

**National COVID-19 Regulations: Impacts on Livestock Vaccinations, Veterinary Services,
and Research Activities in Nepal, Senegal, and Uganda**

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1225 Center Drive Gainesville, FL 32611 United States of America
VVC=Vaccine Value Chains, LVVC=Livestock Vaccine Value Chain, FMD=Foot and Mouth
Disease, CBPP=Contagious Bovine Pleuropneumonia, PPR=Peste des petits ruminants,
DVOs=District Veterinary Officers

Abstract

1 Purpose: The purpose of this paper is to utilize data collected from *Advancing women's*
2 *participation in livestock vaccine value chains in Nepal, Senegal and Uganda (Advance)* during
3 2020-2021 to assess the impacts of COVID-19 safety measures on animal health, including
4 livestock vaccinations, veterinary services, and livestock-related research activities in these
5 countries.

6 Methods: Country coordinators from each of three countries provided weekly reports to Principal
7 Investigators on national COVID-19 regulations, beginning in May 2020. Interviews with
8 country coordinators were conducted during spring 2021 via Zoom to provide additional
9 contextual information regarding the impact of COVID-19 in each country. Information
10 collected during interviews and through weekly reports was analyzed qualitatively to document a
11 historic timeline of COVID-19 policy changes and associated impact on both human and animal
12 health.

13 Results: The main themes that were analyzed in weekly country reports and country coordinator
14 interviews were compliance, politics, access to care, and agriculture. All three countries
15 experienced similar trajectories, with small differences in reporting and spikes for COVID-19
16 cases and a COVID-19 vaccine rollout starting in the spring of 2021.

17 Conclusions: Fluctuations in lockdown policies, employment, and travel restrictions created
18 additional barriers to access of livestock vaccines, animal supplies, and veterinary services in all
19 three countries. Livestock vaccine services were completely halted in some countries because of
20 travel restrictions and disruptions in the supply chain created by the COVID-19 pandemic.
21 Veterinary services were also limited as a result of travel restraints and market closures. Given
22 the global dependence of rural livelihoods on livestock, additional research is needed to examine
23 the near- and long-term impacts of COVID-19 on livestock populations, especially women, and

24 services including livelihoods, gender norms, veterinary services, and livestock-related research
25 activities globally.

26 Keywords

27 Animal health, Veterinary service, Vaccination, COVID-19, Agriculture, One Health

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35 link: [https://www.idrc.ca/en/research-in-action/advancing-womens-participation-livestock-
36 vaccine-value-chains](https://www.idrc.ca/en/research-in-action/advancing-womens-participation-livestock-vaccine-value-chains).

37

38 **Introduction**

39 Global response to the COVID-19 pandemic will likely have long-term impacts on both
40 human and animal health. The pandemic offers a reminder of the importance of infectious
41 disease monitoring and management among both humans and animals as well as the impact of
42 animal health on human health. One Health approaches have been effective in tackling issues
43 surrounding zoonotic disease control, agricultural production, and food security [1]. National
44 policies in response to the COVID-19 pandemic in Nepal, Senegal, and Uganda caused
45 significant barriers for agriculture, veterinary, and research activities.

46 Restrictions on travel and lockdown policies brought many agricultural and economic
47 activities to a standstill with significant impact on local and national food production [2]. The
48 pandemic has exacerbated existing challenges in many developing countries, specifically
49 surrounding agriculture and food security [3, 4, 5, 6]. In our countries of interest, challenges to
50 the animal health sector pre-dated the pandemic. For example, a study conducted by Craighead
51 and colleagues prior to the pandemic found that increased demand for dairy products had created
52 a growing concern among farmers about disease control and delivery of veterinary services for
53 cattle [7]. Lack of funding and access to appropriate inputs were identified as major barriers to
54 livestock care. Similarly, in Nepal, there has been growing demand for animal and dairy products
55 over the past 10 years, which has also led to a greater concern for and interest in monitoring and
56 vaccination for poultry and livestock diseases. Nepal is self-sufficient in producing livestock
57 vaccines; however, limitations on production contribute to inadequate access to livestock
58 vaccines [8]. A 2019 paper identified areas for improvement within the livestock vaccine value
59 chain in Karamoja, Uganda including funding, infrastructure, cold-chain storage, and
60 information scarcity; at that time, only 1 out of 4 districts in Karamoja possessed the equipment

61 needed to store temperature sensitive vaccines [9]. A study analyzing vaccine development in
62 Africa identified barriers to sustainable vaccine manufacturing related to funding and human
63 resources [10]. These limitations, among others, continue to affect the regions being studied and
64 have undoubtedly been exacerbated by the impacts of the COVID-19 pandemic.

