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**Working Paper**

# Fighting Covid-19 amidst Civil Conflict: Micro-Level Evidence from Burkina Faso

Working Paper, No. 2022:9

**Provided in Cooperation with:**
Department of Economics, School of Economics and Management, Lund University

*Suggested Citation:* Sepahvand, Mohammad H.; Verwimp, Philip (2022) : Fighting Covid-19 amidst Civil Conflict: Micro-Level Evidence from Burkina Faso, Working Paper, No. 2022:9, Lund University, School of Economics and Management, Department of Economics, Lund

This Version is available at:
https://hdl.handle.net/10419/260348

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# Fighting Covid-19 amidst Civil Conflict: Micro-Level Evidence from Burkina Faso

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May 2022

LUND UNIVERSITY

# Fighting Covid-19 amidst Civil Conflict: micro-level evidence from Burkina Faso[☆]

**Mohammad H. Sepahvand and Philip Verwimp**[*]

**4 Mai 2022**

## Abstract

How does violent conflict affect the spread of Covid-19? In this paper we analyze how violent conflict influences the adoption of preventative measures and infection rate in a very poor, conflict-affected country, Burkina Faso. We use a unique panel of 1,919 households surveyed during the first six months of the Covid-19 pandemic in 2020 and merge these data with indicators of violence at the municipality and regional level. Infection data are leveraged from 65 test centers across the country. We find a lower adoption rate of preventive measures, and a higher infection rate in areas affected by violence. We control for various socio-economic characteristics and discuss potential mechanisms. We argue that political interventions towards peace and stability also help to tackle the Covid-19 pandemic.

**Keywords:** Violent conflict; Covid-19; Poverty; Burkina Faso

**JEL Classifications** D74, D91, I12, I15

[☆] We are grateful to the National Institute of Statistics and Demography (INSD, Institut National de la Statistique et de la Démographie) in Burkina Faso for collecting the data used in this study and the World Bank for technical assistance. Financial support by the Swedish Research Council is gratefully acknowledged. All remaining errors are our own.

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## 1. Introduction

Africa's Sahel region is potentially one of the richest regions in the world with abundant human and natural resources. It is also one of the worlds most neglected and conflict-ridden regions, with more than three million displaced people across the region. In 2020, more than five million were in need of emergency assistance in the Central Sahel countries of Burkina Faso, Mali and Niger due to the expansion of conflicts and the Covid-19 outbreak (UNOCHA, 2021), with Burkina Faso particularly hard hit by both violence (Turse, 2020) and Covid-19 fatalities (The New Humanitarian, 2020). Further, decades of conflict and war in the region have eroded the national governments' public health capacity. With up to 80 per cent of its population living on less than 2 dollars a day, poverty is more widespread in the Sahel than in most other parts of Africa. This combined with one of the world's highest population growth rates makes the situation in Sahel highly unmanageable for its weak national and regional institutions.

The combination of the ongoing humanitarian and security crises with a health crises imposed by the Covid-19 pandemic on the weak health service system, has a significant impact on the stability and development of Burkina Faso. In an attempt to understand this impact, we investigate how the dynamics of violence affect the infection rate in the country as well as the prevention of the spread of Covid-19. We are particularly interested in the adoption of Covid-19 prevention measures by households and individuals, as they have a direct effect on the spread of the virus, and on the number of people infected by Covid-19.

We investigate this adoption through data from a large household panel survey in Burkina Faso, with data collected at multiple times during the pandemic. To the best of our knowledge this is the first study linking the exposure to violent conflict, infection rates and the adoption of preventive measures against the spread of Covid-19.

We find a higher infection rate and a lower rate of adoption of Covid-19 prevention measures as violence increases. These results vary over the gender of the individuals and their poverty status. Our findings have clear policy implications as the region is experiencing an exponential rise in violence and forced displacement: policy interventions towards peace and stability are needed in order to tackle the Covid-19 pandemic. Our findings are robust to alternative specifications.

In early March 2020, the first cases of Covid-19 were reported in Burkina Faso (US News, 2020). On March 18, the first fatality was confirmed (Africa news, 2020). According to the Ministry of Health, most of the cases had direct contact with the first two cases (Lefaso, 2020). On March 20, the government took a series of measures such as closing schools, banning of

gathering of more than 50 people, health screenings in airports and land borders[1] and imposition of a nationwide curfew from 7pm to 5am to prevent the spread of Covid-19 (Bloomberg, 2020).[2] By this time, the spread of the virus was nationwide, with infection reaching key members of the government and foreign diplomats (AA, 2020; Reuters, 2020).[3] By the end of March, Burkina Faso had the most fatalities in sub-Saharan Africa (WHO, 2020a), with only one hospital in the whole country able to receive coronavirus patients and equipped with five ventilators.[4] During this time, the country had only one Covid-19 testing laboratory in the city of Bobo-Dioulasso, which is over 350 km (and a five hour drive) away from the capital Ouagadougou.

Early on in the pandemic, the government of Burkina Faso with support of key actors such as the WHO created a Covid-19 response plan with the creation of a rapid response team (CORUS, 2020).[5] This team was tasked with monitoring the spread of the virus, tracing contacts and taking tests from suspected cases but also providing facts against rumors related to Covid-19. In line with the country's Covid-19 response plan, focus has been on the health sector and in providing adequate expertise on the ground through WHO programs to be able to early detect Covid-19 and respond accordingly.[6] Focus has also been on providing access to clean water and sanitation, and delivery of emergency food assistance during the lean season, the period between harvests.

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[1] During the first couple of weeks of the pandemic the airports and land borders where closed.

[2] The government issued a decree concerning a lockdown in March 14 (Decret_PRES_n_2020-0215), and it was implemented nationwide between March 16 to March 31 2020. This lockdown was then prolonged from April 2020 onwards. Schools were opened on June 1 and August 3 to 27 only for examinations (no teaching) for a selective group of students (the levels of CM2, 3ème secondaire and supérieur). By October 1 2020 the restrictive measurements to prevent the spread of Covid-19 were reduced, for instance schools were allowed to reopen. This implied that schools started opening in different stages between October and November 2020, but restrictions were still in place concerning gatherings in groups, wearing a mask, and avoiding physical contact.

[3] Those infected by the virus were for example the Minster of Foreign Affairs, Minster of Education, Minster of Interior but also the U.S and Italian Ambassadors to Burkina Faso.

[4] This can be compared with Romania that has approximately the same size of population, which had for the same period 5,181 beds for intensive care units (Statista, 2021).

[5] The government under the Ministry of Health reinforced the Operational Center of Response and Management of Sanitary Emergencies (in french *Centre des Opérations de Réponse aux Urgences Sanitaires*, CORUS) under the supervision of the National Committee for Management of Epidemics (UNDP, 2021).

[6] WHO support to Burkina Faso has included by October 2 2020 help to strengthen its capacities at every level such as: evidence on new virus and Covid-19 dynamics on the regional and global level, infection prevention and control, risks communication and community engagement and security assessment to help teams to reach hard-to-reach communities in Burkina Faso where internally displaced persons are located or where violent attacks by non-state groups occur (WHO, 2020b). In the early weeks and months of the Covid-19 outbreak, the WHO also provided support to deployment of epidemiologists and medical supplies to support national response in setting comprehensive surveillance activities (WHO, April 2020a), training of over 560 health workers on best practices in treating Covid-19 (WHO, April 2020b), evaluating and strengthening the country's laboratory capacity (WHO, June 2020a) and the construction of 13 health quarantine and tracing centers with the sole aim to support the existing health facilities by helping in detecting and quarantining those patients that show Covid-19 symptoms (WHO, June 2020b).

The analyses in this study is based on three datasets: a nationally representative household budget survey (HBS), the Armed Conflict Location and Event Data (ACLED) and national infection data. The HBS is a panel survey covering 1,919 households in Burkina Faso and tracking their adoption of Covid-19 prevention measures over time. It has been collected monthly between June until December 2020, with a baseline survey in 2018 and 2019. The ACLED data cover all the available violent episodes for all the regions, provinces and municipalities in Burkina Faso during the same period of coverage as the HBS. This creates a unique panel structure, which allows us to exploit the timing of the violence and the response in our survey to identify the effect of violence on the adoption of Covid-19 prevention measures. In addition to these datasets, we also have access to data on the rate of infection by Covid-19 at the municipality level from test-centers across the country. This allows us to deepen our understanding of how violent conflict affect the spread of Covid-19.

Our analysis speaks to two strands in the literature. First it adds to the literature on violent conflicts and individual behavior. Their relationship has been shown in terms of the impact of violence on attitudes towards risk, altruism and impatience (Voors et al., 2012). Does pro-social behavior as in the Voors et al. paper extend to wearing Covid-19 face mask or keeping social distance? Or will conflict-affected individuals take more risks regarding their own health and that of others? The burgeoning literature on social behavior during and after conflict has divergent findings, with some papers finding increased anti-social behavior and others not. It is our own take on this literature that the direction and the extend of the effect depends on the type of conflict, the parties involved in the conflict, the length of the conflict as well as the time lapsed between the end of the conflict and the field work. In the case of Burkina Faso the data collection at the household level took place amid ongoing violent conflict. Familiar et al (2016), using data for Burundi, showed that during violent conflict individuals have more psychological distress. Could that have an effect on the adoption of Covid-19 prevention measures?

Second, there are a large number of papers on the spread of Covid-19. In fact, since the start of the pandemic there is a large literature in epidemiology and virology on the mechanisms that halt and spread the violence. However, only a fraction of this research has taken place in poor, conflict-affected environments.

Our unique panel survey, capturing the first six months of the Covid-19 pandemic in 2020, allows us to understand how preventive measures against the spread of Covid-19 change over time while violence is occurring. At the same time, violence can also affect the infection rate directly, for example by gathering a large number of people in camps.

This study makes several contributions. First, it adds to the literature on the nexus between violent conflict and individual behavior in times of a global health crisis. We explicitly investigate how violence affects individuals' adoption of preventive measures to prevent infection by Covid-19. We address the question whether or not lower adoption of preventive measures against the spread of Covid-19, and higher infection rate, is due to a higher occurrence of violence. If violent conflict means that individuals can take less care of their health, as we show in this paper, it means that viruses spread more easily in conflict-affected areas, which signifies an additional threat for public health at the local, national and global level. This makes our study also relevant for the current crisis in Ukraine: a few days after the Russian invasion, the former Dutch Ambassador to Ukraine told BBC that his parents-in-law did not dare to go to a refugee shelter because they were afraid to contract Covid-19. In the same way, Ukrainian refugees entering western-Europe are vaccinated upon arrival because the vaccination rate is lower in Ukraine.

Second, when we show that the results vary according to the poverty status of the household, or, more specifically that poor individuals in violent areas have lower adoption of preventative measures against Covid-19 compared to the non-poor, it means that poverty, conflict and Covid-19 form a deadly triangle. The fight against the spread of Covid-19 is entangled in the fight against poverty and violence.

Third, this study will also be relevant for future research dealing with the influence of dis- and misinformation on individual's behaviors and attitudes in developing countries. Weak and underdeveloped institutions, such as is the case in Burkina Faso, combined with low level of literacy in the population, are not able to counter incomplete and inconsistent misinformation on the benefits of implementing preventive measures against Covid-19 in the midst of a violent conflict.

Understanding how violence influences individuals' behavior into protecting themselves against Covid-19 is fundamental for any policy recommendation to prevent the spread of the virus in poor and conflict-ridden areas such as the Sahel region. Policies that will be of special significance in progressing towards supporting the United Nations' Agenda 2030 formalized in the Sustainable Development Goal (SDG) 3 (Good Health and Well-Being) and SDG 16 (Peace, Justice and Strong Institutions) will help to combat the spread of the virus.

The remainder of this paper is organized as follows: The ensuing section, describes the emerging literature on health, Covid-19 and violence in greater detail. Section 3 outlines the data material used in this study. In Section 4, we present the method and empirical strategy for measuring how violence affects measures adopted to prevent infection by Covid-19 and the

infection rate. In Section 5, the impact of violence on preventive measures against the spread of Covid-19 and the infection rate is analyzed. Finally, in section 6 and 7, we discuss the results, possible underlying mechanisms and present our conclusions with suggestions and recommendations for future research and policy in the Sahel region.

## 2. Literature review

The Covid-19 pandemic has increased economic hardship for individuals and communities in the Sahel. Armed conflict has significant negative effects on human security and development (Collier, 2007), particularly in Sub-Saharan Africa (Gates et al., 2012). Factors such as poor health and decline in GDP are consequences of violent conflict and civil war (Cederman and Weidmann, 2017). The World Bank (2020) noticed in the early months of the Covid-19 pandemic, with lockdowns and travel restrictions, a historical decline in remittances, implying increased insecurity and volatility in income. This resulted in an increased probability of recruitment of joining armed groups to compensate for the loss of livelihood. A high level of disease prevalence and loss in life expectancy could increase the risky behavior of individuals and lower the threshold of joining armed groups (Kustra, 2017).

A pandemic such as the Covid-19 increase the cost for a state to escalate a violent conflict, by forcing the state to allocate resources to the health sector (Price-Smith, 2009). States with strong institutions deal with the impacts of a pandemic such as Covid-19 by extending their social security net (Sobek, 2010). However, in states with weak and under-developed institutions like those in the Sahel, the pandemic exposes the limitations of state capacities. Loss in much needed revenue and aid, infection of security forces or the need to redeploy them elsewhere (Ataguba, 2020), increases the vulnerability of previously protected areas.

Previous research shows that the prevalence of violent conflicts affects the capacity to deal with the Covid-19 pandemic (Mehrl and Thurner 2020). Further, the direct and collateral damage from violent conflicts on health care, sanitation and electricity, in particular on non-combatants is devastating (Wise and Barry 2017; Wagner et al. 2019). Acts of violence, which increase in forced displacement, could also increase the spread of Covid-19. Violent conflict affects the vaccination rate: Østby et al. (2021), show that exposure to violent conflict results in lower vaccination rates. This could be due to limited access for health workers in violence-prone areas.

Further, there is an emerging research on adherence to and trust in preventive measures against the spread of Covid-19. In a study looking at seven European countries in the beginning

of the pandemic in 2020, Varghese et al. (2021) show that adherence is higher for preventive measures such as social distancing compared to hygiene measures. They also show that the adherence to Covid-19 prevention measures seems to be higher among females compared to males, higher for educated compared to less educated persons and higher among older individuals. In Chile, Bronfman et al. (2021) show that females report higher levels of worry and fear of the Covid-19 pandemic and are more prone to adopt preventive hygiene and social distancing behaviors against Covid-19. Adoption of preventive measures seems to be consistent with government recommendations (Ozdemir et al., 2020).

The impact of Covid-19 differs by gender, involving an extra burden for women, including caring for family members, childcare and home schooling (Carlson et al. 2021). Women constitute 70 per cent of all workers in the health and social sector and thus placing them at greater risk of infection (Wenham et al. 2020). There is also a substantial amount of research on violence and Covid-19 that deals with the pandemic link to domestic violence (e.g., Viveiros and Bonomi, 2020; Roesch et al. 2020; Humphreys et al. 2020), interpersonal violence (Mazza et al. 2020) and racial violence (Monahan, 2021).

## 3. Data description

### 3.1. Three Datasets

Our analysis is based on three datasets, a household budget survey (HBS), the Armed Conflict Location and Event Data (ACLED) and Covid-19 test center data. ACLED provides information on all violent episodes including the locality (region, province, municipality), the date, the number of casualties, the type of violence and the actors involved in the violence.[7] Many acts of violence in Burkina Faso occurred during the period of the collection of household survey data in the HBS. Merging the ACLED and HBS datasets allow us to exploit the temporal and spatial occurrence of violence and infer its effect on the adoption of Covid-19 prevention measures.

The HBS, is a national representative panel survey covering 1,919 households spread across the 13 regions of Burkina Faso in both urban and rural areas (INSD, 2020).[8] Each household

[7] ACLED has been used intensively in empirical development economics (e.g. Brück et al., 2016) and research in conflict studies (e.g. Raleigh et al., 2010).

[8] The objective of the HBS has been for the Burkinabé government to monitor the socio-economic impacts of the Covid-19 pandemic with a focus on health and sanitation, earnings, employment, education, food security and vulnerability, shocks and insecurity (INSD, 2020a).

was interviewed in eleven rounds between 2020 and 2021, with a baseline survey collected in 2018 and 2019. The HBS interviews at the household level were randomly scheduled throughout the country before each round, including violence-prone areas.[9] Thus, there was no possibility to self-select the timing or the date of the survey.

This study focuses on different questions in a separate behavioral module of the HBS dealing with Covid-19, collected between June 2020 until December 2020 from the head of the household.[10] It contains questions regarding adoption of Covid-19 prevention measures over time. The Covid-19 module was added to the HBS in the first (June 9 to July 7), third (September 12 to October 21) and fifth (December 9 to December 30) survey rounds in 2020.[11] The data have been collected through computer-assisted telephone interviews (CATI), following similar methods that have been implemented in other countries (UN and World Bank, 2020; Himelein et al., 2020; World Bank, 2021).

The HBS is a subsample of the baseline survey collected in 2018 and 2019. This baseline survey is a face-to-face, nationally representative survey covering 7,010 households across the 13 regions of Burkina Faso. During the data collection of the baseline survey, valid mobile phone numbers were collected from 6,877 households, which constitute the sampling frame of the HBS. From these 6,877 households in 2018 and 2019, 2,500 households where randomly drawn for the data collection of the first survey round of the HBS between June 9 and July 7 2020. This was in order to account for non-response and attrition.[12] 438 of these 2,500 households could not be reached due to mainly wrong or non-functional phone numbers, or because their mobile phones were turned off. This resulted in 2,062 households with functional mobile phone numbers who were contacted. During the first survey round of the HBS 1,968 households where fully interviewed.[13] In the fifth survey round, collected in December 2020,

[9] This was possible as the data were collected via the phone (Computer Assisted Telephone Interview).

[10] The interviewers were instructed that the respondent must be the household head or an adult member of the household equivalent to the household head. In order to have consistent information in the panel, the interviewers were instructed to reach the same respondent in each survey round. Further, a compensation of 500 FCFA (equivalent to 76 euro cents; 1 EUR is approx. 655 FCFA) was given to the respondents after each survey round, to cover the cost of charging the battery of the respondent's mobile phone at village level charging centers (INSD, 2020).

[11] The Covid-19 module has also been collected in the tenth survey round of the HBS (May 25 to June 15 2021). This module is not added to our analytical sample, as we are interested in understanding how the behavioral response to measures adopted to prevent infection by Covid-19 differs during a period where the government imposes and lifts restrictions in order to prevent the spread of the virus.

[12] In order to have a national representative sample, the target sample size for the HBS is 1,800 households. An cumulative, hypothetical non-response rate of 50% would lead to the minimum required target sample of 1,479 households (INSD, 2020).

[13] The interviews were conducted in French, and if needed in the main maternal languages of Moore, Dioula, Fulfulde and Bobo but also in Bissa, Bwamu, Dagari, Gourmatchema, Senoufo, Lobiri and Lele in order to reduce non-response due to language barriers. The questionnaires were validated according to each maternal language by the unit of language and linguistics at University of Ouagadougou in order to have a coherent translation of the

the number of households was 1,919 which is the analytical sample size of the panel resulting in an attrition rate of 2,5 per cent (or 49 households) compared to round 1.[14]

The HBS is thus a national representative panel survey of households with a mobile phone access. A valid question to ask is if our analytical sample does cover the households in the most remote areas of the country. Only 1,9 per cent of the households in our baseline survey of 2018 and 2019 lack access to a valid mobile phone number. Figure A1 in the Appendix shows that households with a valid mobile phone number cover the whole country, including the most remote regions of Sahel, Nord and Boucle du Mouhoun. Next, Figure A1 shows that those households without a valid phone number are more located in the center of the country, and none of them are in the remote areas. Further, our balance table does not show any large differences between the main covariates in the HBS panel survey rounds and the baseline survey (see Appendix Table A1).

The HBS and ACLED are merged at the regional, province and the municipality level. The resulting dataset allows to exploit the timing of the different survey rounds and the timing of the violence to infer the effect of violence on the adoption of Covid-19 measures. It is also possible to obtain information about the history of violence in areas affected by current violence through tracking violent episodes back in time.

Since this merged dataset is within the panel structure of the HBS, it allows us to link individually disaggregated information on demographics such as age and gender, level of education, food and non-food consumption, as well as other variables.

