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Population movements from Bunia, Mongbwalu and Rwampara based on privacy-secure analysis of mobile operator data from Vodacom Congo (DRC)

Supporting surveillance and response priorities for the 2026 DRC Ebola Bundibugyo outbreak

Update 4 June 2026

Update: 4 June 2026
Status: Rapid update

1. Executive summary

1.1 Update to executive summary — 4 June

Since the publication of the first version of this report, a number of health zones which then had no confirmed cases, but were listed in the report as at very high risk, now have confirmed cases. This strengthens the argument for prioritising areas high on the list (Table 1 and Annex A) for surveillance activities. Among the top ten recipient health zones, only two have not yet had confirmed cases as of 1 June (Tchomia, ranked 6th, and Drodro, 9th, both in Ituri), and among the top twenty health zones only six have yet to confirm cases.

1.2 Executive summary — 28 May

This report uses anonymised mobile operator data from Vodacom Congo (DRC) to map population movements out of the three health zones — Bunia, Mongbwalu and Rwampara — that are suspected to be at the origin of the 2026 Ebola Bundibugyo outbreak and account for the vast majority of confirmed and suspected cases in DRC. The aim of the study is to identify which areas across the country face the greatest risk of importation and to inform decision making on where surveillance outside the three main affected health zones should be prioritised.

An anonymised study cohort of subscribers present in the three origin health zones during the period 3–23 April 2026 was followed between 24 April and 24 May 2026. Their subsequent movements provide a very recent estimate of how the population in the three main outbreak areas has spread across DRC.

The largest travel flows remain inside Ituri, with the top five recipient health zones being Lita, Nizi, Bambu, Kilo and Nyankunde. Lita alone has received 22% of the studied cohort, orders of magnitude more than other zones in the province. This points to very large differences in importation risk even within Ituri. Outside Ituri, there are clear flows south to Beni, Katwa, Butembo and Oicha in North Kivu (~1%of the cohort), to Watsa in Haut-Uele (0.7%), Makiso Kisangani in Tshopo (0.35%), and smaller but notable flows to Kinshasa (Nsele and Gombe), Sud-Kivu, Maniema, Tanganyika, Mongala, Equateur, Kasaï Central and Kongo Central, as well as along the Congo River corridor and the Kinshasa–Kikwit–Kananga axis.

Mobility patterns align with the observed case distribution: three of the top five recipient zones and eight out of the ten health zones with confirmed cases outside the three main affected health zones fall within the top 30 destinations. Four important exceptions stand out. Lita, the largest recipient, has no confirmed or suspected cases to date. This warrants a review of surveillance quality in this health zone. Bambu, the third largest recipient, has no confirmed case, but does have both suspected cases and suspected deaths. Conversely, confirmed cases in Goma and Miti Murhesa sit well outside the top 30 (ranks 45 and 127 respectively), a reminder that lower-ranked zones cannot be discounted.

We recommend that highly ranked health zones which are not seen as currently affected be given particular attention in surveillance planning. Important caveats apply: mobility is a key but not the sole predictor of spread (contact patterns ultimately determine transmission), and the data reflect Vodacom subscribers only, though Vodacom is the market leader in Ituri. Further analyses covering additional origin areas, individual health-zone breakdowns, and extended time periods are planned.

1.3 Privacy note

The analysis runs on anonymised Call Detail Records (CDR) — metadata records of mobile phone activity that the operator generates automatically for billing — held inside Vodacom Congo's secure environment. No individual-level data leaves Vodacom's premises. All published results are aggregated to health zone level and to cohort percentages. Subscribers are not identified. The cohort is defined only by presence in the three outbreak health zones during 3–23 April 2026; no other personal attributes are used.

2. Population mobility in relation to the outbreak

2.1 Overview

This report provides data on travel patterns out of Bunia, Mongbwalu and Rwampara health zones. These health zones have seen the vast majority of confirmed and suspected cases and therefore currently confer the largest known exportation risk to other health zones. Additional analyses and data releases are planned.

The data is based on anonymised data on the movements of hundreds of thousands of subscribers on the Vodacom Congo (DRC) network in Ituri. Further details on methods and analytical choices are provided in the methods section.

We follow the movements of all anonymised subscribers who were registered at least once in any of the three health zones of Bunia, Mongbwalu and Rwampara during the three weeks immediately preceding the death of the presumed index case on 24 April 2026. We then follow their movements out of the three health zones.

We compute, at successive days from the end of the reference period at 23 April (+1 day, +7 days, etc.), how many cohort members have been observed in each health zone, capturing the progressive spread of the study cohort day by day (Fig. 1 and Table 1). Each subscriber is counted in a health zone from the first day they are observed there, regardless of how many times they appear subsequently in that health zone. A subscriber observed in multiple health zones is counted in each of those health zones.

