

Poliomyelitis Eradication in Burkina Faso: Progress in Epidemiological Surveillance of Acute Flaccid Paralysis (AFP) and Environmental Surveillance from 2020 to 2024

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Abstract Surveillance for acute flaccid paralysis (AFP) and environmental surveillance is one of the pillars of the polio eradication strategy, particularly in contexts marked by insecurity and the circulation of vaccine-derived polioviruses type 2 (cVDPV2). Through a descriptive and retrospective cross-sectional study, we evaluated the performance of the surveillance system in Burkina Faso between 2020 and 2024, using data from AFP monitoring, active research and environmental monitoring. The indicators were analysed annually and by health district and compared to the standards of the Global Polio Eradication Initiative. A total of 6,243 AFP cases were reviewed; 70.6% were children under five years of age and 58% were boys. Seventy-four cVDPV2 were detected, mainly in 2020. The national rate of non-polio AFP remained above the expected threshold (more than 3 cases per 100,000 children < 15 years), while stool collection adequacy remained generally satisfactory (above 80%). However, several deficiencies remain, including active surveillance visits, contact sample collection, environmental monitoring, and timely delivery of samples to the laboratory. Overall, the system is satisfactory, but its effectiveness would improve in hard-to-reach areas to strengthen early detection and outbreak response.

Keywords Acute Flaccid Paralysis, Burkina Faso, cVDPV2, Environmental Monitoring, Poliomyelitis, Sensitivity, Speed.

Introduction

Despite significant progress since the launch of the Global Polio Eradication Initiative (GPEI), polio remains a persistent threat to international public health [1]. In 1988, the disease still affected about 350,000 children in more than 125 countries, before coordinated vaccination and surveillance efforts led to a reduction of more than 99% in global incidence [2, 3]. Since 2016, only wild poliovirus type 1 has continued to circulate endemically, mainly in Pakistan and Afghanistan, but the emergence of vaccine-derived polioviruses, particularly type 2, has profoundly renewed the challenges of surveillance and response [4] and this since the withdrawal of trivalent and monovalent oral polio vaccine type 2 (Switch) from routine immunization in 2016.

The certification of the WHO African Region as free of wild poliovirus in August 2020 was a historic step forward [5]. However, this certification does not eliminate the risk of poliomyelitis. Outbreaks of cVDPV2, driven by immune gaps, wars and insecurity, population movements and fragile health systems, continue to affect several African countries. The global surveillance network has detected outbreaks of variant polioviruses in 47 countries, with 319 cases of variants reported by the end of 2024 [6].

In this fight for polio eradication, AFP surveillance has a central function. It aims to detect any case compatible with acute flaccid paralysis in children under 15 years of age, or any suspected case of poliomyelitis regardless of age, and then to confirm the etiology virologically by taking stool samples [7]. This surveillance is complemented by environmental surveillance, which identifies the silent circulation of polioviruses in wastewater, even in the absence of clinical cases. The combination of these two approaches increases the sensitivity of the system, shortens the detection time and guides the vaccination decision [8]. The quality of surveillance depends as much on active

detection as on rigorous adherence to standards for sample collection, preservation, transport and analysis [3].

Burkina Faso is located in a regional area exposed to the circulation of variant polioviruses, due to its proximity to several countries that have experienced cVDPV2 outbreaks, including Mali, Niger, Benin and Togo [6]. The low vaccination coverage recorded in some health districts and the inaccessibility of certain parts of the country due to security challenges are all internal weaknesses. Although Burkina Faso was certified free of the autochthonous circulation of wild poliovirus in 2015, it recorded, between 2020 and 2024, seventy-four (74) polioviruses variant type 2, two of which were from environmental monitoring. All thirteen administrative regions reported at least one cVDPV2 during the period [9], reflecting the territorial scale of the risk and the need for highly sensitive surveillance.

The situation in Burkina Faso is also operationally unique. Most cVDPV2 cases were detected in 2020, amid a significant increase in surveillance following the notification of an Indigenous index case linked to transboundary exposure. Technical and operational support, including the recruitment of epidemiological consultants, GPEI coordination and capacity-building of field workers, contributed to increased case reporting [9]. However, the apparent decline in detections after 2021 coincides with the exacerbation of security challenges in several regions [10]. This raises questions about the system's capacity to maintain consistent, sensitive surveillance in hard-to-access health districts.

