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Improved Acute Flaccid Paralysis Surveillance Performance in the Democratic Republic of the Congo, 2010–2012

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Abstract

Background.—The Democratic Republic of the Congo (DRC) began polio eradication activities in 1996. By 2001, DRC was no longer polio endemic. However, wild poliovirus (WPV) transmission was reestablished in 2006 continuing through 2011 (last WPV case onset 20 December 2011), and vaccine-derived poliovirus type 2 (VDPV2) outbreaks occurred during 2004–2012 (last VDPV2 case onset 4 April 2012). Gaps in acute flaccid paralysis (AFP) surveillance have been consistently documented.

Methods.—AFP surveillance indicators were assessed at the national, provincial, and zone de santé (ZS) levels for 2010–2012. A spatiotemporal analysis of compatible, WPV type 1 (WPV1), and VDPV2 cases was performed.

Results.—During 2010–2012, AFP cases were reported from all provinces but not every ZS, particularly in Equateur province and Province Orientale. A spatiotemporal relationship between compatible, WPV1, and VDPV2 cases was noted. Nonpolio AFP rates met objectives at national and provincial levels but were sub-optimal in certain ZS. National and provincial trends in timely stool collection, stool condition, adequate stool, and 60-day follow-up exams improved.

Conclusions.—DRC's AFP surveillance system is functional and improved during 2010–2012. Maintaining improvements and strengthening AFP case detection at the ZS level will provide further support for the apparent interruption of WPV and VDPV2 transmission.

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Keywords

polio eradication; acute flaccid paralysis; surveillance; Democratic Republic of the Congo; Africa; wild poliovirus; vaccine-derived poliovirus

In 1988, the World Health Assembly launched the Global Polio Eradication Initiative (GPEI) [1]. Most countries in the World Health Organization African Region (WHO-AFRO) began polio eradication activities in 1995 [2]. Full implementation of certain elements of the eradication strategy, such as achieving high routine vaccination coverage with at least 3 doses of oral poliovirus vaccine (OPV) in children aged <1 year, National Immunization Days with OPV, and acute flaccid paralysis (AFP) surveillance, did not begin until 1999 or later in the Democratic Republic of the Congo (DRC) because of civil unrest [2–7]. Until 2001, DRC was endemic for wild poliovirus (WPV) transmission, reporting frequent outbreaks, and was considered a reservoir for WPV and an exporter of virus to other countries [3–9]. From 2001 to 2005, no WPV cases were reported in DRC, and the interruption of WPV transmission was assumed [2, 6, 10–18]. However, between 2006 and 2011, outbreaks of WPV type 1 (WPV1) and type 3 (WPV3) were reported in 10 of 11 provinces as a result of importations, ultimately from neighboring Angola [17–28]. Outbreaks of vaccine-derived poliovirus type 2 (VDPV2) were documented during 2004–2012 [20, 21, 28–32]. After epidemic investigation and response, the outbreaks ceased, with the most recent confirmed WPV case reported in Maniema province with an onset of 20 December 2011 and the most recent confirmed VDPV2 case in Katanga province with an onset of 4 April 2012 [31, 33, 34].

Weaknesses in DRC's AFP surveillance have raised concerns about the system's ability to detect all WPV transmission [22, 23, 26, 35–51]. Additionally, analyses of genetic sequences from WPV1 isolates from Burundi (from 2009) and Katanga province, DRC (from 2010), and their comparison to sequences from DRC WPV1 isolates from 2006 to 2008, strongly suggest a period of undetected WPV1 transmission in the east of DRC from approximately mid-2008 to mid-2010 [21–23, 27, 36, 47–49, 51]. Consequently, since 2011 the country has focused on strengthening AFP surveillance at the lowest operational level (ie, the zone de santé [ZS]) [44]. This report presents an analysis of the country's AFP surveillance performance at the national, provincial, and ZS levels for 2010–2012 and outlines measures taken by the Ministry of Public Health (MOH) and its GPEI partners to improve the system's functioning, sensitivity, and quality.

METHODS

Case Classification

All AFP cases reported to the MOH-DRC and WHO-DRC with symptom onset during 1 January 2010–31 December 2012 were reviewed. AFP cases meeting the standard WHO definition of any child <15 years of age with AFP, or any person of any age with clinician-suspected poliomyelitis, as well as the expanded case definition for those ≥15 years of age used in DRC for all persons presenting with sudden and severe difficulty breathing with no prior history of asthma or cardiac disease, were classified according to WHO-AFRO

guidelines [52, 53]. AFP cases were classified (WPV1, VDPV2, compatible, or discarded [discarded cases are non-WPV, non-VDPV, and noncompatible cases and are also referred to as nonpolio AFP, or NP-AFP, cases]) per definitions in the WHO-AFRO guidelines; VDPV2 cases were defined as AFP cases with stool specimens from which Sabin type 2 virus was isolated with >5 nucleotide differences in the VP1 coding region compared to the parent Sabin type 2 vaccine virus strain [32, 53]. No cases of WPV2, WPV3, VDPV1, or VDPV3 were confirmed in DRC during the years reviewed [22–34].