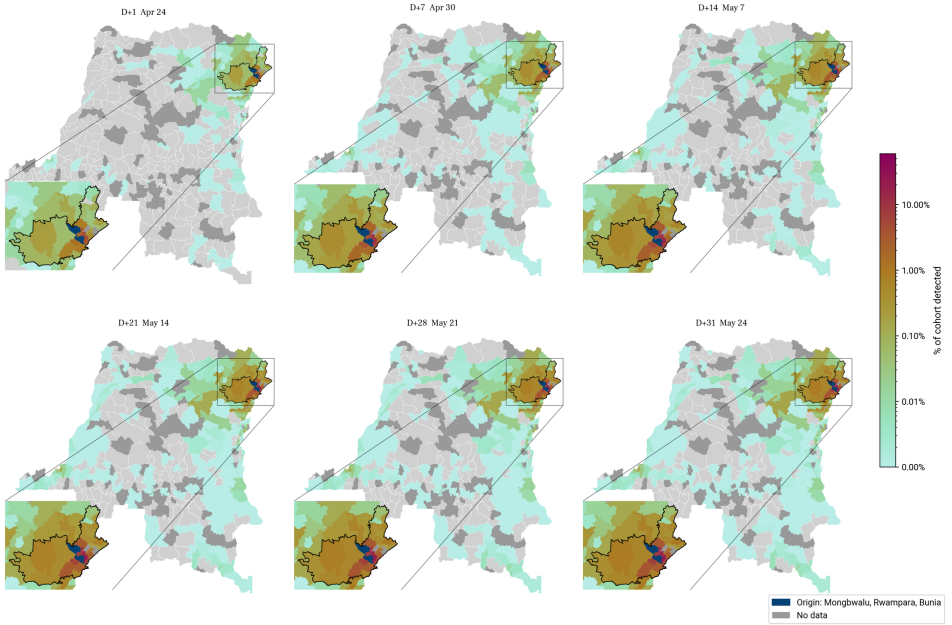

Figure 1. Diffusion of subscribers across DRC from 24 April onwards (among those present in Bunia, Mongbwalu and Rwampara at least once during 3–23 April). Each panel shows the percentage of the subscriber group detected at least once in each health zone by that day (colour log scale; darker shades indicate a higher proportion). Health zones with no recorded travellers are light grey. Health zones excluded for data quality reasons are dark grey. See the table in Annex B for health zones excluded from the study.

Figure 2 shows the situation at the end of the observation period (24 May). Large travel flows are directed to areas inside and close to Ituri. The 14 largest recipient zones are all within Ituri. The top five recipient health zones are Lita, Nizi, Bambu, Kilo and Nyankunde.

