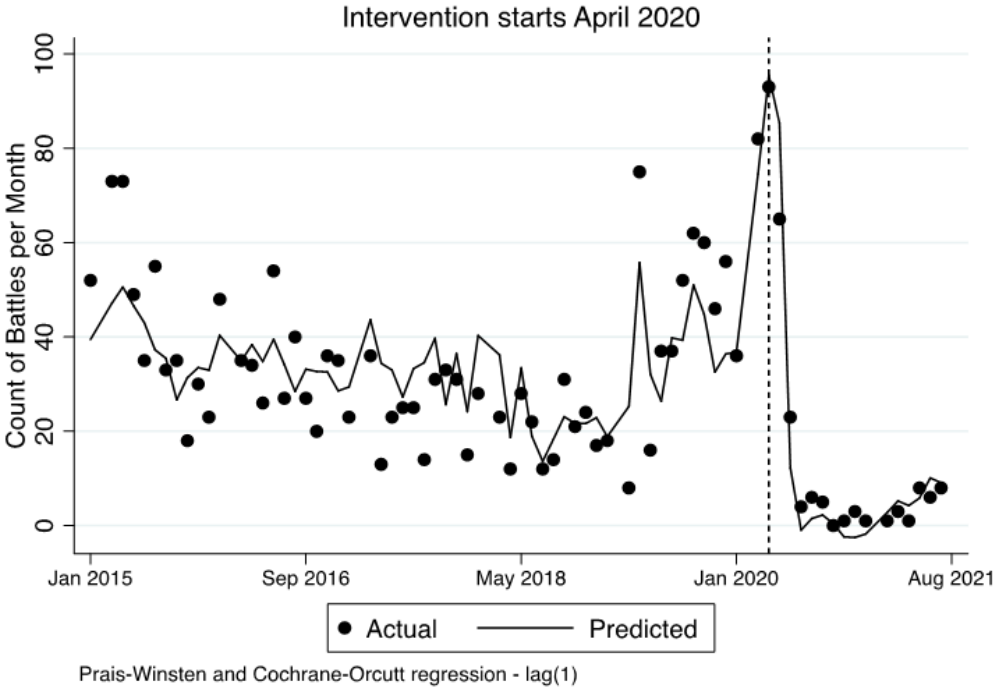

Figure 1

Number of battles per month: Actual and predicted, January 2015–August 2021

Source: Original calculations for this publication.

