



Yearbook  
**vacinaBR 2025**  
Statistical Report on Vaccination in Brazil



# vacinaBR 2025

Yearbook

Statistical Report on Vaccination in Brazil



## Masthead

The 2025 VacinaBR Yearbook  
Statistical Report  
on Vaccination in Brazil

**Edited by**

Natalia Pasternak  
Paulo Almeida  
Fernanda Meirelles

**Analysis and Data Coordinator**  
Gabriel Maia

**Authors**

Ana Goretti Kalume Maranhão  
André Bacchi  
Antonia Maria da Silva Teixeira  
Carla Magda Allan Santos Domingues  
Fernanda Meirelles  
Gabriel Maia  
Mateus de Paula von Glehn  
Regina Célia Mendes do Santos Silva  
Victor Moura

**Graphic Design**

Carolina Daffara  
Gabriel Maia  
Victor Luccas

**Copy Editing**

Gabriel Alves

---

**Technical Advisor on Immunization**  
Antonia Teixeira

**Data Processing Consultancy**  
Brasil.io

**Translation**  
Filippe V. F. Guimarães



**Instituto Questão de Ciência**

**Board of Directors**

Natalia Pasternak  
Paulo Almeida  
Marcelo Yamashita  
Carlos Orsi  
Luiz Almeida

**IQC Team**

Fernanda Meirelles  
Gabriel Maia  
Juan Azevedo  
Kiara Neves  
Mauricio Milanez  
Rebeca Bitencourt

**Further Information:**

Website: <https://iqc.org.br/>  
Email: [iqc@iqc.org.br](mailto:iqc@iqc.org.br)

**Partners**



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# Introduction

When we founded **Instituto Questão de Ciência (IQC)** in 2018, we were prompted by a concern: Brazil needed an independent, qualified voice that would advocate with equal vigor for science and for the public interest. Amid heated discussions on health policies, vaccines, and research funding, the IQC rose out of the conviction that well-informed decisions are not made by chance—they require reliable data, critical analysis, and, above all, transparency.

Seven years later, we renew our mission and give it a fresh new outlet in the form of the **VacinaBR Yearbook: Statistical Report on Vaccination in Brazil**.

Over the past 50 years, vaccines have played a key role in reducing infant mortality, accounting for 40% of the global decline in this statistic. Since 1974, vaccines have prevented 154 million deaths, 95% of them among children under 5.

Equity in vaccination uptake is a global priority that has been affected by the Covid-19 pandemic. We are witnessing the reemergence of vaccine-preventable diseases such as measles in the U.S. and declining vaccination coverage for diseases such as polio in Brazil. Other vaccines, such as the HPV vaccine, have never achieved truly optimal coverage across the whole of Brazil, with notably low uptake rates in the North region.

We need to understand what leads people to forgo vaccination. Understanding the social and behavioral factors that drive or hinder vaccine uptake, including access barriers, is a core topic in research on vaccine acceptance. An accurate diagnosis requires access to data on what coverage has fallen, where it has fallen, how much it has fallen, in which population groups, and in which regions.

The **IQC** has always viewed immunization as a cornerstone of public health. However, monitoring its evolution over time is no trivial matter: official databases are extensive, complex and, at times, difficult to navigate. Transforming millions of scattered records into understandable information for managers, researchers, journalists, and citizens is an essential step toward restoring vaccine coverage, fighting vaccine hesitancy, and guiding investment. That is precisely the role of the yearbook you hold in your hands.

By harmonizing and consolidating data, indicators, and time series, we can offer not merely a snapshot but a tool for continuous monitoring. Each chart or map contained herein was designed to answer a practical question: where are we making progress and where is further action required? Such clarity can drive more effective public policies, strengthen communication campaigns, and inform healthcare providers who face misinformation on a daily basis.

This effort embodies two values that have defined the **IQC** since its inception: an unwavering defense of evidence—because well-collected data is the foundation of any serious conversation; and free access to knowledge—because science only fulfills its social role when it is accessible to all. That is why the **VacinaBR Yearbook** is and always will be free and updated on a yearly basis, consolidating itself as the first-call work of reference for those seeking to understand the panorama of vaccination in Brazil.

May these pages serve as a beacon for fair and successful decision-making, and remind us that each percentage point in vaccine coverage represents thousands of lives protected. I invite readers, managers, and partners to use, question, and continuously improve this work. After all, if science is a collective process, so too is public health.

Happy reading!

Natalia Pasternak  
President, *Instituto Questão de Ciência*

# A message from UNICEF

Dear readers,

It is my great pleasure to present the **VacinaBR Yearbook**, a publication that sheds light on and strengthens Brazil's commitment to the public health of its population through immunization. With an extensive review of data on the scope of immunization efforts in the country, supplemented by thoughtful analyses prepared by key stakeholders, this document is a testament to the ongoing, integrated efforts to ensure that every child and every person everywhere has access to essential vaccines to protect against vaccine-preventable diseases.

This work is an initiative of **Instituto Questão de Ciência (IQC)**, with support from the Brazilian Society of Immunizations (SBIm). Since its founding in 2018, IQC has been a key player in dialogue and dissemination of scientific evidence to inform the development and improvement of public policies in the country. Through its work on data analysis, the **IQC** contributes significantly to the quality of information, scientific education, and advocacy on the importance of vaccination.

The United Nations Children's Fund (UNICEF), as the United Nations agency dedicated to children's rights, has been promoting immunization as a universal right for eight decades. We believe that vaccination is one of the most efficacious and cost-effective public health interventions, capable of saving millions of lives and preventing suffering from infectious diseases.

In Brazil, UNICEF has worked tirelessly alongside government and non-governmental partners to strengthen immunization programs, ensure vaccination coverage, and reach the most vulnerable populations. This yearbook expertly maps the state of immunization in Brazil, providing insights into the progress made and the challenges faced and still persisting, offering a comprehensive overview of strategies and results achieved.

Immunization—like health—is a right of every child and every person and a commitment we must continually renew. More than a technical resource and a rich source of information, the **VacinaBR Yearbook** is an invitation to redouble efforts to strengthen immunization in the country and ensure that no one is left behind.

We thank all those involved in the preparation of this document and in the implementation of vaccination programs. Together, we can build a healthier and safer future for everyone.

Sincerely,

**Youssouf Abdel-Jelil** UNICEF Representative in Brazil

# About the VacinaBR Yearbook

The material you now hold in your hands (whether physically or digitally) is the result of a joint effort by the IQC, with support from the Brazilian Society of Immunizations (Sbim) and the United Nations Children's Fund (UNICEF), to contribute to the production and dissemination of high-quality data and analyses on vaccination in Brazil. We are convinced that the design and implementation of good public policy is not feasible in the absence of consistent, shared, accessible information. Indeed, public debate itself depends on it.

And it is not enough for such information to exist somewhere, in some format, like a rare mineral which must be extracted from stone. It must be clear, understandable to different audiences, and actively disseminated. It was from this premise that the idea for VacinaBR began to take shape in late 2022.

Vaccination has always been a topic dear to the IQC since its founding, and, during a meeting with experts in the field, we realized that, despite the large amount of data available on Tabnet and LocalizaSUS (Brazilian Unified Health System platforms for health data, including vaccination), professionals working with this topic had difficulty navigating the systems to apply filters, make comparisons, and plot graphs—that is, to conduct the analyses they needed for their studies, lectures, publications, and interviews.

We asked journalists and found that they faced the same challenge. Having to understand public databases, process them, and translate them into more accessible written or visual language required knowledge and time that were not always consistent with the dynamics of media outlets and the background of communication professionals.

We then decided, with technical support from Sbim, to put together a team with the aim of building a free, interactive, user-friendly, easily accessible platform for Brazil's vaccination data. We convened vaccination specialists, data scientists, designers, developers, and many other professionals who made the VacinaBR platform a reality, launching it in December 2023.

The platform—which, as of the date of publication of this material, gathers information on all the vaccines from the 2023 childhood vaccination schedule as well as the HPV vaccine—offers maps, charts, and tables related to vaccination data with options to filter or aggregate such data by location, vaccine, disease, and year. Its usefulness was recognized from the outset. The VacinaBR platform has since been widely used by those interested in the subject and is enthusiastically welcomed whenever it is presented at conferences and events.