65 The COVID-19 pandemic and associated policies enforced during national and regional
66 lockdowns had significant impact on research activities related to allocation of project funds,
67 travel restrictions, and human resources [11, 12]. *Advancing women's participation in livestock*
68 *vaccine value chains in Nepal, Senegal and Uganda (Advance)* like many other ongoing research
69 projects, halted field activities at the end of March 2020 to prioritize COVID-19 mitigation and
70 management. By examining documentation of the national policy changes that took place from
71 April 2020 through April 2021, this paper aims to analyze and compare the impact of COVID-19
72 restrictions on access to livestock vaccinations and veterinary services in Uganda, Senegal, and
73 Nepal and to provide guidance for ongoing adaptation and development of interventions in
74 Nepal, Senegal, and Uganda.

75 **Material and Methods**

76 This study utilizes information collected as the Advance project sought to mitigate, manage,
77 and adapt its field activities to COVID-19. Country coordinators in each research site (Uganda,
78 Senegal, and Nepal) completed and shared weekly country reports on COVID-19, which
79 included impacts on agriculture and veterinary services at both the national and district level as
80 well as planned research activities at Advance project sites starting in May 2020 and continuing
81 through April 2021. A list and map of all Advance project sites can be viewed in Appendix C.
82 For the research presented here, these reports were reviewed as secondary data. Interviews were
83 also conducted with country coordinators in order to understand and to glean their perceptions of

84 the COVID-19-related impact on livestock vaccine value chains (LVVC) in country.
 85 Coordinators were interviewed using an interview guide, presented in Appendix I. Data gathered
 86 through interviews were qualitatively analyzed as primary data, using content and thematic
 87 analysis. These data were then synthesized with the weekly country reports provided by country
 88 coordinators. Patterns and comparison across the three countries were evaluated.

89 This study was approved by University of Florida’s Institutional Review Board, protocol
 90 number IRB201901128.

91 **Results**

92 Table 1 below displays the confirmed cases and deaths, recovered cases, active cases,
 93 incidence rate per 100,000 people and case fatality ratio for each country at a national level. Both
 94 Nepal and Senegal experienced two major spikes in cases in late 2020 and late spring 2021 (see
 95 Tables 3 and 4 below). Nepal suffered the largest number of cumulative cases and deaths among
 96 the three countries during the observational period; however, Senegal had the largest case-
 97 fatality ratio, at 2.75 per 100 confirmed cases. Uganda had one major spike in daily cases in late
 98 2020, peaking at 1,859 cases on December 9th, 2020 (see Table 5).

99
 100 **Table 1**

Country	Date	Confirmed	Deaths	Recovered	Active	Incidence Rate	Case-Fatality Ratio
Nepal	Apr-20	5	0	1	4	NA	NA
	May-20	59	0	16	43	NA	NA
	Jun-20	1,811	8	221	1582	6.22	0.44
	Jul-20	14,046	30	4,656	9360	48.21	0.21
	Aug-20	20,086	56	14,492	5538	68.94	0.28
	Sep-20	40,529	239	22,178	18112	139.10	0.59
	Oct-20	79,728	509	57,389	21830	273.63	0.64
	Nov-20	173,567	960	134,842	37765	595.70	0.55
	Dec-20	233,452	1,529	216,594	15329	801.23	0.65
Jan-21	261,019	1,864	253,107	6048	895.84	0.71	

	Feb-21	271,118	2,029	266,600	2489	930.50	0.75
	Mar-21	274,381	2,778	270,605	998	941.70	1.01
	Apr-21	277,461	3,031	272,851	1579	952.27	1.09
Senegal	Apr-20	190	1	45	144	NA	NA
	May-20	1,024	9	356	659	NA	NA
	Jun-20	3,739	42	1,858	1839	22.33	1.12
	Jul-20	6,925	116	4,545	2264	41.36	1.68
	Aug-20	10,284	209	6,822	3253	61.42	2.03
	Sep-20	13,655	284	9,484	3887	81.55	2.08
	Oct-20	15,019	311	12,538	2170	89.70	2.07
	Nov-20	15,630	325	14,958	347	93.35	2.08
	Dec-20	16,107	333	15,627	147	96.20	2.07
	Jan-21	19,364	410	17,375	1579	115.65	2.12
	Feb-21	26,927	638	22,145	4144	160.82	2.37
	Mar-21	35,037	896	29,620	4521	209.25	2.56
	Apr-21	38,782	1,054	37,434	294	231.62	2.72
Uganda	Apr-20	44	0	0	44	NA	NA
	May-20	85	0	52	33	NA	NA
	Jun-20	457	0	72	385	1.00	0.00
	Jul-20	893	0	837	56	1.95	0.00
	Aug-20	1,176	4	1,045	127	2.57	0.34
	Sep-20	3,037	32	1,489	1,516	6.64	1.05
	Oct-20	8,287	75	4,430	3,782	18.12	0.91
	Nov-20	12,743	112	7,556	5,075	27.86	0.88
	Dec-20	21,035	205	9,044	11,786	45.99	0.97
	Jan-21	35,511	265	11,878	23,368	77.63	0.75
	Feb-21	39,606	325	14,229	25,052	86.59	0.82
	Mar-21	40,408	334	15,049	25,025	88.34	0.83
Apr-21	40,889	335	40,452	102	89.39	0.82	

101 Data Source: Center for Systems Science and Engineering at John Hopkins University
102 * Variations in testing availability, monitoring, and surveillance in each country may contribute
103 to errors in these data or limit comparability across time or space.