Surveillance Indicators

Performance of AFP surveillance was evaluated by calculation of standard WHO-AFRO AFP surveillance indicators [53]. Indicators were calculated nationally, as well as for the 11 provinces and each ZS, the lowest operational level for AFP surveillance reporting. In 2010 and 2011, DRC had 508 functional ZS and 512 in 2012.

The NP-AFP rate, an indicator of surveillance sensitivity, was calculated as the number of discarded cases reported in individuals aged <15 years per 100 000 population under the age of 15 years (<15 years of age population) using age-group, national, province, ZS, and year-specific population figures obtained from the MOH-DRC and WHO-DRC as projections from the 1984 national census [53]. The annual target for the NP-AFP rate is ≥2 NP-AFP cases <15 years of age per 100 000 <15 years of age population [53]. Assuming that the true NP-AFP rate is 2 cases per 100 000, the probability that no NP-AFP cases would be notified by a given ZS in 2 or 3 years during 2010–2012 was calculated with ZS-specific annual population figures assuming the number of cases follows a Poisson distribution. A probability of ≤0.10 was considered to be an indicator of possible weaknesses in AFP case detection and notification.

Other key AFP surveillance indicators were calculated in terms of the annual percentage of AFP cases fulfilling a given criteria among all AFP cases. These included (1) percentage of AFP cases with 2 stools collected ≤14 days after the date of paralysis onset; (2) percentage of AFP cases with stool that arrived at the national laboratory in “good condition,” defined as arrival with ice or a temperature indicator of <8°C in the shipping container, adequate stool volume of >8 grams, and no evidence of leakage or desiccation; (3) percentage of AFP cases with “adequate stool,” defined as having 2 stools collected ≤14 days of paralysis onset and for which the stool was in good condition; and (4) percentage with a follow-up exam ≥60 days after paralysis onset among those for whom a ≥60-day follow-up exam was indicated (those whose stool was negative for WPV and VDPV and with stool that was not adequate) [53]. A goal of ≥80% for each indicator was defined to achieve surveillance targets [53].

SAS software version 9.3 and Excel version 2010 were used for data analysis. Maps were created using ArcGIS version 10.1.

RESULTS

Nationally in 2010, 2011, and 2012, respectively, 2196, 2273, and 1867 AFP cases were reported from DRC’s 11 provinces combined (Table 1). Most of the 2010 cases were in

children aged <15 years (97%), but lower percentages were reported in children in this age group in 2011 and 2012 (85% and 89%, respectively). Of note, during 2010–2012 a lower percentage of AFP cases in the <15 years of age group occurred in Bandundu, Bas Congo, and Kinshasa compared with other provinces.

The majority of ZS notified at least 1 AFP case (90%, 92%, and 91% in 2010, 2011, and 2012, respectively) in the years under review (Table 1). Equateur and Province Orientale had the lowest percentage of notifying ZS in 2010 at 81% and 78%, respectively; Equateur had a higher percentage of non-notifying ZS with small <15 years of age populations (85% under 50 000) compared to Province Orientale (50% under 50 000) (Table 1). By 2012, Equateur increased its percentage of notifying ZS to 97% compared to Province Orientale, which remained relatively constant at 81%.

Among the non-notifying ZS during 2010–2012, 24 ZS from 6 provinces did not report an AFP case (or consequently a NP-AFP case) during 2 of the 3 years; more than half of these 24 ZS (13/24 [54%]) had <15 years of age populations of <50 000 in 2012 (Table 2). Considering the annual <15 years of age population of each ZS, the probability that no NP-AFP cases would be notified in 2 of the 3 years between 2010 and 2012 if the actual rate was 2 per 100 000 is presented in Table 2. The ZS from Nord Kivu and Sud Kivu, one of the 7 ZS in Equateur and 5 of the 12 ZS from Province Orientale had probabilities of ≤0.10.

Baka ZS (Katanga province) and Doruma ZS (Province Orientale) did not notify an AFP (or NP-AFP) case during any of the 3 years under review; the respective probabilities of this were 0.45 and 0.16 (Table 2).

In 2010, 100 WPV1 cases were reported from 5 provinces, and in 2011, 93 WPV1 cases were reported in 6 provinces. Among these were 5 cases in 2 provinces and 27 cases in 4 provinces of WPV1 in individuals aged ≥15 years in 2010 and 2011, respectively. No WPV cases were reported in 2012 (Table 3 and Figure 1).

Nineteen VDPV2 cases occurred in 4 provinces in 2010 [32]. All VDPV2 cases reported in 2011 and 2012 were from a geographic cluster of 7 ZS in central Katanga province (Table 3 and Figure 1) [31, 32, 34].