We didn't want to stop there. The wealth of information contained in the platform warranted a more analytical and instrumental format, published regularly and with methodological consistency. Continuing our partnership with Sbim and with the support of UNICEF, the VacinaBR Yearbook: Statistical Report on Vaccination in Brazil was conceived.

As the name implies, this publication will be revised on a yearly basis, providing society with a consistent, regular, educational material that outlines the panorama of immunization in our country over time.

In the first section, the Yearbook presents key statistics on vaccination in chapters organized by disease (which, in some cases, required consolidation of data on more than one vaccine).

For the second section, we invited experts in the field to write analysis and opinion articles on topics related to vaccination.

We are very proud of this first edition. We thank everyone who made it possible, especially the professionals who devoted themselves to this work and brought to the table not only great seriousness and commitment, but also lightness and camaraderie.

It is a great pleasure to share this material with you. We hope it will contribute to expanding vaccination in Brazil and informing the public debate on immunization policies.

**Paulo Almeida**  
Executive Director, Instituto Questão de Ciéncia

**Fernanda Meirelles**  
Coordinator, IQC Science Policy Observatory

# Data sources and methodology

The data presented in this document comes from datasets created by the IQC team for the **VacinaBR Platform**. This platform makes vaccination data in Brazil publicly and accessibly available by geographic divisions selected by the user, from the national level down to data disaggregated by the health regions and health macro-regions that make up the Unified Health System (SUS), as well as the state and Federal District (n=27) and municipal (n=5,570) levels.

The platform was developed based on raw data on doses administered, as consolidated and made available by the Ministry of Health. Using these and other databases, indices relevant to health managers, researchers, and legislators were calculated, such as vaccination coverage, vaccination dropout rates, and coverage homogeneity for vaccines in the National Vaccination Schedules in effect between 2000 and 2023. Only routine vaccination data are used; doses administered as part of vaccination campaigns are not considered.

The reconstruction allowed for the documentation of data processing, as well as the validation of the records of administered doses accounted for in DataSUS to make up these indicators. We expect that readers will be able to replicate the results we obtained by following the documentation and the scripts and tables provided and using the same databases. Data on administered doses were obtained from three sources:

- For the period 1994–2018, datasets of the number of doses administered by municipality and by year, containing information on dose, vaccine, and age group of vaccine recipients were obtained from the Datasus FTP server.
- Data for the period 2017–2022 was made available following a request to DataSUS under the Access to Information Act.
- Data for 2023 were extracted from the InfoMS National Vaccination Schedule dashboard, and include doses transcribed from vaccination cards.

In addition, other data sources were used to process data on doses administered and calculate the indices:

- Population data for individuals aged 2 years or older were obtained from the data tabulator developed by Datasus Tabnet. The data were collected by age, year, and geographic instances for the period 2000–2021.
- For the age groups “0 year” and “1 year,” the population data that make up the denominator of the vaccination coverage indicator were obtained from the Brazilian Ministry of Health’s Live Birth Information System (Sinasc).
- Population data for people aged 15, used for processing data on HPV vaccines, were obtained from the 2022 Census population records via the Automatic Retrieval System (Sidra) of the Brazilian Institute of Geography and Statistics (IBGE).

The vaccine data environment in Brazil is complex and dynamic, which makes it difficult to process over long periods of time, as we did. Moreover, the vaccination schedule has undergone significant changes over the past 23 years.

The coverage indicators above 100% found in this material may result from various factors, mainly inaccuracies in the population estimate of the target audience and errors in recording the number of doses administered.

Historical data are subject to biases due to recording errors and overestimation or underestimation of data in the numerator (doses administered) or denominator (population), compromising the accuracy of the indicators.

Comparing the data in this document with data available on Tabnet or other platforms may reveal discrepancies, albeit minor or nonsignificant, due to the different sources of population data used to estimate vaccination coverage.

A more detailed description of the data sources and methodology used to process and calculate the indicators can be found in the [Methodological Report](#) available on the **VacinaBR Platform**.

Gabriel Aleixo Maia

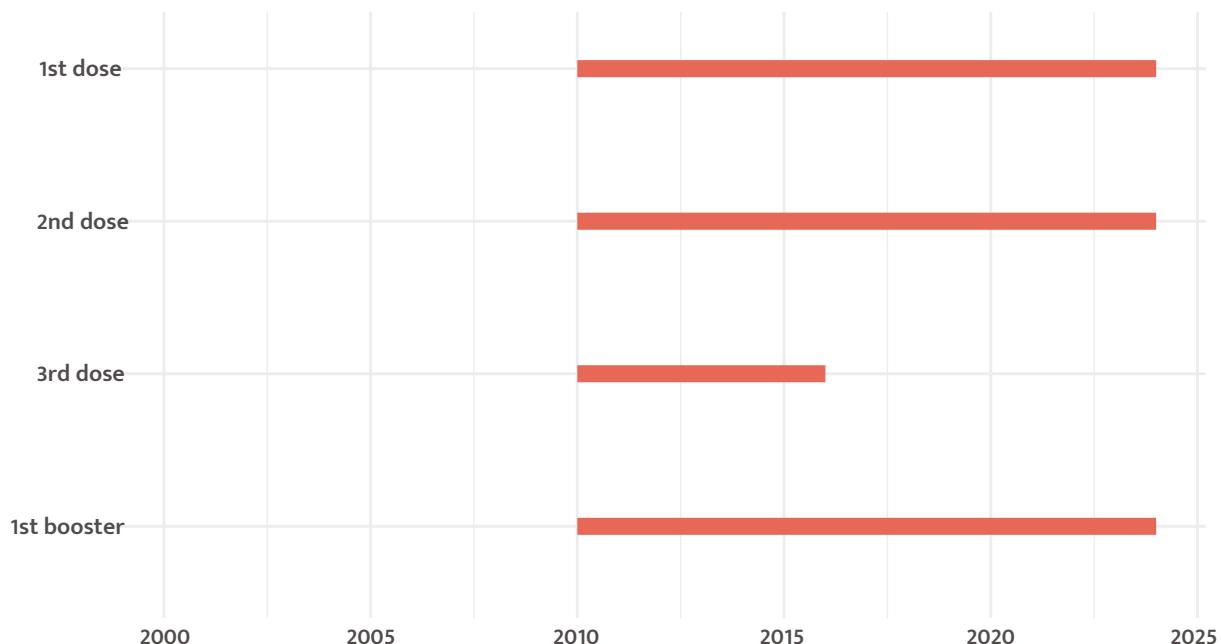
Analysis and Data Coordinator, VacinaBR Yearbook  
Data Science Analyst at Instituto Questão de Ciência

# FACTS AND FIGURES

# 10-VALENT PNEUMOCOCCAL

## History of 10-valent pneumococcal vaccines

■ Pneumococcal (10-valent)



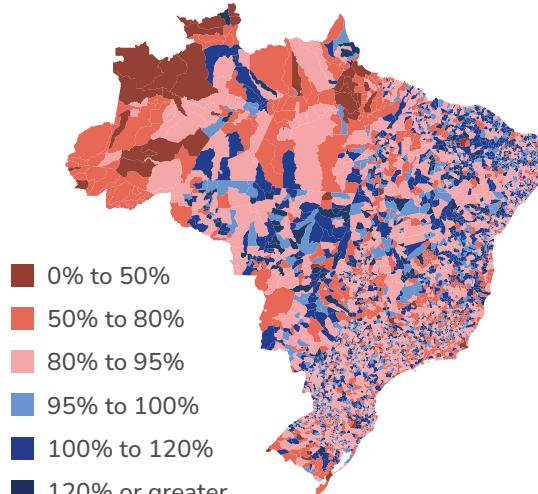
The 10-valent pneumococcal vaccine (PCV-10), included in the National Vaccination Schedule since 2010, provides immunity against 10 serotypes of *Streptococcus pneumoniae*, preventing severe forms of pneumonia and other infections. Between 2010 and 2016, the vaccination schedule consisted of three doses for children under 1 and a booster at 1 year of age. Since 2017, the National Immunization Program (PNI) has recommended two doses of the vaccine and one booster, all administered by 12 months of age. The coverage target is 95% of the target population (infants up to age 12 months) on the basic schedule, with a booster dose at 1 year of age.