This article proposes a structured scientific analysis of the performance of PFA monitoring and environmental monitoring in Burkina Faso over the period 2020-2024. He is particularly interested in two dimensions: sensitivity, understood as the ability of the system to detect suspected cases and produce quality samples; and timeliness, defined as the ability to report,

investigate, route samples and obtain results within the timeframes recommended by WHO and GPEI.

Method

Study Setting

The study was conducted in Burkina Faso, a West African country organized, in terms of health, into thirteen (13) regions and seventy (70) health districts. The health district is the operational unit of the health system and the basic level for reporting, investigation, sample collection, supervision and analysis of surveillance indicators. AFP surveillance data are generated by health facilities and community actors, consolidated at the district and regional levels, and then centralized at the national level by the relevant structures of the Ministry of Health, with technical support from WHO through the GPEI [9].

Environmental surveillance of poliomyelitis, which has been in place in the country since 2016, has gradually expanded. It initially had four sites, before being reorganised following external assessments. In 2021, the network was expanded to six functional sites, mainly in Ouagadougou and Bobo-Dioulasso. In 2024, after a new external evaluation, the number of functional sites reached ten (10), including six (06) in Ouagadougou and four (04) in Bobo-Dioulasso [9]. Wastewater samples are sent to a reference laboratory in the Global network (Institut Pasteur de Dakar), while stool samples from AFP cases are sent to the polio reference laboratory in Abidjan (Institut Pasteur de Côte d'Ivoire).

Study Design

This is a descriptive and retrospective cross-sectional study of poliomyelitis surveillance data in Burkina Faso from 2020 to 2024. The retrospective nature of the data is due to the use of secondary data already collected as part of routine surveillance and programmatic response activities. The cross-cutting nature stems from the analysis of the indicators over a

defined period, without direct intervention with the participants. Finally, the descriptive approach aims to document national and sub-national trends in key indicators and then compare them to the GPEI performance standards.

The study does not seek to establish a formal causal relationship between response interventions and indicator trends. Rather, it aims to assess, based on the available data, whether the surveillance system has reached the expected thresholds of sensitivity and speed in the context of cVDPV2 circulation and security challenges.

Study Population and Sampling

The study population includes all children under 15 years of age living in Burkina Faso who developed AFP between 2020 and 2024, according to the operational definition of surveillance. The study also included cases of any age in which a clinician suspected poliomyelitis. Cases were eligible if they were registered in the national AFP surveillance database or if a duly completed investigation sheet was available at the competent national service level.

The second component of the study population consists of wastewater samples collected between 2020 and 2024 at environmental monitoring sites and recorded in the WHO AFRO database. Sampling was exhaustive: all AFP cases reported in the 70 health districts of Burkina Faso during the period, as well as all available environmental samples, were included. This is in order to limit the risk of selection bias and to obtain a representative assessment of the actual functioning of the national poliomyelitis surveillance system.

Data Collection Technique and Method

The data used are mainly from three sources: the national AFP case-by-case surveillance database, the ISS/eSurv database for active surveillance visits to priority sites, and the

environmental surveillance database for polioviruses. The data were extracted in Excel format, then consolidated and analyzed according to GPEI supervisory standards.

For each AFP case, the information analysed included age, sex, health district, date of onset of paralysis, date of notification, date of investigation, date of stool collection, date of sample submission, date of receipt at central level, date of submission of samples to the reference laboratory, the date of receipt at the reference laboratory, the status of the samples upon arrival, the laboratory results and the dates of receipt of the results at the national level. For environmental monitoring, variables included site name, location, date of collection, date of shipment, date of receipt at the laboratory, status of specimens, and virological results, including detection of enteroviruses and VDPVs.

Nominal data were removed prior to analysis. The study is part of a logic of secondary analysis of anonymized and aggregated routine data. It does not involve any intervention with the population. The results are presented in a comprehensive and non-stigmatizing manner, with a view to improving the national surveillance system.