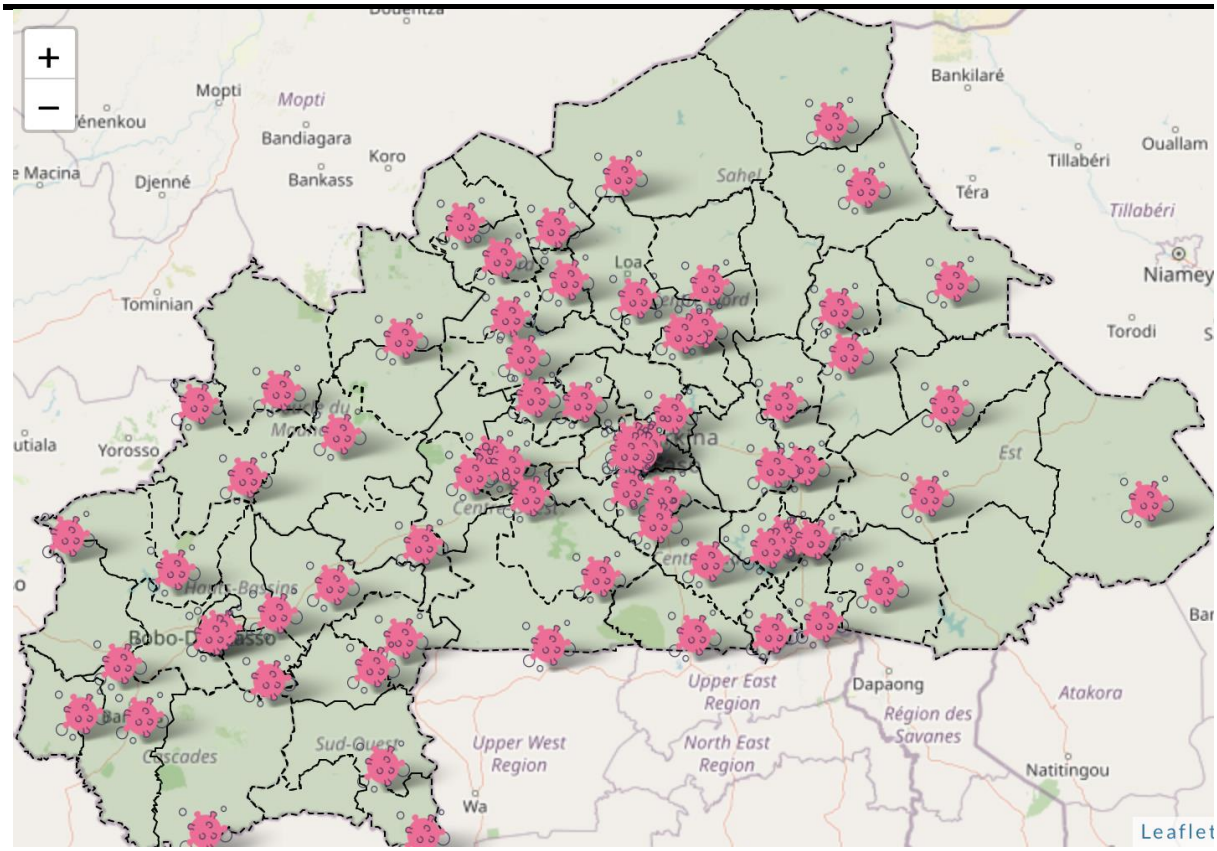
In addition, our analysis will also make use of data on the infection rate of Covid-19. These data contain the number of persons infected by Covid-19 per municipality. It is obtained from test-centers supervised by the Operational Center of Response and Management of Sanitary Emergencies (CORUS, Centre des Opérations de Résponse aux Urgences Sanitaires) that are located across 65 municipalities in the country on 3 September 2021, as depicted in Figure 1. The infection rate of Covid-19 is registered at the level of each test center and we know the municipality of its location. These test-center are for example regional hospitals, urban medical centers or health and sanitary centers within a district in a municipality.

questionnaire for all interviewers. And the interviewers mastered these languages in the area they were assigned to.

[14] This attrition was mainly due to the refusal to participate in the survey, which is also the reason behind the attrition seen between HBS panel survey rounds in the balance table (Appendix Table A1). The household heads that refuse to participate between survey rounds do not have a different profile compared to the participants in terms age, gender, level of education and residential zone (i.e. living in conflict affected region or not) in the cross section of each survey round and between survey rounds in the panel.

For each of these municipalities we use information on the population size (obtained via INSD (2020b)), which allows us to calculate the infection rate (number of infected divided by municipality population size). The dataset is merged again with the ACLED data at the municipality level.

*Figure 1*. Map of Covid-19 test-centers in Burkina Faso.




*Source:* CORUS (2021-09-03)

### 3.2. Description of main variables

The survey module regarding the adoption to Covid-19 prevention measures asks the household head to provide responses on the following elements: (i) their knowledge about Covid-19: (ii) what measures they have adopted to prevent infection by Covid-19; (iii) their knowledge of measures taken by the authorities (the government or local authorities) to prevent the spread of Covid-19, and (iv) their own application of the three most important preventive measures to

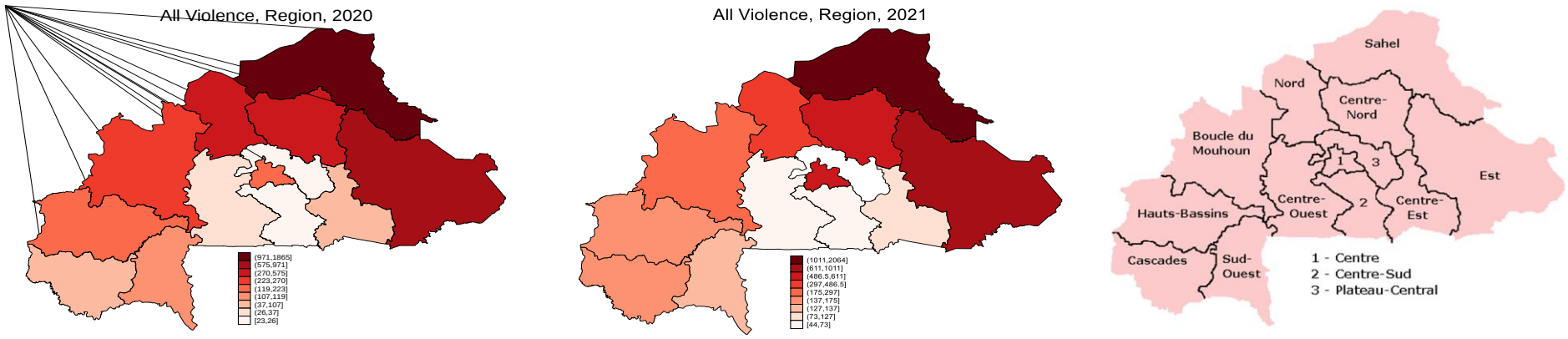
prevent infection by Covid-19. Within each Covid-19 related survey question there are a number of sub-categories, except for the question about knowledge about Covid-19 which is an indicator type of question consisting of a yes or no option (see Appendix Table A2 and A3 for distribution of responses across survey rounds on a national and regional level).[15]

The merged dataset includes all violent events during the same time-period as the one covered in the Covid-19 module for each of the survey rounds containing that module, and for the period of the infection rate of Covid-19. Figure 2 shows the distribution of number of violent episodes per day during the survey rounds in 2020 and for the period of the registered infection rate in 2021. The information on violence is available at the regional, province and municipality level in terms of battles, explosions or remote violence, protests, riots, strategic development of forces and violence against civilians (see Appendix Figure A2 for distribution of number of violent episodes per day across survey rounds and types of violence).[16] We also use the number of fatalities in our empirical analysis, as it is a widely used indicator of the severity of violence. It could for example be that effects only become statistically significant in areas and episodes with a high level of violence. The number of fatalities registered in the ACLED dataset is not always verified by independent bodies, a caveat we need to make here. Estimations in our study have been conducted with and without the number of fatalities, and the results does not differ when compared with the number of violent events as regressor.

[15] The question about measures the individuals have adopted to prevent infection by Covid-19 consist of the following eight YES/NO sub-categories: 1 "Wash hands/Use of disinfectant", 2 "No handshakes/physical greetings", 3 "Use of mask/gloves", 4 "Avoid travel", 5 "Stay at home and only go out if necessary", 6 "Aovid croweded places", 7 "Keep physical distance of 1 meter" and 8 "Avoid touching on your face". The question about their knowledge of measures adopted by the authorities (the government or local authorities) to prevent infection by Covid-19 consist of the following twelve YES/NO sub-categories: 1 "Encourage people to stay at home", 2 "Restrict national travels", 3 "Restrict international travels", 4 "Closing schools and universities", 5 "Curfew/Confinement", 6 "Closing non-essential activities", 7 "Closing markets, yaars, restaurants, bars", 8 "Closing places of worship", 9 "Put in quarantine affected cites", 10 "Closing airports/transport companies", 11 "Prohibition of gathering of 50 people or more" and 12 "Other measures". The question about their own application of the three most important preventive measures to prevent infection by Covid-19 consists of the following YES/NO questions; wash hands more often than usual compared to March 9 for round 1 (or four previous weeks for round 3 and 5), less handshakes/physical greetings compared to March 9 and avoid gatherings of 10 people or more compared to March 9 for round 1(or four previous weeks for round 3 and 5) in survey round 1 or four previous weeks in survey rounds 3 and 5.

[16] The violent event type Battles consist of the following sub-categories; Battle-No change of territory, Battle-Non-state actor overtakes territory and Battle-Government regains territory. The violent event type Strategic development does not involve active fighting but is within the context of war or dispute. It could refer to failed attempts of remote violence, such as disarming and defusing of improvised explosive devices by security forces. Explosions or remote violence are other attempts of remote violence such as missile attacks and mortars, i.e., events in which the tool for engaging in conflict does not require the physical presence of the perpetrator. Protests are coded as violent event types that occur in connection to violent riots in the same area. Violence against civilians are violent event types when any armed or violent group attacks civilians.

*Figure 2.* Distribution of violence per region between 2020 and 2021 in Burkina Faso.



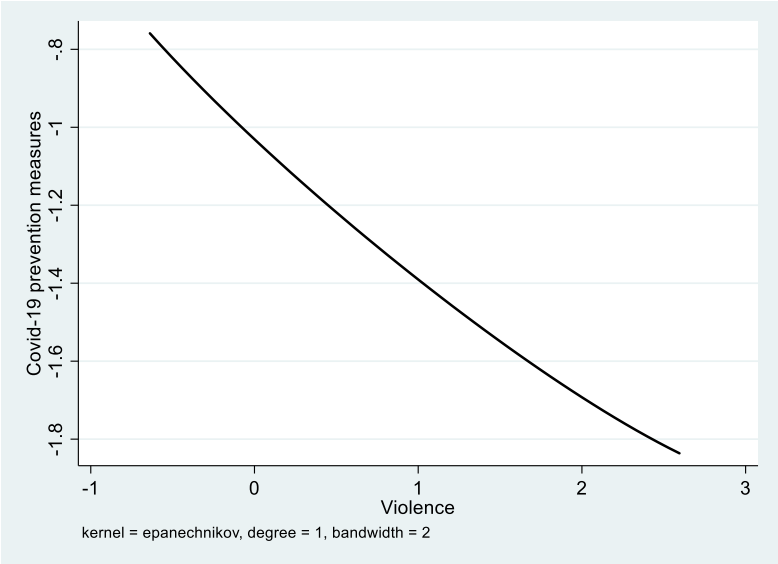

*Note*: Shows the distribution of all violent episodes per day, aggregated per region (13 regions) and year between 2020 and 2021. The darker shades indicate more occurrence of violence. Those regions that are blank lack information about violent episodes.

## 4. Identification and Econometric Specification

### 4.1 Estimation Method

The empirical identification strategy can be illustrated by examining the nonparametric relationship between the adoption of Covid-19 prevention measures and the occurrence of violent events. In Figure 3 we estimate a kernel-weighted local polynomial regression of the adoption of Covid-19 prevention measures on violence using an Epanechnikov kernel. The figure shows a considerable drop in the adoption for higher levels of violence.

*Figure 3*. Kernel-weighted local polynomial regression of adoption to Covid-19 prevention measures on violence using an Epanechnikov kernel, first survey round




*Note*: On the y-axis, we measure the adoption of all Covid-19 prevention measures. And on the x-axis we have our measure of violence. The y-axis variable consist of all the survey questions on measures adopted to prevent infection by Covid-19 (i.e., 'Measures adopted to prevent infection by Covid-19', 'Knowledge of measures adopted by the authorities to prevent infection by Covid-19' and 'Applying the three most preventive measures to prevent infection by Covid-19') which are summarized into one variable, and standardized to mean zero and standard deviation one. The violence variable is measured as the number of violent episodes per day during survey round 1 (between June 9 and July 7 2020), standardized to mean zero and standard deviation one. Each of the three survey questions about measures adopted to prevent infection by Covid-19 shows similar results separately and are available upon request.

To measure the effect of violence on the adoption of Covid-19 prevention measures $Y_{ij}$, of a household head *i* in household *j* in area *a* during time periods *t* = survey rounds 1, 3 and 5, and building on Figure 1, we use the following equation:

$$Y_{ijat} = f(\mathrm{I}_{at},\ \mathrm{X}_i,\ \mathrm{H}_j), \qquad (1)$$

where $\mathrm{I}_{at}$ is a vector of violent episodes occurring in area *a* (e.g., region or municipality) during time periods *t*, $\mathrm{X}_i$ is a vector of the household head's characteristics, such age and level of education, and $\mathrm{H}_j$ is a vector of household characteristics such as total household consumption per capita. The sub-categories for each Covid-19 prevention measure are pooled into one variable, summarized per region and municipality, per survey round and household.[17] The same procedure has been conducted with the violent episodes data, where all the different violent types are pooled into one variable per region and municipality corresponding to the same period as the survey rounds in the HBS, and during the time period when the infection rate per municipality was measured.

In order to test whether the violence occurring at regional and municipality level affects the adoption of Covid-19 prevention measures, we estimate the following baseline regional fixed effect regression:

$$Y_{aijt} = \beta V_{at} + \gamma Z_{aij}^{\mathrm{T}} + \Theta_a + \varepsilon_{aijt}, \qquad (2)$$

where $Y_{aijt}$ is the adoption of Covid-19 prevention measures in area *a* by the household head *i* of household *j* during time periods *t*, $V_{at}$ is the violence occurring in the region and municipality, $Z_{aij}^{\mathrm{T}}$ is a vector of individual household head's socio-economic characteristics, total consumption per capita and residential zones, $\Theta_{\mathrm{a}}$ are the regional fixed effects and $\varepsilon_{aijt}$ is the error term. $\beta$ is our coefficient of interest, it measures the effect of an increase in one standard deviation of the number of violent episodes in the municipality or region on the adoption of Covid-19 prevention measures by the head of the household.

We further test whether the violence occurring at the municipality level affects the infection rate of Covid-19 by estimating the following cross-sectional baseline regional fixed effect regression:

$$y_a = \gamma V_a + \gamma Z_a^{\mathrm{T}} + \Theta_a + \psi_a, \qquad (3)$$

where $y_a$ is the infection rate of Covid-19 in area *a*, $V_a$ is the violence occurring in the municipality, $Z_a^{\mathrm{T}}$ is a vector of individual household head's socio-economic characteristics and total consumption averaged at the municipality level, $\Theta_{\mathrm{a}}$ are the regional fixed effects and $\psi_a$ is the error term. $\gamma$ is our coefficient of interest, it measures the effect of an increase in one

[17] For example, all the eight sub-categories for the survey question about measures the individuals have adopted to prevent infection by Covid-19, are summarized into one variable per each household, in each municipality and region per survey round.

standard deviation of the number of violent episodes in the municipality on the infection rate of Covid-19 at the municipality.

### 4.2. Potential threats to identification

A threat to our identification strategy would occur when armed actors react to measures imposed or adopted to prevent the spread of Covid-19. This would imply a reverse causality, where the adoption of Covid-19 measures influences the occurring of violence. This could for example take place when insurgents or terrorist groups want to test government military readiness by attacking government positions, villages or cities at the moment when these locations experience an outbreak of Covid-19. Or, alternatively, when the government uses the expansion of government reach and power – which typically takes place during a pandemic – to increase its presence and attacks adversaries in belligerent areas.

We have witnessed such a situation with the Ebola outbreak in Eastern DRC: at several occasions the presence of local and international aid workers resulted in attacks on the health centers and in instances of local violence. Local actors did not trust or did not want the aid workers to come to their community.

For the case of Burkina Faso however we do not see the above development. We use two approaches to exclude the issue of reverse causality. First is the timeline of the conflict, second is a robustness analysis: (i) when observing the trend during pre-treatment periods (i.e., the periods before the HBS survey rounds and the measurement of infection rate) we notice that the occurrence of violence is not something new for our years of study in 2020 and 2021. In other words, the warring parties did not wait for Covid-19 to inflict violence on communities. In fact the violence seems to have started after the revolution of 2014 and continued to increase (see Appendix Figure A3 and A4 for distribution of violent episodes on a regional and province level between 2013 and 2021); (ii) we estimate equation (2) with different variants of time intervals for the violence variable, in terms of violence occurring in the region and municipality of the household head *i* of household *j* during the four or twelve previous months preceding the interview in survey round 1 (see Appendix Table A4, A5 and A6). We do that to rule out that the violence occurring in the regions and municipalities is a single event related to the survey period.

## 5. Empirical Results

In this section, we look at the effect of violence on adoption of preventive measures against the spread of Covid-19. To do this, we start by exploring how occurrence of violence affects the different preventive measures separately as well as pooled per region, municipality and survey round, and then continue examining how households' poverty status affect this effect. We also examine how occurrence of violence affects the infection rate of Covid-19.

### 5.1. Effect of violence on adoption of preventive measures against Covid-19

We present results whereby we vary the specification along three dimensions: (i) the number of survey rounds, i.e, first, third and fifth; (ii) the type of adoption measure, i.e. adoption of all measures, knowledge about the measures and application of the three most useful measures; and (iii) the length of the violence taken into consideration, i.e. contemporaneous to the survey round, 4 months preceding the survey round and 12 months preceding.

We first present results from the first survey round in (Table 1a) where we estimate Equation (2). These results examine the effect of contemporaneous violence on the adoption of preventive measures against Covid-19. We use other violence intervals in (Tables A4-A6) in the Appendix. Each column represents a separate regression, and each panel (Panel A to C) a separate preventive measure. Columns 1 to 4 present the results for the full sample on the regional level (M1-M4), with model 4 (M4) giving the full model specification with all controls and regional fixed effects. As the region is a rather large area, with some villages having much less violence than others, our estimate at this level is an 'average' across villages within the region. Fortunately, we can break down the data at the more disaggregated level of the municipality. Column 5 to 8 presents the results of the same regression at the municipality level (M5-M8), with model 8 (M8) showing the full model including the gender effect, where violence is a dummy variable taking the value one if the occurrence of violence are above or below the municipality average.[18] The results show that higher occurrence of violent episodes are significantly associated with lower adoption of preventive measures to prevent infection by Covid-19 in the first survey round.

This effect is also reflected when pooling all the preventive measures into one for the first, third and fifth survey rounds separately (see Appendix Table A7). Part of the preventive measures against Covid-19 were relaxed by the time-period that covers survey round 5, such as

[18] In an effort to find out if extreme violence is driving the effect, we also coded, a dummy variable taking the value one if the occurrence of violence is in highest tertile of all municipalities. Results do not change the sign or magnitude of the effect in our tables. Available on request.

reopening of schools and lifting nationwide curfew, which could imply less adoption of preventive measures. This effect, from survey round 5, is seen in Table A8 in the Appendix when examining the cross-sectional effect between violence and preventive measures for each survey round separately.

In Table 1b we repeat the regression from Table 1a with the same measures in each panel (A-C), the inclusion of the same co-variates in each column, and for contemporaneous violence, but here we use the full panel, meaning the first, third and fifth survey round combined. Differences between households and municipalities in adoption of preventive measures against Covid-19 may be influenced by cultural norms or other unobserved variables that do not change in the course of a few years. Panel data regression using fixed effects allows us to control for all time invariant omitted variable, such as differences in cultural norms between individuals. Table 1b shows that the effect holds also over time, higher level of violence is associated with lower adoption of preventive measures to prevent infection by Covid-19.

Including the gender of the head of the household, we find that the adoption of preventive measures against Covid-19 varies by gender. Table A7 (M7) in the Appendix shows that female headed households seem to adopt more preventive measures against Covid-19 as compared to their male counterpart.