104
105
106 Table 2 below displays the thematic analysis of weekly country reports and country
107 coordinator interviews. The main themes that emerged from these data were compliance,
108 politics, access to care, and agriculture. Sub-themes of compliance included travel restrictions,
109 compliance with COVID-19 safety protocols, and public attitudes, specifically towards COVID-

110 19, its relevance, and perceived threat. Based on these data, travel restrictions had significant
111 impacts on research and agricultural activities. While development of COVID-19 safety
112 protocols was similar in all three countries, adherence to these protocols was low.

113 Sub-themes of politics included national elections, law enforcement of lockdown
114 policies, and protests. General elections took place during the study period in both Uganda
115 (January 2021) and Nepal (April 2021). Major political protests took place in Nepal and Uganda
116 in late 2020 and in Senegal in March 2021. Unlike Uganda and Nepal, Senegal saw a drop in
117 COVID-19 cases at the end of 2020 and experienced a spike in the spring of 2021. This could be
118 due, in part, to the political unrest taking place in Senegal during this time.

119 Subthemes of access to care include veterinary services, treatment for COVID-19,
120 capacity within the healthcare sector for both animal and human health, and access to livestock
121 vaccine services. Travel restrictions, supply chain disruptions and market closures had large
122 impacts on access to veterinary services and livestock vaccines. The prioritization of COVID-19
123 treatment had impacts on hospital capacity and access to routine healthcare services.

124 Sub-themes of agriculture include business closures specifically pertaining to local
125 markets, access to animal and farming supplies, and impacts of weather on crop cycles. Market
126 closures impacted both access to care and income for farmers, and disruptions in the supply
127 chain and trade restrictions created shortages in animal supplies. Impacts of natural weather
128 changes were exacerbated by the impacts of COVID-19 safety protocols. For example,
129 monsoons in Nepal caused landslides and road blockages which further restricted movement for
130 veterinary services.

Table 2: Thematic Analysis Based On Country Weekly Reports and Country Coordinator Interviews

Main Themes

Sub Themes

Compliance	Travel restrictions
	Safety protocols
	Perceived threat
Politics	Elections
	Law enforcement
	Protest
Access to Care	Veterinary Services
	COVID-19
	Capacity
	Vaccines
Agriculture	Market closures
	Resources
	Weather impacts