A higher number of compatible cases were reported in 2012 (43 cases from 10 provinces) relative to 2010 (24 cases from 6 provinces) and 2011 (37 cases from 10 provinces) (Table 3 and Figure 1). Figure 1 illustrates, by ZS and by 3-month period of paralysis onset in 2010–2012, the occurrence of WPV1, VDPV2, and compatible cases in DRC. In Bas Congo, Katanga, Kinshasa, and Maniema, compatible cases are noted to have occurred in the same geographic areas and simultaneously, or nearly so, with cases of WPV1 and VDPV2. Numerous compatible cases were also documented in provinces with no WPV1 or VDPV2 cases, such as Province Orientale and Sud Kivu in 2011 and 2012.

For all years, the national NP-AFP rate exceeded the annual objective of ≥2 cases of NP-AFP <15 years of age per 100 000 population aged <15 years (Table 4). The rate declined from 5.6 in 2010 to 5.0 in 2011 to 4.3 in 2012. With the exception of Nord Kivu in 2012, in all years, all provinces met the annual objective of ≥2; however, most provinces

experienced a decreasing trend in the rate during 2011 and 2012 compared to 2010. Of note are Bandundu, Kinshasa, and Nord Kivu where 61%, 42%, and 44% of ZS reporting AFP cases, respectively, had rates ≥2 in 2012.

Nationally in 2010–2012, the annual objective of ≥80% of all AFP cases having 2 stools collected ≤14 days after the date of paralysis onset was met for each year. In each of the 3 years, the majority of provinces met the objective, improving from 8 and 7 provinces in 2010 and 2011, respectively, to 10 of 11 provinces in 2012, with Katanga not achieving the objective in any of the 3 years (Table 5).

In all years nationally and in all provinces, with the exception of Bandundu in 2010, the percentage of all AFP cases with stool in good condition surpassed the annual objective of ≥80% and had a trend of annual improvement (Table 5).

From 2010 through 2012 at the national level, there was a gradual increase (from 73% to 83%) in the annual percentage of AFP cases with adequate stool; however, the annual objective of ≥80% was met only in 2012 (Table 5). The number of provinces meeting the objective increased from 2 to 3 and then to 9 in 2010, 2011, and 2012, respectively. Adequacy remained below the annual objective for Bas Congo and Katanga for all years.

The annual percentage of AFP cases receiving a ≥60-day exam among those for whom an exam was indicated increased substantially at the national level from 10% in 2010 to 51% in 2011 to 73% in 2012 (Table 5). By 2012, 5 of 11 provinces achieved the ≥80% objective, whereas in 2010 and 2011 no province had at least 80%.

DISCUSSION

DRC has a functional AFP surveillance system that operates despite challenges such as a large national geographic expanse, zones with chronic insecurity and inaccessibility, and a lack of capacity and infrastructure [1, 22, 47–51]. The system has sustained the capacity to detect WPV and VDPV2 outbreaks in numerous provinces [2–9, 17–32]. It has been continually supported by GPEI technical partners, working at the national, provincial, and ZS levels, which also monitor the system’s functioning and progress via weekly situation reports that present analyses of the country’s AFP surveillance indicators [1, 34, 49].

AFP cases were reported to the system from each of DRC’s 11 provinces in each year during 2010–2012. Nationally, in 2011 and 2012, there were higher percentages of AFP cases ≥15 years of age compared to 2010. Bandundu, Bas Congo, and Kinshasa reported higher percentages of cases in this age group compared to all other provinces in all years under review. These were the same 3 provinces that had the highest numbers of WPV1 cases ≥15 years of age in 2010 and 2011, perhaps leading to a greater vigilance for AFP among older individuals. It is noteworthy that in 2011, in response to the occurrence of WPV1 cases in individuals ≥15 years of age, the MOH-DRC adopted an expanded AFP case definition that refers to AFP surveillance in persons in this older age group; this expanded definition remains as national policy [52].

Nationally, the number of AFP cases declined between 2011 and 2012, and the NP-AFP rate experienced a declining trend through the years under review; however, the annual objective of 2 NP-AFP cases <15 years of age per 100 000 persons aged <15 years was met each year. At the provincial level, excepting Nord Kivu in 2012, all provinces met the NP-AFP rate objective in all years; however, 10 of 11 provinces had lower NP-AFP rates in 2012 compared to 2010. Because it is difficult to know if these results represent normal fluctuations or signs of declining surveillance performance, trends in AFP case notification and NP-AFP rates should be closely monitored [49–51].

With the exception of Maniema, the <15 years of age population in each of DRC's provinces exceeded 1 million in the years under review; thus, an analysis of AFP case notification and of NP-AFP rates at the ZS level is essential for evaluation of surveillance. The overall percentage of ZS notifying at least 1 AFP case per year remained stable at approximately 90% in each of the 3 years under review; however, among the ZS notifying at least 1 AFP case, the percentage of ZS with a NP-AFP rate of ≥2 declined at the national level from 87% in 2010 to 75% in 2012. Declines in this percentage were also noted in all provinces between these years. Thus, although AFP cases are being detected in the majority of ZS, the numbers of cases notified are suboptimal in certain ZS, some having sufficient populations to meet minimum annual surveillance objectives [53].