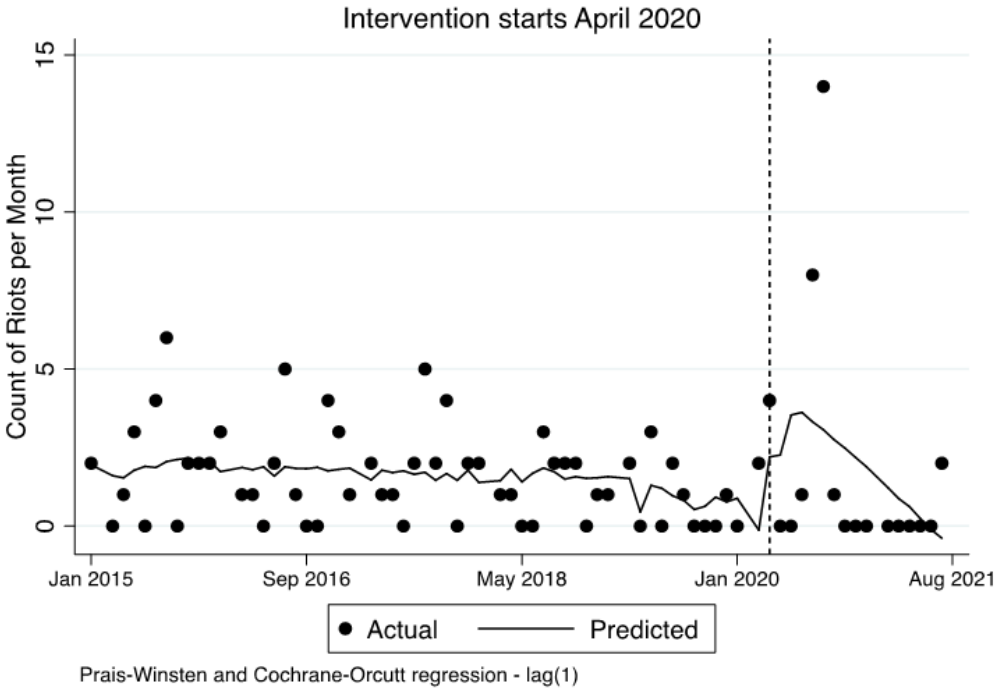

Figure 2

Number of riots per month: Actual and predicted, January 2015–August 2021

Source: Original calculations for this publication.

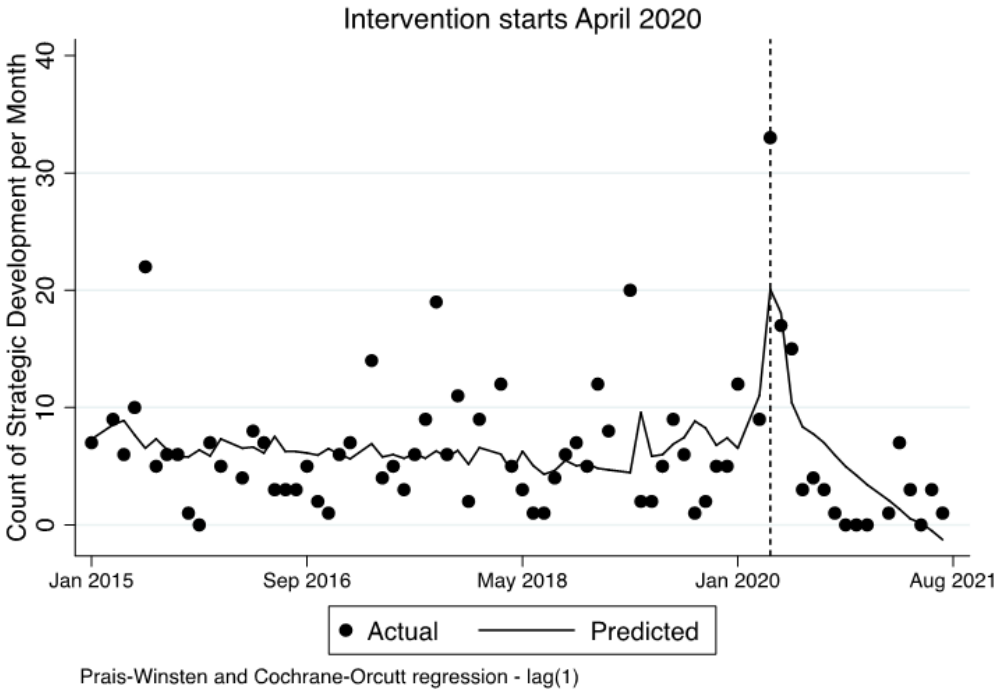

Figure 3

Number of strategic developments per month: Actual and predicted, January 2015–August 2021

Source: Original calculations for this publication.