**Table 1a**. *Adoption to Covid-19 and Violence: The results for full sample in the first survey round*.

| Panel A. Dependent variable: | *Measures adopted to prevent infection by Covid-19* | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | M1 | M2 | M3 | M4 | M5 | M6 | M7 | M8 |
| Violence | -0.67*** | -0.60*** | -0.26*** | -0.27*** | -0.32*** | -0.24*** | -0.63*** | -0.36*** |
| | (0.05) | (0.04) | (0.04) | (0.04) | (0.05) | (0.04) | (0.09) | (0.06) |
| Female (=1) | | | | -0.03** | | | | 0.18*** |
| | | | | (0.01) | | | | (0.06) |
| Additional controls: | No | Yes | Yes | Yes | No | Yes | Yes | Yes |
| Regional FE | No | No | Yes | Yes | No | No | Yes | Yes |
| Constant | 1.55*** | -6.63*** | 0.85*** | 0.83*** | -0.99*** | -8.47*** | -8.16*** | -4.16*** |
| | (0.08) | (0.65) | (0.16) | (0.16) | (0.07) | (0.64) | (0.64) | (0.59) |
| Observations | 1,869 | 1,869 | 1,869 | 1,869 | 1,869 | 1,869 | 1,869 | 1,869 |
| R-squared | 0.260 | 0.409 | 0.982 | 0.982 | 0.084 | 0.289 | 0.305 | 0.530 |
| Panel B. Dependent variable: | *Knowledge of measures adopted by the authorities to prevent infection by Covid-19* | | | | | | | |
| Violence | -0.67*** | -0.61*** | -0.27*** | -0.27*** | -0.32*** | -0.25*** | -0.63*** | -0.36*** |
| | (0.05) | (0.04) | (0.04) | (0.04) | (0.05) | (0.04) | (0.09) | (0.06) |
| Female (=1) | | | | -0.03** | | | | 0.18*** |
| | | | | (0.01) | | | | (0.06) |
| Additional controls: | No | Yes | Yes | Yes | No | Yes | Yes | Yes |
| Regional FE | No | No | Yes | Yes | No | No | Yes | Yes |
| Constant | 1.55*** | -6.59*** | 0.85*** | 0.83*** | -0.99*** | -8.48*** | -8.16*** | -4.16*** |
| | (0.08) | (0.65) | (0.16) | (0.16) | (0.07) | (0.64) | (0.64) | (0.59) |
| Observations | 1,869 | 1,869 | 1,869 | 1,869 | 1,869 | 1,869 | 1,869 | 1,869 |
| R-squared | 0.263 | 0.410 | 0.982 | 0.982 | 0.085 | 0.289 | 0.304 | 0.529 |
| Panel C. Dependent variable: | *Applying the three most preventive measures to prevent infection by Covid-19* | | | | | | | |
| Violence | -0.67*** | -0.60*** | -0.27*** | -0.27*** | -0.31*** | -0.24*** | -0.62*** | -0.36*** |
| | (0.05) | (0.04) | (0.04) | (0.04) | (0.05) | (0.04) | (0.09) | (0.06) |
| Female (=1) | | | | -0.03** | | | | 0.18*** |
| | | | | (0.01) | | | | (0.06) |
| Additional controls: | No | Yes | Yes | Yes | No | Yes | Yes | Yes |
| Regional FE | No | No | Yes | Yes | No | No | Yes | Yes |
| Constant | 1.55*** | -6.56*** | 0.87*** | 0.85*** | -0.99*** | -8.43*** | -8.11*** | -4.16*** |
| | (0.08) | (0.64) | (0.16) | (0.16) | (0.07) | (0.64) | (0.64) | (0.59) |
| Observations | 1,869 | 1,869 | 1,869 | 1,869 | 1,869 | 1,869 | 1,869 | 1,869 |
| R-squared | 0.262 | 0.410 | 0.982 | 0.982 | 0.082 | 0.287 | 0.302 | 0.524 |

*Note*: Shows coefficient estimates (OLS) for adoption of Covid-19 prevention measures for the full sample with violence for survey round 1 (between June 9 and July 7). Panel A to C uses the different adoption of Covid-19 prevention measure as a dependent variable. The violence variable is measured as the number of violent episodes per day during survey round 1 (between June 9 and July 7 2020). Model (1) to (4) shows violent episode for the regional level, and M5-M8 for the municipality. The dependent variable is separately standardized to mean zero and standard deviation one. In M1-M6 the violence variable is separately standardized to mean zero and standard deviation one. In M7-M8 the violence variable is a dummy with value 1 if the level of violence is above the mean level and 0 if below the mean level. We obtain similar results, statistically significant at the 1% level in M7 and at the 5% in M8 when we define value 1 for the highest tertile of level of violence and 0 for the lowest 2/3. Additional controls include age, level of education and yearly total consumption (food and non-food) per capita. Regional FE are regional fixed effects. Standard errors in parentheses are clustered at the enumeration area level, which is a statistically defined geographical unit for sampling purposes somewhat similar to a village. ***, **, * indicating significance at the 1%, 5% and 10% level respectively.

**Table 1b**. *Adoption to Covid-19 prevention measures and Violence: The results for full panel (first, third and fifth survey rounds).*

| Panel A. Dependent variable: | *Measures adopted to prevent infection by Covid-19* | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | M1 | M2 | M3 | M4 | M5 | M6 | M7 | M8 |
| Violence | -0.12*** | -0.12*** | -0.12*** | -0.07*** | -0.25*** | -0.19*** | -0.69*** | -0.39*** |
| | (0.01) | (0.01) | (0.01) | (0.01) | (0.02) | (0.02) | (0.06) | (0.10) |
| Female (=1) | | | -0.05 | | | | 0.17** | |
| | | | (0.07) | | | | (0.08) | |
| Additional controls: | No | Yes | Yes | No | No | Yes | Yes | No |
| FE | No | No | No | Yes | No | No | No | Yes |
| Constant | 1.38*** | -5.60*** | 5.64*** | 1.50*** | 0.52*** | -9.39*** | -9.04*** | 0.64*** |
| | (0.03) | (0.44) | (0.44) | (0.00) | (0.03) | (0.51) | (0.51) | (0.02) |
| Observations | 1,869 | 1,869 | 1,869 | 1,868 | 1,869 | 1,869 | 1,869 | 1,868 |
| R-squared (overall) | 0.150 | 0.240 | 0.240 | 0.150 | 0.025 | 0.165 | 0.166 | 0.041 |
| Panel B. Dependent variable: | *Knowledge of measures adopted by the authorities to prevent infection by Covid-19* | | | | | | | |
| Violence | -0.06*** | -0.06*** | -0.06*** | -0.05*** | -0.26*** | -0.20*** | -0.69*** | -0.31*** |
| | (0.00) | (0.00) | (0.00) | (0.01) | (0.02) | (0.02) | (0.06) | (0.10) |
| Female (=1) | | | -0.03 | | | | 0.18* | |
| | | | (0.07) | | | | (0.09) | |
| Additional controls: | No | Yes | Yes | No | No | Yes | Yes | No |
| FE | No | No | No | Yes | No | No | No | Yes |
| Constant | 1.38*** | -5.86*** | 5.88*** | 1.50*** | 0.50*** | -9.52*** | -9.19*** | 0.61*** |
| | (0.03) | (0.45) | (0.45) | (0.00) | (0.03) | (0.54) | (0.54) | (0.00) |
| Observations | 1,869 | 1,869 | 1,869 | 1,868 | 1,869 | 1,869 | 1,869 | 1,868 |
| R-squared | 0.150 | 0.218 | 0.218 | 0.150 | 0.027 | 0.167 | 0.168 | 0.042 |
| Panel C. Dependent variable: | *Applying the three most preventive measures to prevent infection by Covid-19* | | | | | | | |
| Violence | -0.04*** | -0.04*** | -0.04*** | -0.01 | -0.23*** | -0.18*** | -0.63*** | -0.24*** |
| | (0.01) | (0.01) | (0.01) | (0.01) | (0.02) | (0.02) | (0.06) | (0.10) |
| Female (=1) | | | -0.04 | | | | 0.19** | |
| | | | (0.07) | | | | (0.09) | |
| Additional controls: | No | Yes | Yes | No | No | Yes | Yes | No |
| FE | No | No | No | Yes | No | No | No | Yes |
| Constant | 1.38*** | -5.85*** | -5.88*** | 1.51*** | 0.51*** | -9.66*** | -9.32*** | 0.60*** |
| | (0.03) | (0.45) | (0.46) | (0.00) | (0.03) | (0.54) | (0.54) | (0.02) |
| Observations | 1,869 | 1,869 | 1,869 | 1,868 | 1,869 | 1,869 | 1,869 | 1,868 |
| R-squared (within) | 0.136 | 0.201 | 0.201 | 0.136 | 0.022 | 0.163 | 0.165 | 0.035 |

*Note*: Shows coefficient estimates for adoption of Covid-19 prevention measures for the full panel with violence during survey round 1 (between June 9 and July 7), round 3 (September 12 and October 21) and round 5 (December 9 and 30) in 2020. Panel A to C uses the different adoption of Covid-19 prevention measure as a dependent variable. The violence variable is measured as the number of violent episodes per day during survey round 1, round 3 and round 5 in 2020. Model (1) to (4) shows violent episode for the regional level, and M5-M8 for the municipality. The dependent variable is separately standardized to mean zero and standard deviation one. In M1-M6 the violence variable is separately standardized to mean zero and standard deviation one. In M7-M8 the violence variable is a dummy with value 1 if the level of violence is above the mean level and 0 if below the mean level. We obtain similar results, statistically significant at the 1% level when we define value 1 for the highest tertile of level of violence and 0 for the lowest 2/3. Additional controls include age, level of education and yearly total consumption (food and non-food) per capita. FE are fixed effects, which filters out time-invariants effects such as gender. Robust standard errors in parentheses. ***, **, * indicating significance at the 1%, 5% and 10 level respectively.

### 5.2. Effect of poverty status

An important element in the understanding of the effect of violence on adoption of preventive measures against Covid-19 is in the context of poverty, Burkina Faso being one of the poorest countries in the world. The HBS, with its extensive consumption module, allows us to explore whether or not violence affects the adoption of preventive measures differently for poor and non-poor households. Poverty is defined here in a monetary sense meaning that respondents are considered poor if the value of their consumption is below the poverty line of 1.90 dollar per day per person. The poverty headcount ratio at the national poverty line from the last official calculation from 2018 is 41,4% poor. We present results in tables 2a and 2b. We show that there is a difference in the effect of violence on adoption of preventive measures against Covid-19 in poor versus non-poor households. For both poor and non-poor individuals, violence is associated with significantly lower adoption of preventive measures against Covid-19. For regression using regional level violence M1-M4, the magnitude of the coefficient of violence for poor households in somewhat larger than for non-poor. When we use the binary violence variable (above or below the mean) at the municipality level (M7-M8), the difference between poor and non-poor households is outspoken: the coefficient of the violence variable is smaller and/or statistically insignificant for non-poor households. This may demonstrate that the regional level as location of violence may be too large, with a lot of heterogeneity in levels of violence, some villages not affected, whereas others heavily affected. Averaging the violence at the regional level may not locate the violence precisely enough. Hence M8 is here our preferred specification.

Next, we examine how this effect is portrayed for those that have the lowest compared to the highest consumption level, i.e. bottom and top 10 per cent.[19] Tables A9 and A10 in the Appendix shows a negative relationship between violence and adoption of preventive measures against Covid-19 for the bottom as well as the upper decile, with the magnitude of the coefficient of violence larger for individuals in the bottom decile compared to the upper decile.

[19] The consumption variable consist of food and non-food consumption ranked in 10 categories (i.e. lowest to highest consumption decile), and in Table A9 and A10 the lowest and highest 10 per cent are depicted.

**Table 2a**. *Adoption to Covid-19 prevention measures and Violence: The results for the poor in the full panel (first, third and fifth survey rounds).*

| Panel A. Dependent variable: | *Measures adopted to prevent infection by Covid-19* | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | M1 | M2 | M3 | M4 | M5 | M6 | M7 | M8 |
| Violence | -0.10*** | -0.10*** | -0.10*** | -0.06*** | -0.39*** | -0.35*** | -0.35*** | -0.46*** |
| | (0.01) | (0.01) | (0.01) | (0.01) | (0.02) | (0.03) | (0.08) | (0.12) |
| Female (=1) | | | -0.06 | | | | 0.36** | |
| | | | (0.10) | | | | (0.15) | |
| Additional controls: | No | Yes | Yes | No | No | Yes | Yes | No |
| FE | No | No | No | Yes | No | No | No | Yes |
| Constant | 1.66*** | 1.01*** | 1.02*** | 1.80*** | 0.96*** | 0.13 | -0.19 | 0.12*** |
| | (0.04) | (0.12) | (0.12) | (0.00) | (0.04) | (0.13) | (0.14) | (0.03) |
| Observations | 804 | 804 | 804 | 804 | 804 | 804 | 804 | 804 |
| R-squared (overall) | 0.210 | 0.136 | 0.135 | 0.210 | 0.101 | 0.102 | 0.103 | 0.100 |
| Panel B. Dependent variable: | *Knowledge of measures adopted by the authorities to prevent infection by Covid-19* | | | | | | | |
| Violence | -0.05*** | -0.05*** | -0.05*** | -0.04*** | -0.39*** | -0.35*** | -0.35*** | -0.39*** |
| | (0.01) | (0.01) | (0.01) | (0.01) | (0.02) | (0.03) | (0.08) | (0.13) |
| Female (=1) | | | -0.05 | | | | 0.36** | |
| | | | (0.11) | | | | (0.15) | |
| Additional controls: | No | Yes | Yes | No | No | Yes | Yes | No |
| FE | No | No | No | Yes | No | No | No | Yes |
| Constant | 1.67*** | 0.98*** | 0.99*** | 1.81*** | 0.94*** | 0.12 | -0.20 | 0.09*** |
| | (0.04) | (0.12) | (0.12) | (0.00) | (0.04) | (0.13) | (0.14) | (0.03) |
| Observations | 804 | 804 | 804 | 804 | 804 | 804 | 804 | 804 |
| R-squared | 0.211 | 0.110 | 0.110 | 0.211 | 0.101 | 0.104 | 0.105 | 0.101 |
| Panel C. Dependent variable: | *Applying the three most preventive measures to prevent infection by Covid-19* | | | | | | | |
| Violence | -0.03*** | -0.03*** | -0.03*** | -0.01 | -0.37*** | -0.33*** | -0.29*** | -0.34*** |
| | (0.01) | (0.01) | (0.01) | (0.01) | (0.02) | (0.03) | (0.08) | (0.13) |
| Female (=1) | | | -0.05 | | | | 0.36** | |
| | | | (0.11) | | | | (0.15) | |
| Additional controls: | No | Yes | Yes | No | No | Yes | Yes | No |
| FE | No | No | No | Yes | No | No | No | Yes |
| Constant | 1.67*** | 0.98*** | 0.99*** | 1.81*** | 0.95*** | 0.14 | 0.18 | 0.08*** |
| | (0.04) | (0.12) | (0.12) | (0.00) | (0.04) | (0.13) | (0.14) | (0.03) |
| Observations | 804 | 804 | 804 | 804 | 804 | 804 | 804 | 804 |
| R-squared (within) | 0.193 | 0.115 | 0.113 | 0.193 | 0.051 | 0.085 | 0.111 | 0.051 |

*Note*: Shows coefficient estimates for adoption of Covid-19 prevention measures for the poor with violence during survey round 1 (between June 9 and July 7), round 3 (September 12 and October 21) and round 5 (December 9 and 30) in 2020. Panel A to C uses the different adoption of Covid-19 prevention measure as a dependent variable. The violence variable is measured as the number of violent episodes per day during survey round 1, round 3 and round 5 in 2020. Model (1) to (4) shows violent episode for the regional level, and M5-M8 for the municipality. The dependent variable is separately standardized to mean zero and standard deviation one. In M1-M6 the violence variable is separately standardized to mean zero and standard deviation one. In M7-M8 the violence variable is a dummy with value 1 if the level of violence is above the mean level and 0 if below the mean level. We obtain similar results, statistically significant at the 1% level when we define value 1 for the highest tertile of level of violence and 0 for the lowest 2/3. Additional controls include age and level of education. FE are fixed effects, which filters out time-invariants effects such as gender. Robust standard errors in parentheses. ***, **, * indicating significance at the 1%, 5% and 10 level respectively.

**Table 2b.** *Adoption to Covid-19 prevention measures and Violence: The results for the non-poor in the full panel (first, third and fifth rounds).*

| Panel A. Dependent variable: | *Measures adopted to prevent infection by Covid-19* | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | M1 | M2 | M3 | M4 | M5 | M6 | M7 | M8 |
| Violence | -0.14*** | -0.14*** | -0.14*** | -0.10*** | -0.06* | -0.04 | -0.08* | -0.27 |
| | (0.01) | (0.01) | (0.01) | (0.01) | (0.03) | (0.04) | (0.05) | (0.17) |
| Female (=1) | | | 0.10 | | | | 0.17 | |
| | | | (0.11) | | | | (0.11) | |
| Additional controls: | No | Yes | Yes | No | No | Yes | Yes | No |
| FE | No | No | No | Yes | No | No | No | Yes |
| Constant | 1.06*** | 0.90*** | 0.88*** | 1.14*** | 0.01 | -0.24 | -0.37*** | 1.05*** |
| | (0.03) | (0.10) | (0.10) | (0.00) | (0.04) | (0.15) | (0.13) | (0.04) |
| Observations | 1,065 | 1,065 | 1,065 | 1,065 | 1,065 | 1,065 | 1,065 | 1,065 |
| R-squared (overall) | 0.093 | 0.093 | 0.010 | 0.093 | 0.001 | 0.024 | 0.030 | 0.020 |
| Panel B. Dependent variable: | *Knowledge of measures adopted by the authorities to prevent infection by Covid-19* | | | | | | | |
| Violence | -0.08*** | -0.07*** | -0.07*** | -0.06*** | -0.07** | -0.05 | -0.11** | -0.18 |
| | (0.01) | (0.01) | (0.00) | (0.01) | (0.03) | (0.03) | (0.04) | (0.17) |
| Female (=1) | | | 0.14 | | | | 0.19 | |
| | | | (0.11) | | | | (0.12) | |
| Additional controls: | No | Yes | Yes | No | No | Yes | Yes | No |
| FE | No | No | No | Yes | No | No | No | Yes |
| Constant | 1.05*** | 0.85*** | 0.83*** | 1.12*** | -0.01 | -0.25 | -0.34** | 1.02*** |
| | (0.03) | (0.10) | (0.10) | (0.00) | (0.04) | (0.14) | (0.14) | (0.04) |
| Observations | 1,065 | 1,065 | 1,065 | 1,065 | 1,065 | 1,065 | 1,065 | 1,065 |
| R-squared | 0.093 | 0.070 | 0.074 | 0.093 | 0.002 | 0.023 | 0.030 | 0.021 |
| Panel C. Dependent variable: | *Applying the three most preventive measures to prevent infection by Covid-19* | | | | | | | |
| Violence | -0.04*** | -0.04*** | -0.04*** | -0.01 | -0.04 | -0.02 | -0.09** | -0.09 |
| | (0.01) | (0.01) | (0.01) | (0.01) | (0.03) | (0.04) | (0.05) | (0.17) |
| Female (=1) | | | 0.13 | | | | 0.20* | |
| | | | (0.11) | | | | (0.12) | |
| Additional controls: | No | Yes | Yes | No | No | Yes | Yes | No |
| FE | No | No | No | Yes | No | No | No | Yes |
| Constant | 1.05*** | 0.85*** | 0.83*** | 1.13*** | -0.00 | -0.22 | -0.34** | -1.01*** |
| | (0.03) | (0.10) | (0.10) | (0.00) | (0.04) | (0.14) | (0.14) | (0.04) |
| Observations | 1,065 | 1,065 | 1,065 | 1,065 | 1,065 | 1,065 | 1,065 | 1,065 |
| R-squared (within) | 0.080 | 0.043 | 0.050 | 0.080 | 0.001 | 0.020 | 0.025 | 0.020 |

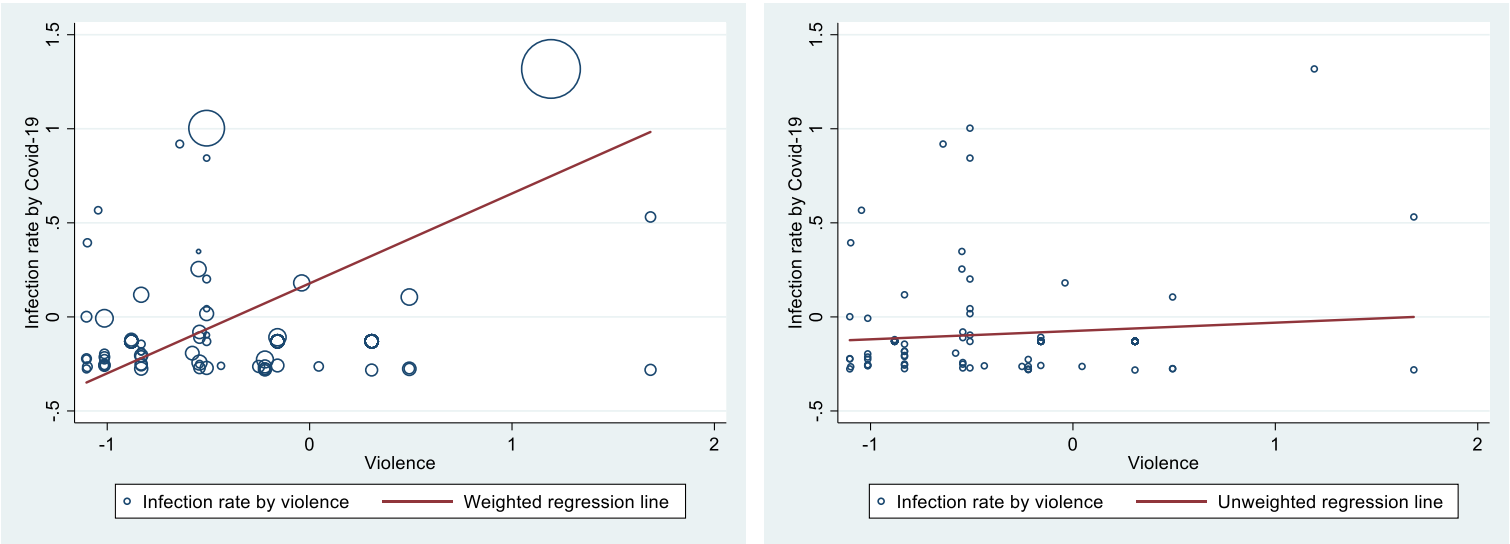
*Note*: Shows coefficient estimates for adoption of Covid-19 prevention measures for the non-poor with violence during survey round 1 (between June 9 and July 7), round 3 (September 12 and October 21) and round 5 (December 9 and 30) in 2020. Panel A to C uses the different adoption of Covid-19 prevention measure as a dependent variable. The violence variable is measured as the number of violent episodes per day during survey round 1, round 3 and round 5 in 2020. Model (1) to (4) shows violent episode for the regional level, and M5-M8 for the municipality. The dependent variable is separately standardized to mean zero and standard deviation one. In M1-M6 the violence variable is separately standardized to mean zero and standard deviation one. In M7-M8 the violence variable is a dummy with value 1 if the level of violence is above the mean level and 0 if below the mean level. We obtain similar results, statistically significant at the 1% level when we define value 1 for the highest tertile of level of violence and 0 for the lowest 2/3. Additional controls include age and level of education. FE are fixed effects, which filters out time-invariants effects such as gender. Robust standard errors in parentheses. ***, **, * indicating significance at the 1%, 5% and 10 level respectively.