In Equateur in 2010 and 2011, the majority of ZS that did not notify AFP (or consequently NP-AFP) cases in the year had <15 years of age populations of <50 000. For ZS with small populations, it is not improbable to observe zero NP-AFP cases in a given year; for example, if the true NP-AFP rate is 2 per 100 000 population aged <15 years and the <15 years of age population is 50 000, the probability of zero NP-AFP cases is 0.37 (assuming a Poisson distribution). Six ZS in Equateur did not notify an AFP (or NP-AFP) case in 2010 and in 2011. For all 6, the probability that no NP-AFP cases would be notified during both years was >0.10. Baka ZS (Katanga province) and Doruma ZS (Province Orientale) did not notify an NP-AFP case during any of the 3 years under review; the respective probabilities of this were 0.45 and 0.16. These analyses suggest that, in the aforementioned ZS, small population size might account for the lack of AFP case notification, rather than solely weaknesses in surveillance; however, AFP case detection in these ZS, and others with similar populations, should be monitored closely.

In Province Orientale, 11 ZS did not notify any AFP (or NP-AFP) cases during 2 of the 3 years under review. For 5 of the 11 ZS, the probability of this occurrence was ≤0.10, suggesting that their lack of NP-AFP cases might have been due to surveillance weaknesses rather than small population size. It is of note that 4 of the 5 ZS are geographically clustered around the city of Bunia, a region of Province Orientale that has experienced chronic insecurity. This example emphasizes the importance of improving the detection of NP-AFP cases in ZS where the population is sufficient for at least 1 case annually [49–51].

Over the 3 years under review, improvements occurred in the annual percentages of AFP cases with 2 stools collected ≤14 days after the date of paralysis onset and of AFP cases with stool in good condition, with the latter indicator at ≥93% in all provinces and 99% nationally in 2012. The improvements in the 14-day indicator were not of the same magnitude as that

of stool condition, and in 2012, only 2 of 11 provinces were >90% for the 14-day indicator; because 99% of all AFP cases notified in all years had 2 stools collected (data not shown), it is the inability to collect both stools in ≤14 days after paralysis onset that seems to drive deficiencies in this indicator. Collection of stool after the 14-day window decreases the likelihood that WPV or VDPV is still being excreted if the AFP case is indeed infected [53]. The collection of even 1 of the 2 stools beyond the 14 days automatically categorizes an AFP case as not adequate, necessitating a ≥60-day exam and analysis by the National Polio Expert Committee (NPEC) [53]. Data collected during rapid surveillance field reviews in DRC in 2012 (described in more detail below) indicate that at least some of the delay in the collection of stools occurs because AFP cases often present to the health system late (ie, close to, or more than, 14 days after the onset of paralysis) [45, 46].

The number of compatible cases increased in 2012 relative to 2010 and 2011, which could be a result of the greater percentage of eligible AFP cases having had a ≥60-day exam and analysis by the NPEC. Of interest are the relationships in time and place of the occurrence of compatible cases with outbreaks of WPV 1 in Bas Congo, Katanga, Kinshasa, and Maniema in 2010–2011 and with the VDPV2 outbreak in central Katanga in 2011–2012. Because these compatible cases had stools that were not adequate, their true status with regard to infection with a WPV or a VDPV and the magnitude and duration of the above-mentioned outbreaks can never be known. Such uncertainty can be avoided if DRC continues its improvement in the percentage of AFP cases with adequate stool. There has also been a continuing annual occurrence of compatible cases in Province Orientale and Sud Kivu. In line with recommendations of the GPEI's Independent Monitoring Board, DRC's surveillance system should be improved, to reduce the numbers of compatible cases [54].

Since 2009, when the country was categorized as having reestablished WPV transmission and following the documentation of evidence for undetected WPV transmission in the east, DRC has taken specific steps to strengthen its AFP surveillance [1, 21–23, 27, 44, 55].

In January 2011, DRC and its GPEI partners prepared an emergency action plan that had the goal of interrupting WPV transmission in 2011 [47, 56]. The plan focused on 6 high-priority provinces and proposed activities related to advocacy to the government, implementation of high-quality polio supplementary immunization activities with OPV where indicated, strengthening of supervision and of routine immunization with OPV, and the conduct of desk and field reviews to assess the quality of AFP surveillance.

During 2010–2012, >100 national and international consultants, including those from the Stop Transmission of Polio (STOP) program, were deployed to the ZS and provincial levels for periods of several months to a year for surveillance capacity building, active AFP case search, supportive supervision, and technical assistance with outbreak response [1, 57].