131 A summary of lockdown policies in all countries is provided in appendix B.

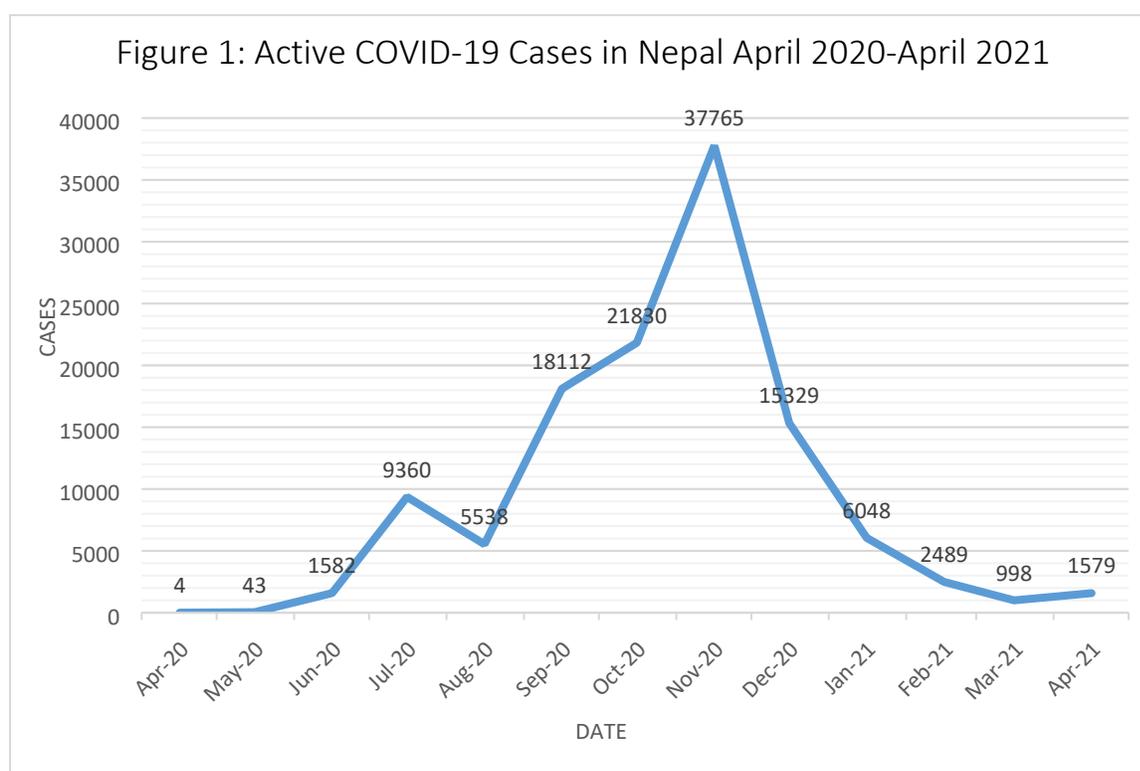
132 Nepal

133 *COVID-19 National Policy*

134 Nationwide lockdown was declared in Nepal on March 24, 2020. All nonessential
135 businesses were closed, including veterinary services, and restrictions on social gatherings and
136 travel were established. For this reason, access to veterinary services was restricted for 2 months
137 until these services were included as essential on May 21, 2020. COVID-19 cases fluctuated
138 throughout the study period as seen in Figure 1 below. The Terai districts of Nepal, which border
139 India, had the highest levels of COVID-19 cases outside of Kathmandu. Importantly, cases in
140 India increased quickly between February and April 2021, which led to the second lockdown in
141 Nepal on April 29, 2021. Though it is outside the scope of our observational time period, cases in
142 Nepal surged again, following India’s surge, beginning in April and peaking in the second week
143 of May, 2021.

144 The first lockdown eased on July 22, 2020, but was reinforced in certain districts as
145 COVID-19 cases increased throughout the fall. Partial or district wide lockdown remained in
146 select areas through the end of August. In an effort to reopen following the lockdown, authority
147 over COVID-19 regulations were passed to individual districts and plans to roll out a national

148 COVID-19 vaccine campaign was established at the start of 2021. Rise in cases through early
149 April 2021, however, led to school closures and restrictions on social gathering of more than 5
150 people in public areas. Regarding travel, the government opened borders for international travel
151 with restrictions in March 2021. At the end of March 2021, the Nepal-India border re-opened
152 with travelers being required to present a negative PCR test upon entry. On April 29, 2021 Nepal
153 authorities introduced the 2nd full lockdown throughout the country.
154



155
156 Data Source: Center for Systems Science and Engineering at John Hopkins
157

158 *Access to Veterinary Services and Livestock Vaccines in Nepal*

159 Several months into country-wide lockdown, disruptions in the supply chain were
160 reported, with negative impact on dairy products, animal feed supplies veterinary medicines, and
161 vaccines. Livestock vaccination campaigns were placed on hold at the end of April 2020 and
162 reopened partially in select districts in June 2020. With fluctuations in COVID-19 cases, the

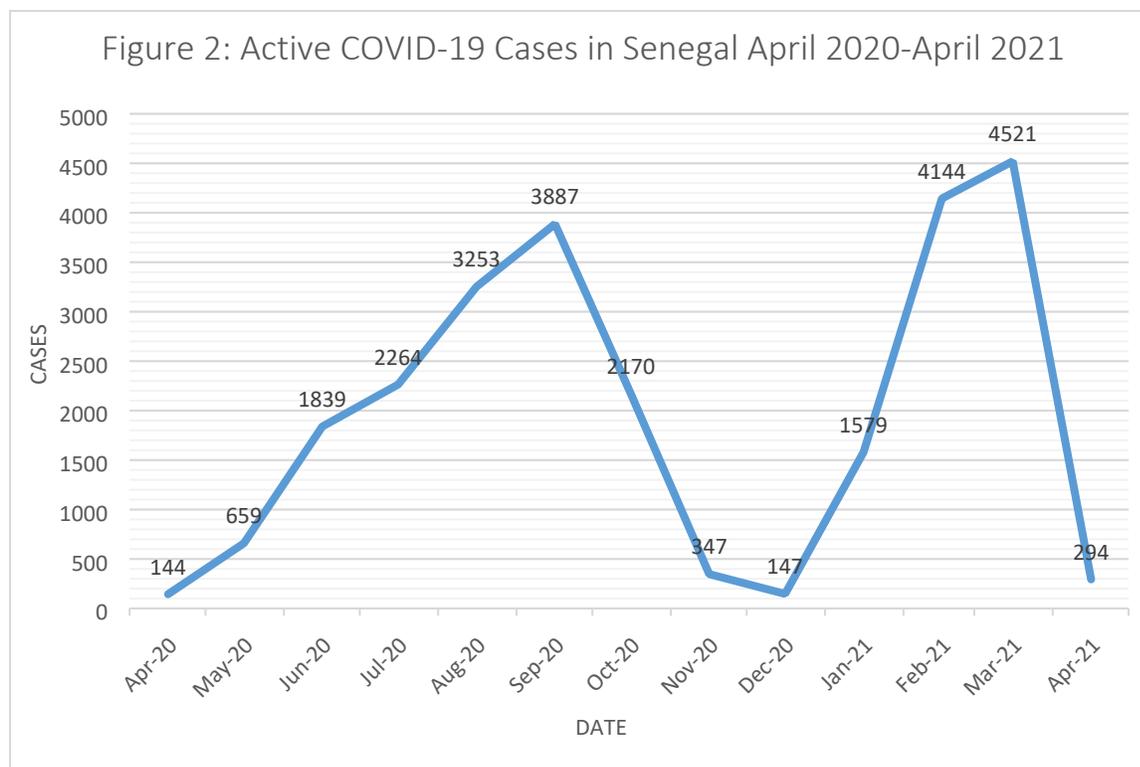
163 Banke district closed its borders indefinitely in August 2020. This impacted inter-district travel
164 and further restricted access to animal services. The restrictions on transportation made it
165 difficult for veterinary technicians to reach certain communities. Easement of lockdown
166 protocols in 2021 allowed routine veterinary services to continue as normal through 2021.