### 5.3. Effect of violence on the infection rate of Covid-19

Having demonstrated the negative relationship between the adoption of Covid-19 prevention measures and the occurrence of violent events, we move to the infection rate. The adoption of preventative measures is key to reduce the spread of infections, and non-observance of preventative measures will contribute to its spread. Of course, that does not need to be the only mechanism whereby violence increases the spread of the virus. We come back on this in the mechanism section.

In Figure 4 we investigate the relationship between the occurrence of violence and the infection rate. The fitted lines in Figure 4 are based on weighted (and unweighted) regression of the infection rate of Covid-19 on violent episodes per municipality. Table 3 presents the results, estimating Equation (3), where the effect of violence on the infection rate of Covid-19 at the municipality level is investigated. In columns 3 and 6 of Table 3, the results suggest that higher occurrence of violent episodes are significantly associated with higher infection rate of Covid-19 in 2021. This is an indication that violent conflicts not only affect household's behavior and attitudes towards implementing preventive measures against Covid-19 but it also has a direct effect on the infection rate.

*Figure 4*. Relationship between violence and infection rate of Covid-19, during 2021.




*Note*: On the x-axes, we have our measure of violence, on the y-axes the infection rate by Covid-19. The y-axes variable is measured as the number of infected per municipality test-centers (65 test-centers) on September 3 2021, divided by the population size in each municipality that holds a test-center and standardized to mean zero and standard deviation one. The violence variable is measured as the number of violent episodes per day between 03 March and 31 august 2021 which are summarized at the municipality level and standardized to mean zero and standard deviation one. The weighted regression line is weighted by the municipality population size. The size of the circles in the left-hand side scatterplot is proportional to the municipality population.

**Table 3**. *Infection rate of Covid-19 and Violence: The results for full sample of test centers*.

| Panel A. Dependent variable: | *Infection rate of Covid-19* | | | | | |
|---|---|---|---|---|---|---|
| | M1 | M2 | M3 | M4 | M5 | M6 |
| Violence | 0.07 | 0.03*** | 0.03*** | 1.82 | 0.04*** | 0.06*** |
| | (0.06) | (0.01) | (0.01) | (1.61) | (0.01) | (0.02) |
| Additional controls: | No | No | Yes | No | No | Yes |
| Regional FE | No | Yes | Yes | No | Yes | Yes |
| Constant | -0.01 | -0.08*** | -0.10 | 1.42 | -0.07*** | -0.88 |
| | (0.05) | (0.00) | (0.08) | (1.28) | (0.00) | (0.85) |
| Observations | 65 | 65 | 65 | 64 | 64 | 64 |
| R-squared | 0.001 | 0.913 | 0.913 | 0.105 | 0.968 | 0.969 |

*Note*: Shows coefficient estimates (OLS) for infection rate of Covid-19 for the full sample with violent. The infection rate of Covid-19 variable is measured as the number of infected per municipality test-centers (65 test-centers) at September 2021, divided by the population size in each municipality that holds a test-center. The violence variable is measured as the number of violent episodes per day between 03 March and 31 august 2021. Models (1) to (3) shows violent episode for the municipality level, and M4-M6 weighted by population size at the municipality level. The dependent and violence variables are separately standardized to mean zero and standard deviation one. Additional controls include age, level of education and yearly total consumption (food and non-food) averaged at the municipality level. Regional FE are regional fixed effects. Standard errors in parentheses are clustered at the enumeration area level, which is a statistically defined geographical unit for sampling purposes somewhat similar to a village. ***, **, * indicating significance at the 1%, 5% and 10% level respectively.

## 6. Underlying mechanism: shut down of health centers

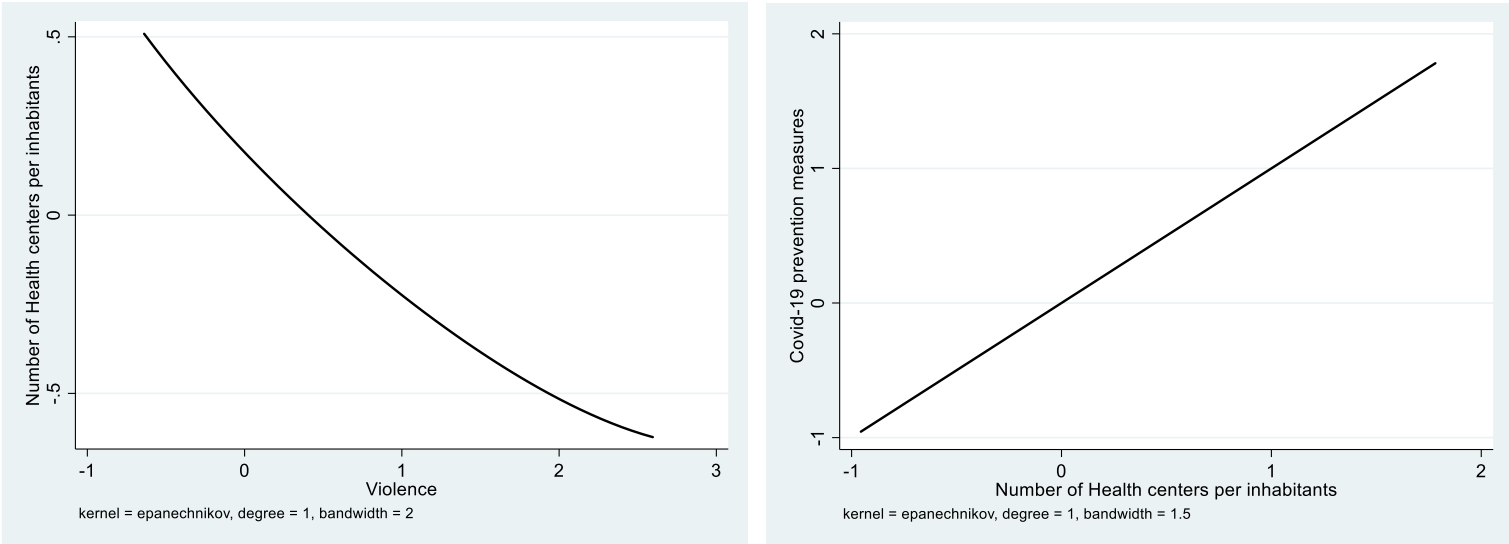
Violent conflicts may negatively affect health by impacting a country's health systems, which in turn could reduce access to and information about preventative services against infectious diseases such as Covid-19. In 2020, during the first pandemic year of the Covid-19 outbreak, around 100 local health centers in Burkina Faso were shut down due to violence in the country. This corresponds to almost 9 per cent of the health infrastructure in the six regions affected by insecurity (WHO, April 2020b). In September 2021, violent attacks had increased this number to more than 320 functioning local health facilities being forced to shut down or used as temporary shelter for internally displaced people. Implying that over 800,000 individuals had restricted access to health care by the end of 2021 (ERCC, 2021).

In an effort to capture the effect of less access to health centers as a potential underlying mechanism, we explore a variable providing information on the number of functional public and private health centers per inhabitant and region in 2020 (accessed through the Ministry of Health in Burkina Faso). This variable is merged with the occurrence of violent episodes and the adoption of preventive measures against Covid-19 per region during our three survey rounds in 2020. Figure 5 examines the nonparametric relationship between the number of public and private health centers per inhabitants, adoption of Covid-19 prevention measures and the occurrence of violent events, through estimating a kernel-weighted local polynomial regression using an Epanechnikov kernel. Figure 5 shows two separate effects: first a considerable drop in the health centers for higher levels of violence, and second a strong increase in the adoption of preventive measures against Covid-19 for higher numbers of health centers.

During the Covid-19 pandemic, non-state armed and violent groups are continuing with violent attacks. For instance in May 2020, with national lockdown and the news turned toward the Covid-19 pandemic, these violent groups expanded their territories in the northern parts of the country (Douce 2020). In year 2020, violent attacks claimed almost 2,300 lives in Burkina Faso (ACLED, 2020).

To summarize: we have found several direct and indirect channels through which violence increases the spread of COVID-19. The first is an indirect one, via a diminished adoption of preventative measures. Second, we observe the closure of many health centers in the violence prone areas. Without adequate support and health information, the spread of disinformation, conspiracy theories and propaganda about the virus through different settings both online and offline is unabated. This could in turn influence people's behaviors and attitudes towards implementing preventive measures against Covid-19, which could increase the infection rate.

*Figure 5*. Kernel-weighted local polynomial regressions of violence on the number of health centers per inhabitant (left side panel), and of the latter on the adoption to Covid-19 prevention measures (right side panel), using an Epanechnikov kernel, in 2020.




*Note*:.On the left-hand side figure on the y-axis, we measure the number of health centers per inhabitants on the regional level. And on the x-axis we have our measure of violence. On the right-hand side figure on the y-axis, we measure the adoption of all Covid-19 prevention measures on the regional level. And on the x-axis we have our measure of the number of health centers per inhabitants on the regional level. The number of health centers per inhabitants variable consist of all operational public and private health centers in 2020 which are summarized per region, divided by the population size per region, and standardized to mean zero and standard deviation one. The adoption of all Covid-19 prevention variable consist of all the survey questions on measures adopted to prevent infection by Covid-19 (i.e., 'Measures adopted to prevent infection by Covid-19', 'Knowledge of measures adopted by the authorities to prevent infection by Covid-19' and 'Applying the three most preventive measures to prevent infection by Covid-19') which are summarized into one variable averaged per region, and standardized to mean zero and standard deviation one. The violence variable is measured as the number of violent episodes per day during survey round 1 (between June 9 and July 7), round 3 (September 12 and October 21) and round 5 (December 9 and 30) in 2020, standardized to mean zero and standard deviation one. Each of the three survey questions about measures adopted to prevent infection by Covid-19 shows similar results separately and are available upon request.

This is especially relevant in a country such as Burkina Faso with low level of literacy and weak institutions that will not be able to filter propaganda against the benefits of implementing preventive measures against Covid-19. A third, more speculative mechanism, which we cannot test with the data is that state and non-state armed actors attack villages whereby infected soldiers/rebels spread the virus via direct contact with the civilian population.

## 7. Conclusions and policy implications

Violent conflicts are a fundamental concern for human development and public health in Africa's Sahel region, negatively impacting health through undermining these countries health system and individuals access to preventive services. The Covid-19 pandemic in the midst of violence has a major impact on the stability in the region. With the lowest vaccine uptake in the world (WHO, 2021), preventive measures against the spread of the Covid-19 is still the main tool for the national governments in the Sahel region to deal with the pandemic. This study, through its use of a unique nationally representative panel survey collected during the first six months of the pandemic from the conflict-ridden Sahelian country of Burkina Faso, offers several insights for future research on the dynamics of violent conflicts and its effect on the adoption of preventive measures to prevent infection by Covid-19.

First, we show that higher occurrence of violence are associated with lower adoption of preventive measures to prevent infection by Covid-19. Therefore, violence should be a key concern when analyzing adoption of individuals' behavior to prevent infection by Covid-19. Second, gender plays a role in the adoption of preventive measures against Covid-19: households headed by females are more willing to adopt preventive measures against the spread of Covid-19.

Third, we find that poverty could play an important role for understanding individuals' behavior in adopting measures to prevent infection by Covid-19. The adoption of preventive measures against the spread of Covid-19, in the midst of violent conflict, seems to be weaker in poor compared to non-poor households. This suggest that Covid-19 prevention programs and research within this context should integrate poverty status.

Consequently, given that the adoption of preventive measures against Covid-19 differs with the occurrence of violence, gender and poverty status, policies to tackle the Covid-19 pandemic in Sub-Saharan Africa and Sahel in particular should be based on an understanding on how violence influence individuals' behavior to protect themselves against Covid-19.

A key contribution of this study is to illustrate that the adoption of preventive measures against the spread of Covid-19 depends on the exposure to violence by households. One of the potential mechanisms that may drive the effect is the closure of health centers in violence-prone areas. Closed or destroyed centers, resulting in unavailable health services has detrimental effects on health, both direct as well as indirect. Direct in the sense that health professionals cannot treat disease, and indirect because the infrastructure to combat propaganda and misinformation on the so-called ineffectiveness of preventative measures is absent.

The growing violence and insecurity has implied that the demand for health services has continued to grow by people fleeing form conflict-affected areas. And Covid-19 is not the only ongoing epidemic in Burkina Faso, other epidemics are cholera and meningitis. According to estimates of the UN Office for the Coordination of Humanitarian Affairs (OCHA) over 2,8 million people where in need of humanitarian aid in 2020 in Burkina Faso, this number had increased to 3,5 million in 2021 (OCHA, 2021).

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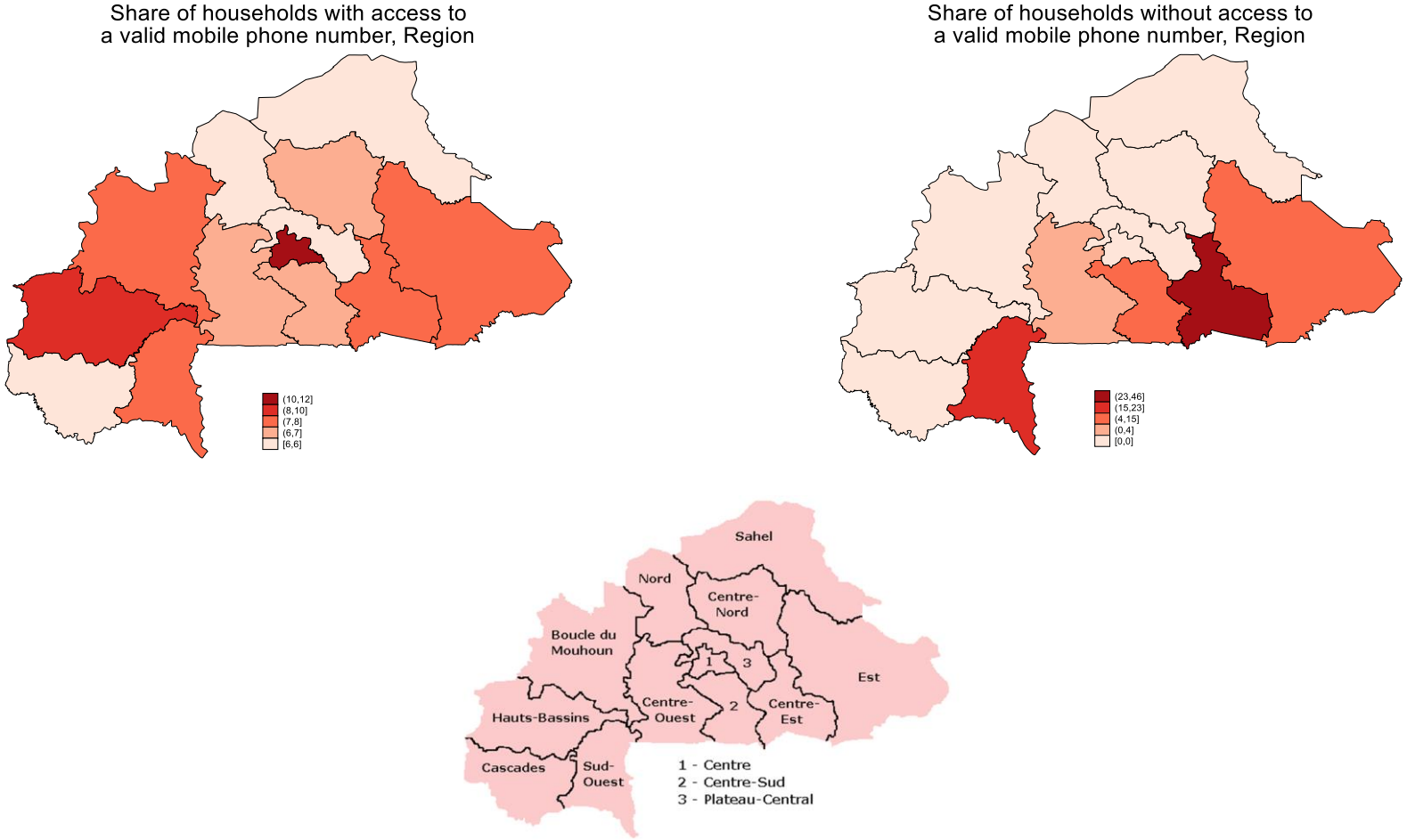
## Appendix

*Figure A1*. Share of households with or without a valid mobile phone number, per region in Burkina Faso.




*Note*: Shows the share of all households with- and without a valid mobile phone number, aggregated per region (13 regions). The darker shades indicate a higher share of households with or without a valid mobile phone number.

