

Covid-19 vs. Ebola:
impact on households and SMEs in
Nord Kivu, DR Congo

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Abstract

Eastern Democratic Republic of Congo is currently facing two major infectious disease outbreaks: Covid-19 and Ebola Virus Disease (EVD). We highlight large differences in the socioeconomic impact of these two outbreaks. The data come from a phone survey that we conducted in May 2020 with 456 households and 144 small firms from a megacity and a rural commune in the province of Nord Kivu. While 3,000 EVD cases and 2,000 EVD deaths were confirmed since August 2018, self-reported impacts of EVD on revenues, access to food and behaviour were limited. In contrast, only 43 Covid-19 cases were reported as of May 30th but respondents reported sizable effects on livelihoods, especially in the large urban hub, and in part driven by substantial job losses. Our results show that different infectious disease outbreaks can have very different effects, largely unrelated to case numbers of the disease. Moderately virulent but highly transmissible viruses such as Covid-19 can trigger a steep economic downturn, especially in areas with high economic interconnectedness, reflecting both national and international policies to contain the pandemic.

Highlights:

- Eastern DRC is currently facing outbreaks of Covid-19 and Ebola Virus Disease.
- We highlight large differences in the socio-economic impact of these outbreaks.
- Covid-19 has a much higher impact on the economy and (food) security.
- This is due to Covid-19's higher transmissibility and related containment measures.
- The socio-economic impact of Covid-19 is largely unrelated to case numbers.

1. INTRODUCTION

Over the last decades, the frequency of emerging infectious diseases (EID) outbreaks has been steadily accelerating and represents a growing threat to the global economy (Jones et al., 2008; Morens & Fauci, 2013; K. F. Smith et al., 2014). Zoonoses, infectious diseases originating from wildlife, represent 60% of known EID and grow at the fastest rate. As the world is trying to contain the current outbreak of Covid-19, the Eastern Democratic Republic of Congo (DRC) faces the additional challenge of tackling another zoonose simultaneously: the Ebola Virus Disease (EVD, Zaire strain).

Focussing on DRC's Nord Kivu province, we study the socioeconomic impact of Covid-19, and how it differs from that of EVD. EID differ by their virologic features, notably regarding case fatality rates and transmissibility, which translate into different public health policies and socio-economic impact. The literature on the cost of diseases distinguishes between the direct economic effects of the disease (mainly health sector costs related to patient treatment), and the indirect costs stemming from disease containment policies (e.g. quarantine, school closure, contact tracing) and behavioural responses (e.g. contagion avoidance behaviour, consumption and investment postponement; Bloom et al., 2018; K. M. Smith et al., 2019). For highly transmissible diseases, the indirect impact can be a multi-fold of the direct costs, unrelated to the actual number of cases (Beutels et al., 2009; Bowles et al., 2016; Keogh-Brown & Smith, 2008; K. M. Smith et al., 2019; Thomas et al., 2015).

The aforementioned studies have linked the socioeconomic impact of a disease to its specific virologic features, for one disease at a time. Instead, we compare the socioeconomic impact across two high-profile disease outbreaks that affect Nord Kivu simultaneously. To do so, we rely on phone interviews with a sample of 600 households and entrepreneurs. So far, most estimates on the impact of Covid-19 have relied on simulation models based on existing datasets (Gerson Mahler et al., 2020; ILO, 2020; Laborde et al., 2020; Sumner et al., 2020), but there are ongoing efforts to collect micro-level data, mainly through phone interviews (e.g. Abebe et al., 2020; Farzana & Amrita, 2020; World Bank, 2020). We contribute to these efforts in order to better understand the economic impact, and do so in the context of Nord Kivu in DR Congo, a country, which – according to the simulated estimates so far – will be among the worst affected by Covid-19 (Gerson Mahler et al., 2020), and is likely to become a prime zoonoses hotspot (Morse et al., 2012).

2. CONTEXT

2.1 Nord Kivu

Nord Kivu is one of DRC's most eastern provinces, bordering neighbouring countries Uganda and Rwanda. It counts about 7 million people, of which 40% live in urban areas, and spans almost 60,000 km² (CAID, 2020). We focus on the provincial capital, Goma, a border city of two million inhabitants (République Démocratique du Congo, 2017), and on Mutwanga, a more remote commune of 45,000 inhabitants (*Interview with Chief*, personal communication, March 2019), located in the north-eastern territory of Beni (Figure 1).