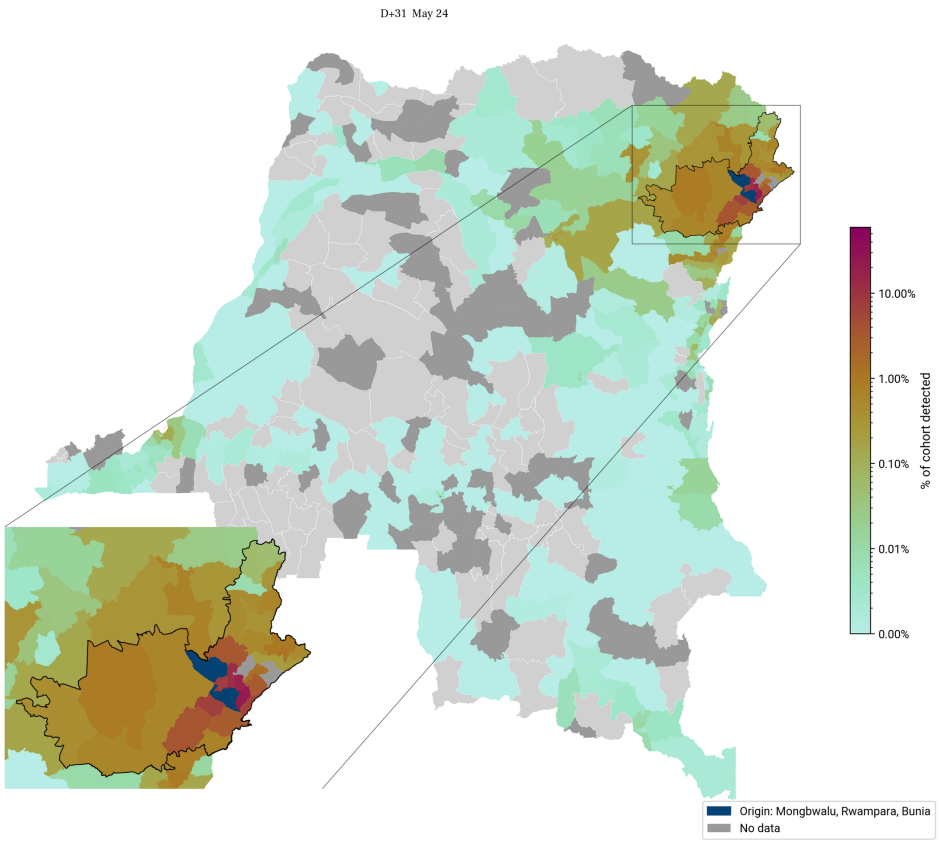

Figure 2. Situation on 24 May. Diffusion of subscribers across DRC from 24 April onwards (among those present in Bunia, Mongbwalu and Rwampara at least once during 3–23 April). The panel shows the percentage of the subscriber group detected at least once in each health zone by 24 May (colour log scale; darker shades indicate a higher proportion). Health zones with no recorded travellers are light grey. Health zones excluded for data quality reasons are dark grey. See the table in Annex B for health zones excluded from the study. This is a larger version of the last map in Figure 1.

There are, however, very large differences in the sizes of flows to different parts of Ituri away from the three main outbreak areas. The largest recipient health zone is Lita, which has seen 22% of all anonymised subscribers studied (Table 1). Other health zones in Ituri, for example Adja and Adi, have seen only a fraction of that flow (less than a hundredth of Lita's flow). This indicates very large differences in risk for new outbreaks across Ituri.

Outside Ituri there are large differences in flows across the country. There is a clear flow of subscribers down towards Beni and Butembo in North Kivu. These health zones have seen approximately 1% of the study group on 24 May. In Haut-Uele, Watsa has received the most travellers (0.7%). In Tshopo, Makiso Kisangani is the top recipient health zone (0.35%). In Kinshasa, Nsele and Gombe have both received 0.13% (ranked 50 and 51 respectively). In Sud-Kivu, Katana is the top recipient, ranking 69 (0.06%). In Maniema, Lubutu ranks 97 (0.02%). In Tanganyika, Nyemba (rank 105, 0.02%) is the top recipient; in Mongala, Yamaluka ranks 124 (0.01%); in Equateur, Mbandaka ranks 137 (0.01%); in Kasaï Central, Lukonga ranks 141 (0.01%); and in Kongo Central, Massa (rank 123, 0.01%) is the top recipient. Several other areas relatively far from the outbreak area have received travellers. These include areas along the Congo River, extending as an arc across the north of DRC, and the east–west travel corridor between Kinshasa, Kikwit and Kananga, south of the central rainforest (Fig. 2).

2.2 Findings

Comparing the travel data with what is known about the distribution of confirmed cases, there is a high concurrence between the mobility data and the case data. Three out of the five top recipient health zones have confirmed cases. Bambu, the third highest ranked in terms of receiving travellers, has both suspected cases and suspected deaths. Eight out of ten health zones with confirmed cases outside the three main outbreak areas are situated within the top 30 health zones in terms of travel from the three main outbreak health zones.

There are noteworthy exceptions to call attention to. Lita has received the most travellers from the outbreak areas but has, as far as we know, no confirmed or suspected cases. This could be because travellers here come from areas with no transmission within the three main outbreak areas. However, responders should review how well surveillance works in the Lita health zone. Bambu ranks third in receiving travellers but has no confirmed case, although it has both suspected cases and suspected deaths. The cases in Goma and Miti Murhesa lie in health zones outside the top 30 ranking (rank 45 and 127 respectively). This is a good

reminder of the randomness and multifactorial nature of infectious disease spread, and that areas outside the top-ranked health zones should also be considered at risk.

We recommend that health zones which are not seen to be affected but rank highly in Table 1 be especially considered regarding surveillance activities.

2.2.1 Update as of 4 June

Since the publication of the first version of this report, a number of health zones which then had no confirmed cases, but were listed in the report as at very high risk, now have confirmed cases. This strengthens the argument for prioritising areas high on the list (Table 1 and Annex A) for surveillance activities. Among the top ten recipient health zones, only two have not yet had confirmed cases as of 1 June (Tchomia, ranked 6th, and Drodro, 9th, both in Ituri), and among the top twenty health zones only six have yet to confirm cases.

2.3 Caveats

Seventy-nine out of five hundred and nineteen health zones are excluded from the study for data quality reasons. See the table in Annex B for a list of these health zones. Please note, as you look at Table 1 and the expanded table in Annex A, that some of these (three) lie in or near Ituri. These health zones should not be forgotten when using our data as a guide for prioritising surveillance activities.

Ebola spreads across the geography through travel. However, contact patterns between infectious and susceptible individuals determine whether new individuals become infected. This means that the movements of people, as estimated in this report, are an important but far from the only predictor of the spatial spread of the epidemic.