**Table A1**. *Descriptive statistics*.

| | R2018/2019A | R2018/2019B | R12020 | R32020 | R52020 | Diff.18/19AB | Diff.R1 | Diff.R5 |
|---|---|---|---|---|---|---|---|---|
| | Mean or % *sd* | Mean or % *sd* | Mean or % *sd* | Mean or % *sd* | Mean or % *sd* | R2018/19A-R2018/19B | R2018/19B-R1 | R2018/19B-R5 |
| Number of Observation | 7010 | 2062 | 1968 | 1943 | 1919 | | | |
| | | | **Explanatory variables** | | | | | |
| *Age* | | | | | | | | |
| 18-29 years | 11% | 10% | 7% | 6% | 6% | 0,01 | 0,03 | 0,04 |
| | 0,00 | 0,01 | 0,01 | 0,01 | 0,01 | | | |
| 30-39 years | 26% | 27% | 25% | 26% | 26% | -0,01 | 0,02 | 0,01 |
| | 0,01 | 0,01 | 0,01 | 0,01 | 0,01 | | | |
| 40-49 years | 25% | 25% | 26% | 26% | 26% | -0,01 | 0,00 | -0,01 |
| | 0,01 | 0,01 | 0,01 | 0,01 | 0,01 | | | |
| 50-59 years | 19% | 19% | 20% | 21% | 21% | 0,00 | -0,01 | -0,02 |
| | 0,00 | 0,01 | 0,01 | 0,01 | 0,01 | | | |
| 60+ years | 20% | 19% | 23% | 21% | 21% | 0,01 | -0,04 | -0,02 |
| | 0,00 | 0,01 | 0,01 | 0,01 | 0,01 | | | |
| Average age | 46,68 | 46,35 | 47,77 | 47,90 | 47,86 | 0,33 | -1,42 | -1,51 |
| | 0,17 | 0,31 | 0,32 | 0,31 | 0,32 | | | |
| *Sex* | | | | | | | | |
| Male | 85% | 84% | 84% | 85% | 84% | 0,01 | 0,00 | 0,00 |
| | 0,00 | 0,01 | 0,01 | 0,01 | 0,01 | | | |
| Female | 15% | 16% | 16% | 15% | 16% | -0,01 | 0,00 | 0,00 |
| | 0,00 | 0,01 | 0,01 | 0,01 | 0,01 | | | |
| | | | **Socio-Eco. Status** | | | | | |
| *Employment status 7 past days* | | | | | | | | |
| Not employed | 12% | 12% | 21% | 12% | 11% | 0,00 | -0,09 | 0,01 |
| | 0,00 | 0,01 | 0,01 | 0,01 | 0,01 | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Employed | 88% | 88% | 79% | 88% | 89% | 0,00 | 0,09 | -0,01 |
| | 0,00 | 0,01 | 0,01 | 0,01 | 0,01 | | | |
| *Employment sector* | | | | | | | | |
| Agriculture | 54,21 | 35,58 | 38 | 44% | 3% | 19 | -3 | 35,55 |
| | 0,01 | 0,01 | 0,01 | 0,01 | 0,00 | | | |
| Mining | 2,25 | 2,00 | 1 | 1% | 0% | 0 | 1 | 2,00 |
| | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | | | |
| Manufacturing | 5,04 | 7,15 | 1 | 1% | 0% | -2 | 6 | 7,15 |
| | 0,00 | 0,01 | 0,00 | 0,00 | 0,00 | | | |
| Tech00, and Science | 2,72 | 4,75 | 1 | 0% | NA | -2 | 4 | |
| | 0,00 | 0,00 | 0,00 | 0,00 | NA | | | |
| Electricity/Water/Gaz/Waste | NA | NA | 1 | 1% | NA | | | |
| | NA | NA | 0,00 | 0,00 | NA | | | |
| Construction | NA | NA | 5 | 3% | 0% | | | |
| | NA | NA | 0,00 | 0,00 | 0,00 | | | |
| Transport (&Construction R2018/19 | 1,73 | 2,65 | 2 | 2% | NA | -1 | 1 | |
| | 0,00 | 0,00 | 0,00 | 0,00 | NA | | | |
| Commerce | 10,19 | 13,49 | 22 | 17% | 1% | -3 | -9 | 13,48 |
| | 0,00 | 0,01 | 0,01 | 0,01 | 0,00 | | | |
| Banking/Insurance | NA | NA | 1 | 1% | NA | | | |
| | NA | NA | 0,00 | 0,00 | NA | | | |
| Personal service | 5,38 | 7,80 | 11 | 8% | 0% | -2 | -4 | 7,79 |
| | 0,00 | 0,01 | 0,01 | 0,01 | 0,00 | | | |
| Education (&Health R2018/19) | 4,52 | 6,90 | 4 | 4% | 0% | -2 | 3 | 6,90 |
| | 0,00 | 0,01 | 0,00 | 0,00 | 0,00 | | | |
| Health | NA | NA | 1 | 1% | 0% | | | |
| | NA | NA | 0,00 | 0,00 | 0,00 | | | |
| Public administration | NA | NA | 5 | 7% | 1% | | | |
| | NA | NA | 0,00 | 0,01 | 0,00 | | | |
| Tourism | 1,33 | 1,85 | 0 | NA | 0% | -1 | 2 | 1,85 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 0,00 | 0,00 | 0,00 | NA | 0,00 | | | |
| Other | 4,79 | 8,45 | 6 | 2% | 1% | -4 | 3 | 8,44 |
| | 0,01 | 0,01 | 0,00 | 0,00 | 0,00 | | | |
| *Monetary poor* | | | | | | | | |
| Yes | 30% | 20% | 31% | 31% | 32% | 0,09 | -0,11 | -0,11 |
| | 0,01 | 0,01 | 0,01 | 0,01 | 0,01 | | | |
| No | 70% | 80% | 69% | 69% | 68% | -0,09 | 0,11 | 0,11 |
| | 0,01 | 0,01 | 0,01 | 0,01 | 0,01 | | | |
| *Residential zone* | | | | | | | | |
| Urban | 45% | 72% | 72% | 66% | 66% | -0,27 | 0,00 | 0,07 |
| | 0,01 | 0,01 | 0,01 | 0,01 | 0,01 | | | |
| Rural | 55% | 28% | 28% | 34% | 34% | 0,27 | 0,00 | -0,07 |
| | 0,01 | 0,01 | 0,01 | 0,01 | 0,01 | | | |
| *Education level* | | | | | | | | |
| Low education | 69% | 56% | 56% | | | 0,13 | - | |
| | 0,01 | 0,01 | 0,01 | | | | | |
| Primary education | 14% | 17% | 17% | | | -0,03 | - | |
| | 0,00 | 0,01 | 0,01 | | | | | |
| Secondary education | 13% | 20% | 20% | | | -0,07 | - | |
| | 0,00 | 0,01 | 0,01 | | | | | |
| University | 4% | 7% | 7% | | | -0,03 | - | |
| | 0,00 | 0,01 | 0,01 | | | | | |
| *Household consumption 2018/2019* | | | | | | | | |
| Food consumption* | 942295 | 1115486 | | | | -173190,80 | | |
| | 9374 | 20981 | | | | | | |
| Non-food consumption | 1104332 | 1463884 | | | | -359552,00 | | |
| | 12331 | 29765 | | | | | | |
| Household size | 6,5 | 6,2 | | | | 0,32 | | |
| | 0,05 | 0,08 | | | | | | |
| | | **Family structure** | | | | | | |

| | | | |
|---|---|---|---|
| *Religion* | | | |
| Catholic/Protestant | 30% | 33% | -0,04 |
| | 0,01 | 0,01 | |
| Muslim | 61% | 62% | -0,01 |
| | 0,01 | 0,01 | |
| Anemism | 9% | 4% | 0,04 |
| | 0,00 | 0,00 | |
| No religion | 0% | 0% | 0,00 |
| | 0,00 | 0,00 | |
| Other religion | 0% | 0% | 0,00 |
| | 0,00 | 0,00 | |
| *Marital status* | | | |
| Single | 4% | 6% | -0,02 |
| | 0,00 | 0,01 | |
| Married | 85% | 83% | 0,02 |
| | 0,00 | 0,01 | |
| Divorced | 2% | 2% | 0,00 |
| | 0,00 | 0,00 | |
| Widowed | 9% | 9% | 0,00 |
| | 0,00 | 0,01 | |
| | | Health | |
| *Disability* | | | |
| Yes | 6% | 5% | 0,01 |
| | 0,00 | 0,00 | |
| No | 94% | 95% | -0,01 |
| | 0,00 | 0,00 | |

Note: The Table shows mean, standard deviation and number of observations for individual's characteristics in the baseline survey, and in survey rounds 1 (R1), 3 (R3) and 5 (R5) in 2020. R2018/2019A is the baseline survey round in 2018/2019. R2018/2020B is the sample drawn from the baseline survey for the Covid-19 questionnaire in 2020. The differences columns indicate the difference between R2018/2019A and R2018/2019B (Diff.18/19AB ), R2018/2019B and R1 (Diff.R1) and R2018/2019B and R5 (Diff.R5) for the individual characteristics.

**Table A2.** *Knowledge about Covid-19: national level*.

| | Round1 | Round2 | Round3 |
|---|---|---|---|
| | Mean or % | Mean or % | Mean or % |
| Knowledge about Covid-19 | 99% | 99% | 100% |
| | **Outcome variables: national** | | |
| *Measures adopted to prevent infection by Covid-19* | | | |
| 1 "Wash hands/Use of disinfectant" | 98% | 98% | 90% |
| 2 "No handshakes/physical greetings" | 96% | 92% | 86% |
| 3 "Use of mask/gloves" | 98% | 97% | 90% |
| 4 "Avoid travel" | 91% | 77% | 74% |
| 5 "Stay at home and only go out if necessary" | 90% | 76% | 70% |
| 6 "Aovid croweded places" | 95% | 87% | 82% |
| 7 "Keep physical distance of 1 meter" | 95% | 87% | 81% |
| 8 "Avoid touching on your face" | 88% | 75% | 70% |
| *Knowledge of measures adopted by the authorities to prevent infection by Covid-19* | | | |
| 1 "Encourage people to stay at home" | 24% | 22% | 26% |
| 2 "Restrict national travels" | 29% | 30% | 25% |
| 3 "Restrict international travels" | 16% | 29% | 30% |
| 4 "Closing schools and universities" | 44% | 52% | 66% |
| 5 "Curfew/Confinement" | 53% | 53% | 54% |
| 6 "Closing non-essential activites" | 14% | 19% | 27% |
| 7 "Closing markets, yaars, resturants, bars " | 64% | 61% | 68% |
| 8 "Closing places of worship" | 58% | 59% | 62% |
| 9 "Put in quarantine affected cites" | 21% | 26% | 27% |
| 10 "Closing airports/transport companies" | 23% | 32% | 35% |
| 11 "Prohibition of gathering of 50 people or more" | 53% | 64% | 55% |
| 12 "Other measures" | 9% | 9% | 10% |
| *Applying the most preventive measures to prevent infection by Covid-19* | | | |
| Wash hands more often than usual compared to March 9 | 98% | 80% | 82% |
| Less handshakes/physical greetings compared to March 9 | 95% | 59% | 59% |
| Avoid gatherings of 10 people or more compared to March 9 | 92% | 53% | 47% |
| | **Knowledge about Covid-19** | | |
| *Regions* | | | |
| 1 "HAUTS BASSINS" | 100% | 100% | 100% |
| 2 "BOUCLE DU MOUHOUN" | 100% | 100% | 100% |
| 3 "SAHEL" | 100% | 100% | 100% |
| 4 "EST" | 99% | 100% | 100% |
| 5 "SUD OUEST" | 100% | 100% | 100% |
| 6 "CENTRE NORD" | 100% | 100% | 100% |
| 7 "CENTRE OUEST" | 100% | 100% | 100% |

| | | | |
|---|---|---|---|
| 8 "PLATEAU CENTRAL" | 100% | 100% | 100% |
| 9 "NORD" | 100% | 100% | 100% |
| 10 "CENTRE EST" | 100% | 99% | 100% |
| 11 "CENTRE" | 100% | 100% | 100% |
| 12 "CASCADES" | 100% | 100% | 100% |
| 13 "CENTRE SUD" | 100% | 100% | 100% |

*Note*: The Table shows the distribution of responses across survey rounds on the national level for the three main outcome variables and their subcategories. For the variable "Knowledge about Covid-19" the distribution of responses is also shown per region.

**Table A3**. *Knowledge about Covid-19: regional level*.

| Panel A. | Round1 | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Mean or % | | | | | | | |
| | 1 "HAUTS BASSINS" | 2 "BOUCLE DU MOUHOUN" | 3 "SAHEL" | 4 "EST" | 5 "SUD OUEST" | 6 "CENTRE NORD" | 7 "CENTRE OUEST" | 8 "PLATEAU CENTRAL" |
| *Measures adopted to prevent infection by Covid-19* | | | | | | | | |
| 1 "Wash hands/Use of disinfectant" | 96% | 95% | 100% | 99% | 96% | 100% | 99% | 98% |
| 2 "No handshakes/physical greetings" | 96% | 94% | 99% | 98% | 96% | 99% | 99% | 93% |
| 3 "Use of mask/gloves" | 97% | 93% | 100% | 99% | 95% | 100% | 99% | 97% |
| 4 "Avoid travel" | 93% | 87% | 99% | 93% | 88% | 98% | 97% | 91% |
| 5 "Stay at home and only go out if necessary" | 89% | 87% | 99% | 93% | 89% | 97% | 97% | 86% |
| 6 "Aovid croweded places" | 95% | 93% | 98% | 98% | 93% | 98% | 99% | 94% |
| 7 "Keep physical distance of 1 meter" | 90% | 95% | 100% | 97% | 93% | 99% | 97% | 93% |
| 8 "Avoid touching on your face" | 85% | 68% | 99% | 97% | 88% | 96% | 97% | 81% |
| *Knowledge of measures adopted by the authorities to prevent infection by Covid-19* | | | | | | | | |
| 1 "Encourage people to stay at home" | 8% | 2% | 27% | 46% | 9% | 22% | 31% | 44% |
| 2 "Restrict national travels" | 33% | 43% | 43% | 36% | 22% | 28% | 28% | 24% |
| 3 "Restrict international travels" | 14% | 19% | 25% | 19% | 4% | 11% | 24% | 11% |
| 4 "Closing schools and universities" | 40% | 30% | 56% | 29% | 34% | 58% | 71% | 31% |
| 5 "Curfew/Confinement" | 50% | 52% | 60% | 37% | 38% | 50% | 73% | 72% |
| 6 "Closing non-essential activites" | 5% | 9% | 3% | 24% | 13% | 2% | 32% | 5% |
| 7 "Closing markets, yaars, resturants, bars " | 63% | 27% | 71% | 53% | 68% | 71% | 85% | 74% |
| 8 "Closing places of worship" | 61% | 56% | 46% | 44% | 39% | 71% | 82% | 66% |
| 9 "Put in quarantine affected cites" | 7% | 12% | 39% | 21% | 13% | 30% | 35% | 7% |
| 10 "Closing airports/transport companies" | 16% | 17% | 33% | 10% | 22% | 26% | 45% | 5% |
| 11 "Prohibition of gathering of 50 people or more" | 61% | 41% | 62% | 42% | 65% | 50% | 48% | 52% |
| 12 "Other measures" | 12% | 26% | 13% | 17% | 12% | 1% | 5% | 11% |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| *Applying the most preventive measures to prevent infection by Covid-19* | | | | | | | | |
| Wash hands more often than usual compared to March 9 | 97% | 98% | 99% | 99% | 98% | 100% | 100% | 99% |
| Less handshakes/physical greetings compared to March 9 | 94% | 92% | 100% | 97% | 97% | 98% | 97% | 98% |
| Avoid gatherings of 10 people or more compared to March 9 | 90% | 89% | 100% | 98% | 89% | 95% | 97% | 97% |

| Panel B. | Round3 | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Mean or % | | | | | | | |
| | 1 "HAUTS BASSINS" | 2 "BOUCLE DU MOUHOUN" | 3 "SAHEL" | 4 "EST" | 5 "SUD OUEST" | 6 "CENTRE NORD" | 7 "CENTRE OUEST" | 8 "PLATEAU CENTRAL" |
| *Measures adopted to prevent infection by Covid-19* | | | | | | | | |
| 1 "Wash hands/Use of disinfectant" | 92% | 94% | 100% | 100% | 100% | 100% | 98% | 96% |
| 2 "No handshakes/physical greetings" | 79% | 73% | 100% | 98% | 100% | 96% | 93% | 85% |
| 3 "Use of mask/gloves" | 89% | 96% | 100% | 100% | 97% | 100% | 96% | 93% |
| 4 "Avoid travel" | 45% | 36% | 98% | 88% | 76% | 96% | 78% | 43% |
| 5 "Stay at home and only go out if necessary" | 43% | 37% | 98% | 88% | 81% | 94% | 81% | 38% |
| 6 "Aovid croweded places" | 70% | 53% | 99% | 98% | 96% | 96% | 83% | 58% |
| 7 "Keep physical distance of 1 meter" | 52% | 57% | 100% | 98% | 95% | 96% | 87% | 71% |
| 8 "Avoid touching on your face" | 35% | 39% | 99% | 97% | 78% | 96% | 79% | 30% |
| *Knowledge of measures adopted by the authorities to prevent infection by Covid-19* | | | | | | | | |
| 1 "Encourage people to stay at home" | 7% | 2% | 3% | 34% | 15% | 17% | 27% | 36% |
| 2 "Restrict national travels" | 28% | 26% | 16% | 31% | 26% | 17% | 25% | 22% |
| 3 "Restrict international travels" | 28% | 6% | 27% | 30% | 11% | 8% | 27% | 25% |
| 4 "Closing schools and universities" | 52% | 27% | 68% | 48% | 59% | 54% | 70% | 24% |
| 5 "Curfew/Confinement" | 60% | 69% | 74% | 51% | 52% | 38% | 86% | 53% |
| 6 "Closing non-essential activites" | 12% | 4% | 8% | 13% | 9% | 4% | 32% | 18% |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 7 "Closing markets, yaars, resturants, bars " | 54% | 29% | 95% | 52% | 84% | 60% | 78% | 56% |
| 8 "Closing places of worship" | 51% | 40% | 93% | 52% | 60% | 64% | 89% | 65% |
| 9 "Put in quarantine affected cites" | 13% | 7% | 64% | 27% | 28% | 26% | 34% | 7% |
| 10 "Closing airports/transport companies" | 38% | 21% | 53% | 25% | 27% | 31% | 37% | 9% |
| 11 "Prohibition of gathering of 50 people or more" | 71% | 60% | 79% | 58% | 68% | 54% | 37% | 57% |
| 12 "Other measures" | 15% | 24% | 2% | 23% | 8% | 1% | 0% | 0% |
| *Applying the most preventive measures to prevent infection by Covid-19* | | | | | | | | |
| Wash hands more often than usual compared to March 9 | 67% | 72% | 96% | 81% | 75% | 84% | 82% | 82% |
| Less handshakes/physical greetings compared to March 9 | 49% | 30% | 69% | 59% | 29% | 62% | 65% | 76% |
| Avoid gatherings of 10 people or more compared to March 9 | 42% | 28% | 84% | 62% | 16% | 56% | 63% | 76% |

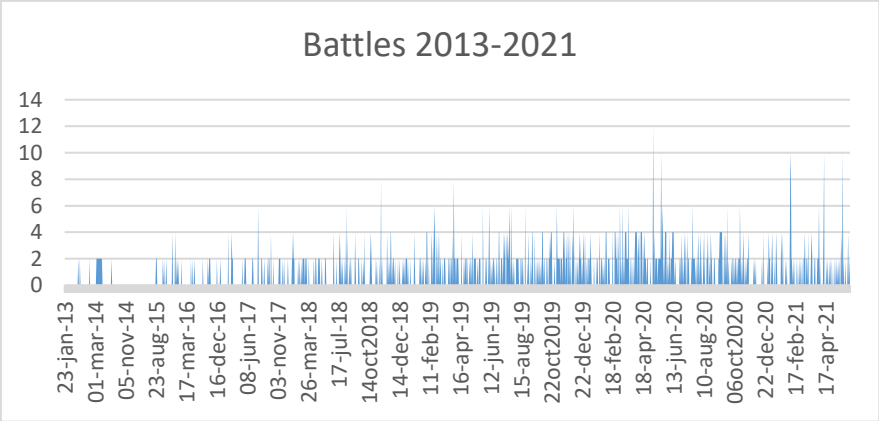
| Panel C. | Round5 | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Mean or % | | | | | | | |
| | 1 "HAUTS BASSINS" | 2 "BOUCLE DU MOUHOUN" | 3 "SAHEL" | 4 "EST" | 5 "SUD OUEST" | 6 "CENTRE NORD" | 7 "CENTRE OUEST" | 8 "PLATEAU CENTRAL" |
| *Measures adopted to prevent infection by Covid-19* | | | | | | | | |
| 1 "Wash hands/Use of disinfectant" | 98% | 99% | 100% | 74% | 100% | 74% | 97% | 92% |
| 2 "No handshakes/physical greetings" | 77% | 99% | 100% | 74% | 100% | 74% | 96% | 88% |
| 3 "Use of mask/gloves" | 98% | 99% | 100% | 73% | 100% | 74% | 98% | 91% |
| 4 "Avoid travel" | 68% | 62% | 100% | 66% | 82% | 72% | 81% | 38% |
| 5 "Stay at home and only go out if necessary" | 59% | 49% | 100% | 67% | 74% | 72% | 80% | 38% |
| 6 "Aovid croweded places" | 81% | 91% | 100% | 74% | 99% | 74% | 82% | 49% |
| 7 "Keep physical distance of 1 meter" | 79% | 80% | 100% | 74% | 88% | 74% | 85% | 53% |
| 8 "Avoid touching on your face" | 48% | 40% | 100% | 78% | 75% | 70% | 77% | 36% |

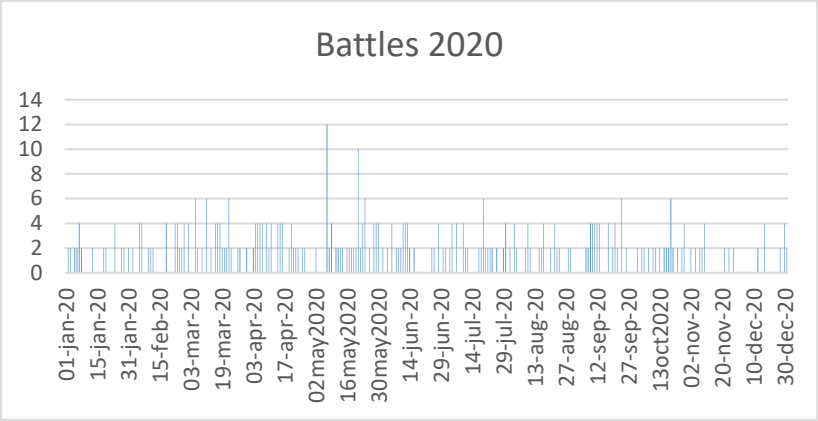
| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| *Knowledge of measures adopted by the authorities to prevent infection by Covid-19* | | | | | | | | |
| 1 "Encourage people to stay at home" | 3% | 3% | 28% | 46% | 11% | 16% | 34% | 31% |
| 2 "Restrict national travels" | 27% | 14% | 39% | 34% | 8% | 9% | 24% | 21% |
| 3 "Restrict international travels" | 23% | 9% | 39% | 49% | 9% | 11% | 21% | 28% |
| 4 "Closing schools and universities" | 75% | 59% | 89% | 43% | 80% | 72% | 77% | 49% |
| 5 "Curfew/Confinement" | 61% | 68% | 94% | 44% | 49% | 54% | 80% | 45% |
| 6 "Closing non-essential activites" | 13% | 3% | 36% | 26% | 8% | 23% | 42% | 31% |
| 7 "Closing markets, yaars, resturants, bars " | 58% | 25% | 98% | 51% | 92% | 68% | 90% | 63% |
| 8 "Closing places of worship" | 58% | 30% | 97% | 44% | 62% | 64% | 94% | 65% |
| 9 "Put in quarantine affected cites" | 12% | 15% | 65% | 28% | 21% | 31% | 33% | 12% |
| 10 "Closing airports/transport companies" | 39% | 22% | 63% | 23% | 32% | 33% | 31% | 23% |
| 11 "Prohibition of gathering of 50 people or more" | 72% | 46% | 83% | 64% | 52% | 62% | 23% | 42% |
| 12 "Other measures" | 15% | 23% | 19% | 22% | 3% | 0% | 0% | 4% |
| *Applying the most preventive measures to prevent infection by Covid-19* | | | | | | | | |
| Wash hands more often than usual compared to March 9 | 81% | 70% | 98% | 85% | 66% | 93% | 80% | 93% |
| Less handshakes/physical greetings compared to March 9 | 39% | 33% | 91% | 58% | 40% | 64% | 67% | 77% |
| Avoid gatherings of 10 people or more compared to March 9 | 33% | 28% | 89% | 51% | 14% | 51% | 60% | 69% |

*Note*: The Table shows the distribution of responses per survey rounds and region for the three main outcome variables and their sub-categories.