Data Analysis Technique

The databases were pre-processed to correct deficiencies, fill in missing data where possible, and recode variables according to WHO and GPEI operational definitions. Indicators were calculated using pivot tables and descriptive statistical summaries. Results were produced by year, by health district and, for some indicators, by environmental monitoring site.

The main sensitivity indicators analyzed were: the rate of non-polio AFP per 100,000 children under 15 years of age, stool adequacy, proportion of districts meeting standards, frequency of active surveillance visits to priority sites, collection of contact samples of inadequate cases, completeness of follow-up at day 60, detection of non-polio enteroviruses in feces and detection of enteroviruses in wastewater. The main indicators of timeliness were: notification within seven days of onset of paralysis, investigation within 48 hours of notification, delivery of stool samples to the central level within 72 hours and reference laboratory within 7 days, delivery of environmental samples, and receipt of final laboratory results within the recommended timeframe (46 days).

The performance thresholds used correspond to GPEI standards: at least 3 cases of non-polio AFP per 100,000 children under 15 years of age in epidemic or priority countries, at least 80% adequate bowel movements, at least 80% expected visits to priority sites, at least 80% early notification, at least 80% investigation within 48 hours, at least 80% of samples arriving at the laboratory within the required timeframe, and an enterovirus detection rate in line with the recommendations to assess the quality of collection and transport.

Results

General Description of AFP and cVDPV2 Cases

Table 1 shows the evolution and sex distribution of the number of AFP cases by year from 2020 to 2024 in Burkina Faso.

Table 1. Distribution of AFP Cases by Sex and Year in Burkina Faso from 2019 to 2024

Gender	2020	2021	2022	2023	2024	Grand Total	Proportion (%)
F	466	620	516	483	513	2598	42
M	714	780	744	647	760	3646	58
Grand Total	1180	1400	1260	1130	1273	6243	100
Ratio (F/H)	0,7	0,8	0,7	0,7	0,7	0,7	

Source: Burkina Faso Polio Surveillance Database 2020-2024

As shown in Table 1, a total of 6,243 cases of AFP were reported in Burkina Faso between 2020 and 2024, with an irregular annual trend. This uneven evolution suggests a generally active surveillance, but possibly influenced by variations in accessibility, the intensity of active research activities and the dynamics of programmatic support.

AFP cases were predominantly male, with males accounting for 58% of cases compared to 42% for females. The ratio of girls to boys remained stable overall at around 0.7.

Table 2 presents the distribution of AFP cases by age group and year in Burkina Faso

Table 2. Distribution of AFP Cases by Age Group and Year (2020-2024)

Age/Year	2020	2021	2022	2023	2024	Total	%
Less than 1 year old	104	114	82	99	85	484	7,8
1- 4 years old	743	886	816	682	794	3921	62,8
5 - 14 years old	325	389	349	332	385	1780	28,5
Sup 15 years old	8	11	13	17	9	58	0,9
Total	1180	1400	1260	1130	1273	6243	100,0

Source: Burkina Faso Polio Surveillance Database 2020-2024

The age distribution shows a clear predominance of children under five years of age, who accounted for 70.6% of cases. The age group of 1 to 4 years was the most represented

with 62.8% of cases, followed by children aged 5 to 14 years with 28.5%.

Figure 1 shows the distribution of reported cases of variant poliovirus type 2 by year in Burkina Faso from 2020 to 2024.

