

Epidemiological Report

Acute Flaccid Paralysis/Poliomyelitis

Historic series 2010 – 2021

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BRIEF HISTORY

Poliomyelitis, popularly known as infantile paralysis, despite being eradicated in Brazilian territory, remains a current and highly important public health disease, since it still occurs in an endemic or epidemic way in several countries, mainly in Africa and the Middle East.¹ Factors such as the intense mobilization and migration of people from these continents to Brazil and other Latin American countries impose the need for highly sensitive and permanent surveillance to prevent their reintroduction, requiring qualification and awareness of medical professionals for their early identification.

Poliomyelitis is an acute viral infectious disease of extremely variable severity, which may occur as an inapparent infection or present clinical manifestations, often characterized by fever, malaise, headache, gastrointestinal disorders, and neck stiffness, accompanied or not by paralysis, which occurs in about 1% of poliovirus infections. The motor deficit is installed suddenly, and its evolution often does not exceed three days, generally affecting the lower limbs, in an asymmetrical way, and having as main characteristics muscle flaccidity, with preserved sensitivity, and areflexia (absence of reflexes) in the affected segment. Thus, poliomyelitis belongs to a group of diseases and conditions that cause acute flaccid paralysis (AFP).²

Regarding the epidemiological scenario, it is inferred that until the first half of the 1980s, poliomyelitis was of high incidence in Brazil, contributing significantly to the high annual prevalence of physical sequelae observed in this period. In 1980, as a measure to control the disease, the expansion of vaccination coverage was adopted through mass campaigns throughout the national territory, using the oral Sabin vaccine in two annual stages of one day each, in the age group of 0 to 5 years. The decrease in cases was observed as follows: for the country, from 1,280 cases in 1980 to 122 in 1981; and in the state of São Paulo (SSP), from 101 to 7, in the same period.

The last confirmed Brazilian case of poliomyelitis was registered in 1989 in the municipality of Souza, in Paraíba; in São Paulo, the last record had occurred in the previous year (1988) in the city of Teodoro Sampaio. In 1991, Peru was the last nation in the Americas to register cases of the disease. In 1994, the Pan American Health Organization (PAHO) certified the eradication of autochthonous transmission of wild poliovirus in the American continents, after three years without the circulation of this virus. Since then, all countries in the region have committed themselves to maintaining high and homogeneous vaccination coverage, as well as active and sensitive epidemiological surveillance to immediately identify the reintroduction of wild poliovirus in each national territory, adopting control measures capable of preventing its dissemination.

ETIOLOGICAL AGENT

Poliovirus is composed of serotypes 1, 2 and 3 (type 1 or Brunhild, type 2 or Lansing, and type 3 or León) belonging to the *Enterovirus* genus, family *Picornaviridae*. Wild polioviruses of all three serotypes can cause flaccid paralysis, but only serotype 1 (PVS1) is still circulating in two countries around the world that are considered endemic for the disease (Afghanistan and Pakistan). Circulation of wild serotype 2 has not been observed since 1999 and the last record of wild serotype 3 was in Nigeria in November 2012. In addition to wild serotype 1, vaccine-derived poliovirus, in particular serotype 2 (PVDV2), is circulating in several countries, mainly in Africa and the Middle East, causing AFP. Since 2017 there have been more cases of paralysis by PVDV than by the wild virus.

TRANSMISSION MODE

Direct person-to-person contact:

- via the fecal-oral route (most often), through objects, food and water contaminated with feces from patients or carriers; and
- by the oral-oral route, through droplets of secretions from the oropharynx (when talking, coughing, or sneezing).

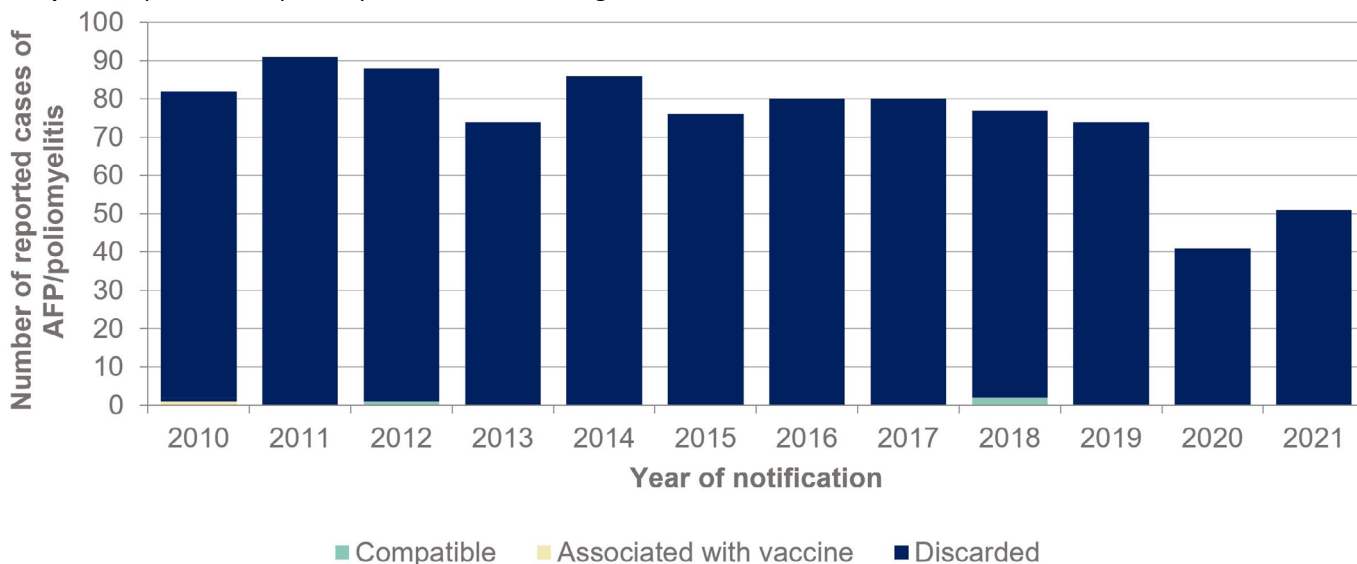
The lack of sanitation, poor housing conditions and poor personal hygiene are factors that favor the transmission of the poliovirus.