Nord Kivu was the epicentre of the first and second Congo war (1996-1997 and 1998-2003). Despite the 2003 formal peace agreement, it is still home to almost 100 different armed groups (KST, 2020). The armed groups fight for control over resources (such as minerals, timber, charcoal), but also extort civilians at roadblocks and kidnap for ransom. In May 2020, the month of our interviews, Kivu Security Tracker counted 46 clashes between armed groups, 56 violent deaths among civilians, 16 abductions and 9 kidnappings for ransom, for Sud and Nord Kivu combined (KST, 2020). At the start of the year, in January 2020, the province counted 1.7 million internally displaced people, of which the majority is staying with host families (UNHCR, 2020) .

In the rural areas, the vast majority of the population lives from agriculture and livestock raising (CAID, 2020). Mining is among the most important off-farm income sources, and considerably adds to state revenue (World Bank, 2016). Both for farm and non-farm products, (informal) cross-border trade is critically important. For instance, more than 50,000 people cross the border each day at the Gisenyi-Goma One Stop Border Post (Mercy Corps, 2019b), while there are also many crossings at the 765-km long porous borders with Uganda (Ilunga Kalenga et al., 2019).

Population is overwhelmingly young, with approximately 48% below 15 years old (République Démocratique du Congo, 2017). Poverty and food insecurity are widespread. It is estimated that 60% live under the international \$1.9 poverty line (World Bank, 2016) . The health infrastructure is inadequate: there is a density of only 1 doctor per 15,529 inhabitants; and the child mortality rate in 2012 was 131 per 1,000 live births (République Démocratique du Congo, 2017). Only 5% of households has access to their own tap water, 60% has access to another source of potable water, while 35% entirely lack access to potable water (République Démocratique du Congo, 2014). The lack of access to water is a particular problem in the City of Goma with its long queues at crowded communal taps, and where 70% of the population does not have access to a clean water source within a 30 min roundtrip, increasing the challenge of disease containment (Mercy Corps, 2019a).

The most common diseases are malaria, respiratory infections and diarrhoeal diseases (CAID, 2020). Outbreaks of measles, cholera and yellow fever repeatedly occur (Arie, 2019; Ilunga Kalenga et al., 2019), and in August 2018 an EVD outbreak was declared. A first case of Covid-19 was recorded in Eastern DRC in March 2020.

2.2 EVD and Covid-19

Figure 1 shows the temporal and spatial progress of EVD and Covid-19 in Nord Kivu. The first EVD case was detected in Mangina a few kilometres west of Beni, Nord Kivu. In the course of two years, it spread across 29 health zones, including 19 in Nord Kivu, 9 in Ituri and 1 in Sud Kivu. Most cases were however recorded in and around the cities of Beni and Butembo. Four additional EVD cases were registered in Kasese district, Uganda which borders Nord Kivu. The last confirmed case of the 2018-20 EVD outbreak dates back to April, 27th, 2020 (WHO, 2020a). As of May 30 2020, 3,462 cases were confirmed, causing the death of 2,279 people (WHO, 2020a). These numbers make this tenth EVD outbreak in DRC the second largest in the world, only surpassed by the 2013-16 outbreak in West Africa. Covid-19 first emerged in Wuhan, China, at the end of 2019. A first case was detected in Kinshasa (the DRC's capital) on March 10 2020, and on March 31st in Nord Kivu. As of May 31 2020, 43 Covid-19 cases were confirmed in Nord Kivu, mainly in Goma.

There are multiple virologic differences between EVD and Covid-19. Transmissibility is the most important one from an economic cost perspective. Whereas Covid-19 is highly transmissible, EVD is only moderately so. The difference in transmissibility mainly stems from three underlying differences. First, while transmission of EVD occurs through contact with body fluids¹, Covid-19 primarily spreads through respiratory droplets². Second, while there is very little pre-symptomatic infectiousness in the case of EVD, the majority of Covid-19 cases are asymptomatic (WHO, 2020c, 2020d). Third, EVD is more virulent. While the latest WHO update reports a Covid-19 case fatality ratio of 4.3% in the DRC (WHO, 2020e), the 2018-2020 EVD outbreak in eastern Congo had a case fatality rate of 65.8%. As a result, EVD often kills its host before others can be infected.