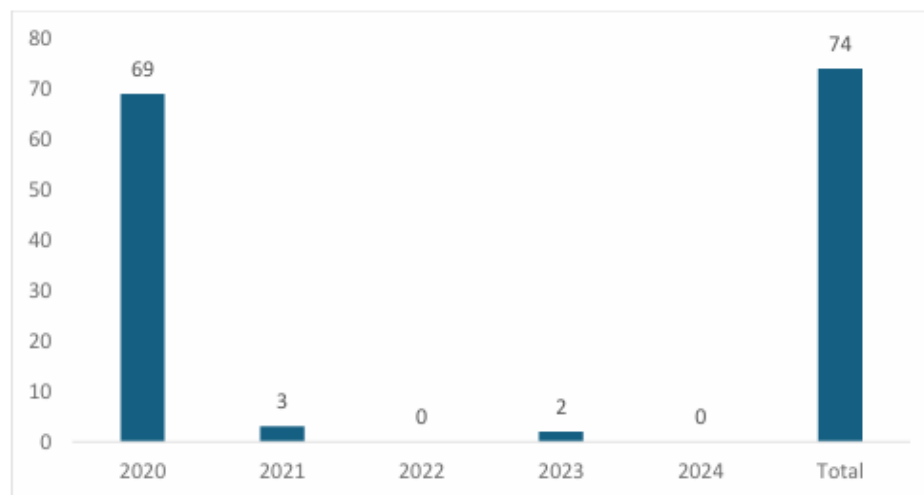


Figure 1. Evolution of the Number of Cases of Poliovirus Derived from Circulating Vaccine Strain Type 2 by Year 2020 to 2024 in Burkina Faso

Source: Burkina Faso Polio Surveillance Database 2020-2024

For cVDPV2, 74 detections were reported during the study period, of which 72 were from AFP cases and 2 from environmental monitoring. The majority of detections were recorded in 2020 with 69 cases, followed by 3

detections in 2021 and 2 detections in 2023. No cVDPV2 was reported in 2022 and 2024. Of the cVDPV2-positive AFP cases, 53% were male and 96% were in children under five years of age, primarily those aged 1 to 4 years.

Sensitivity of Surveillance

The sensitivity of surveillance was assessed through active surveillance visits, non-polio AFP rate, stool adequacy, contact collection, follow-up at day 60, detection of non-polio enteroviruses in stool and detection of enteroviruses in wastewater.

The number of visits to priority active surveillance sites increased substantially between 2020 and 2023, from 1,033 visits in 2020 to 7,074 in 2023, before decreasing to 4,915 in 2024. However, this quantitative improvement did not translate into the 80%

standard of expected visits to high and very high priority sites. No health district has achieved this minimum performance in the 2020-2024 period. The border districts with Mali, Niger and Benin, as well as those in the Centre-North and East regions, were regularly insufficiently covered. This situation reveals a structural fragility of active surveillance in areas of difficult access.

Table 3 presents the evolution of the main indicators that assess the sensitivity of poliomyelitis surveillance in Burkina Faso by year from 2020 to 2024.

Table 3. Evolution of the Polio Surveillance Sensitivity Indicators in Burkina Faso 2020-2024

Indicators	2020	2021	2022	2023	2024	WHO Standard	Assessment
PFA NP rate (per 100000) children under 15 years of age)	10,86	13,39	12,56	10,43	11,46	≥ 3	Very satisfactory at the national level
Proportion of health districts that have achieved the WHO standard (%)	97	99	94	91	96	80%	Very satisfying
Stool adequacy rate (%)	86,02	89,64	88,46	95,31	94,34	≥ 80	Satisfactory, but heterogeneous
Proportion (%) of site visits	3,56	9,14	10,13	14,01	10,84	≥ 80	Insufficient
Collection of stool samples from contacts (%)	53,5	14,9	30,7	24,4	63,0	≥ 80	Insufficient
Follow-up at day 60 (%)	97,5	99,3	87,0	98,2	98,6	≥ 80	Very satisfying
Detection of NPENTs in stool (%)	13	11	12	13	13	≥ 10	Satisfactory
Status of Environmental Samples on Arrival at the Laboratory (%)	92,31	96,49	97,66	99,22	99,47	$\geq 80\%$	Very satisfying
Enterovirus in Environmental Monitoring	15,38	24,56	37,50	16,41	40,64	≥ 50	Insufficient, despite an improvement in 2024

Source: AFP monitoring databases, Environmental Monitoring and Integrated Supervision, Burkina Faso_2020-2024

The rate of non-polio AFP per 100,000 children under 15 years of age remained generally satisfactory, ranging from 10.43 to 13.39, as shown in Table 3. At the national level, it was 10.86 in 2020, 13.39 in 2021, 12.56 in 2022, 10.43 in 2023 and 11.46 in 2024 per 100,000 children under 15 years of age, i.e. values consistently above the standard of 3. The proportion of health districts meeting the standard ranged from 91% to 99%. However, 11 health districts, or 16%, had at least one underperformance during the period; Barsalogho, Diapaga and Titao have been underperforming for at least two years. The districts of Dori and Sebba have experienced a continuous decline in performance, which is a warning signal in areas already weakened by insecurity.