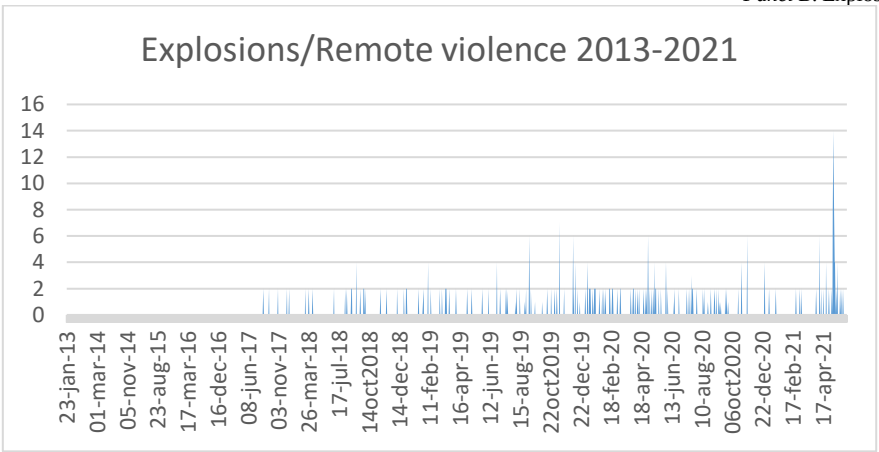
*Figure A2*. Distribution of violent episodes over time and types of violence: The results for 2013-2021 and 2020.

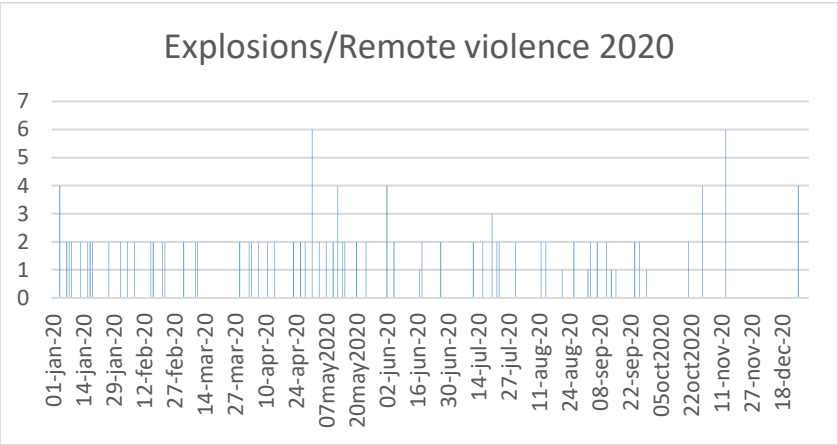
*Panel A*. Battles.



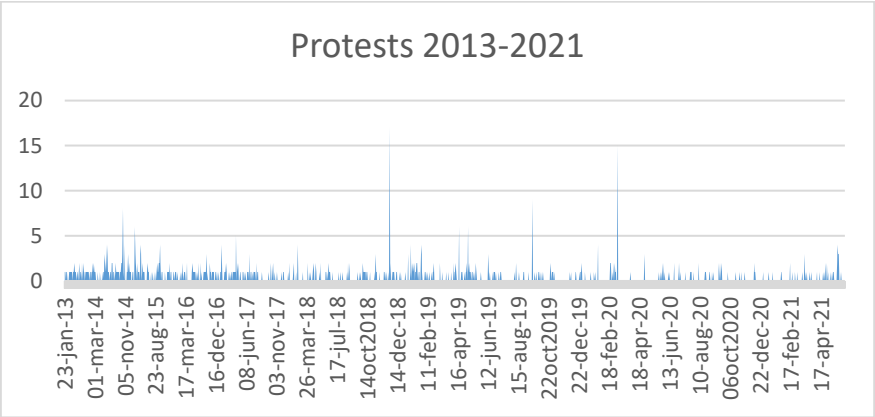



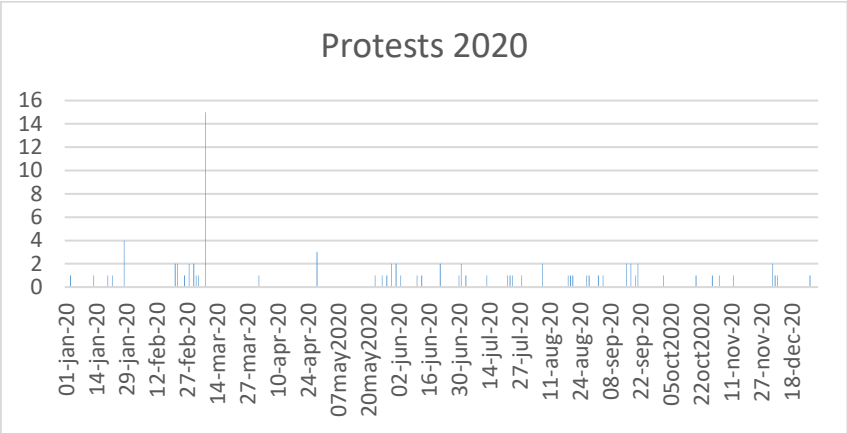

*Panel B*. Explosions/Remote violence.



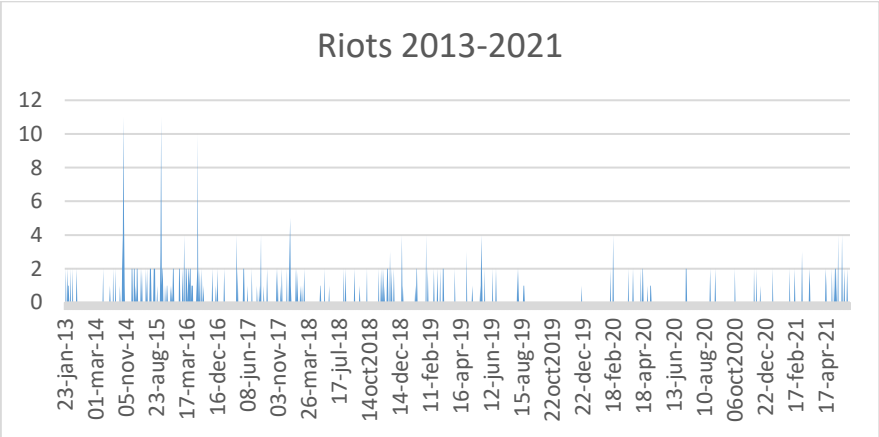



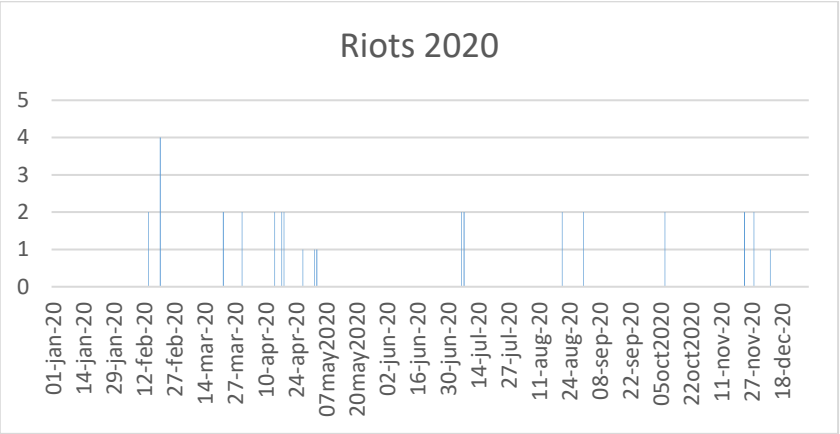
*Panel C*. Protests.



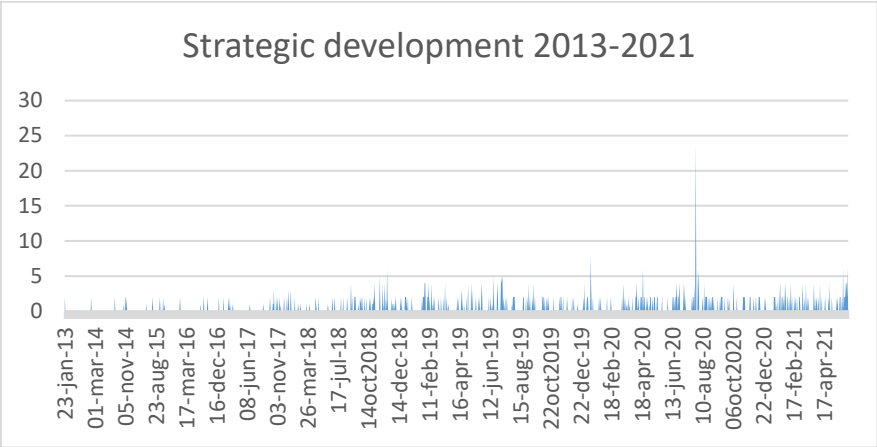



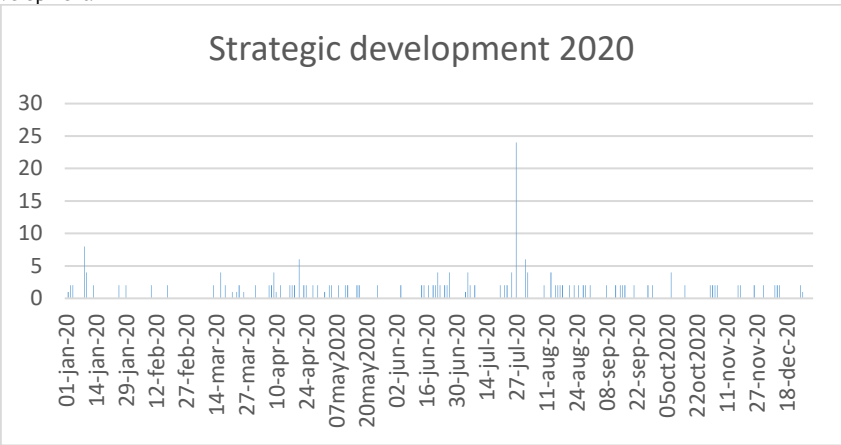

*Panel D*. Riots.



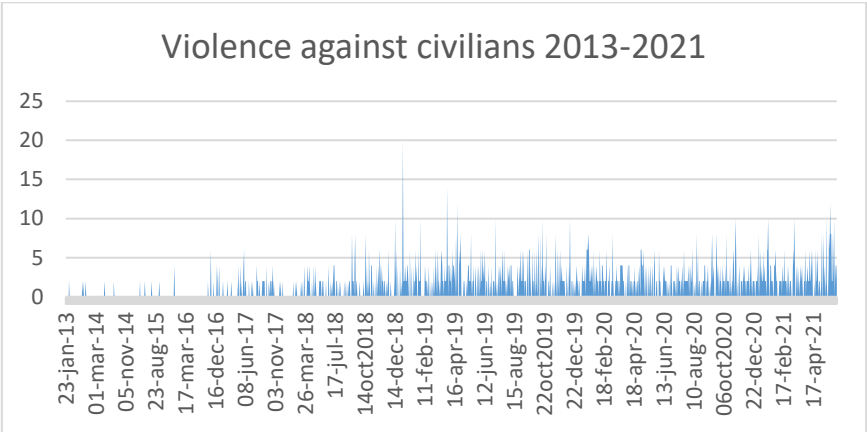



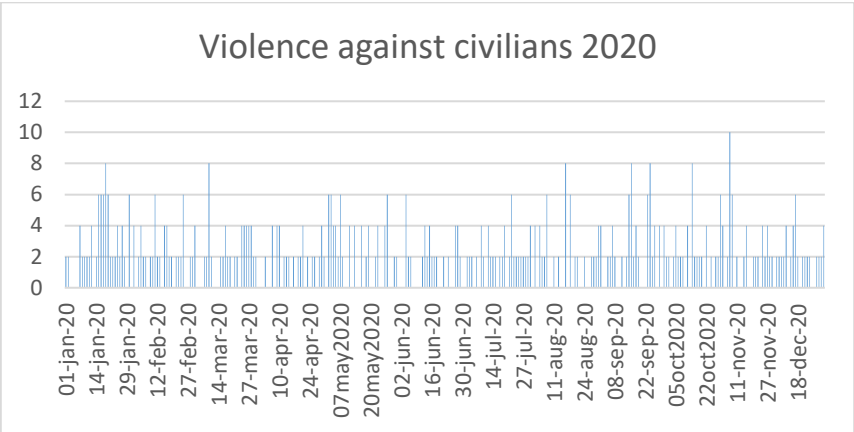
*Panel E*. Strategic development.



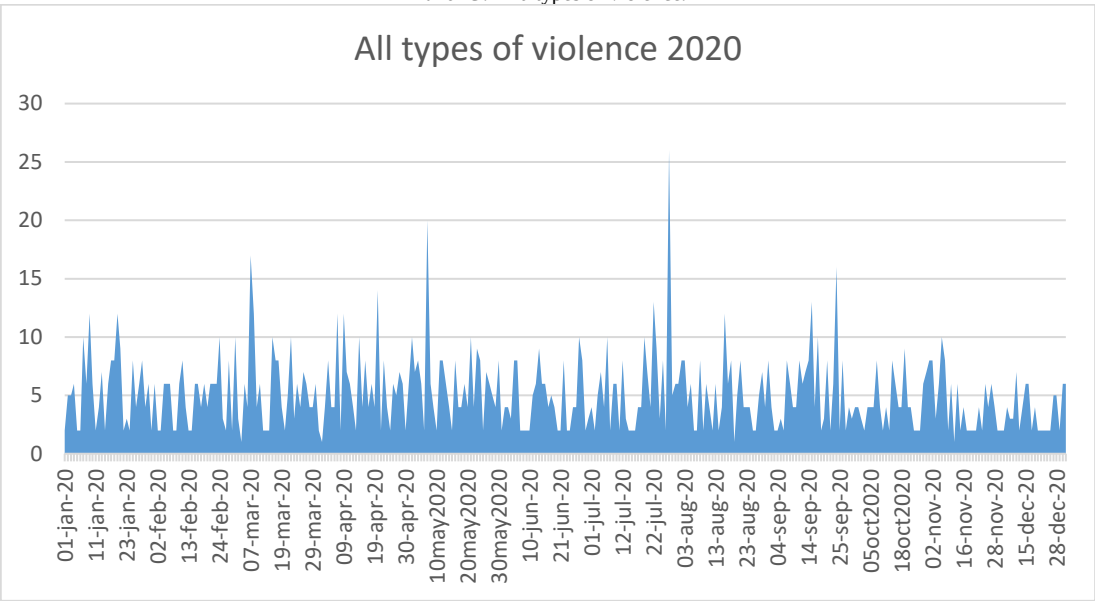




*Panel F*. Violence against civilians.



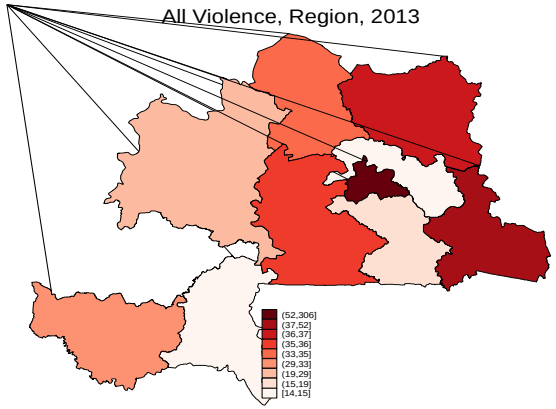
*Panel G*. Alla types of violence.

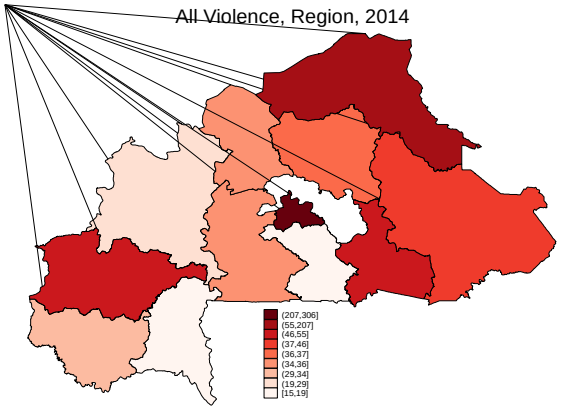


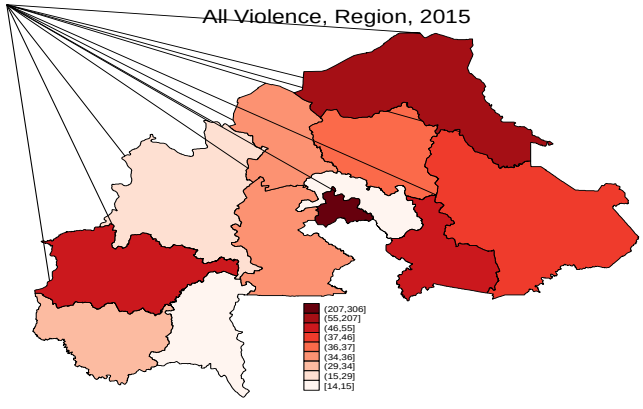

*Note*: Shows the distribution of number of daily violent episodes over time and violent types in 2020, including the survey rounds in 2020: round 1 (between June 9 and July 7), round 3 (between September 12 and October 21) and round 5 (between December 9 and 30). The distribution is also shown for the period 2013-2021, in order to illustrate trends in violence prior to the period of study.

*Figure A3.* Distribution of violence per region between 2013 and 2021 in Burkina Faso.

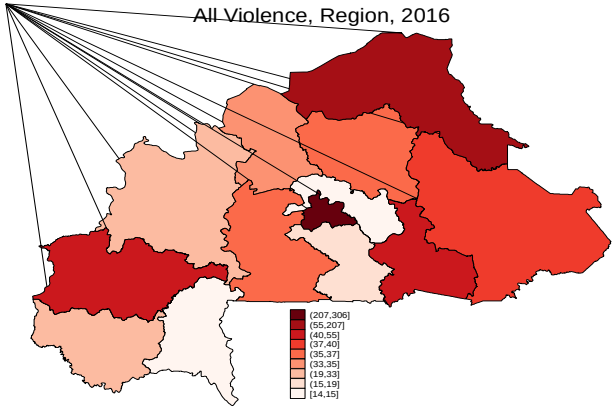
*Panel A.* Violence 2013-2015.