¹ The transmission can occur “through direct contact with the blood, secretions, organs or other bodily fluids of infected people, and with surfaces and materials (e.g. bedding, clothing) contaminated with these fluids” (WHO, 2020c).

² According to WHO (2020c) “The disease spreads primarily from person to person through small droplets from the nose or mouth, which are expelled when a person with COVID-19 coughs, sneezes, or speaks... These droplets can land on objects and surfaces around the person such as tables, doorknobs and handrails. People can become infected by touching these objects or surfaces, then touching their eyes, nose or mouth”.

These differences drive the basic reproduction number (R_0) or the expected number of cases an infected person will cause, on average, during their infectious period in absence of control measures. R_0 fluctuates around 1.5 for EVD³, but attains about 3 to 4 according to the first estimates for Covid-19⁴. Furthermore, the effective reproduction number (R_e), or the number of cases an infected person effectively causes (in the presence of control measures), can be reduced more easily for EVD because of its easily detectable symptoms at an early stage, and because avoiding contact with bodily fluids is more straightforward than avoiding contact with respiratory droplets (Mizumoto et al., 2019). EVD's R_e can be brought down even more since the development of the highly effective rVSV-ZEBOV-GP EVD vaccine which was used for the first time towards the end of the 2014-16 West-African outbreak, and again in the recent DR Congo outbreak, where it was 97.5% effective at stopping EVD transmission, relative to no vaccination (WHO, 2020e) .

Because of EVD's moderate transmissibility, the spread of the 2018-20 outbreak could be contained to a limited geographic area. Containment measures included real-time epidemiologic surveillance, testing, contact tracing, ring vaccination, provision of safe and dignified burials, and systematic screening of 177 million travellers at 80 points of entry – yet borders remained open the entire time (Ilunga Kalenga et al., 2019; WHO, 2020a). In contrast, Covid-19 quickly evolved into a pandemic, despite drastic containment measures. In Nord Kivu, EVD screening points were still active and allowed to filter people with fever. Additional measures included border closings with Rwanda and Uganda on March 22 and 23, as well as a lockdown of cities from April 6 to 19. A second lockdown was decided on May 19 for another two weeks after seven new cases were reported in Nord Kivu (Mediacongo, 2020; Radio Okapi, 2020). As part of the lockdowns, churches and restaurants were closed, maximum occupancy in public transport was decreased and non-essential shops on markets were closed. Beyond these local and regional measures, the global economic slow-down caused by Covid-19 led to a decrease in the demand for and prices of minerals – the primary export goods of DRC; a depreciation of the Congolese franc (-8% since 01/01/2020); and an increase in the price of basic necessities (+5% to 88% on March 26, shortly after the closing of borders; KST, 2020).

³ R_0 was estimated at 1.8 during the 1995 outbreak in Congo, at 1.3 during the 2000 outbreak in Uganda and at 1.5 for Guinea, 1.4 for Sierra Leone and 1.9 for Liberia during the 2014 outbreak in West-Africa (Althaus, 2014; Chowell et al., 2004; Khan et al., 2015).

⁴ Sanche et al. (2020) estimate R_0 at 5.7 for the outbreak in Wuhan, China, but research in Brazil and Europe arrives at estimates in the 3 to 4 range (Flaxman et al., 2020; Mellan et al., 2020) .

3. SAMPLE & SURVEY

We present results based on phone surveys. Our sample consists of 600 respondents, representing 456 households and 144 SMEs in Goma and Mutwanga. Table 1 provides a breakdown by respondent type and location. The respondents are part of two larger research projects. About 80% of the current sample was part of a research project in which we investigate the socio-economic impact of electricity provision. One third of these respondents were sampled randomly from waitlists of future electricity clients, while the others were randomly sampled from a full census of households and SMEs conducted for the entire town of Mutwanga and 12 neighborhoods of Goma. The remaining 20% are a random sample of households and SMEs that were recently connected to the electricity grid of Virunga Energies in Goma. Appendix 1 provides further information regarding the sample.