167 Senegal

168 *COVID-19 National Policy*

169 A state of emergency was officially declared in Senegal on March 23, 2020. Lockdown
170 policies were put in place immediately, including restrictions on social gatherings and
171 transportation, a nighttime curfew, shutdown of public spaces (e.g., schools), and prohibition of
172 weekly markets across urban and rural communities. Budget reductions caused by the
173 reallocation of funds towards COVID-19 efforts impacted funding for conferences, mission
174 expenses, transport costs, and equipment. The state of emergency was lifted at the beginning of
175 August 2020, and weekly rural markets reopened to the public at this time. International travel
176 opened at the start of 2021. Mask wearing and social distance protocols remained in place
177 throughout the spring 2021; however, curfews were lifted starting on March 19, 2021. Based on
178 our data, it seems that general adherence to safety protocols was low and lockdown policies were
179 not consistently enforced. Figure 2 below displays the active COVID-19 cases in Senegal from
180 April 2020 through April 2021.

181 Attitudes towards the COVID-19 vaccine were reported as hesitant. This appears to be in
182 part due to information scarcity on the vaccine, as well as fears surrounding the novelty of the
183 vaccine. Senegal received its first batch of vaccines in late February 2021. Vaccines came from
184 Sinopharm, Indian government (CovidShield), and the COVAX initiative (AstraZeneca).



185
186
187
188

Data Source: Center for Systems Science and Engineering at John Hopkins

Access to Veterinary Services and Livestock Vaccines in Senegal

189 The national vaccine campaign for Peste des petits ruminants (PPR) closed on March 31,
190 2020 and remained closed until the end of November 2020. The national vaccination campaigns
191 re-opened in November 2020 and ran until March 2021. Given that a significant proportion of
192 vaccines distributed to livestock keepers come through the national vaccine campaign, this
193 significantly limited access to livestock vaccines for the 8 months the country was under
194 lockdown.