While Flowminder's monthly population mobility reports for DRC estimate population movement through integration of survey data to adjust for biases in phone ownership, local market shares and other factors (methods here), these estimates are based only on Vodacom's subscribers. Vodacom is the market leader in Ituri.

Table 1 — Top 30 recipient health zones (full table in Annex A)

Table 1. Proportion of subscribers (out of those seen at least once in Bunia, Mongbwalu or Rwampara during 3–23 April) who were seen in health zones across DRC at different times. Each row is a health zone with at least one recorded cohort member, ranked by the percentage of the cohort detected at the end of the period (24 May). Health zones with no recorded cohort presence are excluded. Rows highlighted in red had at least one confirmed case as of 27 May; rows highlighted in orange received their first confirmed case after the original publication of this report (between 27 May and 1 June).

Rank	Province	Health Zone	30 Apr (D+7)	7 May (D+14)	14 May (D+21)	21 May (D+28)	24 May (D+31)
1	Ituri	Lita	11	15.11	18.21	20.6	21.55
2	Ituri	Nizi	9.97	12.62	14.45	15.83	16.33
3	Ituri	Bambu	6.45	8.39	9.99	11.15	11.98
4	Ituri	Kilo	3.9	5.43	6.37	7.11	7.35
5	Ituri	Nyankunde	3.45	4.89	5.8	6.48	6.8
6	Ituri	Tchomia	4.57	5.38	5.89	6.39	6.55
7	Ituri	Komanda	1.76	2.55	3.03	3.46	3.64
8	Ituri	Damas	1.87	2.6	2.91	3.2	3.32
9	Ituri	Drodro	1.32	1.97	2.4	2.76	2.89
10	Ituri	Gety	1.61	2.18	2.45	2.69	2.77
11	Ituri	Fataki	0.51	0.82	1.06	1.27	1.35
12	Ituri	Logo	0.48	0.71	0.92	1.1	1.17
13	Ituri	Rimba	0.36	0.58	0.77	0.93	1
14	Ituri	Mahagi	0.46	0.63	0.79	0.92	0.97
15	Nord-Kivu	Beni	0.34	0.53	0.71	0.89	0.96
16	Nord-Kivu	Katwa	0.41	0.57	0.73	0.89	0.96
17	Ituri	Mambasa	0.44	0.58	0.69	0.81	0.86
18	Nord-Kivu	Butembo	0.35	0.5	0.64	0.79	0.84
19	Nord-Kivu	Oicha	0.25	0.43	0.58	0.74	0.8
20	Haut-Uele	Watsa	0.27	0.4	0.49	0.62	0.67
21	Ituri	Boga	0.22	0.54	0.59	0.64	0.66
22	Ituri	Aru	0.24	0.37	0.48	0.58	0.61
23	Ituri	Mandima	0.25	0.37	0.45	0.56	0.6
24	Ituri	Lolwa	0.23	0.36	0.46	0.55	0.59
25	Nord-Kivu	Kalunguta	0.15	0.28	0.38	0.51	0.55
26	Ituri	Kambala	0.15	0.26	0.38	0.48	0.53
27	Ituri	Nyarambe	0.21	0.3	0.38	0.46	0.49
28	Ituri	Biringi	0.17	0.27	0.36	0.43	0.46
29	Nord-Kivu	Musienene	0.14	0.27	0.34	0.42	0.45
30	Ituri	Nia Nia	0.15	0.25	0.31	0.37	0.42

2.4 Partnership between Vodacom and Flowminder

Since 2018, Vodacom Congo (DRC) and the Flowminder Foundation have been collaborating to put anonymised mobile data at the service of development and humanitarian action in the Democratic Republic of Congo. This partnership combines operator metadata (CDRs) provided by Vodacom Congo with Flowminder's analytical expertise in big data, in strict compliance with subscriber privacy. Together, the two organisations have produced mobility indicators to support the government's response to COVID-19, estimate population displacement following the eruption of Mount Nyiragongo in 2021, and strengthen routine immunisation planning for the Expanded Programme on Immunization (EPI). This collaboration illustrates how the Congolese private sector, national health authorities, and technical partners can combine their strengths to produce timely, evidence-based insights for the benefit of the people of the DRC. The analyses are carried out on de-identified mobile data. No individual-level data leaves Vodacom's secure premises.

2.5 Future analyses

We will provide further analyses of the travel patterns, including additional areas of departure, separate analysis per health zone, and coverage of additional time periods. We welcome requests and discussion with responders to best serve the community.

Data underlying our regular monthly reports across the whole of the DRC are available on HDX here.

2.6 Citation

Please use this citation when referring to this report:

Population movements from Bunia, Mongbwalu and Rwampara based on privacy-secure analysis of mobile operator data from Vodacom Congo. Flowminder. 4 June 2026.