Stool adequacy was also satisfactory nationally, at 86.02% in 2020, 89.64% in 2021, 88.46% in 2022, 95.31% in 2023, and 94.34% in 2024. The standard of 80% was exceeded throughout the period. Forty health districts, or 57 per cent, have consistently achieved this minimum performance. However, seven health districts underperformed for more than a year, and three districts (Baskuy in 2020, Titao in 2022, and Diapaga in 2023) underperformed on the two key AFP surveillance indicators, namely non-polio AFP rate and stool adequacy.

The collection of contact samples from inadequate AFP cases remained the main weakness of sensitivity. At the national level, the indicator has evolved irregularly: 53.5% in 2020, 14.9% in 2021, 30.7% in 2022, 24.4% in 2023 and 63.0% in 2024. Even the improvement observed in 2024 remains below the 80% norm. Less than half of the health districts met the minimum threshold for contact collection, with the lowest performance observed in 2021. This inadequacy limits the ability to properly document inadequate cases and to exclude residual viral circulation.

On the other hand, the follow-up of inadequate AFP cases on day 60 showed an overall high performance. The national

proportions were 97.5% in 2020, 99.3% in 2021, 87.0% in 2022, 98.2% in 2023 and 98.6% in 2024. Apart from a relative decline in 2022, the indicator remained well above the 80% threshold. This is an important element of quality, as follow-up on day 60 makes it possible to assess the presence of residual paralysis and to support the final classification of cases.

The national detection rate of non-polio enteroviruses in feces remained satisfactory, ranging from 11% to 13%, with a national average of 12%. This level exceeds the minimum standard of 10% and reflects acceptable collection, storage, and transport quality. However, the sub-national analysis reveals strong disparities. Some districts such as Tougouri, Zabre and Boussouma had high performance, while Toma, Titao and Orodara never met the minimum standard in the five years studied.

Environmental monitoring showed more contrasting performance. Average enterovirus detection rates in wastewater remained low from 2020 to 2023, ranging from 15.38% to 37.50%, before reaching 40.64% in 2024. The proportion of sites reaching the 50% detection threshold was 0% in 2020 and 2021, 40% in 2022, 0% in 2023 and 50% in 2024. Despite an improvement after the 2024 external review and the reorganization of the site network, the national performance remains below the standard requiring 80% of sites to achieve a detection rate of at least 50%.

Speed of Monitoring

Speed was analyzed through the time it takes to notify, investigate, ship stool samples, ship environmental samples, optimize the field, and obtain lab results. This dimension is crucial, as the late detection of a VDPV delays the risk assessment, the reporting of the event and the implementation of the response.

Table 4 below summarizes the indicators used to assess the timeliness of specimen

detection, collection and processing in polio surveillance.

Table 4. Summary of Timeliness Indicators for Polio Surveillance in Burkina Faso, 2020–2024

Indicators	2020	2021	2022	2023	2024	WHO Standard	Assessment
Notification within 7 days	72,1	80,3	83,0	83,8	82,3	≥80	National improvement, persistent disparities
Investigation within 48 hours	96,4	94,9	99,0	97,8	99,3	≥80	Very satisfying
Stool arriving at the laboratory within 7 days of the date of collection of the 2nd stool	10,8	17,4	24,8	23,9	28,2	≥80	Very insufficient
Environmental samples in the laboratory within 7 days	61,54	85,96	88,28	92,97	94,12	≥80	Satisfactory since 2021
VDPV results within 46 days	94,5	99,9	100,0	96,1	54,1	≥80	To be strengthened

Source: PFA and environmental monitoring databases, Burkina Faso, 2020-2024

The proportion of AFP cases reported within seven days of the onset of paralysis improved nationally from 72.1% in 2020 to 80.3% in 2021, 83.0% in 2022, 83.8% in 2023 and 82.3% in 2024. The national threshold of 80% was therefore reached from 2021. However, the analysis by district shows that the country has not reached the standard that 80% of districts should report cases within seven days. The districts of Gaoua, Koupéla and Djibo remained underperforming throughout the period, suggesting the existence of persistent barriers to early notification.