EPIDEMIOLOGICAL SITUATION

In the last 12 months, 22 countries reported cases of paralysis from wild and/or vaccine-derived polioviruses, of which two are still considered endemic for wild poliomyelitis: Afghanistan and Pakistan. In 2021, among the disease-free nations for several years, Malawi recorded one case of poliomyelitis by the wild type 1 virus, and Ukraine, two by the vaccine virus type 2. In addition to these, in 2022 events are also occurring in poliomyelitis-free countries, with one case of PVS1 being detected in Mozambique and another of PVDV3 in Israel. Furthermore, there was environmental detection of vaccine-derived poliovirus in the United Kingdom, in London, for four consecutive months, and PVDV2 in the United States. It is worth mentioning that both countries have not used the oral polio vaccine (OPV) since 2000 and 2004, respectively.¹

When observing the distribution of cases in the period, 2011 appears as the year with the highest number of notifications (91). It is noteworthy that throughout the analyzed historical series, there was no confirmation of cases, which allows us to infer that all 900 cases were not confirmed for poliomyelitis. There were, however, three records compatible with poliomyelitis: one in 2012 and two in 2018, in addition to one associated with the vaccine in 2010 (Graph 1).

Graph 1. Reported AFP/poliomyelitis cases according to the closure criteria, SSP, 2010 to 2021.*



Source: DFWD/ESC/DCC/SHD-SP. *Data extracted on June 30, 2022.

It is important to clarify that it is only considered compatible with poliomyelitis any and all cases of AFP that did not have adequate collection of a stool sample and that presented sequelae after 60 days of motor deficit onset, provided that there is a compatible clinical condition (for example, sequelae asymmetric in a lower limb) or examination compatible with poliomyelitis, such as electroneuromyography (ENMG) with lesion of the anterior horn of the spinal cord, in addition to evolution to death or unknown clinical evolution. It is noteworthy that they are only closed as compatible cases after analysis and classification carried out by a technical committee linked to the Ministry of Health.

Vaccine-associated poliomyelitis involves cases of AFP in which there is isolation of vaccine virus in the stool sample(s) and the presence of a sequela compatible with poliomyelitis 60 days after the onset of motor impairment. Thus, it should be noted that there are two types of vaccine-related poliomyelitis:

1) AFP, which starts between 4 and 45 days after receiving OPV and presents neurological sequelae compatible with poliomyelitis 60 days after the onset of motor deficit.

2) Case of poliomyelitis associated with vaccine administered in contacts:

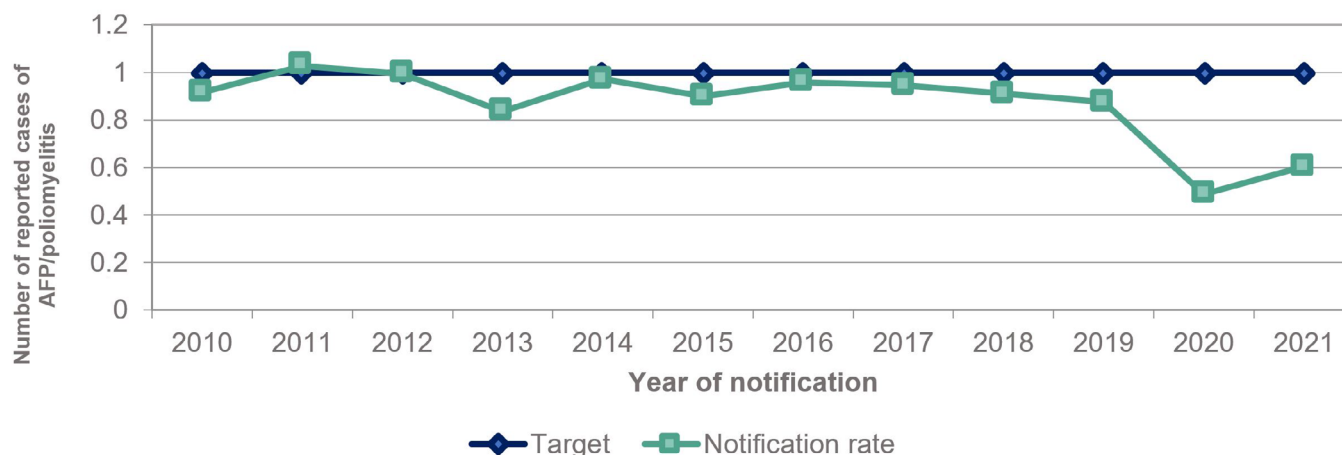
a) AFP that arises after contact with a child who has received OPV up to 40 days before; and

b) paralysis that appears from four to 85 days after exposure to the vaccinated contact and the individual presents neurological sequelae compatible with poliomyelitis 60 days after the motor deficit.

In any of the above situations, the isolation of vaccine poliovirus in the feces is an essential condition for the case to be considered as associated with the vaccine. Hence the need to collect stool properly in the first 14 days after the onset of motor deficit. If the collection is late, between 15 and 60 days later, and there is isolation of the vaccine virus, the case will be classified as associated with the vaccine. In this sense, it is worth mentioning that the 2010 case classified as such manifested motor deficit 22 days after receiving the vaccine. Among the cases compatible with poliomyelitis, only in 2012 was a timely collection of feces performed, and the P3 vaccine was detected. This and the other two cases presented sequelae 60 days after the onset of the motor deficit. It is worth mentioning that, although the result of the stool sample was in the two cases from 2018, they presented compatible clinical and ENMG results suggestive of poliomyelitis.

When comparing the notifications of the historical series, there is a drop in the number of cases from 2016 onwards. It is believed that the implementation of non-pharmacological measures as a strategy to reduce morbidity and mortality from covid-19 has positively influenced the non-exposure of children under 15 years of age to other pathogens that can lead to the occurrence of AFP. And this is directly reflected in the notification rates, as well as in the possible occurrence of underreporting in 2020 and 2021, when we observed the lowest volume of the evaluated period in both years.