The phone surveys were conducted by experienced local enumerators, who used the Kobo Toolbox app to record answers. The surveys were kept as short as possible and consisted of a number of simple questions regarding the impact of Covid-19 and EVD. First, we presented the respondents with the following potential consequences of Covid-19 and asked them whether they applied to them or their household: 1) decreased revenue in economic activity; 2) more difficulties to satisfy food requirements; 3) faced a higher incidence of criminality. These were simple yes or no questions, but respondents had the option to refuse to answer or to indicate that they did not know. Respondents were then asked to answer these same questions, with regards to EVD. Second, we asked them about behavioral changes in response to Covid-19 and EVD. The questions were taken from Vinck et al. (2019) and asked whether respondents: 1) avoided visiting family members; 2) avoided visiting neighbors; 3) avoided taking public transport; 4) avoided going to markets; 5) avoided going to churches; 6) stayed home more often than usual; 7) avoided shaking hands to greet people; and 8) washed their hands more frequently. Third, we asked respondents to assess their likelihood of contracting Covid-19. Answer categories were 1) very unlikely; 2) unlikely; 3) don't know; 4) likely; 5) very likely. Finally, for the subset of SMEs in Goma, we asked how many workers they had to fire because of Covid-19.

4. RESULTS

4.1 Livelihoods

The self-reported impact of Covid-19 on livelihoods strongly exceeds that of EVD (Table 2-A). While 85% of respondents report a decreased revenue due to Covid-19, only 14% indicates that EVD had

such an effect. Moreover, 58% of respondents reports that Covid-19 has caused difficulties to satisfy their food requirements, while for EVD this was only the case for 8%. One third of respondents further link Covid-19 to a higher incidence of criminality, while only 11% report such an effect for EVD.

The revenue decline likely relates in part to job losses. We find that 32% of the SMEs surveyed in Goma report having fired employees over the last weeks, because of Covid-19. These employees represent 26% of the permanent staff and 62% of daily workers of the affected SMEs. 13% of the SMEs in Goma declared having stopped their activities temporarily. Small shops, restaurants and bars were, unsurprisingly, most affected.

It is further interesting to note that – whether talking about revenue, food security or crime – the share of respondents that reports an impact of either Covid-19 or EVD is always higher in Goma than in Mutwanga. This likely relates to the high population density of Goma, leading to more stringent lockdown measures – but may also reflect its high economic interconnectedness, both in terms of cross-border trade and its own vibrant service sector. The differences between Goma and Mutwanga are both statistically ($p < 0.01$) and economically significant. Appendix 2 further shows that the differences between Covid-19 and EVD hold within the subsamples of households and SMEs, and within the groups of respondents that are connected to the Virunga Energies grid and those that are not.

4.2 Behaviours and risk

Respondents also report that Covid-19 had a much stronger impact on their behaviors than EVD: a multifold of respondents indicate to avoid visiting family or neighbors, taking public transport, going to markets or churches and to stay more at home than usual (Table 3-A). Only when it comes to shaking and washing hands, the difference between Covid-19 and EVD is less pronounced. The behavioral changes are strongest in Goma, especially for Covid-19, which may reflect the more stringent policy responses to Covid-19 in urban areas), but probably also relates to the fact that respondents in Goma indicate a higher likelihood of contracting Covid-19. While 39% of respondents in Goma finds that likely or very likely, this is only the case for 14% in Mutwanga (Table 4).

5. DISCUSSION AND CONCLUDING REMARKS

Outbreaks of EID are a growing threat to humanity and the global economy (Jones et al., 2008; Morens & Fauci, 2013; K. F. Smith et al., 2014). To weapon against this threat, and design context-appropriate public health measures and economic policy responses, more knowledge is needed on how exactly

EID affect different societies and economies. Transferring lessons learned from one epidemic or pandemic to the other needs to be done carefully however, as impacts can vary drastically (e.g. Barro et al., 2020; Correia et al., 2020).

The latter point is illustrated in this paper: we find that the impact of Covid-19 on the economy and (food) security in Nord Kivu is much higher than that of EVD. The higher impact of Covid-19 is largely due to its higher transmissibility, which led to drastic containment measures, and a quick global spread of the disease, further exacerbating its economic impact through economic interconnectedness. The higher Covid-19 impact on megacity Goma than on more remote Mutwanga further illustrates the vulnerability that (economic) interconnectedness poses. Job losses were one part of the impact pathway, especially affecting temporary staff, who tend to be already poorer than permanent staff. Another pathway, documented elsewhere (KST, 2020) is a rapid surge in the prices of basic necessities.