Dose	Target age	Vaccine
<b>1st dose</b>	<b>2 months</b>	<b>PCV-10</b>
<b>2nd dose</b> Coverage reference	<b>4 months</b>	<b>PCV-10</b>
<b>1st booster</b>	<b>12 months</b>	<b>PCV-10</b>

Without the protection afforded by the vaccine, streptococci can cause sepsis, otitis, meningitis, and pneumonia. The presence of bacteria in the respiratory system can be asymptomatic, facilitating transmission. Pneumococcal disease is especially dangerous in children, older adults, and immunocompromised individuals.

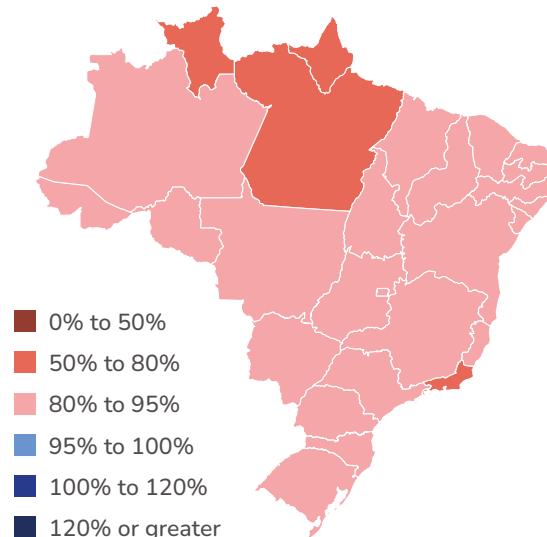
## Coverage for the 2nd dose of 10-valent pneumococcal vaccine

Children under 1, 2023, by municipality



## Coverage for the 2nd dose of 10-valent pneumococcal vaccine

Children under 1, 2023, by state



As shown in the images above, the majority of Brazilian states achieve between 80 and 95% vaccination coverage. This average, however, masks discrepancies between municipalities, as can be seen, for example, in the states of Amazonas and Rio Grande do Sul.

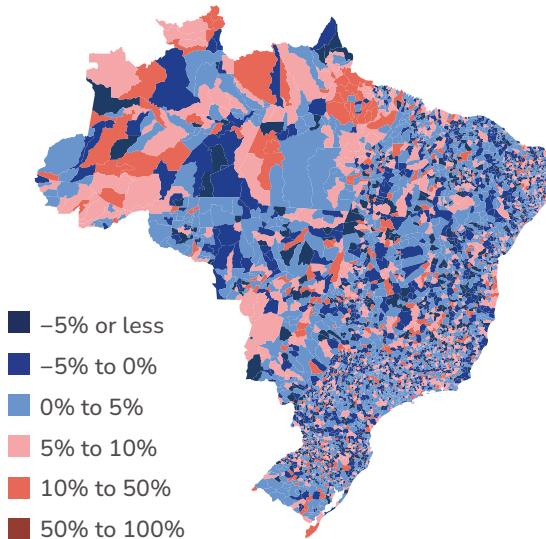
## Coverage for doses of vaccines containing a 10-valent pneumococcal component

2023, by state, %

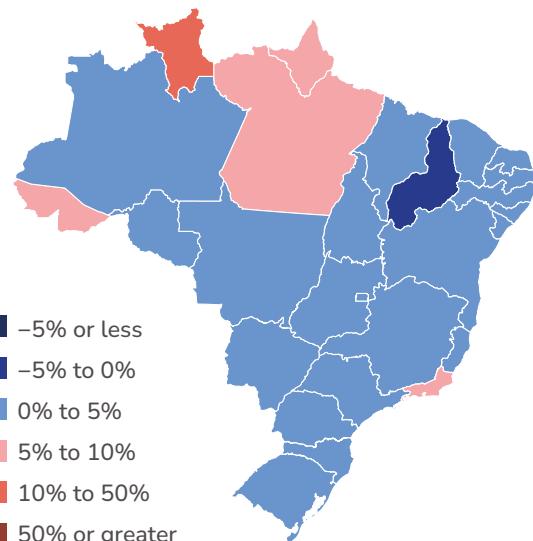
	1st dose	2nd dose	1st booster
MS	92.6	90.9	84.6
MT	94.9	91.7	85.1
GO	82.6	80.8	73.4
DF	87.0	85.2	78.9
SE	88.3	86.7	81.8
RN	91.2	88.0	80.6
PI	91.5	91.8	89.8
PE	84.8	82.9	76.0
PB	90.0	87.2	82.2
MA	90.0	86.9	81.1
CE	92.9	92.3	88.6
BA	90.4	90.0	82.6
AL	94.4	91.8	87.4
TO	96.1	93.6	91.2
RR	90.5	77.2	72.1
RO	96.1	93.7	84.7
PA	85.8	79.8	74.4
AM	90.1	86.4	82.7
AP	73.8	68.7	62.2
AC	88.3	82.2	51.7
SP	86.3	84.8	87.1
RJ	75.8	71.8	63.0
MG	83.2	82.8	74.5
ES	89.2	87.6	84.1
SC	88.9	88.0	77.3
RS	90.4	88.9	78.8
PR	88.6	87.6	79.3

Vaccination coverage is below target for all doses, declining at the second dose and the booster when compared to the first. Only Tocantins and Rondônia reached the 95% target for the first dose, and no state achieved this figure for subsequent doses. On the other hand, coverage rates below 80% were found in two states for one dose, and in four states for two doses.

### Dropout rate for the 2nd dose of 10-valent pneumococcal vaccine Children under 1, 2023, by municipality



### Dropout rate for the 2nd dose of 10-valent pneumococcal vaccine Children under 1, 2023, by state



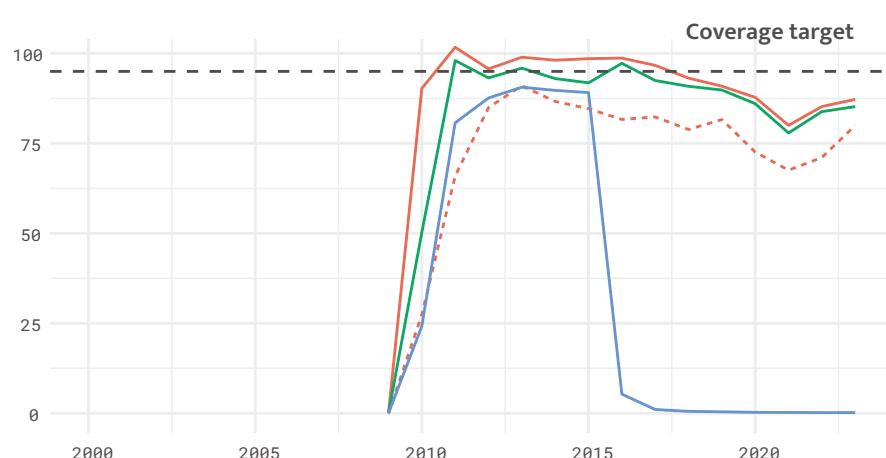
### Coverage rate by primary and booster dose of vaccines containing a 10-valent pneumococcal component

Children under 1, Brazil, 2010 to 2023

#### By type of dose, %

- 1st dose
- 2nd dose
- 3rd dose\*
- 1st booster

\*3rd dose withdrawn in 2016



There is an overall trend of declining coverage rates after 2015, showing signs of recovery in 2022 and 2023. It is also worth noting that the vaccine dropout rate, which fluctuated between 2013 and 2018, has remained stable at a low percentage in recent years.