In addition, considering the data on the population under 15 years old extracted from Fundação Seade, among the years analyzed only in 2011 (1.03/100,000 inhabitants) it was possible to reach the adequate notification rate, with a worsening of the results observed from 2016 (0.96/100,000 inhabitants), with 2020 (0.49/100,000 inhabitants) having the worst result. Although the result for 2021 (0.61/100,000 inhabitants) was better compared to 2020, it was still far from what is recommended by the Ministry of Health, that is, a notification rate of at least 1/100,000 inhabitants ([Graph 2](#)).

Graph 2. AFP case notification rate, SSP, 2010 to 2021.*

Source: DFWD/ESC/DCC/SHD-SP. *Data extracted as of June 30, 2022.

Regarding the rate of notification of cases among children under 15 years of age by epidemiological surveillance group (ESG), in the period from 2010 to 2021 the highest rate was verified in 2016 in the ESG São José do Rio Preto (6.00/100,000 inhabitants). Regarding the last five years, the highest rate was recorded in 2017, in ESG Araçatuba (3.84/100,000 inhabitants). When looking at 2021, this notification was higher in ESG Registro (3.38/100,000 inhabitants), followed by ESG São João da Boa Vista (2.14/100,000 inhabitants) and ESG Marília (1.89/100,000 inhabitants) ([Table 1](#)).

Table 1. AFP/poliomyelitis notification rate by ESG of notification, SSP, 2010 to 2021.*

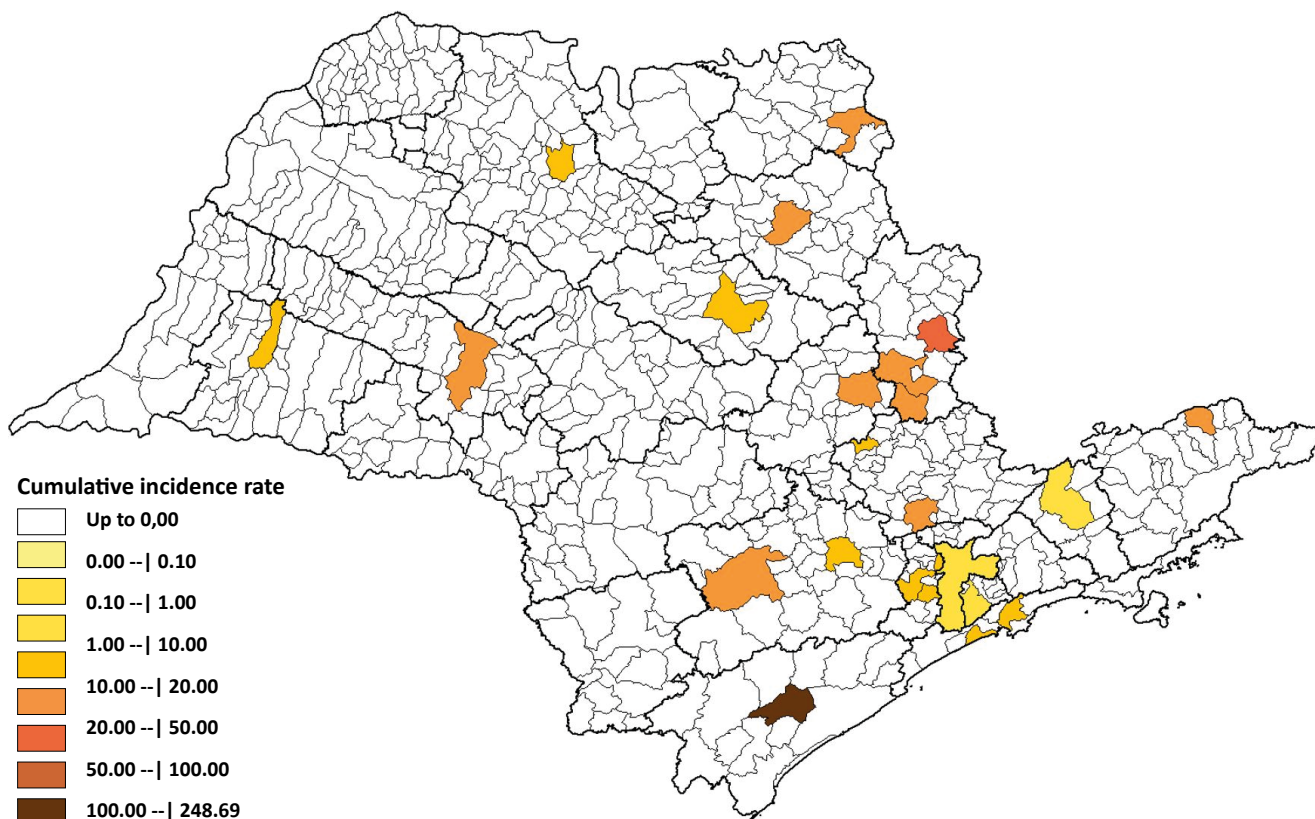
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Araçatuba	0.00	0.72	0.00	0.00	0.00	0.00	0.77	3.84	1.54	0.77	0.00	0.00
Araraquara	1.08	0.00	0.54	0.00	0.00	0.00	0.00	0.57	0.57	1.14	0.58	0.58
Assis	1.04	1.04	0.00	2.09	1.04	2.24	1.12	0.00	0.00	2.24	0.00	0.00
Barretos	0.00	0.00	0.00	0.00	0.00	2.61	0.00	0.00	0.00	0.00	0.00	0.00
Bauru	0.00	0.46	0.91	0.00	1.82	0.49	0.00	0.00	0.00	0.00	0.00	0.00
Botucatu	0.00	0.00	2.43	0.00	0.81	0.86	0.00	0.00	0.00	0.00	0.00	0.00
Campinas	0.84	1.09	0.97	0.60	0.97	0.98	0.86	1.23	1.60	0.74	0.36	0.49
Capital	1.63	1.41	1.54	1.11	1.28	1.15	1.28	1.24	1.24	1.02	0.71	0.67
Caraguatatuba	0.00	1.47	1.47	4.41	1.47	0.00	0.00	0.00	1.53	0.00	0.00	0.00
Franca	0.00	1.39	0.00	0.70	1.39	0.74	0.74	0.00	0.74	0.00	0.00	1.52
Franco da Rocha	1.53	0.00	0.77	0.00	0.00	0.00	0.00	0.00	1.60	0.00	0.00	0.00
Itapeva	1.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Jales	0.00	0.00	4.30	0.00	0.00	0.00	4.82	0.00	0.00	0.00	0.00	0.00
Marília	0.83	0.83	1.66	1.66	1.66	0.91	0.91	0.91	0.00	0.91	0.00	1.89
Mogi das Cruzes	0.15	0.45	1.06	0.30	0.60	0.48	0.16	0.16	0.32	0.00	0.32	0.00
Osasco	0.15	0.61	0.30	0.61	0.46	0.31	0.63	0.16	0.31	0.16	0.15	0.62
Piracicaba	0.68	0.68	1.02	0.68	0.00	0.36	1.08	1.44	0.36	1.08	0.37	0.37
Presidente Prudente	3.38	1.13	0.00	4.51	2.25	2.44	2.44	0.00	2.44	0.00	0.00	1.26
Presidente Venceslau	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Registro	1.38	2.75	1.38	0.00	1.38	0.00	3.18	3.18	0.00	1.59	0.00	3.38
Ribeirão Preto	0.36	0.73	1.09	0.00	1.09	2.26	1.50	2.63	2.63	0.00	1.13	1.51
Santo André	1.13	1.13	0.38	1.32	1.13	0.20	0.40	0.60	0.60	0.20	0.40	0.20
Santos	0.55	1.36	0.27	0.82	0.55	0.28	0.28	0.00	0.56	2.25	0.56	0.84
São João da Boa Vista	1.28	2.56	0.64	0.00	1.92	0.69	0.00	0.69	0.69	0.69	0.00	2.14
São José do Rio Preto	1.32	2.20	3.52	3.08	3.96	5.07	6.00	3.23	1.85	3.69	2.32	0.93
São José dos Campos	1.87	0.00	0.47	1.40	0.94	1.44	0.96	0.96	0.00	1.92	0.00	0.47
Sorocaba	0.68	0.91	0.45	0.68	0.23	0.72	0.48	0.72	0.00	1.69	0.72	0.72
Taubaté	0.00	1.82	0.45	0.00	0.45	0.00	1.46	1.94	1.94	1.46	0.98	0.49