Since 2012, tracking systems have been established for monitoring the conduct of 60-day follow-up exams for AFP cases with stool specimens that were not adequate and for monitoring the shipment of stool specimens from the provinces to the national laboratory in Kinshasa.

The system has benefited from AFP surveillance desk reviews conducted in 2011–2013 at the national level by external GPEI partners [42–44, 47]. During these reviews, AFP surveillance data were reviewed, indicators calculated and evaluated, and recommendations made for system strengthening. In addition, AFP surveillance field reviews were conducted by external and internal GPEI partners in Bandundu, Bas Congo, Equateur, Katanga, Maniema, and Province Orientale in 2012 [45, 46]. The field reviews were conducted in ZS where there had been recent WPV1 cases, where AFP surveillance indicators indicated weaknesses, or where there was a history of nonnotification of AFP cases. The observations made during the field reviews corroborate conclusions drawn from this analysis of national case-based AFP surveillance data. Namely, whereas AFP surveillance indicators, such as NP-AFP rates, at the national and provincial levels might meet standard objectives, the sensitivity of the system at the ZS, particularly the level of detection of AFP cases, their timely presentation to the health system, and the collection of 2 stool specimens ≤14 days after the date of paralysis onset, is suboptimal in certain ZS. During the field reviews, the opportunity was taken to discuss these elements of AFP surveillance with ZS staff.

In 2012 and 2013, >1000 MOH ZS- and provincial-level surveillance officers in DRC's 11 provinces were provided with training on AFP surveillance. In addition to technical material on polioviruses, case definitions, specimen collection, and data analysis, an emphasis was placed on the importance of regular and active AFP case searches and of the full engagement of the private sector, nontraditional health providers, nongovernmental organizations (particularly in areas of civil unrest), and the community in AFP surveillance.

CONCLUSIONS

During 2010–2012, national and provincial trends in timely stool collection, stool condition, adequate stool, and 60-day follow-up exams all showed improvement. Maintaining these improvements and strengthening AFP case detection at the ZS will provide supportive evidence for the apparent interruption of WPV and VDPV2 transmission in DRC [58]. The continued strengthening of AFP surveillance is imperative, and future instances of undetected WPV transmission must be prevented [21–23, 27, 49–51]. New undetected WPV transmission and/or outbreaks would be a setback for a country that has recently made tremendous progress toward implementing polio eradication strategies [41, 50, 51]. In March 2013, DRC was removed from the list of countries with reestablished transmission due to the absence of confirmed WPV cases in 2012 [58]. DRC needs to assure that communities and the private sector are sensitized to and active in AFP surveillance so that all AFP cases are identified and reported to the health system as soon as possible after paralysis onset [54]. Moreover, in areas of insecurity and inaccessibility (chronic and acute), the engagement of local partners and the use of innovative strategies are necessary to assure that surveillance is operational and sensitive in all places at all times. The process of certification of polio eradication will require documentation of surveillance that is adequate for the early detection of transmission. DRC should continue its trend toward reaching this goal.