The investigation of cases within 48 hours of notification was very satisfactory. The results show that, from 2020 to 2024, almost all districts reached the minimum required threshold of 80%. This indicator is one of the major strengths of the surveillance system in Burkina Faso. It reflects the ability of surveillance teams to respond promptly once the case is reported, although this performance does not fully compensate for the shortcomings in early reporting in some districts.

The timeliness of stool samples to the reference laboratory remained low. Only 6% of districts achieved the expected performance of 80% of samples arriving at the laboratory within seven days of collecting the second bowel movement in 2023. In the majority of districts, more than three-quarters of the samples did not arrive within the recommended timeframe. This weakness is particularly important in a country that does not have a polio reference laboratory on its territory and depends on international transport to Abidjan.

The analysis of average lead times confirms this logistical vulnerability. On average, 39.7% of stool samples arrived at the central level within 72 hours, with extremes ranging from 0% to 94.1%. Only the districts of Baskuy, Sig-Noghin, Nongr-Massom, Po and Bousé reached the 80% threshold. For arrival at the reference laboratory within seven days, the national average performance was only 20.7%, with extreme values of 3.2% to 62.4%. No health district has reached the minimum required threshold of 80%. This suggests that

the delivery chain between the field, the central level and the international laboratory remains one of the most critical links in the system.

The speed of shipment of environmental samples, on the other hand, has more favorable performance. At the national level, the proportion of wastewater samples arriving at the laboratory within seven days was 61.54% in 2020, 85.96% in 2021, 88.28% in 2022, 92.97% in 2023, and 94.12% in 2024. The Ouagadougou sites generally performed well after 2020, while some sites in Bobo-Dioulasso experienced delays, particularly between 2022 and 2024. Environmental samples arrived in very good condition, with the proportion in good condition ranging from 92.31% in 2020 to 99.47% in 2024.

The timeliness of final results for VDPVs was satisfactory from 2020 to 2023, with a national proportion of AFP/VDPV cases receiving results within 46 days increasing from 95.5% in 2020 to 96.1% in 2023. However, in 2024, only 3% of districts had received their laboratory results on time and 41% had received fewer results within 46 days of the onset of paralysis. This break in performance deserves a specific analysis, as it can compromise the speed of virological detection and the responsiveness of the response.

Discussion

The results show that polio surveillance in Burkina Faso between 2020 and 2024 has satisfactory overall performance, particularly for the key sensitivity indicators of non-polio AFP rate, stool adequacy, and follow-up at day 60. These results suggest that the national system can detect a high number of suspected cases and produce samples of acceptable quality. They confirm the likely impact of capacity building of actors, GPEI support and mobilization of surveillance teams after the emergence of cVDPV2.

The prevalence of AFP cases in boys and children under five years of age is consistent with the epidemiology reported in several

studies in Africa. The high proportion of cVDPV2 cases in children under five years of age is consistent with Namageyo-Funa observations [11], which suggests that young children with insufficient immunity are the group most exposed to circulating poliovirus variants. This distribution reminds us that surveillance cannot be separated from the quality of routine immunization and the coverage of response campaigns.

The peak of cVDPV2 observed in 2020 can be interpreted as the joint result of effective viral circulation and increased system sensitivity after the index case was notified. The decline in detections after 2021 could reflect the effect of vaccine response campaigns implemented in accordance with the GPEI's standard operating procedures [12]. However, this decline should be interpreted with caution, as it coincides with worsening security challenges in several regions, which may reduce access to cases, site supervision, and regular active surveillance.

The rate of non-polio AFP is one of the most robust achievements of the system. National performance, ranging from 10.43 to 13.39 per 100,000 children under 15 years of age, far exceeds the WHO standard. They are higher than those reported in Niger [13] and reflect a strong capacity to detect suspected cases. However, the persistence of underperforming districts such as Barsalogho, Diapaga, Sebba and Titao indicates that the national average masks pockets of fragility. From an eradication perspective, these pockets are critical, as low local sensitivity may be sufficient to allow silent transmission.

The adequacy of stools, which is consistently above the 80% threshold, is a second strength of the surveillance system. It reflects the ability of those in the field to collect samples on time, in sufficient quantities and under acceptable conservation conditions. These results are better than those reported in some studies, notably in the Democratic Republic of Congo [14], and comparable to more successful

African experiments. However, health districts with repeated underperformance require targeted support, as the adequacy of the stool directly conditions the ability to confirm virologically.