Source: DFWD/ESC/DCC/SHD-SP. *Data extracted as of June 30, 2022.

It is worth mentioning that over the years there has been variation in the number of AFP/poliomyelitis reporting units in the SSP, that is, hospitals that admit children under 15 years of age or care services that have a pediatrician or neurologist/neuropediatrician. Of the 447 units that regularly reported negative weekly reporting and active case finding to the DFWD, 56 reported suspected AFP/poliomyelitis cases in 2019, 27 in 2020, and 38 in 2021. In this sense, the importance of active search and case notification is reinforced, because, even with 447 regular reporting units, it is known that the SSP has more services that serve the target audience, whether public or private, in which it is still necessary to implement routines related to the AFP/poliomyelitis surveillance program to verify better notification rates by health region and at the state level.

As for the AFP notification rate per 100,000 inhabitants under 15 years of age per municipality, in the period from 2010 to 2021 the highest accumulations were recorded in Pariquera-Açu (248.69), Águas de São Pedro (218.34) and Igaratá (162.34) ([Figure 1](#)).

Figure 1. Spatial distribution of the cumulative AFP case notification rate per 100,000 population under 15 years of age, by reporting municipality, SSP, 2010 to 2021.*

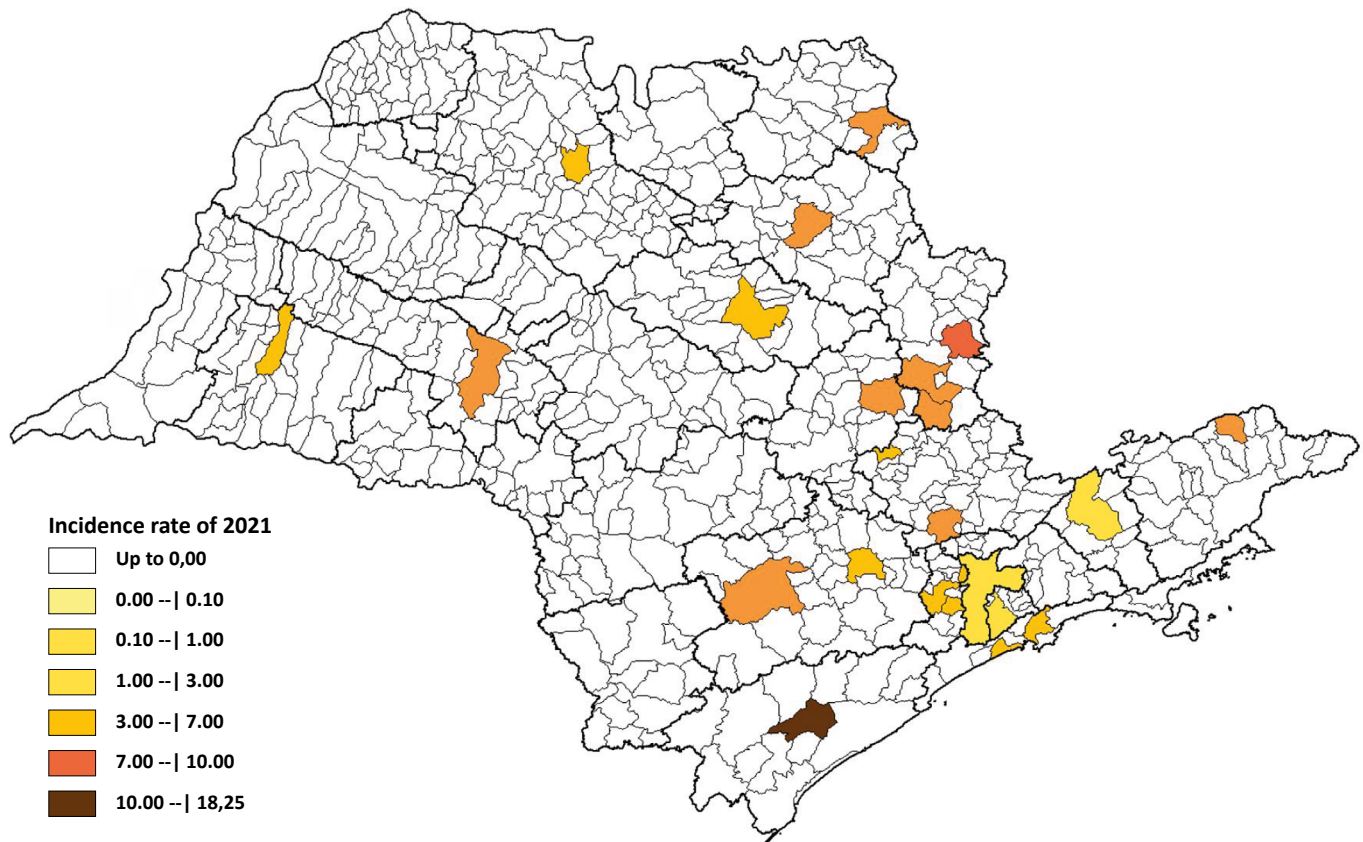


Source: DFWD/ESC/DCC/SHD-SP. *Data extracted on June 30, 2022.

When observing only the year 2021, the municipalities with the highest rates were Registro (18.25), São João da Boa Vista (7.28) and Cruzeiro (6.54) (Figure 2).

It is known that AFP is not a diagnosis, but a warning symptom, which can manifest itself in poliomyelitis and in other diseases, such as Guillain-Barré syndrome, transverse myelitis, viral meningitis, in stroke. and spinal cord tumor, among others. Thus, when AFP is identified, its notification is recommended even if there is no suspicion of poliomyelitis.