Flowminder's reports are accessible at: https://www.flowminder.org/resources/publications-reports/drc-reports-publications

For enquiries please contact info@flowminder.org.

3. Methods and data

3.1 Input data

The analysis uses three types of daily-level Call Detail Records (CDR) files provided by Vodacom: voice calls, SMS, and mobile data sessions (MDS). CDRs are transactional records generated automatically by a mobile network operator for each communication event — voice call, SMS, or mobile data session — made or received by a subscriber. Each record contains a timestamp, an anonymised subscriber identifier, and the identifier of the cell tower that handled the event, which provides an approximate geographic location. CDRs do not capture the content of communications.

The geographic reference unit throughout is the health zone ("zone de santé"). Data on health zones with confirmed and suspected cases derive from the latest INSP situation reports, retrieved from the DRC Ebola Bundibugyo 2026 Dashboard on 4 June and referring to case data released 1 June.

3.2 Methods for cohort and period selection

3.2.1 Step 1 — Cohort identification

Reference period: 3–23 April 2026 (20 days).

The cohort consists of all subscribers who were active in any of the three origin health zones — Bunia, Mongbwalu or Rwampara — during the three weeks immediately preceding the first death of the outbreak on 24 April 2026. These zones were selected as the presumed geographic source of the outbreak; the reference period was set to capture the general population present in those zones in the weeks before the epidemic became known. A longer period, including March, would have captured travel during a time when there were fewer infectious cases in these areas. A shorter period in April would have provided scope for more randomness in the occurrence of small flows.

For each origin zone, CDR files across all three event types dated within the reference period were scanned, and anonymised subscribers recorded within those zones were tagged. Subscribers observed in a zone — or multiple zones — during the reference period were pooled and deduplicated.

3.2.2 Step 2 — CDR extraction for the analysis period

Analysis period: 24 April – 24 May 2026 (31 days).

All CDR files dated within the analysis period are scanned across all three event types. From each file, only records belonging to cohort members were retained, along with the hashed subscriber identifier, cell tower identifier, and timestamp. This produces a cohort-filtered set of daily CDR files covering the full 31-day analysis window.

More information on the analysis of CDR data can be found at www.flowgeek.org.

3.3 Mobile operator data for prediction of spatial spread of infectious diseases

The first validation study of using mobile operator data for predicting infectious disease outbreaks was provided for the cholera epidemic in Haiti (Bengtsson et al., Sci Rep, 2015). The same results have been shown for multiple agents, e.g. dengue (Wesolowski, PNAS, 2015) and COVID-19 (Chang et al., Nature, 2021).

Annex A — full table

Full table: proportion of subscribers (out of those seen at least once in Bunia, Mongbwalu or Rwampara during 3–23 April) who were seen in health zones across DRC at different times. Each row is a health zone with at least one recorded cohort member, ranked by the percentage of the cohort detected at the end of the period (24 May). Health zones with no recorded cohort presence are excluded. Rows highlighted in red had at least one confirmed case as of 27 May; rows highlighted in orange received their first confirmed case after the original publication of this report (between 27 May and 1 June).

Annex A. All ranked health zones with at least one recorded cohort member.

Rank	Province	Health Zone	30 Apr (D+7)	7 May (D+14)	14 May (D+21)	21 May (D+28)	24 May (D+31)
1	Ituri	Lita	11	15.11	18.21	20.6	21.55
2	Ituri	Nizi	9.97	12.62	14.45	15.83	16.33
3	Ituri	Bambu	6.45	8.39	9.99	11.15	11.98
4	Ituri	Kilo	3.9	5.43	6.37	7.11	7.35
5	Ituri	Nyankunde	3.45	4.89	5.8	6.48	6.8
6	Ituri	Tchomia	4.57	5.38	5.89	6.39	6.55
7	Ituri	Komanda	1.76	2.55	3.03	3.46	3.64
8	Ituri	Damas	1.87	2.6	2.91	3.2	3.32
9	Ituri	Drodro	1.32	1.97	2.4	2.76	2.89
10	Ituri	Gety	1.61	2.18	2.45	2.69	2.77
11	Ituri	Fataki	0.51	0.82	1.06	1.27	1.35
12	Ituri	Logo	0.48	0.71	0.92	1.1	1.17
13	Ituri	Rimba	0.36	0.58	0.77	0.93	1
14	Ituri	Mahagi	0.46	0.63	0.79	0.92	0.97
15	Nord-Kivu	Beni	0.34	0.53	0.71	0.89	0.96
16	Nord-Kivu	Katwa	0.41	0.57	0.73	0.89	0.96
17	Ituri	Mambasa	0.44	0.58	0.69	0.81	0.86
18	Nord-Kivu	Butembo	0.35	0.5	0.64	0.79	0.84
19	Nord-Kivu	Oicha	0.25	0.43	0.58	0.74	0.8
20	Haut-Uele	Watsa	0.27	0.4	0.49	0.62	0.67
21	Ituri	Boga	0.22	0.54	0.59	0.64	0.66
22	Ituri	Aru	0.24	0.37	0.48	0.58	0.61
23	Ituri	Mandima	0.25	0.37	0.45	0.56	0.6
24	Ituri	Lolwa	0.23	0.36	0.46	0.55	0.59
25	Nord-Kivu	Kalunguta	0.15	0.28	0.38	0.51	0.55
26	Ituri	Kambala	0.15	0.26	0.38	0.48	0.53
27	Ituri	Nyarambe	0.21	0.3	0.38	0.46	0.49
28	Ituri	Biringi	0.17	0.27	0.36	0.43	0.46
29	Nord-Kivu	Musienene	0.14	0.27	0.34	0.42	0.45
30	Ituri	Nia Nia	0.15	0.25	0.31	0.37	0.42
31	Tshopo	Makiso Kisangan	0.17	0.24	0.29	0.34	0.35
32	Ituri	Aungba	0.1	0.17	0.25	0.31	0.34
33	Haut-Uele	Isiro	0.09	0.2	0.24	0.29	0.32
34	Ituri	Ariwara	0.13	0.2	0.24	0.3	0.31