The collection of contact samples of inadequate cases remains a major shortcoming. This indicator is essential when samples from the index case do not meet the suitability criteria, as it reduces the risk of uncertain classification and increases the probability of detection of viral circulation. The results observed in Burkina Faso aren't isolated; they're close to those reported in other countries, where the sampling proportions per contact were often below the recommendations [3]. The poor performance observed in 2021 and 2023 suggests organizational, logistical or community difficulties that must be analyzed at the health district level.

The 60th-day follow-up appears very satisfactory. It clearly exceeds the performance reported in Mauritania [15] and remains comparable or higher than those observed in other countries in the subregion. This performance demonstrates a good mechanism for recalling and following up on inadequate cases. It also improves the quality of the final classification of cases, distinguishing between residual paralysis and complete recovery.

Environmental monitoring is an area that needs to be strengthened. Despite an improvement in 2024 following the external review and reorganization of sites, enterovirus detection rates in wastewater remain below WHO standards. These results are close to those reported in Cameroon [16], but lower than the performance observed in Nigeria [17]. The problem does not seem to be only logistical, because the condition of the samples on arrival at the laboratory is very satisfactory. It could be more a matter of the choice of sites, their hydrological representativeness, the density of the population basins covered, the conditions of abstraction and the environmental seasonality.

Regarding speed, the results are mixed. Early notification has improved and investigation within 48 hours is excellent. These two indicators show a good capacity to respond as soon as a case is identified. Investigative performance is comparable to that reported in Mauritania [15] and in Niger [18]. However, health districts such as Djibo, Gaoua and Koupéla remain below the standards for early notification. contexts of insecurity, access disruptions and weak community surveillance hinder the rapid detection of AFP in several African countries [3].

The main weakness of timeliness is the shipment of stool samples to the reference laboratory. The national average of 20.7% for laboratory arrival within seven days is well below the standard of 80%, and no health district meets the expected threshold. This weakness is particularly worrying because Burkina Faso depends on an international reference laboratory. Transport delays reduce the margin available for viral isolation, intratypic differentiation (DIT), sequencing, and rapid notification of the final result. Observations in Niger [19] and in Ghana [20] confirm that logistical delays are a major constraint for virological surveillance.

Conversely, environmental monitoring has relatively strong logistics. Wastewater samples arrive at the laboratory increasingly quickly and almost always in good condition, with proportions in good condition close to 100% at the end of the period. These performances are comparable to those observed in South Africa [21]. They demonstrate that the country has an efficient packaging and transport capacity for environmental samples. The challenge is therefore to translate this logistical strength into better virological sensitivity by optimizing the site network.

The drop observed in 2024 for the receipt of final PVDV results within 46 days is a worrying signal. It may reflect laboratory constraints, sequencing delays, international network overload, or problems with the transmission of

results. As part of the GPEI procedures, an outbreak must be assessed and fully responded to within strict timelines; Any delay in confirmation can therefore affect the speed of the response. A specific analysis of laboratory delays and communication flows between the reference laboratory, the national level and the health districts is needed.

Finally, the lack of a structured surveillance system for VDPVs in individuals with primary immunodeficiency is an emerging gap. According to the WHO, only a few African countries were implementing this specialized surveillance in 2024. However, immunocompromised people can shed vaccine polioviruses for long periods and can serve as a potential reservoir. The gradual integration of this component would strengthen Burkina Faso's capacity to detect silent sources of VDPV at an early stage.

Limitations

This study has some limitations that must be considered in the interpretation of the results. These are:

1. The retrospective nature and the use of secondary data from routine monitoring expose the analysis to problems of completeness, accuracy and consistency of the information recorded.
2. The study is essentially descriptive and does not allow for a rigorous causal relationship between the interventions implemented and the evolution of surveillance performance.
3. Insecurity and difficulties in accessing some localities have likely led to under-detection of cases of acute flaccid paralysis, reduced active surveillance visits, and delays in sample collection and transport. Therefore, the absence of cVDPV2 detection in certain areas or during certain periods of the study does not formally exclude silent viral circulation.