## Coverage for the 2nd dose of 10-valent pneumococcal vaccine

Children under 1, by state, 2010 to 2023, %

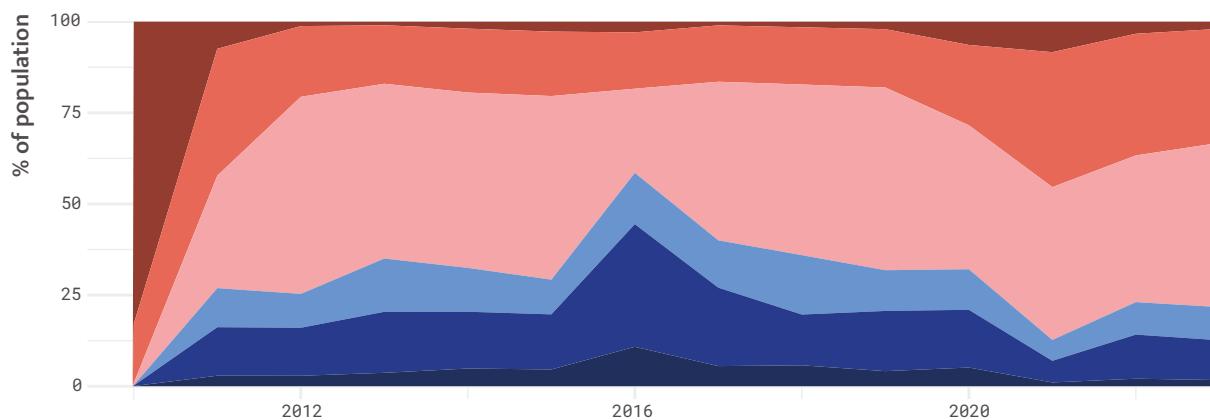
■ 0% to 50% ■ 50% to 80% ■ 80% to 95% ■ 95% to 100% ■ 100% to 120% ■ 120% or greater

	2012					2016					2020					2023	
MS	32.9	85.8	91.6	96.8	119.5	111.1	106.0	96.8	95.8	98.5	94.0	81.0	90.4	90.9			
MT	9.3	70.5	83.8	89.8	86.4	90.2	104.5	89.2	87.8	87.7	89.2	82.2	89.0	91.7			
GO	19.0	97.3	89.9	91.9	84.3	82.1	93.6	89.2	86.4	86.5	86.2	79.3	82.5	80.8			
DF	29.7	75.5	82.6	96.6	96.1	63.5	140.6	88.4	86.7	87.6	88.9	81.3	84.3	85.2			
SE	36.8	94.4	97.7	99.0	92.5	91.1	93.6	88.5	91.1	87.5	78.8	79.5	91.5	86.7			
RN	19.6	81.7	92.1	87.4	82.9	83.8	89.0	79.8	89.1	93.1	81.7	76.8	87.4	88.0			
PI	0.4	79.8	97.8	96.5	81.8	77.6	84.1	84.5	84.4	87.8	85.2	78.6	94.0	91.8			
PE	30.2	93.8	95.5	92.5	93.0	98.4	109.5	96.3	95.4	91.4	82.6	76.0	86.6	82.9			
PB	31.9	84.7	88.3	90.6	88.8	88.5	95.9	91.1	93.6	99.1	82.1	76.5	83.3	87.2			
MA	1.0	51.8	81.2	89.8	80.3	81.3	85.0	86.5	84.0	83.5	72.8	70.6	82.7	86.9			
CE	1.5	83.4	93.2	94.2	96.1	98.7	120.6	108.9	114.3	96.6	99.7	83.1	94.4	92.3			
BA	2.9	67.3	87.1	92.0	90.1	88.4	81.2	85.4	81.4	82.0	83.4	70.5	85.7	90.0			
AL	6.8	69.5	87.1	87.8	88.5	87.8	100.5	94.5	94.5	94.9	83.5	83.7	93.6	91.8			
TO	36.5	93.8	94.9	96.1	88.6	90.2	101.7	93.6	94.8	96.2	93.9	87.5	96.2	93.6			
RR	23.1	71.8	71.4	73.0	77.2	85.0	97.9	94.3	77.8	72.1	74.0	61.9	70.6	77.2			
RO	23.7	85.6	95.9	96.5	99.7	101.1	107.5	107.9	98.0	103.9	95.0	83.5	90.6	93.7			
PA	0.7	46.5	74.9	78.5	67.4	58.4	78.8	79.0	76.0	81.9	72.2	63.7	75.3	79.8			
AM	7.7	60.9	73.6	72.5	74.4	82.8	92.7	89.4	87.7	92.9	85.9	75.9	89.6	86.4			
AP	4.3	58.4	72.6	71.0	62.0	68.9	108.6	77.8	78.1	86.9	52.3	53.2	61.2	68.7			
AC	5.0	48.1	70.3	70.2	59.2	72.6	92.0	88.0	84.5	91.0	78.6	72.3	81.3	82.2			
SP	41.8	84.9	86.9	92.7	95.6	92.5	94.0	94.8	91.5	91.0	90.2	82.1	80.7	84.8			
RJ	2.0	68.2	78.0	83.7	83.2	87.4	109.0	98.1	92.0	83.1	67.5	63.5	67.9	71.8			
MG	49.4	98.3	95.6	98.0	94.9	96.8	100.3	94.6	97.8	92.4	93.2	81.2	86.8	82.8			
ES	44.3	103.0	97.9	94.5	92.2	93.8	100.0	89.6	89.1	90.0	86.5	81.2	83.5	87.6			
SC	55.7	98.0	94.7	93.0	93.5	95.9	98.4	89.2	87.5	95.9	91.8	85.4	86.7	88.0			
RS	14.7	90.0	86.2	83.6	90.7	85.5	94.4	91.0	90.6	91.9	93.5	84.2	86.6	88.9			
PR	34.7	91.9	92.0	95.8	94.3	96.1	96.5	95.0	92.0	92.1	93.5	87.2	87.4	87.6			

## Fraction of the Brazilian population living in municipalities in each vaccination coverage range for the 2nd dose of 10-valent pneumo 10-valent vaccine

Children under 1, Brazil, 2010 to 2023

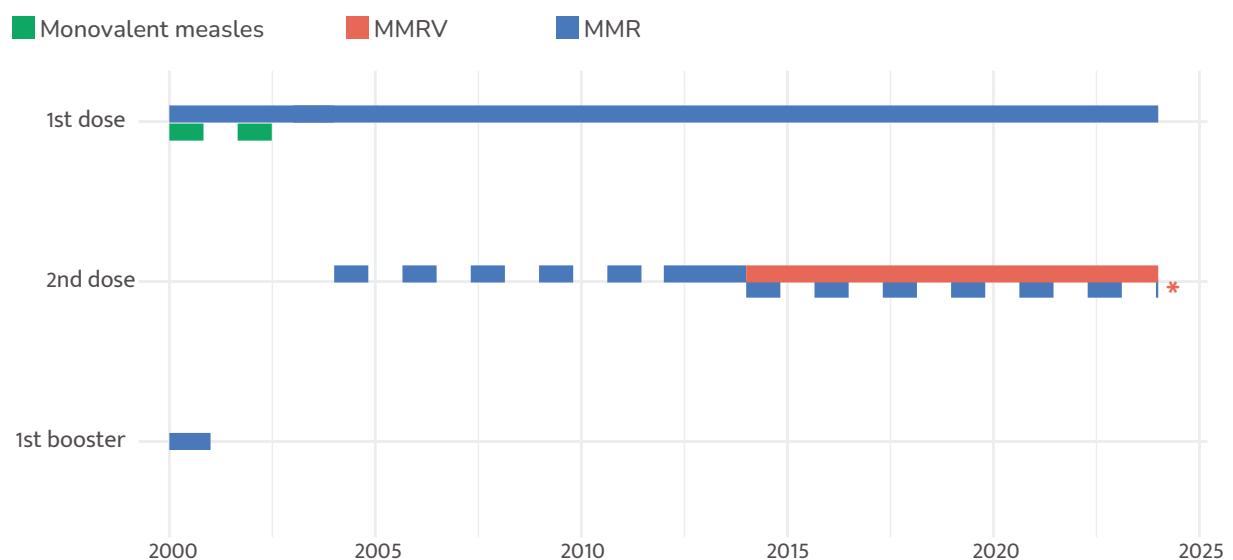
■ 0% to 50% ■ 50% to 80% ■ 80% to 95% ■ 95% to 100% ■ 100% to 120% ■ 120% or greater



Only in the year 2016 did the fraction of the Brazilian population living in cities that met the vaccination target exceed 50%. A significant decline is noted after 2020.