Figure 2. Spatial distribution of the reporting rate of AFP cases per 100,000 population under 15 years of age, by reporting municipality, SSP, 2021.*



Source: DFWD/ESC/DCC/SHD-SP. *Data extracted on June 30, 2022.

Therefore, there is a list of differential diagnoses to be investigated that are recommended by the DFWD containing 39 ICD-10. Among the notifications observed in the period, Guillain-Barré syndrome (G61.0) was the most frequent, with 289 cases ([Table 2](#)).

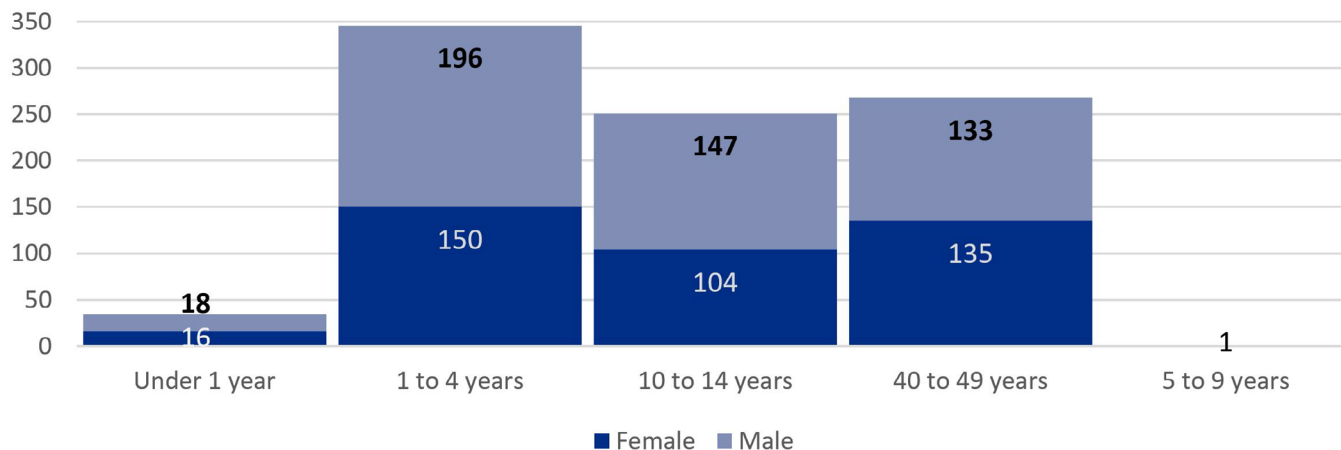
Table 2. Diagnostic hypotheses mentioned in the AFP notification forms, SSP 2010 to 2021.*

CID-10	DESCRIPTION	Nº CASES
A05.9	Unspecified bacterial food poisoning	1
A80	Acute poliomyelitis	2
A80.0	Acute paralytic poliomyelitis associated with the vaccine virus	2
C72.9	Malignant neoplasm of central nervous system, unspecified (tumor)	5
G04.0	Acute disseminated encephalitis	9
G04.2	Meningoencephalitis and bacterial meningomyelitis not classified elsewhere	1
G04.8	Other encephalitis, myelitis and encephalomyelitis	7
G04.9	Unspecified encephalitis, myelitis and encephalomyelitis	22
G05.1	Encephalitis, myelitis and encephalomyelitis in viral diseases classified elsewhere	15
G37.3	Acute transverse myelitis	23
G55	Compression of nerve roots and plexuses	1
G57.0	Sciatic nerve injury	2
G57.9	Unspecified lower limb mononeuropathies	4
G61.0	Guillain-Barré syndrome (post-infectious polyneuritis)	289
G61.9	Unspecified inflammatory polyneuropathy	13
G62.9	Unspecified polyneuropathy	21
G70.0	Myasthenia gravis	2
G72.3	Periodic paralysis	2
G72.9	Unspecified myopathy	8
G81.0	Flaccid hemiplegia	10
G81.9	Unspecified hemiplegia	7
G82.0	Flaccid paraplegia	14
G82.3	Flaccid quadriplegia	6
G83.1	Lower limb monoplegia	5
G83.2	Upper limb monoplegia	2
G83.3	Upper limb monoplegia	1
G83.4	Cauda equina syndrome	1
G83.9	Unspecified paralytic syndrome (ignored – IGN)	9
I64	Unspecified stroke	17
T13.9	Unspecified lower limb trauma, level unspecified	3

Source: DFWD/ESC/DCC/SHD-SP. *Data extracted on June 30, 2022.