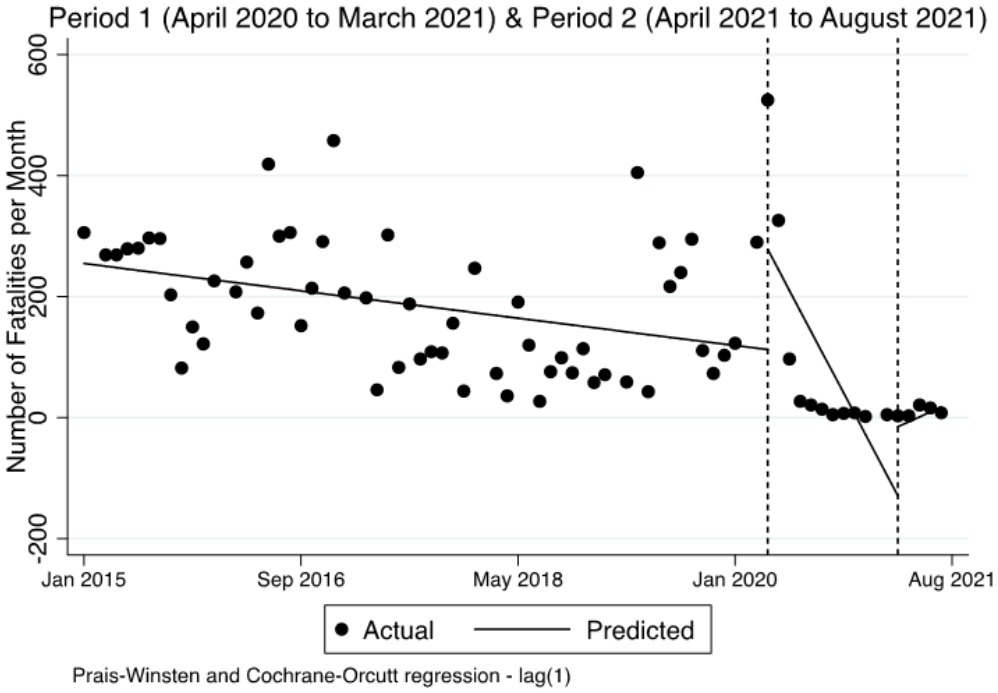

Figure 4

Number of fatalities per month: Actual and predicted, January 2015–August 2021

Source: Original calculations for this publication.

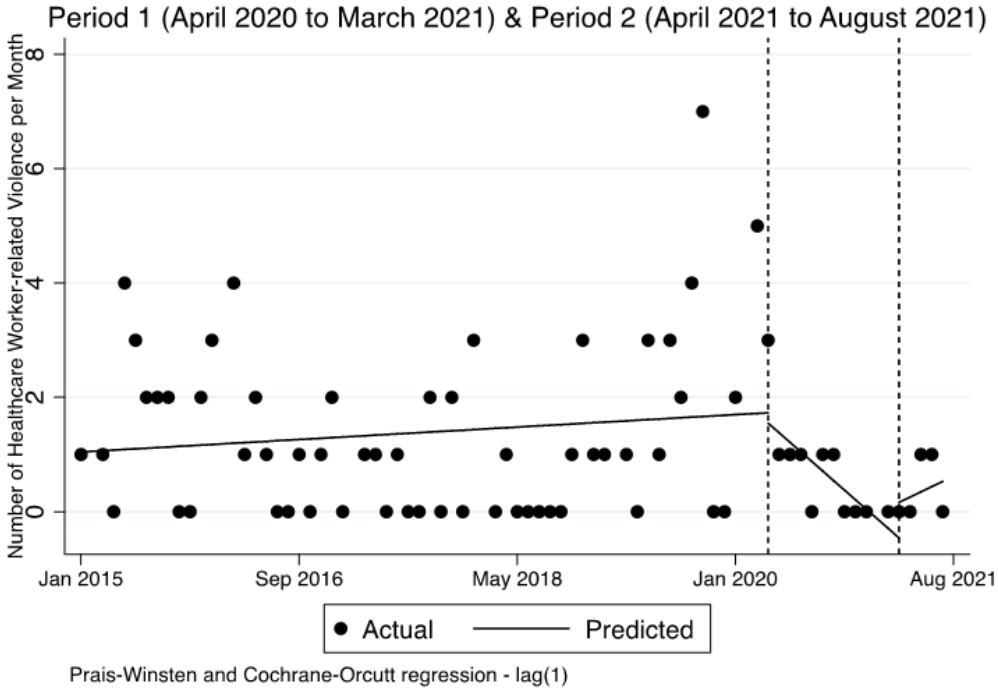

Figure 5

Number of healthcare worker-related incidence of violence per month: Actual and predicted, January 2015–August 2021

Source: Original calculations for this publication.