# MEASLES, MUMPS, AND RUBELLA

## History of measles, mumps, and rubella vaccines



Measles, mumps and rubella are easily transmitted viral diseases, spread by droplets of saliva suspended in the air. All three can cause fever, fatigue, and inflammation in different parts of the body.

Measles causes a generalized inflammation of the blood vessels, leading to the onset of red spots on the skin, eye irritation, and a runny nose. There is severe malaise, and a dry cough is also present. The condition can progress to pneumonia and encephalitis, with serious consequences.

Mumps primarily affects the salivary glands, but can also cause inflammation in other glandular tissues, such as the breasts and testicles. By affecting the salivary glands, it causes swelling and pain on one or both sides of the face.

In addition to nonspecific symptoms of viral infection, rubella causes a skin rash and swelling of the lymph nodes in the head and neck. The virus can be transmitted from mother to fetus or infant in the form of congenital rubella syndrome. There is a risk of miscarriage and congenital malformations.

Dose	Target age	Vaccine
<b>1st dose</b>	<b>12 months</b>	<b>MMR</b>
<b>Single dose*</b> Coverage reference	<b>15 months</b>	<b>MMRV</b>

\* Due to insufficient supply of the measles, mumps, rubella, and varicella (MMRV) vaccine, from 2015 onwards the recommended scheme has involved a second dose of the MMR vaccine simultaneously with a dose of monovalent varicella vaccine as a replacement regimen for the single-dose MMRV.

\*\*This chapter was updated on July 7, 2025. There are minor differences compared to the version originally published on June 17, 2025, resulting from a new review of the data.

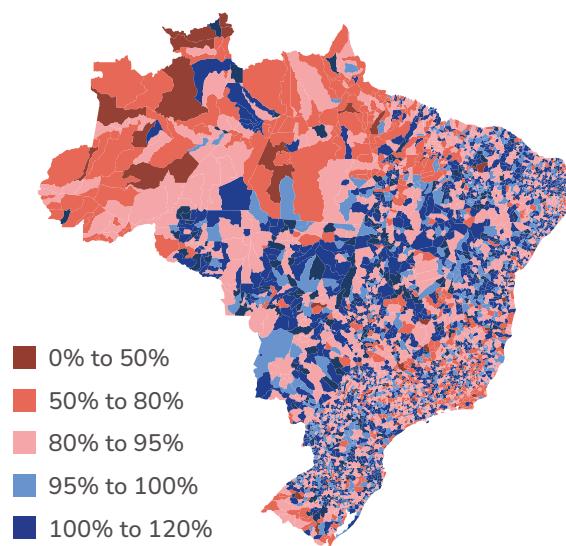
Since 2003, vaccination against measles, mumps, and rubella has been carried out with the MMR vaccine. In 2004, a second dose was recommended for children between 4 to 6 years of age, with no restriction on it being administered earlier, particularly in the event of outbreaks.

In 2013, in response to the introduction of the tetravalent MMRV (measles, mumps, rubella, and varicella) vaccine, the scheme was modified so that the first dose consists of the MMR vaccine and a single dose of the MMRV vaccine is given in lieu of the second dose of MMR. Due to insufficient supply of the MMRV vaccine, however, in 2015 the scheme was changed to consist of a second dose of the MMR vaccine given simultaneously with a dose of monovalent varicella vaccine as a replacement regimen for the single-dose MMRV.

Until 2012, coverage for vaccines containing measles, rubella, and mumps components was estimated only with the first dose (D1) of the MMR vaccine in the 1-year-old population. Starting in 2013, second-dose coverage was estimated with either the single-dose MMRV vaccine or the second dose (D2) of MMR vaccine.

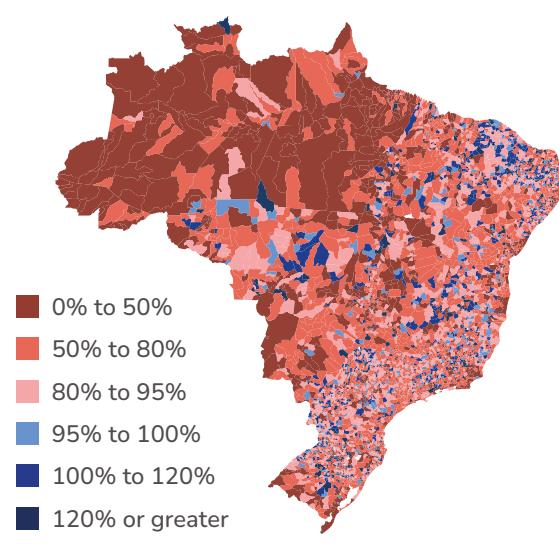
## Coverage for the 1st dose of MMR vaccine

Children aged 1 year, 2023, by municipality



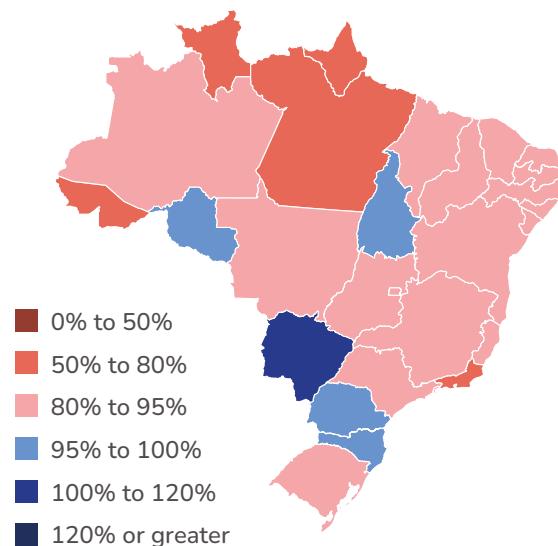
## Coverage for the 2nd dose of MMR vaccine or single-dose MMRV vaccine

Children aged 1 year, 2023, by municipality



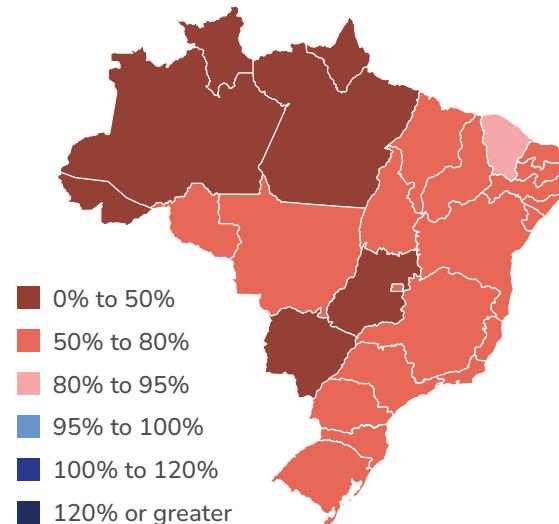
## Coverage for the 1st dose of MMR vaccine

Children aged 1 year, 2023, by state



## Coverage for the 2nd dose of MMR vaccine or single-dose MMRV vaccine

Children aged 1 year, 2023, by state



Although the concept of vaccination coverage generally requires completion of all doses in the schedule outlined in the National Immunization Program (PNI), in the case of measles, mumps, and rubella, some indicators and public policies consider only administration of the first dose for calculation of the indicator. Therefore, this section presents maps and tables relating to data for both the first and second doses.

Coverage for both doses is below 50% in most Brazilian states. São Paulo was the state with the highest coverage for the full scheme, but still only reached 73% of the target population.

If only the first dose is considered, the situation is somewhat better. Even so, only Santa Catarina, Mato Grosso do Sul, Tocantins, Rondônia, and Paraná meet the target.