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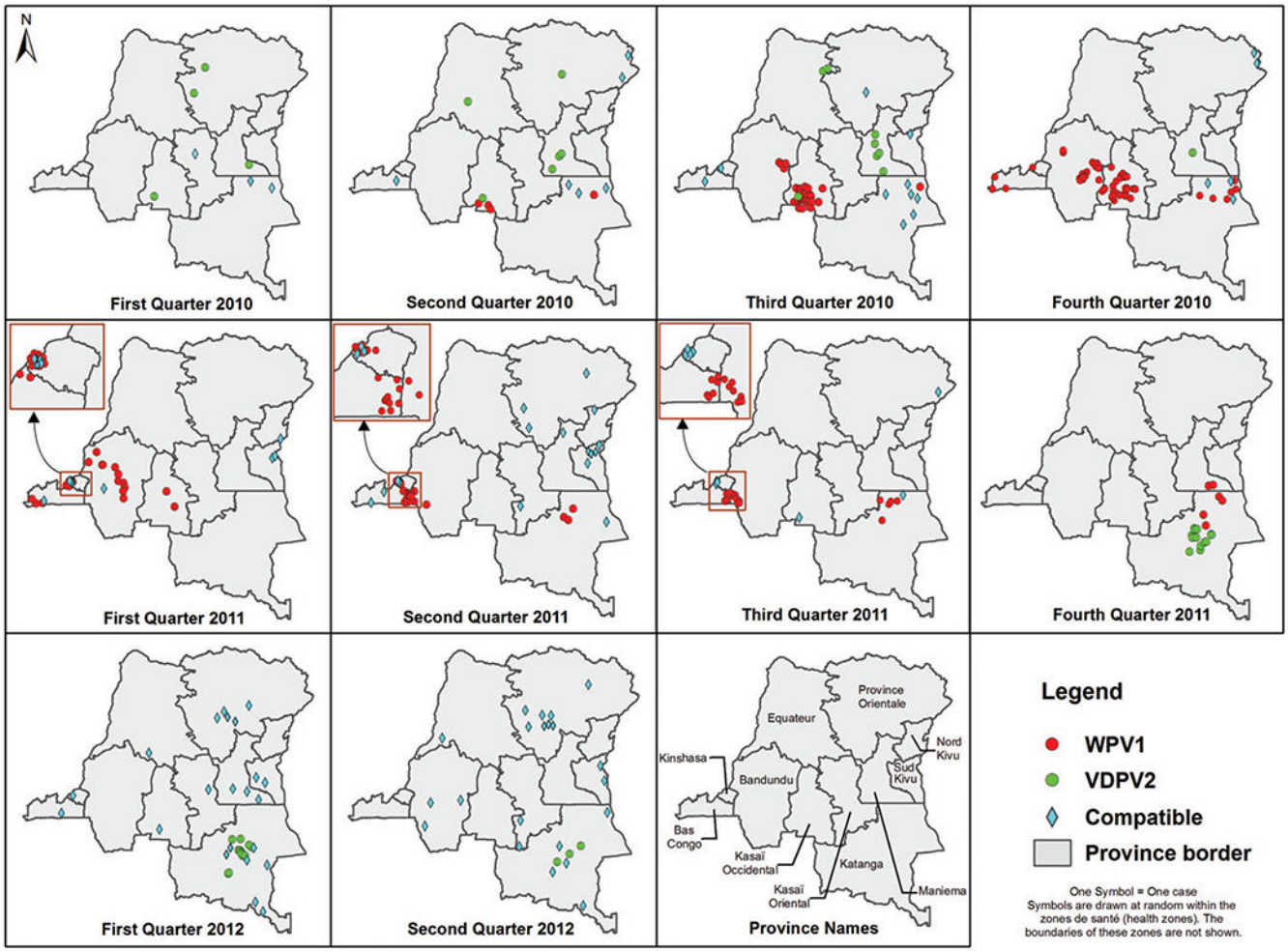

Figure 1.

Wild poliovirus type 1 (WPV1), vaccine-derived poliovirus type 2 (VDPV2), and compatible cases in the Democratic Republic of the Congo, by zone de santé and quarter, 1 January 2010 to 30 June 2012. No WPV1, VDPV2, or compatible cases were notified in 2012 after the second quarter. As a reference, a legend of province names is provided in the map in the third row, third panel to the right.

Table 1.

Description and Notification of Acute Flaccid Paralysis Cases in the Democratic Republic of the Congo, by Province, 2010–2012

	2010					2011					2012				
	AFP Cases		Notification of AFP Cases			AFP Cases		Notification of AFP Cases			AFP Cases		Notification of AFP Cases		
Province	No. AFP Cases	% AFP Cases Aged <15 y	No. ZS in Province	% ZS Notifying ≥1 AFP Case	Among the ZS Notifying 0 AFP Cases, % With <15 y of Age Population of >50 000	No. AFP Cases	% AFP Cases Aged <15 y	No. ZS in Province	% ZS Notifying ≥1 AFP Case	Among the ZS Notifying 0 AFP Cases, % With <15 y of Age Population of >50 000	No. AFP Cases	% AFP Cases Aged <15 y	No. ZS in Province	% ZS Notifying ≥1 AFP Case	Among the ZS Notifying 0 AFP Cases, % With <15 y of Age Population of >50 000
Bandundu	271	87	52	94	33	208	73	52	94	33	167	78	52	89	83
Bas Congo	84	89	31	94	50	139	71	31	97	0	58	83	31	81	33
Equateur	197	97	69	81	15	234	93	69	81	8	312	93	69	97	100
Kasaï Occidental	299	99	44	93	0	163	91	44	98	100	161	89	44	100	N/A
Kasaï Oriental	280	99	51	100	N/A	265	92	51	100	N/A	167	92	51	94	67
Katanga	310	100	67	97	50	347	94	67	91	33	349	89	67	93	20
Kinshasa	137	93	35	91	33	268	52	35	97	0	109	74	35	89	75
Maniema	67	100	18	100	N/A	57	95	18	89	0	57	89	18	100	N/A
Nord Kivu	95	99	24	96	100	92	85	24	96	100	71	94	28	82	40
Province Orientale	301	98	83	78	50	351	94	83	84	39	289	97	83	81	50
Sud Kivu	155	99	34	88	50	149	93	34	97	100	127	91	34	100	N/A
National	2196	97	508	90	37	2273	85	508	92	29	1867	89	512	91	53

Abbreviations: AFP, acute flaccid paralysis; N/A, not applicable; ZS, zone de santé.

Table 2.