About age group and sex, from 2010 to 2021 the notifications were concentrated between 1 and 4 years old (38.4%) and in males (54.9%) (Graph 3).

Graph 3. Distribution of reported cases by sex and age group, SSP, 2010 to 2021*.



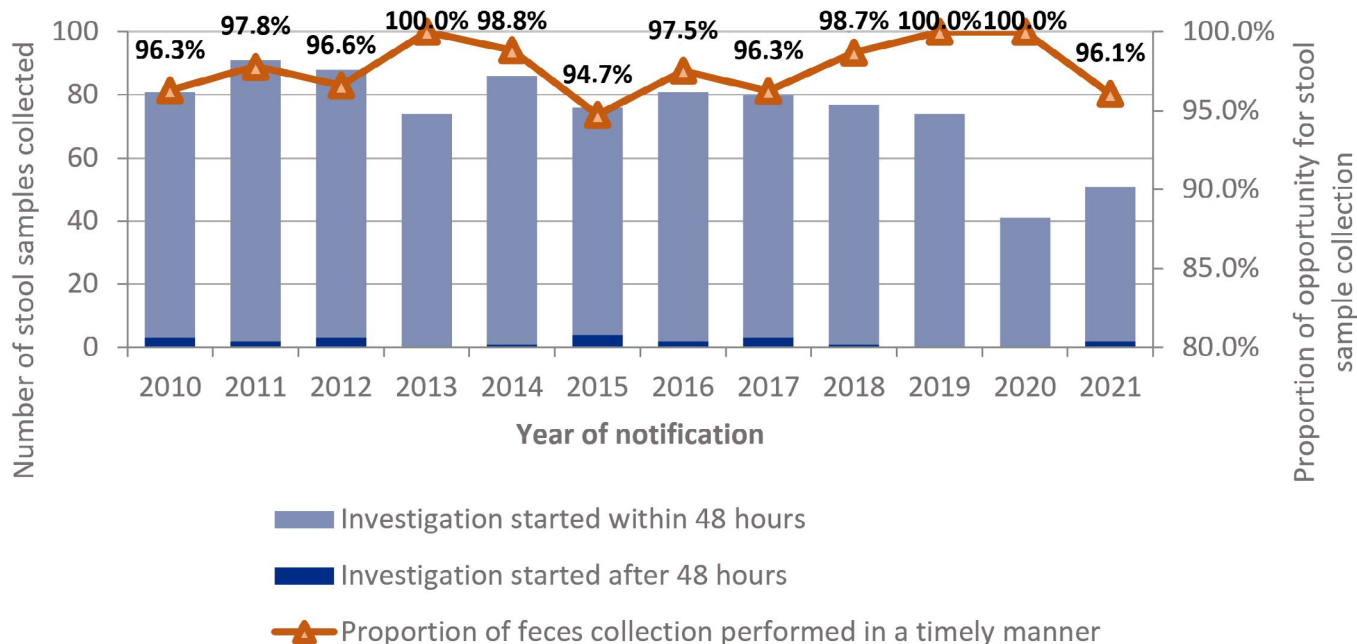
Source: DFWD/ESC/DCC/SHD-SP. *Data extracted on June 30, 2022.

When analyzing only the year 2021, they were predominant in the age group from 10 to 14 years old (41.2%) and in males (60.8%). In 2016, a laboratory technician in the field of virology had contact with *Enteroviruses* and developed AFP, justifying its inclusion in the database, being the only case in people over 15 years of age.

In the face of the occurrence of cases, the notification must occur immediately to the health authorities at the local level, by the health professional to the notifying unit, which in turn simultaneously communicates the municipal and state health departments, through the Strategic Information Center in Health (Cievs).

Case investigation procedures must be initiated within 48 hours. Thus, it is noted that 2015 was the year with the lowest proportion of timely notifications (94.7%); in 2021, only two cases did not have the investigation started within the recommended deadline, while in 2013, 2019 and 2020 all investigations were started within 48 hours. However, it is worth mentioning that throughout the period evaluated, the goal of 80% of investigations initiated in a timely manner was exceeded ([Graph 4](#)).

Graph 4. Proportion of cases that were reported according to timeliness of investigation initiation, SSP, 2010 to 2021*.