Simulations of the Covid-19 impact find DR Congo to be among the three countries most at risk for worsening food insecurity (WFP, 2020), and with the largest estimated increase in the number of poor (Gerson Mahler et al., 2020). Our findings corroborate these gloomy predictions. Besides the immediate socioeconomic cost that we observe today, there will likely be severe persistent effects of school dropouts, lower food intake during early childhood, interrupted vaccination campaigns, and most likely also of a slow recovery in revenues from remittances and resource exports. In addition, and as already suggested by our findings on the self-reported incidence of criminality, by fuelling the ranks of the un(der)employed, the Covid-19 crisis could further prolong and intensify instability in the region.

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Figure and Tables

Figure 1 displays the temporal (A) and spatial (B) spread of EVD (purple) and Covid-19 (red) cases in Eastern DRC. In Panel A, EVD and Covid-19 cases are represented using a disease-specific scale. The peak of EVD happened over the second quarter of 2019. EVD cases then slowly decreased. The first Covid-19 cases were recorded on March 31st in Ituri province and on April 2nd in Nord Kivu. Panel B displays cases by health zone. Most EVD cases are located in the northern part of Nord Kivu nearby Beni and Butembo. As of May 27, cases are concentrated in Goma (31 cases), Beni (3 cases) and Rutshuru (1 case). [Note: the figure will be updated with the most up to date numbers before publication]