Notification of Acute Flaccid Paralysis Cases in the Democratic Republic of the Congo, by Province and Zone de Santé, 2010–2012

		Notification of AFP/NP-AFP Cases 2010–2012						
Province	**Zone de Santé**	**2010 Population Aged <15 y**	**2010**	**2011 Population Aged <15 y**	**2011**	**2012 Population Aged <15 y**	**2012**	**Probability That No NP-AFP Cases Would Be Notified in 2 (or 3*) y, 2010–2012[a]**
Equateur	Bominenge	60 669	—	62 490	X	64 364	—	0.08
	Bomongo	38 121	—	39 265	—	40 443	X	0.21
	Djombo	38 469	—	39 623	—	40 811	X	0.21
	Ingende	13 920	—	14 338	—	14 768	X	0.57
	Irebu	30 767	—	31 690	—	32 641	X	0.29
	Monkoto	47 218	—	48 635	—	50 094	X	0.15
	Ntondo	23 829	—	24 544	—	25 280	X	0.38
Katanga	Baka	12 966	—	13 355	—	13 755	—	0.45*
	Kalamba	38 959	X	40 128	—	41 332	—	0.20
	Kowe	12 011	X	12 372	—	12 743	—	0.61
Kinshasa	Lingwala	34 930	—	35 978	—	37 057	X	0.24
	Maluku II	26 737	—	27 539	X	28 366	—	0.33
Nord Kivu	Lubero	166 007	—	170 987	X	176 117	—	0.001
Province Orientale	Bambu-Mines	66 440	—	68 433	X	70 486	—	0.07
	Boga	27 047	—	27 859	X	28 695	—	0.33
	Damas	48 282	X	49 731	—	51 223	—	0.13
	Doruma	29 222	—	30 099	—	31 002	—	0.16*
	Drodro	69 243	—	71 320	—	73 459	X	0.06
	Gethy	89 895	—	92 592	—	95 370	X	0.03
	Gombari	38 021	—	39 162	X	40 337	—	0.21
	Kilo	26 709	—	27510	—	28 335	X	0.34
	Lolwa	28 324	X	29 174	—	30 049	—	0.31
	Nizi	49 601	—	51 089	X	52 622	—	0.13
	Rimba	96 875	—	99 781	X	102 775	—	0.02

		Notification of AFP/NP-AFP Cases 2010–2012						
Province	**Zone de Santé**	**2010 Population Aged <15 y**	**2010**	**2011 Population Aged <15 y**	**2011**	**2012 Population Aged <15 y**	**2012**	**Probability That No NP-AFP Cases Would Be Notified in 2 (or 3*) y, 2010–2012[a]**
	Yaleko	57 209	—	58 925	X	60 693	—	0.10
Sud Kivu	Mulungu	57 485	—	59 210	—	60 986	X	0.10

X = At least one NP-AFP case was notified. — = No AFP (or consequently NP-AFP) cases were notified. Abbreviations: AFP, acute flaccid paralysis; NP-AFP, nonpolio acute flaccid paralysis.

[a]Assumes a Poisson rate of 2 per 100 000 population aged <15 years.

Table 3.

Classification of Acute Flaccid Paralysis Cases in the Democratic Republic of the Congo, by Province, 2010–2012

	2010						2011						2012					
	WPV1						WPV1						WPV1					
Province	No.	No. Aged ≥15 y	Compatible	VDPV2	Discarded	Total	No.	No. Aged ≥15 y	Compatible	VDPV2	Discarded	Total	No.	No. Aged ≥15 y	Compatible	VDPV2	Discarded	Total
Bandundu	23	4	0	0	248	271	22	5	1	0	185	208	0	N/A	3	0	164	167
Bas Congo	3	0	2	0	79	84	22	4	3	0	114	139	0	N/A	1	0	57	58
Equateur	0	N/A	0	3	194	197	0	N/A	0	0	234	234	0	N/A	2	0	310	312
Kasaï Occidental	65	1	0	3	231	299	2	1	1	0	160	163	0	N/A	1	0	160	161
Kasaï Oriental	0	N/A	1	0	279	280	0	N/A	1	0	264	265	0	N/A	3	0	164	167
Katanga	8	0	14	0	288	310	12	0	2	13	320	347	0	N/A	12	17	320	349
Kinshasa	1	0	1	0	135	137	33	17	15	0	220	268	0	N/A	1	0	108	109
Maniema	0	N/A	0	10	57	67	2	0	1	0	54	57	0	N/A	3	0	54	57
Nord Kivu	0	N/A	0	0	95	95	0	N/A	2	0	90	92	0	N/A	0	0	71	71
Province Orientale	0	N/A	5	3	293	301	0	N/A	4	0	347	351	0	N/A	13	0	276	289
Sud Kivu	0	N/A	1	0	154	155	0	N/A	7	0	142	149	0	N/A	4	0	123	127
National	100	5	24	19	2053	2196	93	27	37	13	2130	2273	0	N/A	43	17	1807	1867

Abbreviations: N/A, not applicable; VDPV2, vaccine-derived poliovirus type 2; WPV1, wild poliovirus type 1.