Rank	Province	Health Zone	30 Apr (D+7)	7 May (D+14)	14 May (D+21)	21 May (D+28)	24 May (D+31)
35	Haut-Uele	Gombari	0.13	0.2	0.24	0.29	0.31
36	Haut-Uele	Makoro	0.09	0.17	0.23	0.27	0.3
37	Ituri	Angumu	0.13	0.18	0.23	0.26	0.28
38	Nord-Kivu	Kyondo	0.07	0.12	0.17	0.22	0.25
39	Ituri	Rethy	0.09	0.13	0.16	0.21	0.23
40	Tshopo	Kabondo	0.1	0.14	0.18	0.21	0.22
41	Nord-Kivu	Masereka	0.04	0.08	0.11	0.15	0.17
42	Tshopo	Bafwasende	0.05	0.09	0.12	0.15	0.16
43	Tshopo	Wanierukula	0.05	0.09	0.12	0.15	0.16
44	Nord-Kivu	Mutwanga	0.04	0.08	0.11	0.14	0.15
45	Nord-Kivu	Goma	0.06	0.08	0.11	0.13	0.14
46	Nord-Kivu	Mabalako	0.05	0.08	0.1	0.13	0.14
47	Haut-Uele	Wamba	0.05	0.08	0.1	0.13	0.14
48	Haut-Uele	Dungu	0.05	0.08	0.1	0.12	0.14
49	Nord-Kivu	Karisimbi	0.05	0.08	0.1	0.13	0.13
50	Kinshasa	Nsele	0.04	0.08	0.1	0.13	0.13
51	Kinshasa	Gombe	0.07	0.09	0.11	0.12	0.13
52	Nord-Kivu	Nyiragongo	0.04	0.06	0.09	0.11	0.12
53	Tshopo	Tshopo	0.05	0.07	0.09	0.11	0.12
54	Kinshasa	Limete	0.04	0.07	0.08	0.1	0.1
55	Nord-Kivu	Lubero	0.03	0.05	0.07	0.09	0.1
56	Nord-Kivu	Kayna	0.03	0.05	0.07	0.09	0.1
57	Tshopo	Mangobo	0.04	0.06	0.07	0.09	0.09
58	Kinshasa	Lingwala	0.04	0.06	0.07	0.09	0.09
59	Tshopo	Lubunga	0.03	0.05	0.07	0.09	0.09
60	Kinshasa	Binza Ozone	0.05	0.07	0.08	0.09	0.09
61	Kinshasa	Kokolo	0.04	0.06	0.07	0.08	0.09
62	Kinshasa	Kasa Vubu	0.04	0.05	0.07	0.08	0.08
63	Kinshasa	Kinshasa	0.03	0.05	0.07	0.08	0.08
64	Kinshasa	Kalamu 1	0.03	0.05	0.06	0.08	0.08
65	Kinshasa	Kintambo	0.03	0.05	0.06	0.07	0.07
66	Kinshasa	Lemba	0.02	0.04	0.06	0.07	0.07
67	Kinshasa	Masina 1	0.02	0.04	0.05	0.07	0.07
68	Nord-Kivu	Rutshuru	0.01	0.03	0.04	0.06	0.07
69	Sud-Kivu	Katana	0.02	0.03	0.04	0.06	0.06
70	Kinshasa	Bandalungwa	0.02	0.04	0.05	0.06	0.06
71	Ituri	Laybo	0.02	0.03	0.04	0.05	0.06
72	Kinshasa	Masina 2	0.01	0.03	0.04	0.05	0.06
73	Kinshasa	Kikimi	0.01	0.03	0.04	0.05	0.05
74	Kinshasa	Barumbu	0.02	0.03	0.04	0.05	0.05
75	Sud-Kivu	Ibanda	0.02	0.03	0.04	0.05	0.05
76	Kinshasa	Matete	0.02	0.03	0.04	0.05	0.05
77	Ituri	Adi	0.02	0.03	0.03	0.04	0.05