## Coverage for doses of vaccines containing a measles, mumps, and rubella component, 2023, by state, %

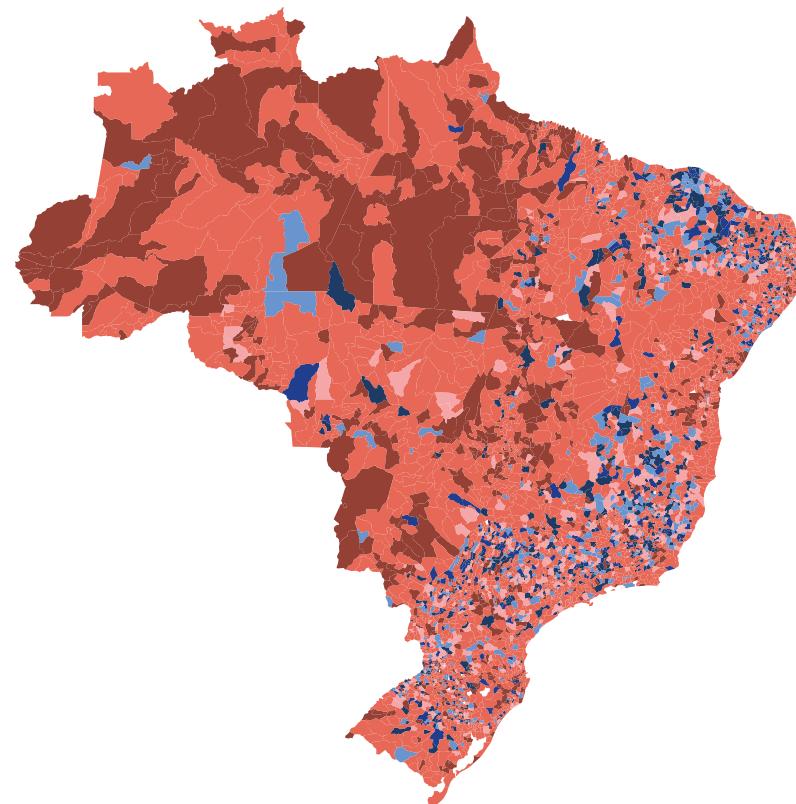
	0% to 50%	50% to 80%	80% to 95%	95% to 100%	100% to 120%	120% or greater
	1st dose				2nd dose	
MS	<b>101.1%</b>				<b>44.7%</b>	
MT	<b>92.4%</b>				<b>56.7%</b>	
GO	<b>85.1%</b>				<b>48.5%</b>	
DF	<b>88.6%</b>				<b>70.5%</b>	
SE	<b>91.8%</b>				<b>72.6%</b>	
RN	<b>87.0%</b>				<b>63.1%</b>	
PI	<b>93.6%</b>				<b>69.2%</b>	
PE	<b>82.4%</b>				<b>54.1%</b>	
PB	<b>88.9%</b>				<b>68.7%</b>	
MA	<b>81.4%</b>				<b>59.2%</b>	
CE	<b>91.2%</b>				<b>82.3%</b>	
BA	<b>88.5%</b>				<b>58.4%</b>	
AL	<b>92.8%</b>				<b>69.5%</b>	
TO	<b>95.6%</b>				<b>56.3%</b>	
RR	<b>79.4%</b>				<b>47.9%</b>	
RO	<b>97.0%</b>				<b>56.0%</b>	
PA	<b>74.4%</b>				<b>35.5%</b>	
AM	<b>81.3%</b>				<b>48.0%</b>	
AP	<b>69.5%</b>				<b>39.9%</b>	
AC	<b>77.9%</b>				<b>41.1%</b>	
SP	<b>88.4%</b>				<b>73.0%</b>	
RJ	<b>70.2%</b>				<b>55.0%</b>	
MG	<b>84.7%</b>				<b>69.4%</b>	
ES	<b>85.8%</b>				<b>76.2%</b>	
SC	<b>95.5%</b>				<b>72.4%</b>	
RS	<b>94.4%</b>				<b>68.1%</b>	
PR	<b>95.2%</b>				<b>70.6%</b>	

The reduction in coverage between the first and second doses of vaccines containing a measles, mumps, and rubella component is quite significant. The states with the largest decrease in each region are: in the Midwest, Mato Grosso do Sul, from 101.1% to 44.7%; in the Northeast, Bahia, from 88.5% to 58.4%; in the North region, Rondônia, from 97% to 56%; in the Southeast, São Paulo, from 88.4% to 73%; and in the South region, Rio Grande do Sul, from 94.4% to 68.1%.

## Dropout rate for vaccines containing a measles, mumps, and rubella component

Children aged 1 year, 2023, by municipality

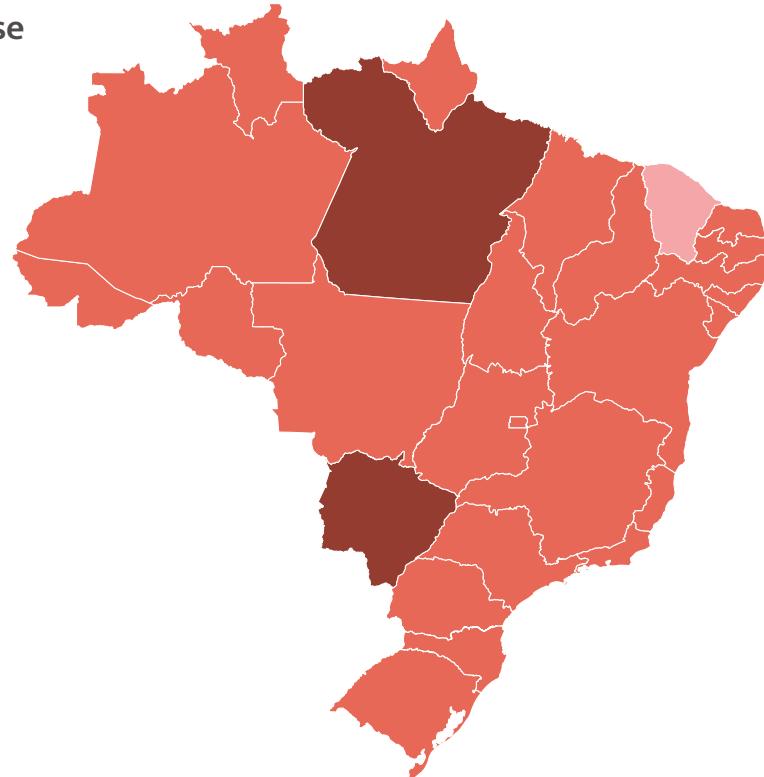
- 5% or less
- 5% to 0%
- 0% to 5%
- 5% to 10%
- 10% to 50%
- 50% to 100%



## Coverage for the 2nd dose of MMR vaccine or single-dose MMRV vaccine

Children aged 1 year, 2023, by state

- 5% or less
- 5% to 0%
- 0% to 5%
- 5% to 10%
- 10% to 50%
- 50% to 100%



The high dropout rate for the measles, mumps, and rubella vaccination schedule in the year 2023 is noteworthy. In the states of Pará and Mato Grosso do Sul, dropout rates are over 50%. In other words, more than half of children who had their first dose did not receive the second dose. The only state with a dropout rate below 10% is Ceará.

## Coverage for each dose of vaccines containing a measles, mumps, and rubella component

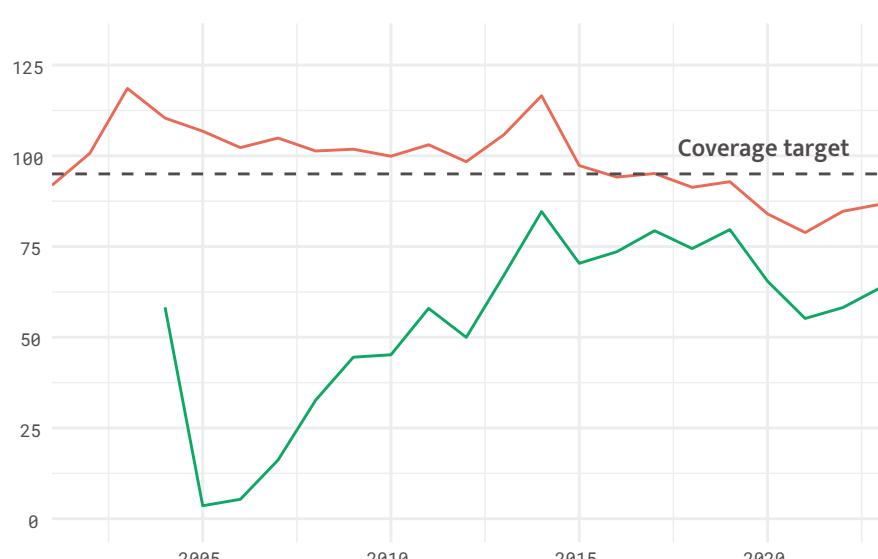
Children aged 1 year, Brazil,

2000 to 2023

By type of dose, %

— 1st dose

— 2nd dose



## First-dose coverage for vaccines containing an MMR component

Children aged 1 year, by state, 2002 to 2023, in %

■ 0% to 50% ■ 50% to 80% ■ 80% to 95% ■ 95% to 100% ■ 100% to 120% ■ 120% or greater