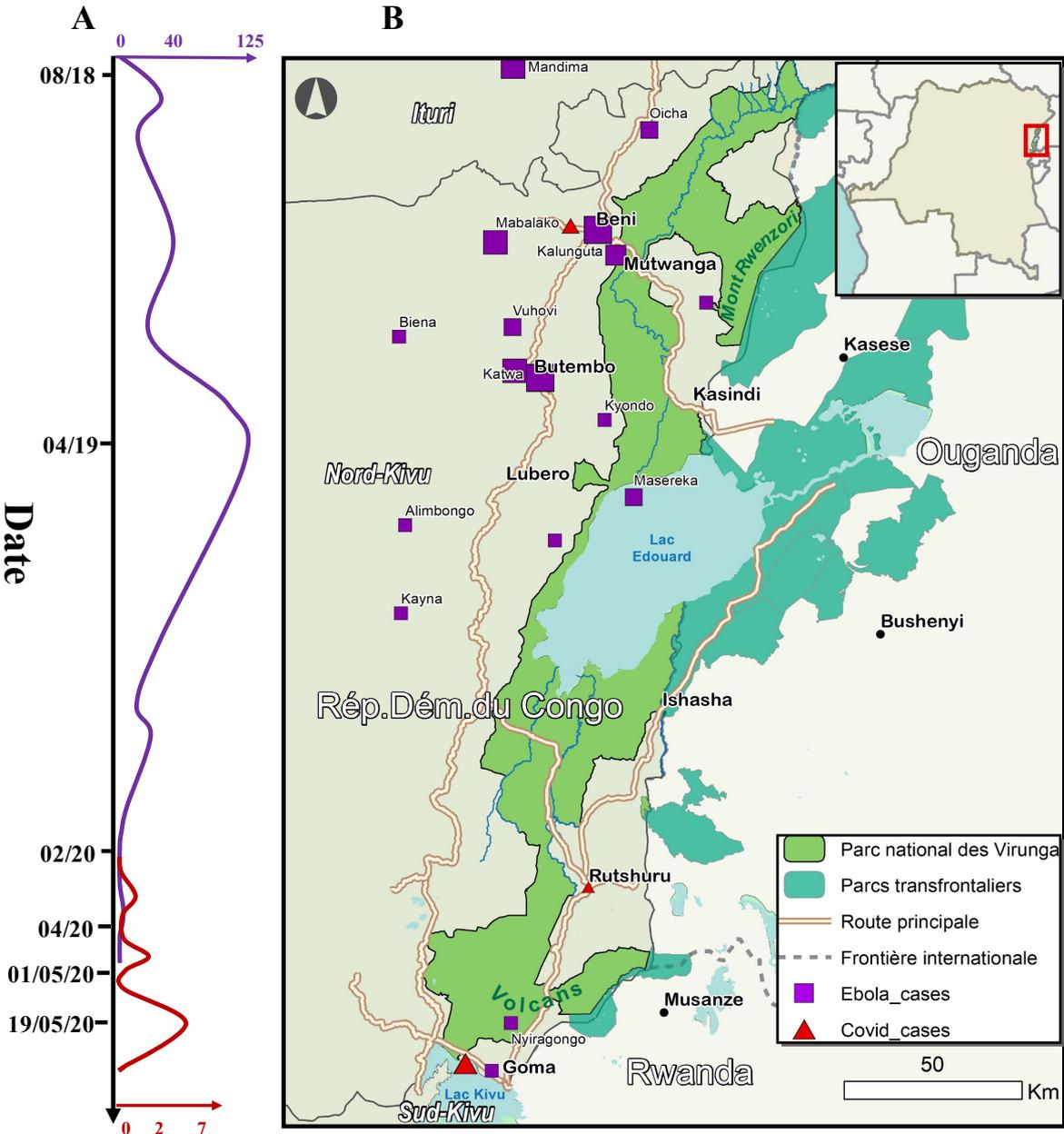


Table 1. Breakdown of preliminary sample, by respondent type and location

	Goma	Mutwanga	Total
SME	94	50	144
Household	169	287	456
Total	263	337	600

Table 2. Self-reported impact of Covid-19 vs EVD

	obs.	% that indicates effect	
		Covid-19	EVD
Panel A : full sample			
decreased revenue in economic activity	600	85%	14%
more difficulties to satisfy food requirements	600	58%	8%
faced a higher incidence of criminality	600	33%	11%
Panel B : Mutwanga			
decreased revenue in economic activity	337	77%	7%
more difficulties to satisfy food requirements	337	42%	2%
faced a higher incidence of criminality	337	9%	6%
Panel C : Goma			
decreased revenue in economic activity	263	95%	23%
more difficulties to satisfy food requirements	263	80%	15%
faced a higher incidence of criminality	263	63%	18%

Table 3. Self-reported behavioral change due to Covid-19 vs EVD

	Panel A:		Panel B:		Panel C:	
	Full sample (n=600)		Mutwanga (n=337)		Goma (n=263)	
	Covid-19	EVD	Covid-19	EVD	Covid-19	EVD
Avoid visiting family	50%	12%	29%	15%	77%	9%
Avoid visiting neighbours	31%	9%	9%	9%	59%	8%
Avoid taking public transport	47%	6%	35%	6%	63%	6%
Avoid going to markets	28%	3%	31%	3%	25%	2%
Avoid going to churches	93%	10%	94%	15%	91%	2%
Staying more at home than usual	61%	5%	50%	4%	75%	6%
Avoid shaking hands to greet people	83%	65%	81%	79%	84%	46%
Washing hands more frequently	89%	75%	86%	87%	92%	59%

Table 4. Self-reported likelihood of contracting Covid-19

	Full sample (n=584)	Mutwanga (n=337)	Goma (n=247)
Likely or very likely	24%	14%	39%
Unlikely or very unlikely	53%	66%	36%
Uncertain	22%	20%	26%

Notes: Due to a coding error, the sample for Goma is slightly smaller for this question (by 16 observations).

Appendix
to
Covid-19 vs. Ebola:
Impact on households and SMEs in Nord Kivu, DR Congo