Rank	Province	Health Zone	30 Apr (D+7)	7 May (D+14)	14 May (D+21)	21 May (D+28)	24 May (D+31)
78	Kinshasa	Binza Meteo	0.02	0.03	0.04	0.04	0.05
79	Kinshasa	Ndjili	0.01	0.02	0.03	0.04	0.04
80	Kinshasa	Selembao	0.01	0.03	0.03	0.04	0.04
81	Sud-Kivu	Kadutu	0.01	0.02	0.03	0.04	0.04
82	Kinshasa	Kingabwa	0.01	0.02	0.03	0.04	0.04
83	Kinshasa	Ngiri Ngiri	0.01	0.02	0.03	0.04	0.04
84	Kinshasa	Mont Ngafula 1	0.02	0.03	0.03	0.04	0.04
85	Haut-Uele	Pawa	0.01	0.02	0.03	0.04	0.04
86	Kinshasa	Mont Ngafula 2	0.02	0.02	0.03	0.04	0.04
87	Sud-Kivu	Minova	0	0.01	0.02	0.03	0.04
88	Kinshasa	Police	0.01	0.02	0.02	0.03	0.04
89	Kinshasa	Kingasani	0.01	0.02	0.02	0.03	0.03
90	Sud-Kivu	Bagira	0.01	0.01	0.02	0.03	0.03
91	Haut-Uele	Rungu	0.01	0.02	0.02	0.03	0.03
92	Sud-Kivu	Kabare	0.01	0.01	0.02	0.03	0.03
93	Kinshasa	Maluku 1	0.01	0.01	0.02	0.03	0.03
94	Nord-Kivu	Alimbongo	0.01	0.01	0.02	0.03	0.03
95	Haut-Uele	Faradje	0.01	0.01	0.02	0.02	0.03
96	Nord-Kivu	Walikale	0.01	0.01	0.02	0.02	0.02
97	Maniema	Lubutu	0.01	0.01	0.02	0.02	0.02
98	Haut-Uele	Aba	0.01	0.02	0.02	0.02	0.02
99	Kinshasa	Kalamu 2	0.01	0.01	0.01	0.02	0.02
100	Kinshasa	Makala	0	0.01	0.01	0.02	0.02
101	Haut-Katanga	Lubumbashi	0.01	0.01	0.01	0.02	0.02
102	Bas-Uele	Buta	0.01	0.02	0.02	0.02	0.02
103	Tshopo	Bafwagbogbo	0.01	0.01	0.01	0.02	0.02
104	Tshopo	Banalia	0	0.01	0.01	0.02	0.02
105	Tanganyika	Nyemba	0.01	0.01	0.01	0.02	0.02
106	Haut-Uele	Niangara	0.01	0.01	0.01	0.01	0.02
107	Kinshasa	Ngaba	0	0.01	0.01	0.01	0.01
108	Haut-Katanga	Mumbunda	0	0.01	0.01	0.01	0.01
109	Kinshasa	Bumbu	0	0.01	0.01	0.01	0.01
110	Nord-Kivu	Kamango	0.01	0.01	0.01	0.01	0.01
111	Nord-Kivu	Kirotshe	0	0.01	0.01	0.01	0.01
112	Haut-Katanga	Tshamilemba	0	0.01	0.01	0.01	0.01
113	Kinshasa	Kisenso	0	0.01	0.01	0.01	0.01
114	Maniema	Kindu	0	0.01	0.01	0.01	0.01
115	Sud-Kivu	Uvira	0	0.01	0.01	0.01	0.01
116	Tshopo	Isangi	0	0.01	0.01	0.01	0.01
117	Tanganyika	Kalemie	0	0	0.01	0.01	0.01
118	Nord-Kivu	Manguredjipa	0	0	0.01	0.01	0.01
119	Tshopo	Basoko	0	0	0.01	0.01	0.01
120	Nord-Kivu	Biena	0	0	0.01	0.01	0.01