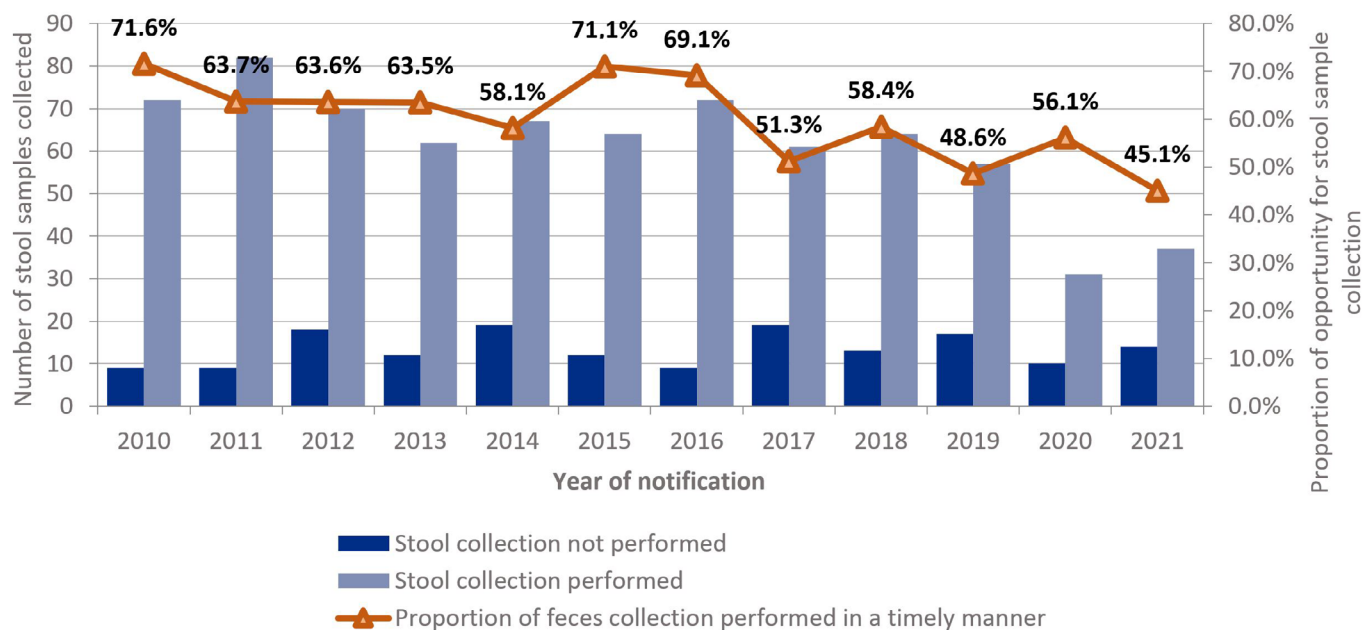


Source: DFWD/ESC/DCC/SHD-SP. *Data extracted on June 30, 2022.

Based on the objectives of AFP surveillance, in addition to reporting and case investigation rates, it is also necessary to observe the collection of feces from all persons under 15 years of age, or who meet the reporting criteria, within 14 days after the onset of motor deficit. Thus, it is inferred that it is still necessary to intensify actions aimed at collecting feces from all notified patients, as well as improving the opportunity to perform such a procedure.

In this sense, it should be noted that 2021 was the year with the lowest proportion of samples collected in a timely manner (up to 14 days after the onset of the motor deficit). This corresponds to 45.1% of cases, when the target established by the Ministry of Health is at least 80% ([Graph 5](#)).

Graph 5. Proportion of stool samples collected from reported cases and collection opportunity, SSP, 2010 to 2021.*



Source: DFWD/ESC/DCC/SHD-SP. *Data extracted on June 30, 2022.

One of the pillars of AFP/poliomyelitis surveillance is environmental monitoring and polio vaccine coverage. Regarding environmental monitoring, in the SSP it is carried out by the Environmental Company of the State of São Paulo (Cetesb), through the examination of samples of human fecal composition in sewage, collected at points selected as strategic by the State Commission for Prevention and Combating Cholera and other Diseases Transmitted by Water and Food, coordinated by CVE/CCD/SES-SP.

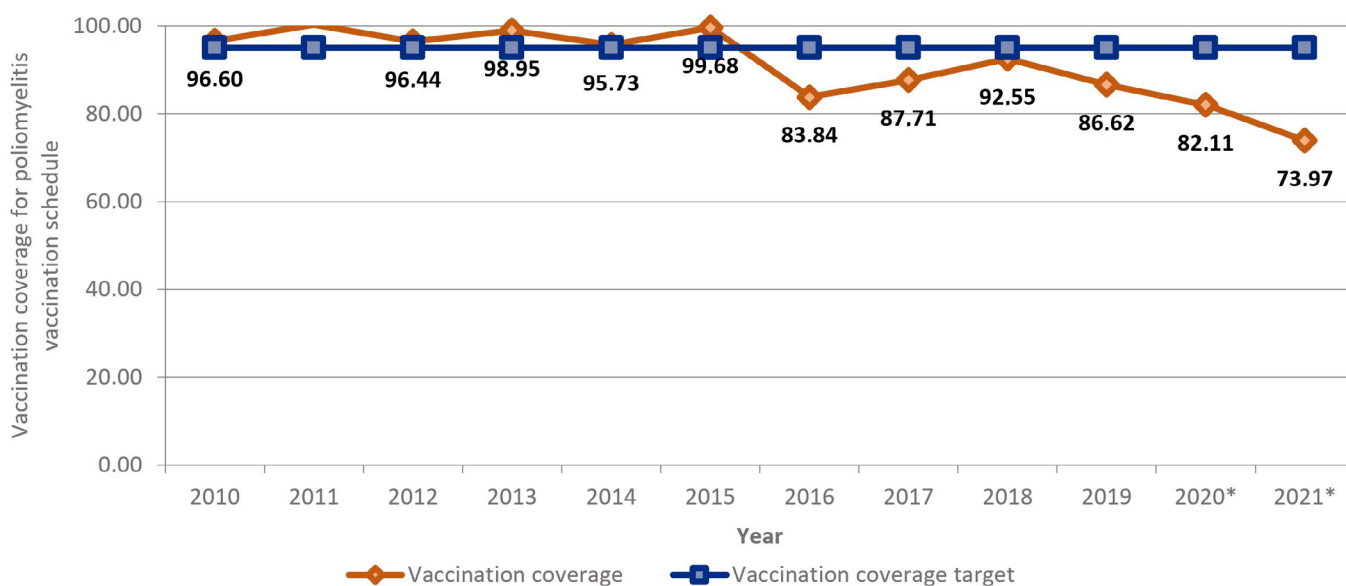
In 2014, one of the viruses isolated by Cetesb, in the sanitary sewer at Viracopos airport, in Campinas (SP), was characterized as wild poliovirus type 1 (PV1). This finding was confirmed by Fundação Oswaldo Cruz (Fiocruz) and, after complete sequencing of the VP1 gene and research carried out in the GeneBank database, it was found that it had 95% nucleotide identity with a wild poliovirus isolated in Chad (CHA1011675), in the year 2010, belonging to a genotype of wild poliovirus from West Africa, characteristic of Nigeria (WEAF-B).³ The World Health Organization (WHO) global poliomyelitis reference laboratory has characterized this poliovirus as originating in Equatorial Guinea. Also in 2014, another environmental sample isolated a poliovirus derived from the type 2 vaccine (VDPV2) in the port of São Sebastião, on the coast of São Paulo, but it was not possible to determine its origin. Although these polioviruses were found in the environment, there was no case of poliomyelitis registered in the territory of São Paulo.³

As a result of covid-19, it was necessary to temporarily suspend the service of collecting water samples for poliovirus research between the beginning of 2020 and December 2021. The activity resumed in 2022.