June, 2020

Appendix 1

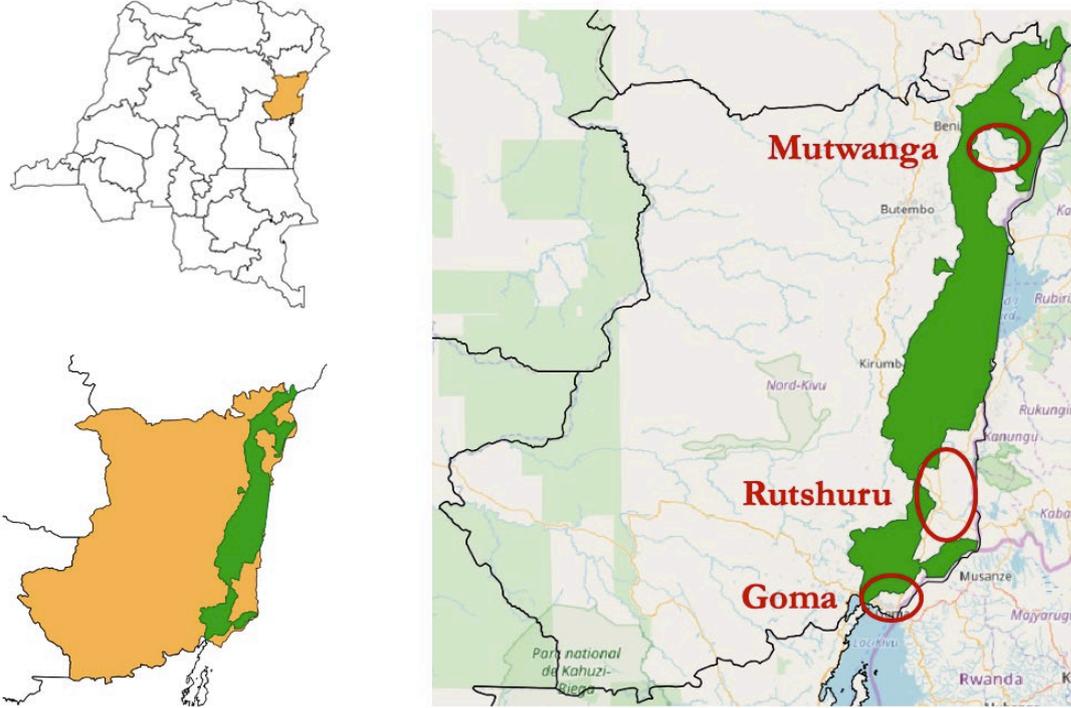
The research note presents results based on phone surveys. Our sample consists of 600 respondents, representing 456 households and 144 SMEs spread over urban Goma and rural Mutwanga. The respondents are part of two larger research projects.

About 80% of the current sample are part of a research project in which we investigate the socio-economic impact of electricity provision in Nord Kivu.⁵ Within the framework of that project, we conducted 908 personal interviews (with 719 households and 189 SMEs). These interviews took place in the period March-August 2019 and focused on two research areas: the town of Mutwanga and the city of Goma. Figure A.1 shows the location of Mutwanga and Goma within North-Kivu. Figure A.2 shows the location of our research area within the city of Goma, which consists of neighborhoods that were recently connected to the electricity grid of Virunga Energies. One third of these 908 respondents were sampled randomly from waitlists of Virunga Energies' future electricity clients. The remaining two thirds were randomly sampled from a full census of households and SMEs for the entire town of Mutwanga (where we recorded 5,513 households and 318 SMEs) and the research area within the city of Goma (where we recorded 15,915 households and 829 SMEs). With the phone survey, we aim to reach all 908 respondents that were interviewed before. In the coming weeks, we therefore plan to interview an additional 350 respondents. These additional data will be used to update the analysis in the research note before publication.

The remaining 20% of the current sample are randomly drawn from a list of households and SMEs that were recently connected to the electricity grid of Virunga Energies in Goma. In the coming weeks, we plan to extend the phone surveys to an additional 200 SMEs that are connected to the electricity grid of Virunga Energies in the rural area of Rutshuru (see Figure A.1). These additional data will also be used to update the analysis in the research note before publication.

⁵ For more information, see [link withheld to preserve author anonymity].

Figure A.1 Location of Mutwanga, Goma and Rutshuru within North-Kivu



Notes: The panel on the top left shows the map of the DR Congo, with the province of North-Kivu indicated in orange. The Panel on the bottom left shows North-Kivu, with the Virunga national park indicated in green. The map on the right indicates the research areas of Mutwanga, Goma and Rutshuru.

Figure A.2 Research area in Goma



Appendix 2

Table A.1 Self-reported impact of Covid-19 vs EVD in various sub-samples

	obs.	% that indicates effect	
		Covid-19	EVD
<i>Panel A : Households</i>			
decreased revenue in economic activity	456	82%	11%
more difficulties to satisfy food requirements	456	54%	6%
faced a higher incidence of criminality	456	26%	10%
<i>Panel B : SMEs</i>			
decreased revenue in economic activity	144	95%	21%
more difficulties to satisfy food requirements	144	71%	12%
faced a higher incidence of criminality	144	53%	15%
<i>Panel C : connected to Virunga SARL electricity grid</i>			
decreased revenue in economic activity	417	89%	16%
more difficulties to satisfy food requirements	417	56%	9%
faced a higher incidence of criminality	417	33%	12%
<i>Panel D : not connected to Virunga SARL electricity grid</i>			
decreased revenue in economic activity	183	75%	8%
more difficulties to satisfy food requirements	183	63%	4%
faced a higher incidence of criminality	183	31%	9%