Rank	Province	Health Zone	30 Apr (D+7)	7 May (D+14)	14 May (D+21)	21 May (D+28)	24 May (D+31)
121	Sud-Kivu	Kalehe	0	0	0	0	0.01
122	Haut-Katanga	Kipushi	0	0	0.01	0.01	0.01
123	Kongo Central	Massa	0	0	0.01	0.01	0.01
124	Mongala	Yamaluka	0	0.01	0.01	0.01	0.01
125	Ituri	Adja	0	0.01	0.01	0.01	0.01
126	Kinshasa	Kimbanseke	0	0	0	0.01	0.01
127	Sud-Kivu	Miti Murhesa	0	0	0.01	0.01	0.01
128	Nord-Kivu	Bambo	0	0	0.01	0.01	0.01
129	Kinshasa	Maluku 2	0	0	0	0.01	0.01
130	Kinshasa	Biyela	0	0	0	0.01	0.01
131	Sud-Kivu	Mwana	0	0	0	0	0.01
132	Tshopo	Bengamisa	0	0	0	0.01	0.01
133	Sud-Kivu	Ruzizi	0	0	0	0	0.01
134	Sud-Kivu	Nyantende	0	0	0	0.01	0.01
135	Bas-Uele	Poko	0	0	0	0.01	0.01
136	Lualaba	Manika	0	0	0	0.01	0.01
137	Equateur	Mbandaka	0	0	0.01	0.01	0.01
138	Sud-Kivu	Walungu	0	0	0	0	0.01
139	Mongala	Lisala	0	0	0	0.01	0.01
140	Kongo Central	Kisantu	0	0	0	0	0.01
141	Kasaï Central	Lukonga	0	0	0	0	0.01

Annex B — excluded health zones

List of DRC health zones not included in the study (79 out of 519 health zones across DRC) due to data quality reasons. These health zones did not simply fail to receive travellers from the three main outbreak health zones; they are fully excluded from the study.

Annex B. Health zones excluded from the study for data quality reasons.

Province	Health Zone
Equateur	Djombo
Equateur	Iboko
Equateur	Ntondo
Haut-Katanga	Kashobwe
Haut-Katanga	Kowe
Haut-Katanga	Mufunga Sampwe
Haut-Lomami	Butumba
Haut-Lomami	Lwamba
Haut-Uele	Doruma
Ituri	Jiba
Ituri	Linga
Ituri	Mangala
Kasaï	Bulape
Kasaï	Kitangwa
Kasaï	Mutena
Kasaï	Ndjoko Mpunda
Kasaï	Nyanga
Kasaï Central	Bilomba
Kasaï Central	Bobozo
Kasaï Central	Bunkonde

Province	Health Zone
Kasaï Central	Dibaya
Kasaï Central	Kalomba
Kasaï Central	Lubondaie
Kasaï Central	Lubunga
Kasaï Central	Masuika
Kasaï Central	Mutoto
Kasaï Central	Ndekesha
Kasaï Central	Tshibala
Kasaï Central	Tshikula
Kasaï Central	Yangala
Kasaï Oriental	Cilundu
Kasaï Oriental	Citenge
Kasaï Oriental	Mpokolo
Kasaï Oriental	Mukumbi
Kongo Central	Kibunzi
Kongo Central	Kimvula
Kongo Central	Kinkonzi
Kongo Central	Luozi
Kongo Central	Mangembo
Kwango	Tembo

Province	Health Zone
Kwilu	Kimputu
Kwilu	Moanza
Kwilu	Mungindu
Lomami	Kalenda
Lomami	Kamiji
Lomami	Lubao
Lomami	Ludimbi Lukula
Lomami	Mulumba
Lomami	NGandajika
Lomami	Tshofa
Lualaba	Kafakumba
Lualaba	Lualaba
Maindombe	Mimia
Maindombe	Pendjwa
Mongala	Bongandanga
Mongala	Bumba
Mongala	Yamongili
Nord-Kivu	Birambizo
Nord-Kivu	Rwanguba
Nord-Kivu	Vuhovi

Province	Health Zone
Nord-Ubangi	Abuzi
Nord-Ubangi	Bili
Nord-Ubangi	Businga
Nord-Ubangi	Wasolo
Sankuru	Omendjadi
Sankuru	Tshudi Loto
Sud-Kivu	Minembwe
Sud-Kivu	Mwenga
Sud-Ubangi	Bominenge
Sud-Ubangi	Mawuya
Sud-Ubangi	Mbaya
Tshopo	Basali
Tshopo	Lowa
Tshopo	Opala
Tshopo	Yakusu
Tshuapa	Bokungu
Tshuapa	Ikela
Tshuapa	Mompono
Tshuapa	Yalifafu

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Romain Goldenberg led and produced the analysis, created the charts and co-authored the report; Linus Bengtsson interpreted the charts and mobility statistics, and authored the report; Daniel Power co-authored the report; Joachim Jellinek and Chris Brooks produced the aggregates derived from pseudonymised call detail records; and Apphia Yuma provided support and oversight for the analysis and the project.

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