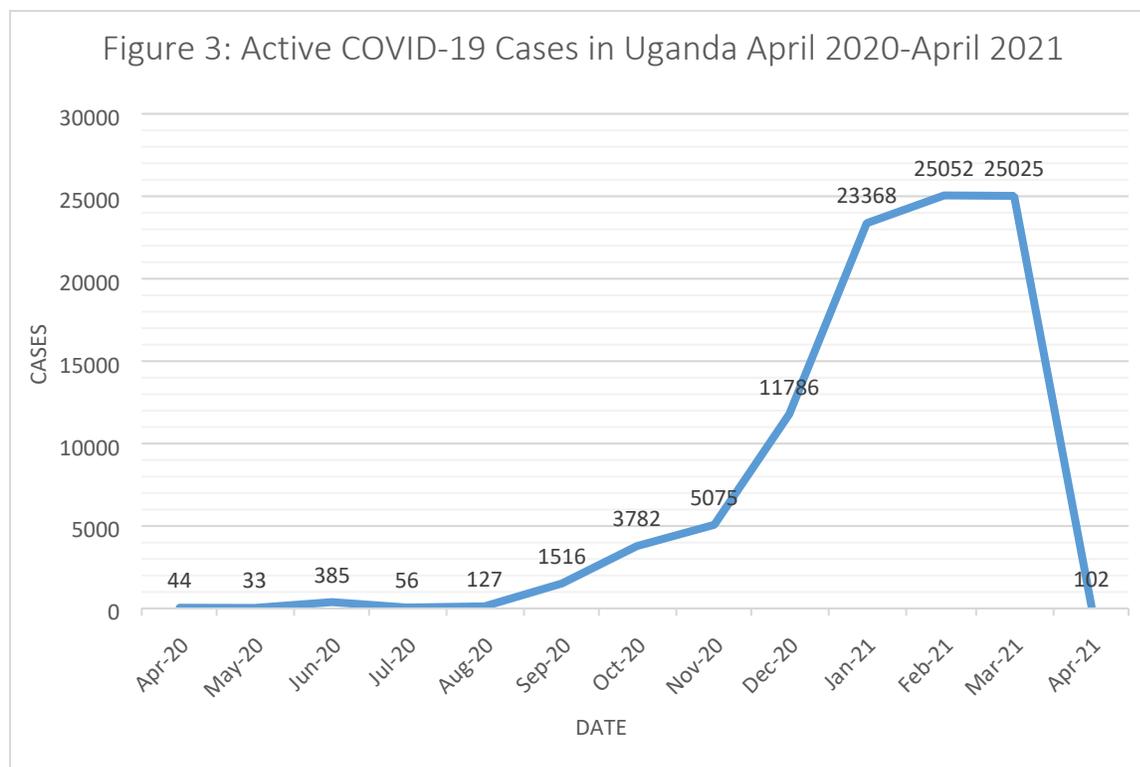
195 Uganda

196 *COVID-19 National Policies*

197 The first positive COVID-19 case in Uganda was reported on March 21, 2020, followed
198 by a countrywide lockdown starting April 1, 2020. Restrictions enforced within lockdown
199 policies included limits on social gatherings, mask wearing, nighttime curfew, and travel

200 restrictions, including restrictions on public transportation, inter-district travel, and shutdown of
201 the international airport in Entebbe. Places of worship, schools, and markets were closed through
202 the end of September 2020. These restrictions were observed to be less heavily enforced in rural
203 areas. Cases continued to rise through the end of the year causing strain on the COVID-19
204 designated hospitals and leading to fluctuations in lockdown policies. Figure 3 below displays
205 the active COVID-19 cases in Uganda from April 2020 through April 2021. Cases appear to be
206 concentrated in population dense regions with high levels of traffic including Kampala, Mukono,
207 Wakiso, and Luwero. While safety measures remained in force throughout spring 2021, it was
208 reported that safety protocols were often ignored by the general public and not heavily enforced
209 by the government.

210 Uganda received its first batch of vaccine doses at the beginning of 2021 and vaccines
211 were administered in stages starting in February 2021. Healthcare workers and essential
212 personnel were prioritized, followed by high-risk populations including senior citizens over the
213 age of 55. Vaccines (Covishield, AstraZeneca/Oxford, Vero-cell) were supplied through several
214 channels, including major investment by the Chinese government and COVAX. Initial uptake of
215 the vaccine was low at 0.61% of the population by the end of April 2021. This was likely due to
216 skepticism surrounding the novelty of the vaccine according to coordinator interviews.



217
 218 Data Source: Center for Systems Science and Engineering at John Hopkins University
 219 **Reporting of COVID-19 cases dropped in April 2021. Testing/reporting is not reflective of*
 220 *actual cases*

221
 222 *Access to Veterinary Services and Livestock Vaccines in Karamoja*

223 Livestock vaccination for foot and mouth disease (FMD), contagious bovine
 224 pleuropneumonia (CBPP), peste des petits ruminants (PPR) and contagious caprine
 225 pleuropneumonia (CCPP) were completed through the end of June 2020 in most project sites,
 226 excluding Amudat. Transportation and funding limitations delayed this process. Starting in July,
 227 vaccination activity was reported to be slowing down, as vaccination supplies were limited,
 228 likely due to lack of logistical support. Routine veterinary services continued through lockdown
 229 and vaccine activity picked up in September 2020, as a rabies vaccine campaign was rolled out
 230 in multiple districts. Vaccination campaigns for FMD, PPR and rabies began in October 2020 in
 231 Amudat. Uptake during this campaign was reported to be low due to the lack of any active
 232 outbreaks in this area during this time frame. FMD vaccines were distributed to different districts

233 in Karamoja at the beginning of January 2021. District Veterinary Officers (DVOs) were able to
234 obtain acaricides and antibiotics at the beginning of 2021 from MAAIF and FAO in preparation
235 to FMD vaccination campaigns, which started in late February 2021.

236 Research implications:

237 In all three countries, travel restrictions enforced as part of lockdown protocols delayed
238 research activities for the Advance project, as international and domestic travel were limited for
239 research staff. Fluctuations in lockdown policies contributed to disruptions in data collection for
240 the Advance project. For example, field work in Nepal was terminated in March and did not
241 resume until August 2020. Similarly, data collection in Uganda was delayed due to COVID-19
242 restrictions, with field activities starting in July 2020 rather than April 2020. In Senegal, data
243 collection was halted halfway through field work, in March 2020, and with did not restart until
244 February of 2021. During the study period, the research team adapted its activities to varied
245 COVID-19 measures by moving meetings and stakeholder engagement to virtual interactions,
246 and data collection to phone interviews.

247 **Discussion**

248 This study has aimed to analyze and compare the impact of COVID-19 policies and
249 safety protocols on access to livestock vaccinations and veterinary services in Nepal, Senegal,
250 and Uganda and to provide guidance for development and implementation of interventions in
251 these countries. Our findings, generated through weekly country reports and interviews with
252 country coordinators from each country, showed parallel experiences in some ways, but unique
253 setbacks and realities that differed across country contexts.

254 In Nepal, local restrictions, border closures and disruptions in the supply chain likely
255 contributed to significant change in access to animal care and vaccines specifically for

256 communities in rural areas. Household income was also reported to have been negatively
257 impacted by lockdown measures. Restrictions on travel created barriers for farmers to transport
258 their products to markets in a timely manner, potentially impacting both income and financial
259 decision making. Closure of the livestock and veterinary services (from national level to rural
260 municipality level) further limited access to veterinary services.