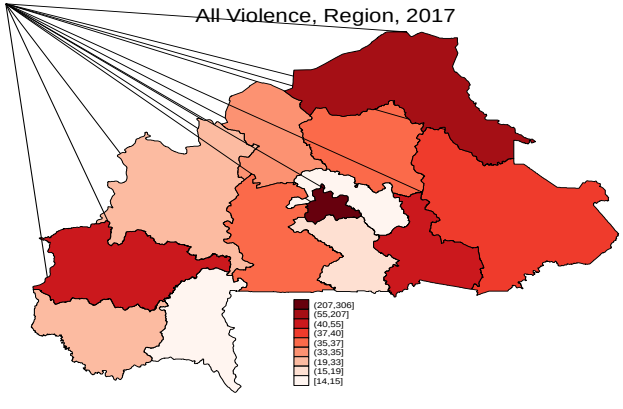


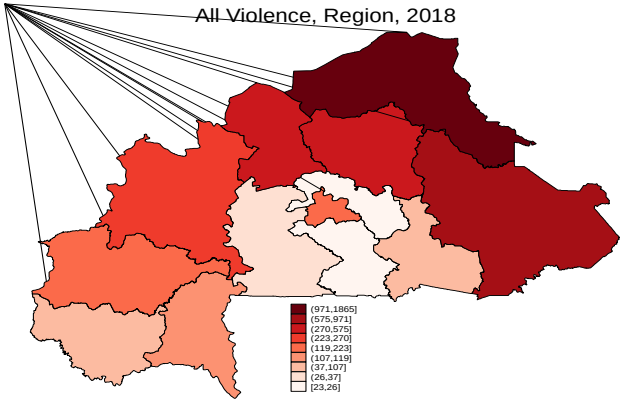



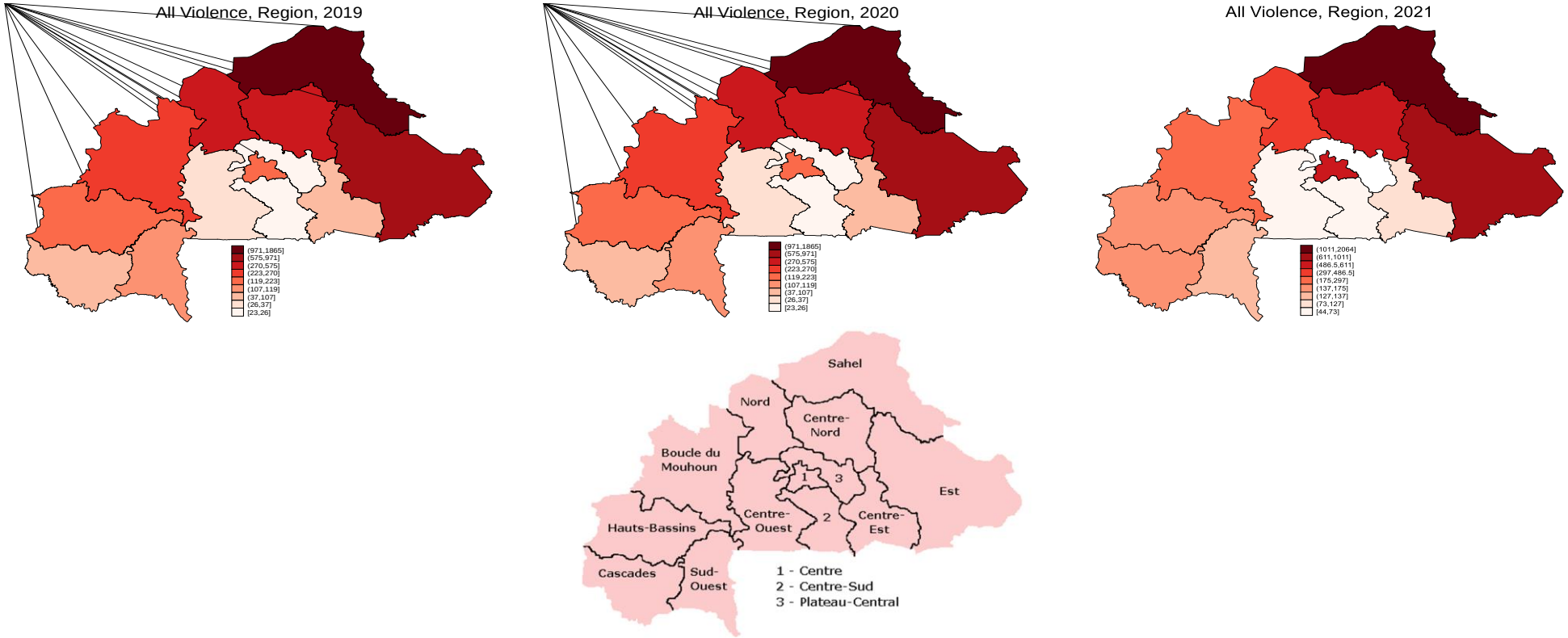

*Panel B.* Violence 2016-2018.



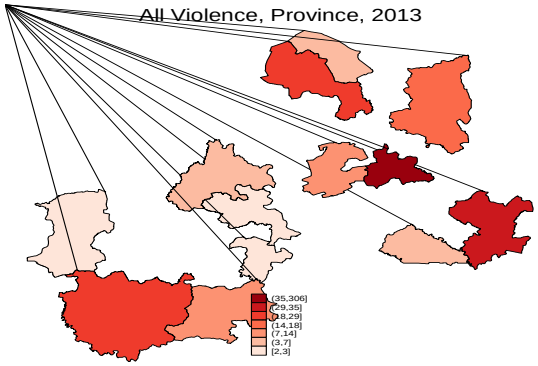
*Panel C*. Violence 2019-2021.

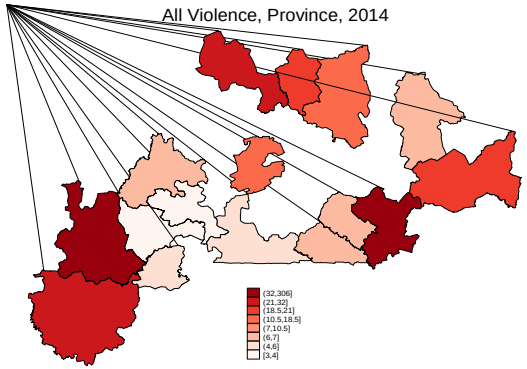


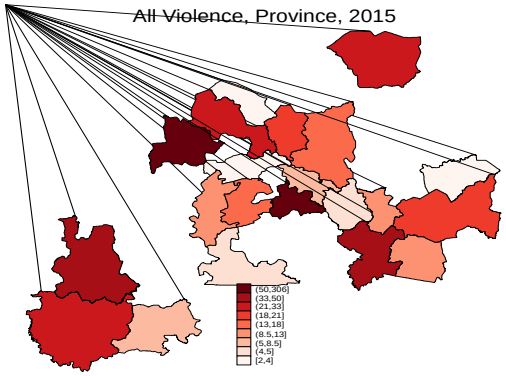

*Note*: Shows the distribution of all violent episodes per day, aggregated per region (13 regions) and year between 2013 and 2021. The darker shades indicate more occurrence of violence. Those regions that are blank lack information about violent episodes.

*Figure A4.* Distribution of violence per province between 2013 and 2021 in Burkina Faso.

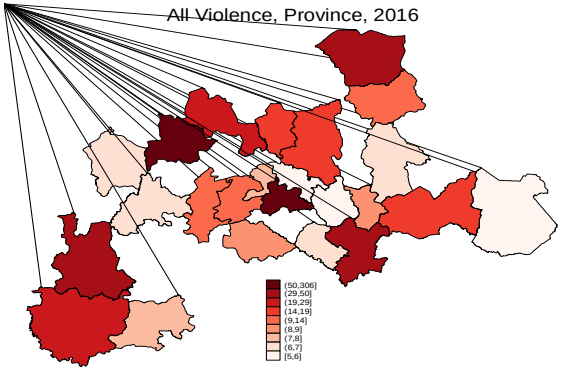
*Panel A.* Violence 2013-2015.

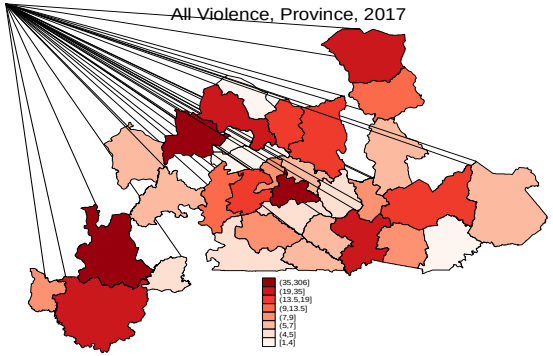


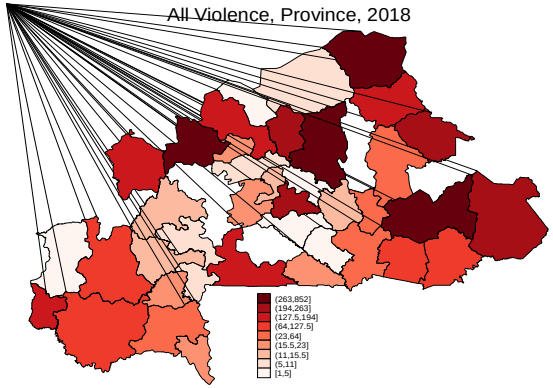



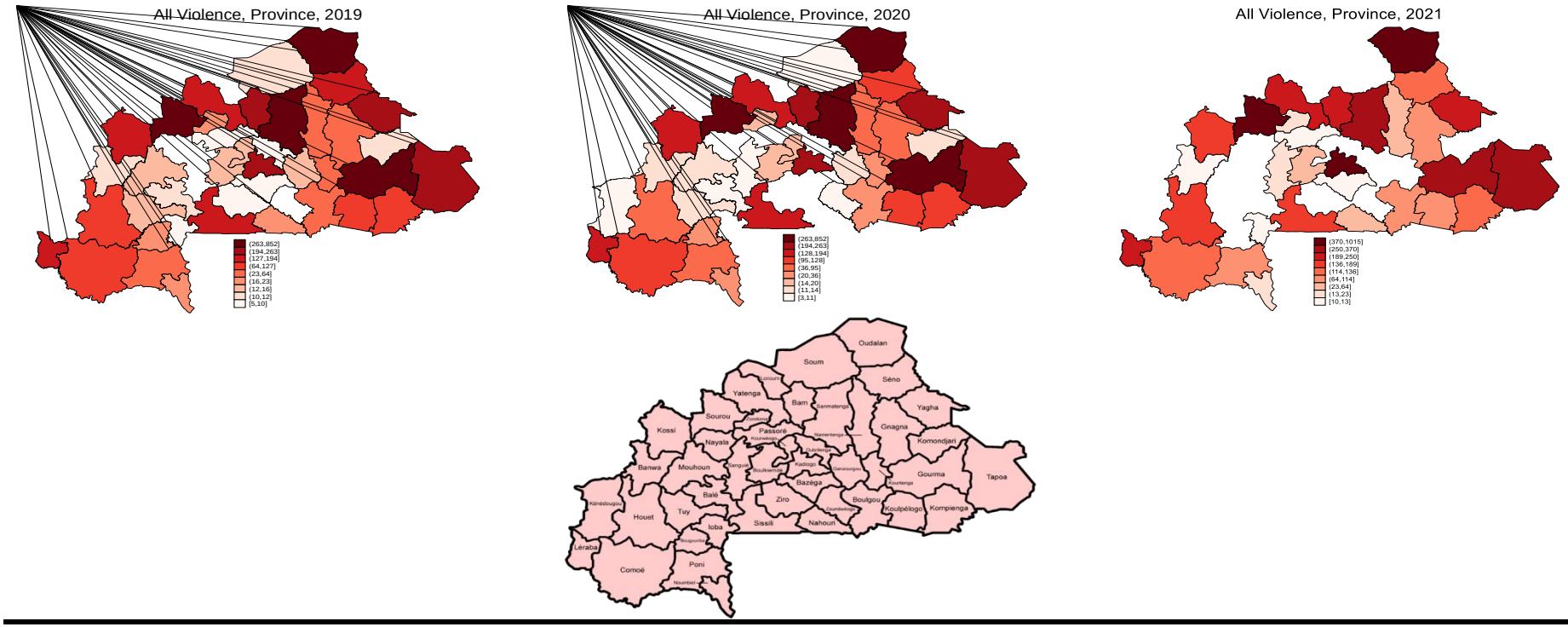

*Panel B.* Violence 2016-2018.



*Panel C***.** Violence 2019-2021.




*Note*: Shows the distribution of all violent episodes per day, aggregated per province (45 provinces) and year between 2013 and 2021. The darker shades indicate more occurrence of violence. Those provinces that are blank lack information about violent episodes.

**Table A4**. *Adoption to Covid-19 prevention measures and Violence: The results for the four previous months from round 1*.

| Panel A. Dependent variable: | *Measures adopted to prevent infection by Covid-19* | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | M1 | M2 | M3 | M4 | M5 | M6 | M7 | M8 |
| Violence | -0.38*** | -0.34*** | -0.08*** | -0.08*** | -0.15*** | -0.11*** | -0.28*** | -0.20*** |
| | (0.04) | (0.03) | (0.01) | (0.01) | (0.03) | (0.03) | (0.08) | (0.07) |
| Female (=1) | | | | -0.01 | | | | 0.13** |
| | | | | (0.01) | | | | (0.05) |
| Additional controls: | No | Yes | Yes | Yes | No | Yes | Yes | Yes |
| Regional FE | No | No | Yes | Yes | No | No | Yes | Yes |
| Constant | 1.33*** | -6.21*** | 0.74*** | 0.74*** | -1.11*** | -8.53*** | -8.16*** | -5.07*** |
| | (0.08) | (0.71) | (0.13) | (0.13) | (0.06) | (0.59) | (0.56) | (0.50) |
| Observations | 1,750 | 1,750 | 1,750 | 1,750 | 1,750 | 1,750 | 1,750 | 1,750 |
| R-squared | 0.091 | 0.246 | 0.979 | 0.979 | 0.020 | 0.241 | 0.512 | 0.514 |
| Panel B. Dependent variable: | *Knowledge of measures adopted by the authorities to prevent infection by Covid-19* | | | | | | | |
| Violence | -0.38*** | -0.35*** | -0.08*** | -0.08*** | -0.15*** | -0.11*** | -0.28*** | -0.19*** |
| | (0.04) | (0.03) | (0.01) | (0.01) | (0.03) | (0.03) | (0.08) | (0.07) |
| Female (=1) | | | | -0.01 | | | | 0.13** |
| | | | | (0.01) | | | | (0.05) |
| Additional controls: | No | Yes | Yes | Yes | No | Yes | Yes | Yes |
| Regional FE | No | No | Yes | Yes | No | No | Yes | Yes |
| Constant | 1.33*** | -6.19*** | 0.73*** | 0.72*** | -1.11*** | -8.53*** | -8.18*** | -5.09*** |
| | (0.08) | (0.71) | (0.13) | (0.13) | (0.06) | (0.59) | (0.56) | (0.50) |
| Observations | 1,750 | 1,750 | 1,750 | 1,750 | 1,750 | 1,750 | 1,750 | 1,750 |
| R-squared | 0.093 | 0.248 | 0.979 | 0.979 | 0.020 | 0.242 | 0.512 | 0.513 |
| Panel C. Dependent variable: | *Applying the three most preventive measures to prevent infection by Covid-19* | | | | | | | |
| Violence | -0.38*** | -0.34*** | -0.09*** | -0.09*** | -0.15*** | -0.11*** | -0.27*** | -0.19*** |
| | (0.04) | (0.03) | (0.01) | (0.01) | (0.03) | (0.03) | (0.08) | (0.07) |
| Female (=1) | | | | -0.01 | | | | 0.13** |
| | | | | (0.01) | | | | (0.05) |
| Additional controls: | No | Yes | Yes | Yes | No | Yes | Yes | Yes |
| Regional FE | No | No | Yes | Yes | No | No | Yes | Yes |
| Constant | 1.34*** | -6.15*** | 0.75*** | 0.75*** | -1.12*** | -8.53*** | -8.14*** | -5.09*** |
| | (0.08) | (0.70) | (0.13) | (0.13) | (0.06) | (0.58) | (0.56) | (0.50) |
| Observations | 1,750 | 1,750 | 1,750 | 1,750 | 1,750 | 1,750 | 1,750 | 1,750 |
| R-squared | 0.092 | 0.248 | 0.979 | 0.979 | 0.020 | 0.240 | 0.506 | 0.508 |

*Note*: Shows coefficient estimates (OLS) for adoption of Covid-19 prevention measures for the full sample with violence. Panel A to C uses the different adoption of Covid-19 prevention measure as a dependent variable. The violence variable is measured as the number of violent episodes per day during the four previous months from round 1 (between June 9 and July 7). Model (1) to (4) shows violent episode for the regional level, and M5-M8 for the municipality. The dependent variable is separately standardized to mean zero and standard deviation one. In M1-M6 the violence variable is separately standardized to mean zero and standard deviation one. In M7-M8 the violence variable is a dummy with value 1 if the level of violence is above the mean level and 0 if below the mean level. We obtain similar results, statistically significant at the 1% level when we define value 1 for the highest tertile of level of violence and 0 for the lowest 2/3. Additional controls include age, level of education and yearly total consumption (food and non-food) per capita. Regional FE are regional fixed effects. Standard errors in parentheses are clustered at the enumeration area level. ***, **, * indicating significance at the 1%, 5% and 10% level respectively.

**Table A5**. *Adoption to Covid-19 prevention measures and Violence: The results for the twelve previous months from round 1*.

| Panel A. Dependent variable: | *Measures adopted to prevent infection by Covid-19* | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | M1 | M2 | M3 | M4 | M5 | M6 | M7 | M8 |
| Violence | -0.28*** | -0.25*** | -0.03*** | -0.03*** | -0.10*** | -0.06*** | -0.21*** | -0.20*** |
| | (0.03) | (0.03) | (0.01) | (0.01) | (0.03) | (0.03) | (0.07) | (0.06) |
| Female (=1) | | | | -0.01 | | | | 0.12** |
| | | | | (0.01) | | | | (0.05) |
| Additional controls: | No | Yes | Yes | Yes | No | Yes | Yes | Yes |
| Regional FE | No | No | Yes | Yes | No | No | Yes | Yes |
| Constant | 1.23*** | -5.94*** | 0.68*** | 0.68*** | -1.17*** | -8.08*** | -7.81*** | -4.72*** |
| | (0.07) | (0.74) | (0.13) | (0.13) | (0.06) | (0.59) | (0.56) | (0.47) |
| Observations | 1,968 | 1,968 | 1,968 | 1,968 | 1,968 | 1,968 | 1,968 | 1,968 |
| R-squared | 0.052 | 0.202 | 0.977 | 0.977 | 0.009 | 0.216 | 0.509 | 0.510 |
| Panel B. Dependent variable: | *Knowledge of measures adopted by the authorities to prevent infection by Covid-19* | | | | | | | |
| Violence | -0.28*** | -0.25*** | -0.04*** | -0.04*** | -0.10*** | -0.07*** | -0.21*** | -0.20*** |
| | (0.03) | (0.03) | (0.01) | (0.01) | (0.03) | (0.03) | (0.07) | (0.06) |
| Female (=1) | | | | -0.01 | | | | 0.12** |
| | | | | (0.01) | | | | (0.05) |
| Additional controls: | No | Yes | Yes | Yes | No | Yes | Yes | Yes |
| Regional FE | No | No | Yes | Yes | No | No | Yes | Yes |
| Constant | 1.23*** | -5.92*** | 0.67*** | 0.67*** | -1.17*** | -8.10*** | -7.82*** | -4.73*** |
| | (0.07) | (0.74) | (0.13) | (0.13) | (0.06) | (0.59) | (0.56) | (0.47) |
| Observations | 1,968 | 1,968 | 1,968 | 1,968 | 1,968 | 1,968 | 1,968 | 1,968 |
| R-squared | 0.054 | 0.203 | 0.977 | 0.977 | 0.009 | 0.217 | 0.508 | 0.510 |
| Panel C. Dependent variable: | *Applying the three most preventive measures to prevent infection by Covid-19* | | | | | | | |
| Violence | -0.28*** | -0.25*** | -0.04*** | -0.04*** | -0.10*** | -0.06*** | -0.21*** | -0.20*** |
| | (0.03) | (0.03) | (0.01) | (0.01) | (0.03) | (0.03) | (0.07) | (0.06) |
| Female (=1) | | | | -0.01 | | | | 0.12** |
| | | | | (0.01) | | | | (0.05) |
| Additional controls: | No | Yes | Yes | Yes | No | Yes | Yes | Yes |
| Regional FE | No | No | Yes | Yes | No | No | Yes | Yes |
| Constant | 1.23*** | -5.89*** | 0.69*** | 0.69*** | -1.17*** | -8.06*** | -7.79*** | -4.73*** |
| | (0.07) | (0.74) | (0.13) | (0.13) | (0.06) | (0.58) | (0.56) | (0.47) |
| Observations | 1,968 | 1,968 | 1,968 | 1,968 | 1,968 | 1,968 | 1,968 | 1,968 |
| R-squared | 0.053 | 0.203 | 0.977 | 0.977 | 0.009 | 0.216 | 0.503 | 0.505 |

*Note*: Shows coefficient estimates (OLS) for adoption of Covid-19 prevention measures for the full sample with violence. Panel A to C uses the different adoption of Covid-19 prevention measure as a dependent variable. The violence variable is measured as the number of violent episodes per day during the twelve previous months from round 1 (between June 9 and July 7). Model (1) to (4) shows violent episode for the regional level, and M5-M8 for the municipality. The dependent variable is separately standardized to mean zero and standard deviation one. In M1-M6 the violence variable is separately standardized to mean zero and standard deviation one. In M7-M8 the violence variable is a dummy with value 1 if the level of violence is above the mean level and 0 if below the mean level. We obtain similar results, statistically significant at the 1% level when we define value 1 for the highest tertile of level of violence and 0 for the lowest 2/3. Additional controls include age, level of education and yearly total consumption (food and non-food) per capita. Regional FE are regional fixed effects. Standard errors in parentheses are clustered at the enumeration area level. ***, **, * indicating significance at the 1%, 5% and 10% level respectively.