	2002	2005	2010	2015	2020	2023																	
MS	99.9	100.2	119.5	104.3	97.7	99.5	104.0	98.9	99.7	100.2	96.6	96.2	102.2	155.5	117.7	101.1	99.0	100.0	105.9	84.3	85.1	97.7	101.1
MT	88.8	100.4	130.8	116.5	112.2	103.8	109.8	105.5	101.9	97.7	97.6	94.0	107.4	117.9	96.8	96.4	95.2	85.9	88.2	81.1	84.3	93.4	92.4
GO	95.7	99.2	110.0	108.0	106.8	104.9	113.2	108.9	106.9	106.8	115.5	104.9	110.6	129.1	97.3	85.1	90.2	87.5	88.7	78.8	83.2	85.8	85.1
DF	102.2	99.9	101.7	96.7	100.8	97.3	95.3	91.7	95.8	92.4	88.9	93.8	104.6	108.0	68.0	127.6	87.4	85.0	86.5	88.9	91.1	96.1	88.6
SE	102.2	103.5	132.5	116.9	97.9	95.1	102.6	101.8	98.3	98.2	101.1	97.8	114.1	98.9	98.5	90.7	95.2	92.3	90.4	79.4	78.9	89.4	91.8
RN	39.5	75.3	116.8	107.1	103.4	98.9	107.1	98.1	99.2	100.7	102.0	100.4	115.7	110.9	93.6	94.1	87.8	87.6	90.3	83.4	73.6	82.0	87.0
PI	94.6	95.4	117.3	115.3	106.7	102.1	103.0	99.9	99.2	97.9	100.2	100.1	106.2	108.1	93.2	79.3	85.3	85.9	87.3	80.4	80.2	83.4	93.6
PE	69.9	84.6	119.6	112.1	110.7	105.7	111.0	107.2	108.6	104.8	118.0	105.9	120.2	110.3	98.4	111.4	111.6	101.3	99.5	81.8	75.3	83.1	82.4
PB	107.5	96.9	111.1	111.0	105.8	114.8	106.8	101.1	119.3	104.6	94.7	114.4	129.7	99.9	94.0	99.7	94.4	100.7	80.4	73.0	79.9	88.9	
MA	107.0	104.8	119.7	105.1	117.2	108.4	119.3	114.8	113.7	109.9	116.6	100.2	110.4	127.1	91.5	79.5	87.8	81.6	83.3	64.4	67.9	71.8	81.4
CE	117.7	108.8	131.3	110.7	112.7	101.5	106.9	103.1	103.7	103.9	113.1	99.7	115.9	144.4	109.1	116.2	108.2	110.4	100.1	91.0	79.1	95.2	91.2
BA	114.0	98.5	120.3	130.3	115.0	109.1	108.3	102.6	106.1	103.0	102.9	99.1	109.8	122.1	95.3	84.6	86.1	80.3	83.9	83.5	69.5	79.2	88.5
AL	58.3	94.2	101.7	116.4	112.9	98.5	99.5	94.0	100.6	98.6	92.1	95.2	114.5	113.9	101.3	101.3	112.8	102.5	101.5	84.4	80.2	89.4	92.8
TO	84.3	89.6	122.4	96.0	103.8	99.7	103.6	99.1	99.8	95.3	93.0	91.1	103.7	114.2	100.6	91.4	94.1	88.1	89.2	84.2	83.8	84.1	95.6
RR	61.9	75.3	110.2	105.8	115.6	93.2	97.2	100.7	96.0	94.1	96.9	85.1	83.0	108.1	105.4	88.3	91.1	96.8	71.3	55.6	71.9	66.7	79.4
RO	91.9	105.1	125.2	131.2	112.7	111.3	107.7	120.6	99.6	100.4	103.7	99.4	111.1	143.8	107.2	108.4	109.4	99.6	104.8	87.0	87.9	93.5	97.0
PA	58.1	139.2	146.0	141.2	118.6	116.7	118.5	112.6	110.9	110.6	110.8	102.7	101.0	122.1	77.5	69.5	74.2	76.3	80.8	63.0	66.2	67.2	74.4
AM	32.2	81.5	106.2	86.8	107.2	106.3	107.0	103.7	104.0	100.0	96.5	102.6	97.1	112.1	93.8	84.4	89.0	87.8	92.1	77.7	75.4	76.5	81.3
AP	131.7	89.8	114.5	122.7	100.5	93.6	96.4	97.4	95.2	92.1	88.6	86.6	92.7	111.0	89.2	100.3	81.5	79.6	86.4	53.2	67.6	59.5	69.5
AC	67.8	104.6	99.4	126.4	99.1	85.5	107.7	104.7	96.9	96.7	107.6	85.4	99.3	99.2	86.7	76.1	86.3	79.3	85.7	60.3	64.7	69.8	77.9
SP	105.1	105.1	119.9	105.6	102.3	98.7	98.9	97.7	98.6	94.9	99.9	97.6	102.2	106.0	95.6	91.7	95.3	90.4	93.6	92.6	83.0	84.9	88.4
RJ	90.8	96.2	114.5	104.9	104.6	100.0	99.8	95.0	97.0	95.0	107.8	95.4	107.0	112.0	101.1	107.7	105.5	99.1	98.4	67.4	63.2	71.6	70.2
MG	107.6	106.4	118.5	112.3	107.0	101.5	106.6	99.3	102.0	99.6	99.7	101.8	102.3	119.6	103.4	98.3	99.3	96.6	96.6	95.7	86.0	91.3	84.7
ES	99.7	101.0	126.2	113.6	108.5	107.4	103.6	102.0	101.7	99.7	103.0	101.9	106.0	107.9	98.0	103.5	94.5	93.4	94.7	90.6	83.1	79.9	85.8
SC	101.1	91.4	115.4	100.5	100.1	100.5	99.7	100.4	100.9	101.2	98.4	95.7	101.0	112.8	104.1	94.5	94.8	92.3	95.2	88.4	87.9	102.1	95.5
RS	22.8	86.6	110.9	103.2	97.6	97.0	98.7	96.6	94.3	93.6	94.2	88.9	94.7	114.9	96.6	87.4	88.8	89.0	92.4	91.6	83.0	95.8	94.4
PR	101.4	101.7	107.1	95.3	100.3	97.0	99.1	96.7	98.9	95.6	96.7	97.5	105.6	118.5	102.4	91.3	95.5	90.7	93.9	89.7	91.3	95.1	95.2