261 In Senegal, prohibition of weekly markets also limited public access to private veterinary
262 services. Veterinarians reported that shipments for supplies were slowed due to COVID-19
263 restrictions. Limited veterinary workers, in addition to decreased surveillance and monitoring of
264 animals, may have negative impacts on animal health and vaccination behaviors. COVID-19
265 restrictions appear to have worsened already existing issues related to animal health and
266 livestock sales in this region. Additionally, fluctuations in employment due to business closures
267 and travel restrictions likely impacted access to consistent and adequate veterinary services. This
268 decrease in income could also impact the demand for animal products and livestock.

269 In Uganda, livestock vaccination efforts continued through the end of the study period;
270 however, restrictions on transportation and travel may have interrupted the vaccine supply chain
271 and/or created additional barriers for livestock keepers seeking access to livestock vaccinations.
272 Similarly, agriculture campaigns and training for community animal health workers were
273 delayed due to challenges presented by the pandemic. Areas such as Tapac Sub-county in
274 Moroto District have reported receiving limited vaccine supplies. These limitations may have
275 been exacerbated by the travel and financial barriers introduced during the pandemic.

276 All three countries followed similar timelines for lockdown procedures and COVID-19
277 vaccine rollout. Early in 2021, the public expressed skepticism concerning the safety and
278 effectiveness of the COVID-19 vaccine. Country coordinators in all countries reported relaxed

279 adherence to COVID-19 restrictions through the end of 2020 and into 2021. Attitudes towards
280 COVID-19 could be reflective of perceived severity and susceptibility to other infectious
281 diseases including livestock diseases. While the nature of the COVID-19 infection, its novelty
282 and vaccine distribution vary significantly from that of livestock infectious diseases, future
283 research should focus on attitudes towards livestock vaccination following the COVID-19
284 pandemic.

285 **Conclusions**

286 Overall, it is clear that the COVID-19 pandemic and associated policy responses from
287 April 2020 through April 2021, though necessary to protect the public and mitigate morbidity
288 and mortality from COVID-19, decreased access to livestock vaccines, veterinary services, and
289 animal supplies in three LMIC, and very likely negatively affected behaviors that foster animal
290 health, as well as household income of farmers. Research studies on animal health in LMIC, such
291 as the Advance project, should consider these impacts and how they may affect interpretation
292 and generalizability of research findings generated in the period following the pandemic. The
293 impact of COVID-19 on animal health including livestock vaccinations, veterinary services, and
294 livestock related research activities will be felt for years, with anticipated consequences on food
295 security and livelihood security, among others. While COVID-19 remains a direct threat to
296 human health, this research illustrates that it may further undermine human health and wellbeing
297 through the negative impact it has on animal health. These findings underscore the need for a
298 One Health approach to understanding all health.

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356 Appendix A: Interview Questions from Country Coordinator Interviews

- 357 1. What sources are being used to determine COVID-19 cases?
- 358 2. Do you feel that the pandemic has had any impacts on perceptions surrounding
359 vaccination in general?
- 360 3. How has animal health been re-prioritized during lockdown?
- 361 4. How has veterinary service utilization been affected as transportation and other social
362 distance policies continue?
- 363 5. Many of the reports indicate that social distance/lockdown measures are not being
364 enforced or followed by citizens. Why do you think this is?
- 365 6. Are there any trends in where COVID-19 cases are coming from? Why do you think
366 these trends exist?

367 Appendix B: Summary of COVID-19 Lockdown Measures During Fall 2020 in Nepal, Senegal
 368 and Uganda

Country	Lockdown Policies
Nepal	<ul style="list-style-type: none"> • Mask wearing and social distancing is required in public spaces. • Closure of non-essential businesses and schools starting in March 2020. • Odd-even system of vehicle rationing scheme in areas with high COVID-19 cases. • Restrictions on travel (limit of 10 people border crossing from India) inter-district travel and air travel (international and domestic). • Curfew restrictions prohibit activity between 9 pm to 5 am in Kathmandu, Lalitpur and Bhaktapur Districts. All passenger vehicles are also banned from entering the Kathmandu Valley from 7 pm to 7 am. • District Administration Office in Kathmandu restrained mobility of people through entry points to the valley and prohibited any assembly, workshop or symposium inside the valley.
Senegal	<ul style="list-style-type: none"> • Mask wearing and social distancing is required in public spaces. • Closure of businesses, schools and places of worship. Mosques and churches reopened as of December 2020. Universities resumed in September 2020. • Restrictions on travel. The Blaise Diagne International Airport (AIBD): resumed working on 15th of July 2020.