**Table A6**. *Adoption to Covid-19 prevention measures and Violence: The results for the four and twelve previous months from round 1*.

| Panel A. Dependent variable: | *All measures adopted to prevent infection by Covid-19* | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | M1 | M2 | M3 | M4 | M5 | M6 | M7 | M8 |
| Violence four months | -0.38*** | -0.34*** | -0.08*** | -0.08*** | -0.15*** | -0.11*** | -0.28*** | -0.19*** |
| | (0.04) | (0.03) | (0.01) | (0.01) | (0.03) | (0.03) | (0.08) | (0.07) |
| Female (=1) | | | | -0.01 | | | | 0.13** |
| | | | | (0.01) | | | | (0.05) |
| Additional controls: | No | Yes | Yes | Yes | No | Yes | Yes | Yes |
| Regional FE | No | No | Yes | Yes | No | No | Yes | Yes |
| Constant | 1.33*** | -6.18*** | 0.74*** | 0.74*** | -1.11*** | -8.52*** | -8.16*** | -5.08*** |
| | (0.08) | (0.71) | (0.13) | (0.13) | (0.06) | (0.59) | (0.56) | (0.50) |
| Observations | 1,750 | 1,750 | 1,750 | 1,750 | 1,750 | 1,750 | 1,750 | 1,750 |
| R-squared | 0.092 | 0.247 | 0.979 | 0.979 | 0.020 | 0.241 | 0.510 | 0.512 |
| Panel B. Dependent variable: | *All measures adopted to prevent infection by Covid-19* | | | | | | | |
| Violence twelve months | -0.28*** | -0.25*** | -0.04*** | -0.04*** | -0.10*** | -0.07*** | -0.21*** | -0.20*** |
| | (0.03) | (0.03) | (0.01) | (0.01) | (0.03) | (0.03) | (0.07) | (0.06) |
| Female (=1) | | | | -0.01 | | | | 0.12** |
| | | | | (0.01) | | | | (0.05) |
| Additional controls: | No | Yes | Yes | Yes | No | Yes | Yes | Yes |
| Regional FE | No | No | Yes | Yes | No | No | Yes | Yes |
| Constant | 1.23*** | -5.92*** | 0.68*** | 0.68*** | -1.17*** | -8.08*** | -7.81*** | -4.73*** |
| | (0.07) | (0.74) | (0.13) | (0.13) | (0.06) | (0.59) | (0.56) | (0.47) |
| Observations | 1,968 | 1,968 | 1,968 | 1,968 | 1,968 | 1,968 | 1,968 | 1,968 |
| R-squared | 0.053 | 0.202 | 0.977 | 0.977 | 0.009 | 0.217 | 0.507 | 0.508 |

*Note*: Shows coefficient estimates (OLS) for adoption of all Covid-19 prevention measures for the full sample with violence. The adoption of all Covid-19 prevention measures variable consist of all the survey questions on measures adopted to prevent infection by Covid-19 (i.e., 'Measures adopted to prevent infection by Covid-19', 'Knowledge of measures adopted by the authorities to prevent infection by Covid-19' and 'Applying the three most preventive measures to prevent infection by Covid-19'). The violence variable is measured as the number of violent episodes per day during the four (Panel A) and twelve (Panel B) previous months from round 1 (between June 9 and July 7). Model (1) to (4) shows violent episode for the regional level, and M5-M8 for the municipality. The dependent variable is separately standardized to mean zero and standard deviation one. In M1-M6 the violence variable is separately standardized to mean zero and standard deviation one. In M7-M8 the violence variable is a dummy with value 1 if the level of violence is above the mean level and 0 if below the mean level. We obtain similar results, statistically significant at the 1% level when we define value 1 for the highest tertile of level of violence and 0 for the lowest 2/3. Additional controls include age, level of education and yearly total consumption (food and non-food) per capita. Standard errors in parentheses are clustered at the enumeration area level. ***, **, * indicating significance at the 1%, 5% and 10% level respectively.

**Table A7**. *Adoption to Covid-19 prevention measures and Violence: The results for the full panel (first, third and fifth survey rounds)*.

| Dependent variable: | *All measures adopted to prevent infection by Covid-19* | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | M1 | M2 | M3 | M4 | M5 | M6 | M7 | M8 |
| Violence | -0.07*** | -0.07*** | -0.07*** | -0.04*** | -0.25*** | -0.19*** | -0.67*** | -0.31*** |
| | (0.00) | (0.00) | (0.00) | (0.01) | (0.02) | (0.02) | (0.06) | (0.10) |
| Female (=1) | | | -0.04 | | | | 0.18** | |
| | | | (0.07) | | | | (0.09) | |
| Additional controls: | No | Yes | Yes | No | No | Yes | Yes | No |
| FE | No | No | No | Yes | No | No | No | Yes |
| Constant | 1.38*** | -5.78*** | 5.81*** | 1.50*** | 0.51*** | -9.55*** | -9.20*** | 0.62*** |
| | (0.03) | (0.45) | (0.45) | (0.00) | (0.03) | (0.53) | (0.53) | (0.02) |
| Observations | 1,869 | 1,869 | 1,869 | 1,868 | 1,869 | 1,869 | 1,869 | 1,868 |
| R-squared (overall) | 0.146 | 0.218 | 0.218 | 0.146 | 0.025 | 0.166 | 0.181 | 0.110 |

*Note*: Shows coefficient estimates for the adoption of all Covid-19 prevention measures for the full panel with violence during survey round 1 (between June 9 and July 7), round 3 (September 12 and October 21) and round 5 (December 9 and 30) in 2020. The adoption of all Covid-19 prevention measures variable consist of all the survey questions on measures adopted to prevent infection by Covid-19 (i.e., 'Measures adopted to prevent infection by Covid-19', 'Knowledge of measures adopted by the authorities to prevent infection by Covid-19' and 'Applying the three most preventive measures to prevent infection by Covid-19'). The violence variable is measured as the number of violent episodes per day during survey round 1, round 3 and round 5 in 2020. Model (1) to (4) shows violent episode for the regional level, and M5-M8 for the municipality. The dependent variable is separately standardized to mean zero and standard deviation one. In M1-M6 the violence variable is separately standardized to mean zero and standard deviation one. In M7-M8 the violence variable is a dummy with value 1 if the level of violence is above the mean level and 0 if below the mean level. We obtain similar results, statistically significant at the 1% level when we define value 1 for the highest tertile of level of violence and 0 for the lowest 2/3. Additional controls include age, level of education and yearly total consumption (food and non-food) per capita. FE are fixed effects, which filters out time-invariants effects such as gender. Robust standard errors in parentheses. ***, **, * indicating significance at the 1%, 5% and 10 level respectively.

**Table A8**. *Adoption to Covid-19 and Violence: The results for each survey round separately*.

| Panel A. Dependent variable: | *All measures adopted to prevent infection by Covid-19 round 1* | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | M1 | M2 | M3 | M4 | M5 | M6 | M7 | M8 |
| Violence round 1 | -0.67*** | -0.60*** | -0.27*** | -0.27*** | -0.32*** | -0.24*** | -0.63*** | -0.36*** |
| | (0.05) | (0.04) | (0.04) | (0.04) | (0.05) | (0.04) | (0.09) | (0.06) |
| Female (=1) | | | | -0.03** | | | | 0.18*** |
| | | | | (0.01) | | | | (0.06) |
| Additional controls: | No | Yes | Yes | Yes | No | Yes | Yes | Yes |
| Regional FE | No | No | Yes | Yes | No | No | Yes | Yes |
| Constant | 1.55*** | -6.59*** | 0.85*** | 0.84*** | -0.99*** | -8.46*** | -8.14*** | -4.16*** |
| | (0.08) | (0.65) | (0.16) | (0.16) | (0.07) | (0.64) | (0.64) | (0.59) |
| Observations | 1,869 | 1,869 | 1,869 | 1,869 | 1,869 | 1,869 | 1,869 | 1,869 |
| R-squared | 0.262 | 0.410 | 0.982 | 0.982 | 0.084 | 0.289 | 0.518 | 0.521 |
| Panel B. Dependent variable: | *All measures adopted to prevent infection by Covid-19 round 3* | | | | | | | |
| Violence round 3 | -0.48*** | -0.42*** | -0.02*** | -0.02*** | -0.37*** | -0.27*** | -1.00*** | -0.09*** |
| | (0.05) | (0.04) | (0.00) | (0.00) | (0.07) | (0.06) | (0.09) | (0.03) |
| Female (=1) | | | | 0.00 | | | | 0.14*** |
| | | | | (0.01) | | | | (0.01) |
| Additional controls: | No | Yes | Yes | Yes | No | Yes | Yes | Yes |
| Regional FE | No | No | Yes | Yes | No | No | Yes | Yes |
| Constant | 1.43*** | -6.40*** | 0.80*** | 0.80*** | 1.24*** | -10.93*** | -3.75*** | -1.08*** |
| | (0.08) | (0.71) | (0.08) | (0.08) | (0.11) | (1.00) | (0.69) | (0.20) |
| Observations | 1,869 | 1,869 | 1,869 | 1,869 | 1,869 | 1,869 | 1,869 | 1,869 |
| R-squared | 0.140 | 0.293 | 0.995 | 0.995 | 0.053 | 0.314 | 0.581 | 0.582 |
| Panel C. Dependent variable: | *All measures adopted to prevent infection by Covid-19 round 5* | | | | | | | |
| Violence round 5 | -0.30*** | -0.26*** | -0.03*** | -0.03*** | -0.15*** | -0.08 | -0.51*** | -0.01 |
| | (0.03) | (0.03) | (0.01) | (0.01) | (0.04) | (0.05) | (0.13) | (0.11) |
| Female (=1) | | | | -0.02 | | | | 0.22** |
| | | | | (0.02) | | | | (0.09) |
| Additional controls: | No | Yes | Yes | Yes | No | Yes | Yes | Yes |
| Regional FE | No | No | Yes | Yes | No | No | Yes | Yes |
| Constant | 1.53*** | -4.58*** | 1.07*** | 1.06*** | 1.32*** | -10.64*** | -9.96*** | -5.94*** |
| | (0.08) | (0.76) | (0.20) | (0.20) | (0.10) | (1.00) | (0.94) | (0.83) |
| Observations | 1,869 | 1,869 | 1,869 | 1,869 | 1,869 | 1,869 | 1,869 | 1,869 |
| R-squared | 0.064 | 0.203 | 0.949 | 0.949 | 0.010 | 0.293 | 0.532 | 0.535 |

*Note*: Shows coefficient estimates (OLS) for adoption of all Covid-19 prevention measures for the full sample with violence separately for survey round 1 (between June 9 and July 7), round 3 (September 12 and October 21) and round 5 (December 9 and 30) in 2020. The adoption of all Covid-19 prevention measures variable consist of all the survey questions on measures adopted to prevent infection by Covid-19 (i.e., 'Measures adopted to prevent infection by Covid-19', 'Knowledge of measures adopted by the authorities to prevent infection by Covid-19' and 'Applying the three most preventive measures to prevent infection by Covid-19'). The violence variable is measured as the number of violent episodes per day during survey round 1,3and 5 in 2020. The dependent and violence variables are separately standardized to mean zero and standard deviation one. Model (1) to (4) shows violent episode for the regional level, and M5-M8 for the municipality. Additional controls include all the controls as in Table 1a, same for Regional FE. Standard errors in parentheses are clustered at the enumeration area level. ***, **, * indicating significance at the 1%, 5% and 10% level respectively.

**Table A9**. *Adoption to Covid-19 prevention measures and Violence: The results for the lowest consumption decile during 2020.*

| Panel A. Dependent variable: | *Measures adopted to prevent infection by Covid-19* | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | M1 | M2 | M3 | M4 | M5 | M6 | M7 | M8 |
| Violence | -0.11*** | -0.11*** | -0.10*** | -0.07*** | -0.46*** | -0.42*** | -1.27*** | -0.11 |
| | (0.01) | (0.01) | (0.01) | (0.01) | (0.04) | (0.04) | (0.13) | (0.41) |
| Female (=1) | | | -0.00 | | | | 0.08 | |
| | | | (0.18) | | | | (0.18) | |
| Additional controls: | No | Yes | Yes | No | No | Yes | Yes | No |
| FE | No | No | No | Yes | No | No | No | Yes |
| Constant | 2.17*** | 1.49*** | 1.49*** | 2.30*** | 1.42*** | 0.78*** | 1.09*** | 1.53*** |
| | (0.07) | (0.27) | (0.27) | (0.00) | (0.07) | (0.27) | (0.28) | (0.07) |
| Observations | 284 | 284 | 284 | 284 | 284 | 284 | 284 | 284 |
| R-squared (overall) | 0.316 | 0.104 | 0.105 | 0.316 | 0.043 | 0.064 | 0.070 | 0.100 |
| **Panel B. Dependent variable:** | *Knowledge of measures adopted by the authorities to prevent infection by Covid-19* | | | | | | | |
| Violence | -0.04*** | -0.04*** | -0.04*** | -0.03** | -0.45*** | -0.42*** | -1.32*** | -0.01 |
| | (0.01) | (0.01) | (0.00) | (0.01) | (0.04) | (0.05) | (0.14) | (0.41) |
| Female (=1) | | | -0.01 | | | | 0.11 | |
| | | | (0.19) | | | | (0.20) | |
| Additional controls: | No | Yes | Yes | No | No | Yes | Yes | No |
| FE | No | No | No | Yes | No | No | No | Yes |
| Constant | 2.20*** | 1.46*** | 1.48*** | 2.32*** | 1.42*** | 0.78*** | 1.10*** | 1.52*** |
| | (0.07) | (0.28) | (0.28) | (0.00) | (0.07) | (0.29) | (0.30) | (0.07) |
| Observations | 284 | 284 | 284 | 284 | 284 | 284 | 284 | 284 |
| R-squared | 0.101 | 0.111 | 0.102 | 0.284 | 0.040 | 0.100 | 0.101 | 0.100 |
| **Panel C. Dependent variable:** | *Applying the three most preventive measures to prevent infection by Covid-19* | | | | | | | |
| Violence | -0.03*** | -0.03*** | -0.03** | -0.01 | -0.43*** | -0.40*** | -1.23*** | -0.10 |
| | (0.01) | (0.01) | (0.01) | (0.02) | (0.04) | (0.05) | (0.14) | (0.41) |
| Female (=1) | | | -0.01 | | | | 0.12 | |
| | | | (0.19) | | | | (0.20) | |
| Additional controls: | No | Yes | Yes | No | No | Yes | Yes | No |
| FE | No | No | No | Yes | No | No | No | Yes |
| Constant | 2.20*** | 1.48*** | 1.48*** | 2.33*** | 1.44*** | 0.82*** | 1.12*** | 1.52*** |
| | (0.07) | (0.28) | (0.28) | (0.00) | (0.07) | (0.29) | (0.30) | (0.07) |
| Observations | 284 | 284 | 284 | 284 | 284 | 284 | 284 | 284 |
| R-squared (within) | 0.050 | 0.051 | 0.050 | 0.270 | 0.051 | 0.111 | 0.103 | 0.052 |

*Note*: Shows coefficient estimates (OLS) for adoption of Covid-19 prevention measures for the lowest consumption decile with violence during survey round 1 (between June 9 and July 7), round 3 (September 12 and October 21) and round 5 (December 9 and 30) in 2020. Panel A to C uses the different adoption of Covid-19 prevention measure as a dependent variable. The violence variable is measured as the number of violent episodes per day during survey round 1, round 3 and round 5 in 2020. Model (1) to (4) shows violent episode for the regional level, and M5-M8 for the municipality. The dependent variable is separately standardized to mean zero and standard deviation one. . In M1-M6 the violence variable is separately standardized to mean zero and standard deviation one. In M7-M8 the violence variable is a dummy with value 1 if the level of violence is above the mean level and 0 if below the mean level. We obtain similar results, statistically significant at the 1% level when we define value 1 for the highest tertile of level of violence and 0 for the lowest 2/3. Additional controls include age and level of education. FE are fixed effects, which filters out time-invariants effects such as gender. Robust standard errors in parentheses. ***, **, * indicating significance at the 1%, 5% and 10 level respectively.

**Table A10**. *Adoption to Covid-19 prevention measures and Violence: The results for the highest consumption decile during 2020.*

| Panel A. Dependent variable: | *Measures adopted to prevent infection by Covid-19* | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | M1 | M2 | M3 | M4 | M5 | M6 | M7 | M8 |
| Violence | -0.10*** | -0.10*** | -0.10*** | -0.04 | -0.20*** | -0.22*** | -0.28* | -0.28 |
| | (0.02) | (0.02) | (0.02) | (0.04) | (0.06) | (0.05) | (0.17) | (0.27) |
| Female (=1) | | | 0.02 | | | | 0.18 | |
| | | | (0.18) | | | | (0.20) | |
| Additional controls: | No | Yes | Yes | No | No | Yes | Yes | No |
| FE | No | No | No | Yes | No | No | No | Yes |
| Constant | 0.84*** | 0.82*** | 0.81*** | 0.84*** | -0.45*** | -0.36*** | -0.29 | -0.34*** |
| | (0.05) | (0.08) | (0.09) | (0.01) | (0.06) | (0.18) | (0.23) | (0.07) |
| Observations | 325 | 325 | 325 | 325 | 325 | 325 | 325 | 325 |
| R-squared (overall) | 0.064 | 0.104 | 0.105 | 0.064 | 0.040 | 0.064 | 0.070 | 0.040 |
| Panel B. Dependent variable: | *Knowledge of measures adopted by the authorities to prevent infection by Covid-19* | | | | | | | |
| Violence | -0.05*** | -0.05** | -0.05** | -0.00 | -0.18*** | -0.20*** | -0.28* | -0.17 |
| | (0.02) | (0.02) | (0.02) | (0.03) | (0.05) | (0.05) | (0.16) | (0.28) |
| Female (=1) | | | 0.04 | | | | 0.18 | |
| | | | (0.18) | | | | (0.19) | |
| Additional controls: | No | Yes | Yes | No | No | Yes | Yes | No |
| FE | No | No | No | Yes | No | No | No | Yes |
| Constant | 0.81*** | 0.73*** | 0.72*** | 0.81*** | -0.46*** | -0.39** | -0.34 | -0.38*** |
| | (0.05) | (0.07) | (0.09) | (0.01) | (0.05) | (0.17) | (0.21) | (0.07) |
| Observations | 325 | 325 | 325 | 325 | 325 | 325 | 325 | 325 |
| R-squared | 0.101 | 0.110 | 0.102 | 0.101 | 0.040 | 0.060 | 0.061 | 0.040 |
| Panel C. Dependent variable: | *Applying the three most preventive measures to prevent infection by Covid-19* | | | | | | | |
| Violence | -0.01 | -0.00 | -0.00 | -0.10* | -0.22*** | -0.24*** | -0.35** | -0.11 |
| | (0.02) | (0.02) | (0.02) | (0.05) | (0.06) | (0.05) | (0.17) | (0.28) |
| Female (=1) | | | 0.04 | | | | 0.17 | |
| | | | (0.19) | | | | (0.19) | |
| Additional controls: | No | Yes | Yes | No | No | Yes | Yes | No |
| FE | No | No | No | Yes | No | No | No | Yes |
| Constant | 0.82*** | 0.72*** | 0.71*** | 0.81*** | -0.45*** | -0.36*** | -0.30 | -0.39*** |
| | (0.05) | (0.08) | (0.10) | (0.01) | (0.06) | (0.17) | (0.22) | (0.07) |
| Observations | 325 | 325 | 325 | 325 | 325 | 325 | 325 | 325 |
| R-squared (within) | 0.050 | 0.051 | 0.050 | 0.050 | 0.051 | 0.110 | 0.102 | 0.051 |

*Note*: Shows coefficient estimates (OLS) for adoption of Covid-19 prevention measures for the highest consumption decile with violence during survey round 1 (between June 9 and July 7), round 3 (September 12 and October 21) and round 5 (December 9 and 30) in 2020. Panel A to C uses the different adoption of Covid-19 prevention measure as a dependent variable. The violence variable is measured as the number of violent episodes per day during survey round 1, round 3 and round 5 in 2020. Model (1) to (4) shows violent episode for the regional level, and M5-M8 for the municipality. The dependent variable is separately standardized to mean zero and standard deviation one. In M1-M6 the violence variable is separately standardized to mean zero and standard deviation one. In M7-M8 the violence variable is a dummy with value 1 if the level of violence is above the mean level and 0 if below the mean level. We obtain similar results, statistically significant at the 1% level when we define value 1 for the highest tertile of level of violence and 0 for the lowest 2/3. Additional controls include age and level of education. FE are fixed effects, which filters out time-invariants effects such as gender. Robust standard errors in parentheses. ***, **, * indicating significance at the 1%, 5% and 10 level respectively.