As for the vaccination schedule for protection against polio, since 2016 the Ministry of Health recommends the application of three doses of the inactivated polio vaccine (IPV) and two booster doses of OPV, at 2, 4, 6 and 15 months and at 4 months. years old.

When analyzing the vaccine coverage for the complete IPV scheme (three doses), there is a marked decrease since 2018. The year 2021 was the year with the lowest coverage (73.97%) in the evaluated period, surpassing the verified in 2016 (83.84%), the year in which the vaccination schedule was changed (Graph 6).

Graph 6. Vaccination coverage for complete regimen against poliomyelitis, SSP, 2010 to 2021.*

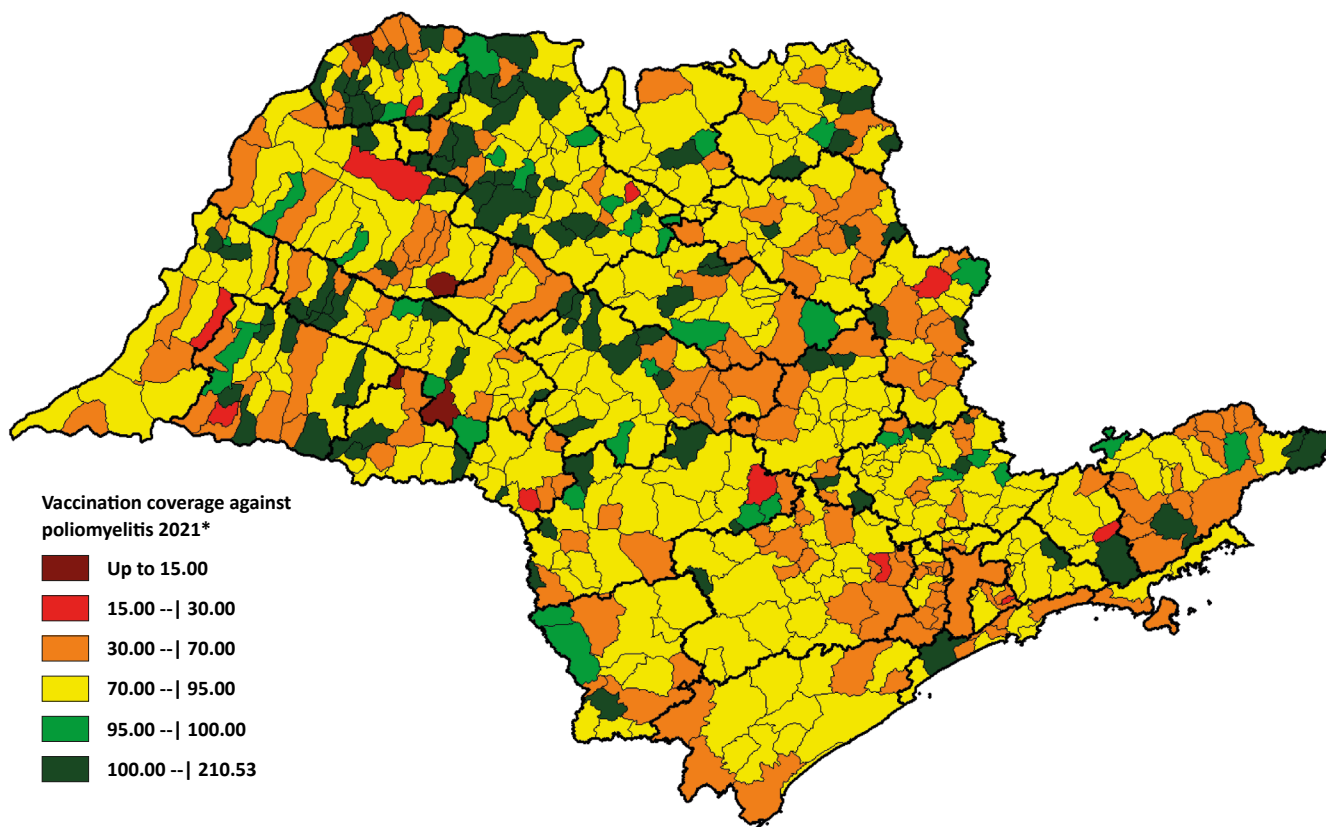


Source: DDTHA/CVE/CCD/SES-SP. *Data subject to change, extracted on July 21, 2022.

The fact is also observed when evaluating vaccination coverage by epidemiological surveillance group, with the lowest observed in 2021 in the ESG Capital (62.5%), Osasco (62.7%) and Taubaté (66.7%) and the highest in the ESG São José do Rio Preto (83.8%), Botucatu (83.2%) and Piracicaba (82.6%).

In 2021, vaccination coverage was also unsatisfactory in 78.29% (505/645) of the municipalities in São Paulo (Figure 3).

Figure 3. Spatial distribution of poliomyelitis vaccine coverage, SSP, 2021.*



Source: DFWD/ESC/DCC/SHD-SP. *Data subject to change, extracted on March 9, 2022.

This performance indicates the need to increase the aforementioned coverage to reduce the risk of a possible reintroduction of the poliovirus. This is because, when vaccination coverage is verified within the expected percentages, the number of susceptible individuals exposed to a greater risk of contamination by the poliovirus is reduced.

Even though the last case of poliomyelitis was confirmed in Brazil in 1989, given the drop in vaccine coverage, not only in the SSP, but in all the federated units of the country, and with the viral circulation endemic in Pakistan and Afghanistan and of derivatives vaccines in several countries, there is a risk for the occurrence of imported cases in the country. In addition, possible circulation of the poliovirus in the national territory may occur if there is local transmission.

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