	<ul style="list-style-type: none">• The European Union (Schengen Area) banned all movement from Senegal.• Restrictions on gathering for body removal (deaths) and baptisms within the hospital grounds.• Limited capacity of vehicles. The government has lifted restrictions on public transportation in December 2020; however, all passengers must wear masks in vehicles.
Uganda	<ul style="list-style-type: none">• Mask wearing and social distancing is required in public spaces.• Restrictions on vehicle capacity (boda bodas)• Closure of nonessential businesses including markets and restaurants as well as schools and places of worship.• Social gatherings may not exceed more than 200 people.• Curfew time from 9:00 PM to 5:30 AM.

Appendix C: List of Advance Project Sites

Country	Province/Region	District
Nepal	Bagmati Province	<ul style="list-style-type: none"> • Dhading • Chitwan • Nuwakot
	Gandaki Province	<ul style="list-style-type: none"> • Tanahun • Kaski
	Lumbini Province	<ul style="list-style-type: none"> • Palpa
Senegal	Kaffrine	
Uganda	Karamoja	<ul style="list-style-type: none"> • Moroto • Kotido • Abim • Amudat

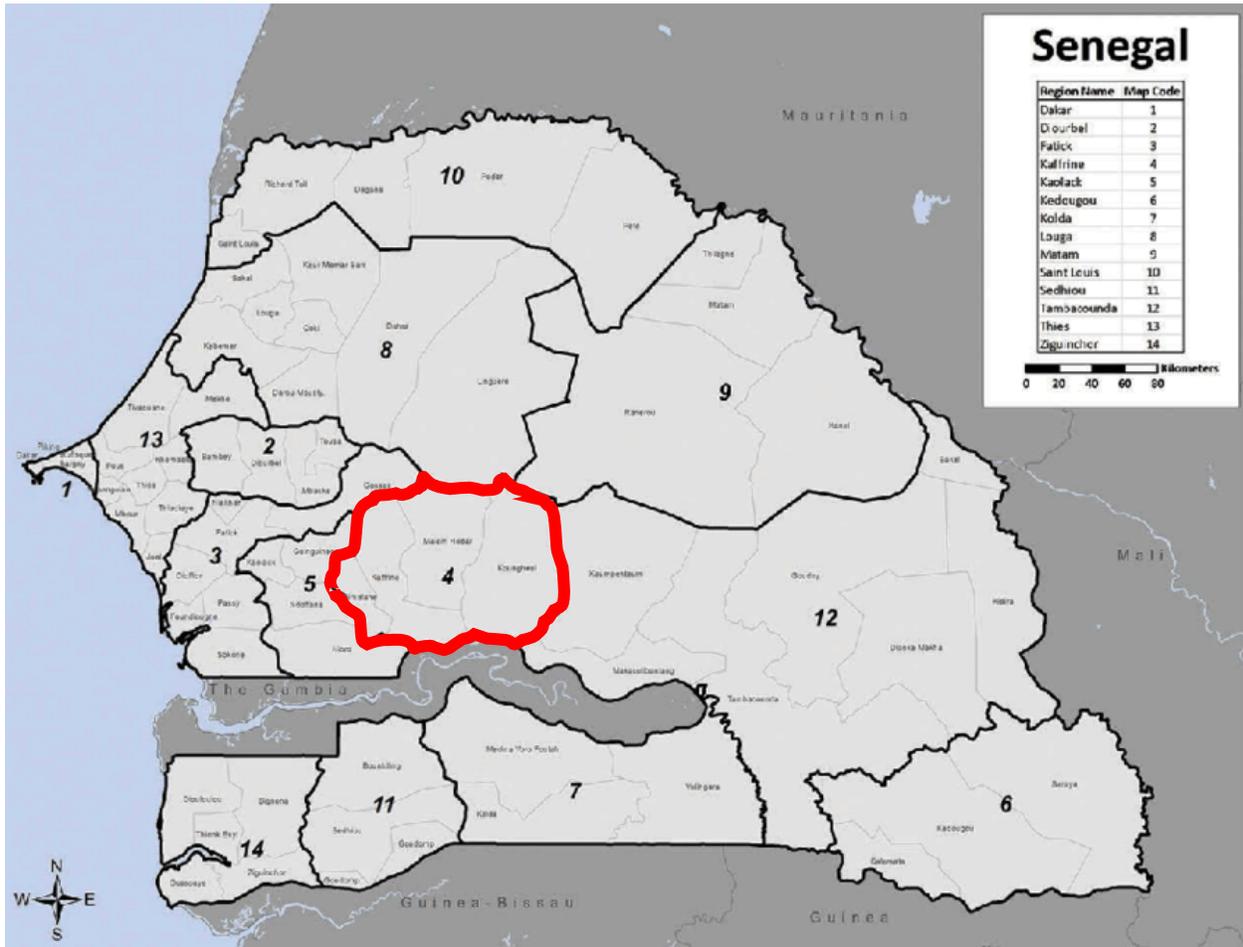
370 Map of Nepal Project Sites



371

372 Map highlighting project sites in Nepal [13]

373 Map of Senegal Project Sites



374
375 Map highlighting Kaffrine project sites in Senegal [14].

376 Map of Uganda Project Sites



377

378 Map highlighting Karamoja project sites in Uganda [15].