The results suggest the following implications for strengthening future responses to cVDPV2 in Burkina Faso

1. Strengthen community-based surveillance in hard-to-reach areas through the structured involvement of community-based health workers, local leaders, traditional healers, IDP associations, and intermediaries in border areas.
2. Implement strategies tailored to areas with limited access, including remote monitoring, use of community focal points, integrated missions with other health programs, and coordination with humanitarian actors.
3. Give operational priority to districts that have repeatedly underperformed, particularly in regions affected by insecurity and along the borders, through enhanced supervision, community support and corrective plans with deadlines.
4. Make it mandatory and immediately traceable to collect stool from contacts for any case of AFP with inadequate swab, in accordance with national and international procedures.
5. Review the entire delivery chain, from the sampling site to the central level and then to the reference laboratory, in order to precisely identify the points of delay and reduce cumulative delays.
6. Decentralize collection and transit points as much as possible and use a real-time tracking system to know the location, shipping time, receipt time, and status of each sample.
7. Gradually expand environmental monitoring beyond Ouagadougou and Bobo-Dioulasso to high-risk urban or border areas, subject to technical feasibility and expected quality of sampling.
8. Conduct in-depth technical investigations in EM sites with

persistently low enterovirus detection rates to distinguish between sitting selection, sampling method, flow rate, dilution, or seasonality issues.

9. Perform a specific analysis of the performance disruption observed in 2024 to determine whether it is the result of actual delays, overloading of the laboratory network, or insufficient data completeness.
10. Regularly cross-reference surveillance data with routine immunization coverage, SIA results, zero-dose children, population movements, and security data.
11. Prioritize vaccination and active research activities in areas where low surveillance performance and low herd immunity coexist.

Conclusion

The evaluation of AFP and environmental monitoring performance in Burkina Faso from 2020 to 2024 highlights a system that is globally sensitive and responsive but marked by subnational disparities and operational shortcomings. The rates of non-polio AFP, stool adequacy, follow-up to day 60 and rapid investigation demonstrate a real national capacity to detect, investigate and document suspected polio cases. These achievements are likely linked to strengthened surveillance after the emergence of cVDPV2, GPEI support, and the commitment of health system actors.

However, several shortcomings limit the device's optimal performance. Active surveillance in priority sites remains well below standards, particularly in border districts and insecurity-affected areas. Collection of contact samples from inadequate cases remains insufficient. Environmental monitoring, although better organized in 2024, still does not meet the required thresholds for detecting enteroviruses. Finally, delivery of stool samples to the international reference laboratory is a

critical link and likely delays virological confirmation and response.

In light of these results, Burkina Faso should consolidate AFP surveillance achievements while targeting low-performing districts. Priorities include strengthening community-based surveillance, improving access to difficult areas, systematizing contact sampling, optimizing international sample transport, and continuously re-evaluating environmental monitoring sites. The gradual integration of surveillance of VDPVs in immunocompromised individuals would also be a strategic step towards global polio eradication.

Conflicts of Interest

The author declares no conflicts of interest related to this study.

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Authors' Contributions

- ZONGO Inoufou (Z.I.) conceptualized and designed the study. Z.I. and SESSOUMA Abdoulaye (S.A.) cleaned the PFA surveillance database.
- Z.I. and SAWADOGO Siméon (S.S.) contributed to the concept and design of the study.
- Z.I., S.S. and Fla KOUETA (F.K.) developed the conceptual framework and methodology of the study.
- Z.I., S.A. and S.S. contributed to the analysis of the data.
- S.S., F.K., NEYA Christèle, Mâ OUATTARA, HAMA Balkissa Modibo and TOBOE Désiré contributed to the critical reading of the content of the manuscript.
- Z.I. contributed to the interpretation of the results, the writing and revision of the

manuscript, and approved the final version for publication.

Ethical Approval

The study has received approval from the Health Research Ethics Board. Informed consent was obtained from all participants and participant confidentiality was respected throughout the study.

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Data Availability

All databases generated and/or analyzed during this study are available at the level of the Directorate of Prevention through Vaccinations of the Ministry of Health and from the principal investigator and can be obtained in case of reasonable need.

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