Table 4.

Nonpolio Acute Flaccid Paralysis Rates in the Democratic Republic of the Congo, by Province, 2010–2012

	2010				2011				2012			
Province	**Population Aged <15 y**	**No. of NP-AFP Cases Notified That Were Aged <15 y**	**NP-AFP Rate (Cases of NP-AFP Aged <15 y/100 000 Population Aged <15 y)**	**Among the ZS Notifying an AFP Case, % With an NP-AFP Rate ≥2**	**Population Aged <15 y**	**No. of NP-AFP Cases Notified That Were Aged <15 y**	**NP-AFP Rate (Cases of NP-AFP Aged <15 y/100 000 Population Aged <15 y)**	**Among the ZS Notifying an AFP Case, % With an NP-AFP Rate ≥2**	**Population Aged <15 y**	**No. of NP-AFP Cases Notified That Were Aged <15 y**	**NP-AFP Rate (Cases of NP-AFP Aged <15 y/100 000 Population Aged <15 y)**	**Among the ZS Notifying an AFP Case, % With an NP-AFP Rate ≥2**
Bandundu	3 542 100	220	6.2	90	3 648 360	134	3.7	71	3 757 815	127	3.4	61
Bas Congo	1 530 537	70	4.6	86	1 576 452	80	5.1	87	1 623 745	48	3.0	80
Equateur	3 961 448	188	4.8	84	4 080 292	217	5.3	71	4 202 693	289	6.9	82
Kasaï Occidental	3 312 540	228	6.9	88	3 411 918	146	4.3	84	3 514 268	143	4.1	82
Kasaï Oriental	4 194 166	277	6.6	94	4 319 990	243	5.6	78	4 449 588	151	3.4	75
Katanga	5 050 964	287	5.7	88	5 202 491	299	5.8	89	5 467 060	283	5.2	86
Kinshasa	3 255 847	125	3.8	63	3 353 523	115	3.4	71	3 454 133	80	2.3	42
Maniema	922 298	57	6.2	89	949 969	52	5.5	94	978 466	48	4.9	83
Nord Kivu	2 917 052	94	3.2	87	3 004 559	76	2.5	70	3 491 097	67	1.9	44
Province Orientale	4 354 976	287	6.6	89	4 485 625	326	7.3	89	4 620 196	267	5.8	84
Sud Kivu	2 243 124	153	6.8	87	2 310 421	132	5.7	82	2 379 734	112	4.7	79
National	35 285 052	1986	5.6	87	36 343 600	1820	5.0	81	37 938 795	1615	4.3	75

Abbreviations: AFP, acute flaccid paralysis; NP-AFP, nonpolio AFP; ZS, zone de santé.

Table 5.

Selected Acute Flaccid Paralysis Surveillance Indicators in the Democratic Republic of the Congo, 2010–2012

	% AFP Cases With 2 Stools Collected ≤14 d After Paralysis Onset (Target ≥80%)			% AFP Cases With Stool Judged in Good Condition* by the National Laboratory (Target ≥80%)			% AFP Cases With Adequate Stool** (Target ≥80%)			% AFP Cases Negative for WPV and VDPV That had Inadequate Stool*** and a Follow-up Exam ≥60 d After Paralysis Onset (Target ≥80%)		
Province	**2010**	**2011**	**2012**	**2010**	**2011**	**2012**	**2010**	**2011**	**2012**	**2010**	**2011**	**2012**
Bandundu	84	82	84	72	89	98	60	72	82	1	21	70
Bas Congo	88	78	83	88	92	93	77	71	78	53	47	85
Equateur	75	79	85	91	98	99	70	78	84	0	62	82
Kasaï Occidental	77	82	92	87	94	98	68	77	90	0	76	69
Kasaï Oriental	88	90	90	94	98	99	83	88	90	6	36	82
Katanga	76	72	76	85	97	99	64	70	76	20	47	73
Kinshasa	81	83	88	97	97	100	79	81	88	10	75	92
Maniema	84	75	81	90	100	100	76	75	81	0	31	100
Nord Kivu	82	86	85	84	88	93	70	78	80	0	35	42
Province Orientale	92	91	86	97	99	99	89	90	85	13	65	63
Sud Kivu	81	82	85	89	96	99	74	79	84	29	50	50
National	82	82	84	88	96	99	73	79	83	10	51	73

*Good condition is defined as the arrival of stool specimens to the national laboratory with ice or a temperature indicator of <8°C in the shipping container, adequate stool volume of >8 grams, and no evidence of leakage or dessication.

**Adequate stool is defined as 2 stools collected ≤14 days of paralysis onset and for which the stool was in good condition upon arrival at the national laboratory.

***Inadequate stool is that which was not adequate.

Abbreviations: AFP, acute flaccid paralysis; VDPV, vaccine-derived poliovirus; WPV, wild poliovirus.