## Coverage for the full regimen of vaccines containing a measles, mumps, and rubella component

Children aged 1 year, by state, 2004 to 2023,%

	0% to 50%		50% to 80%		80% to 95%		95% to 100%		100% to 120%		120% or greater		
2004													
MS	69.9	2.4	4.9	18.8	42.1	59.6	56.9	64.6	69.6	35.2	100.4	60.6	87.6
MT	40.8	8.6	16.5	41.6	62.6	73.8	66.4	75.9	71.9	58.7	88.2	60.9	77.2
GO	12.7	4.5	5.9	24.3	45.8	61.3	57.8	72.2	63.5	65.0	79.0	56.6	80.3
DF	87.1	0.3	0.2	1.3	1.1	2.0	1.3	30.9	4.3	103.5	89.5	64.3	124.2
SE	106.9	6.2	8.6	24.9	59.8	79.9	74.1	82.0	87.1	81.7	62.3	65.7	69.4
RN	68.6	2.2	3.1	10.3	26.4	42.3	47.3	61.3	60.8	65.4	80.8	68.5	49.0
PI	54.3	5.2	8.5	21.2	33.6	52.2	53.4	69.4	75.2	79.0	58.6	39.5	58.9
PE	63.4	4.8	7.5	20.9	38.7	54.1	57.7	63.8	59.8	64.7	86.4	80.4	65.9
PB	44.1	3.3	8.0	29.6	48.6	58.5	63.1	52.4	45.0	58.6	71.3	52.8	55.0
MA	28.2	3.1	4.2	13.0	24.0	36.6	46.1	66.2	51.5	47.4	71.8	60.1	47.2
CE	34.0	4.1	8.6	23.3	45.5	61.9	65.1	72.0	63.1	69.1	126.3	87.3	85.1
BA	40.1	2.1	3.6	8.9	21.3	34.3	36.8	41.8	51.8	68.2	84.1	68.1	54.6
AL	15.7	4.8	7.3	20.9	40.1	53.3	53.0	54.1	59.7	60.4	82.3	75.7	58.5
TO	56.2	6.5	10.9	37.2	61.1	73.8	73.6	72.8	63.8	73.3	75.2	47.7	74.3
RR	34.6	6.4	8.5	16.8	52.3	55.2	45.9	54.9	44.1	21.3	82.5	84.0	70.5
RO	6.3	5.8	6.7	22.5	59.5	67.3	65.6	68.3	68.3	77.3	93.9	77.0	73.7
PA	30.9	4.7	8.7	18.8	33.7	44.2	47.6	59.6	53.6	35.4	55.1	36.3	61.0
AM	1.4	3.1	5.7	17.9	35.4	47.7	49.9	46.3	53.2	55.1	79.4	72.2	74.1
AP	3.2	2.9	6.6	22.4	47.5	51.7	49.0	48.1	55.6	47.0	71.1	67.2	82.4
AC	8.0	2.8	1.6	7.6	15.6	26.9	30.8	56.5	27.7	26.6	56.5	46.0	64.5
SP	94.3	0.2	0.2	4.3	13.3	24.6	26.5	59.8	17.9	74.9	94.7	86.4	76.4
RJ	14.0	6.3	8.7	21.8	43.0	53.2	50.2	55.4	57.9	66.2	91.3	82.3	71.0
MG	86.1	0.5	0.8	5.2	6.8	10.8	10.5	21.2	51.2	77.5	76.4	62.0	87.7
ES	53.7	4.4	6.0	24.0	58.5	77.0	71.1	72.3	62.4	84.3	86.8	74.8	77.6
SC	98.1	10.4	9.4	30.7	78.5	93.7	87.8	90.1	87.0	68.0	81.7	73.3	85.7
RS	77.0	8.5	9.5	23.5	45.1	54.4	53.3	62.5	63.1	64.0	77.2	55.0	75.3
PR	72.6	6.5	10.7	31.0	62.2	77.6	74.4	75.7	59.2	72.5	81.6	68.3	84.7
2010													
MS	56.9	2.4	4.9	18.8	42.1	59.6	56.9	64.6	69.6	35.2	100.4	60.6	87.6
MT	40.8	8.6	16.5	41.6	62.6	73.8	66.4	75.9	71.9	58.7	88.2	60.9	77.2
GO	12.7	4.5	5.9	24.3	45.8	61.3	57.8	72.2	63.5	65.0	79.0	56.6	80.3
DF	87.1	0.3	0.2	1.3	1.1	2.0	1.3	30.9	4.3	103.5	89.5	64.3	124.2
SE	106.9	6.2	8.6	24.9	59.8	79.9	74.1	82.0	87.1	81.7	62.3	65.7	69.4
RN	68.6	2.2	3.1	10.3	26.4	42.3	47.3	61.3	60.8	65.4	80.8	68.5	49.0
PI	54.3	5.2	8.5	21.2	33.6	52.2	53.4	69.4	75.2	79.0	58.6	39.5	58.9
PE	63.4	4.8	7.5	20.9	38.7	54.1	57.7	63.8	59.8	64.7	86.4	80.4	65.9
PB	44.1	3.3	8.0	29.6	48.6	58.5	63.1	52.4	45.0	58.6	71.3	52.8	55.0
MA	28.2	3.1	4.2	13.0	24.0	36.6	46.1	66.2	51.5	47.4	71.8	60.1	47.2
CE	34.0	4.1	8.6	23.3	45.5	61.9	65.1	72.0	63.1	69.1	126.3	87.3	85.1
BA	40.1	2.1	3.6	8.9	21.3	34.3	36.8	41.8	51.8	68.2	84.1	68.1	54.6
AL	15.7	4.8	7.3	20.9	40.1	53.3	53.0	54.1	59.7	60.4	82.3	75.7	58.5
TO	56.2	6.5	10.9	37.2	61.1	73.8	73.6	72.8	63.8	73.3	75.2	47.7	74.3
RR	34.6	6.4	8.5	16.8	52.3	55.2	45.9	54.9	44.1	21.3	82.5	84.0	70.5
RO	6.3	5.8	6.7	22.5	59.5	67.3	65.6	68.3	68.3	77.3	93.9	77.0	73.7
PA	30.9	4.7	8.7	18.8	33.7	44.2	47.6	59.6	53.6	35.4	55.1	36.3	61.0
AM	1.4	3.1	5.7	17.9	35.4	47.7	49.9	46.3	53.2	55.1	79.4	72.2	74.1
AP	3.2	2.9	6.6	22.4	47.5	51.7	49.0	48.1	55.6	47.0	71.1	67.2	82.4
AC	8.0	2.8	1.6	7.6	15.6	26.9	30.8	56.5	27.7	26.6	56.5	46.0	64.5
SP	94.3	0.2	0.2	4.3	13.3	24.6	26.5	59.8	17.9	74.9	94.7	86.4	76.4
RJ	14.0	6.3	8.7	21.8	43.0	53.2	50.2	55.4	57.9	66.2	91.3	82.3	71.0
MG	86.1	0.5	0.8	5.2	6.8	10.8	10.5	21.2	51.2	77.5	76.4	62.0	87.7
ES	53.7	4.4	6.0	24.0	58.5	77.0	71.1	72.3	62.4	84.3	86.8	74.8	77.6
SC	98.1	10.4	9.4	30.7	78.5	93.7	87.8	90.1	87.0	68.0	81.7	73.3	85.7
RS	77.0	8.5	9.5	23.5	45.1	54.4	53.3	62.5	63.1	64.0	77.2	55.0	75.3
PR	72.6	6.5	10.7	31.0	62.2	77.6	74.4	75.7	59.2	72.5	81.6	68.3	84.7
2015													
MS	56.9	2.4	4.9	18.8	42.1	59.6	56.9	64.6	69.6	35.2	100.4	60.6	87.6
MT	40.8	8.6	16.5	41.6	62.6	73.8	66.4	75.9	71.9	58.7	88.2	60.9	77.2
GO	12.7	4.5	5.9	24.3	45.8	61.3	57.8	72.2	63.5	65.0	79.0	56.6	80.3
DF	87.1	0.3	0.2	1.3	1.1	2.0	1.3	30.9	4.3	103.5	89.5	64.3	124.2
SE	106.9	6.2	8.6	24.9	59.8	79.9	74.1	82.0	87.1	81.7	62.3	65.7	69.4
RN	68.6	2.2	3.1	10.3	26.4	42.3	47.3	61.3	60.8	65.4	80.8	68.5	49.0
PI	54.3	5.2	8.5	21.2	33.6	52.2	53.4	69.4	75.2	79.0	58.6	39.5	58.9
PE	63.4	4.8	7.5	20.9	38.7	54.1	57.7	63.8	59.8	64.7	86.4	80.4	65.9
PB	44.1	3.3	8.0	29.6	48.6	58.5	63.1	52.4	45.0	58.6	71.3	52.8	55.0
MA	28.2	3.1	4.2	13.0	24.0	36.6	46.1	66.2	51.5	47.4	71.8	60.1	47.2
CE	34.0	4.1	8.6	23.3	45.5	61.9	65.1	72.0	63.1	69.1	126.3	87.3	85.1
BA	40.1	2.1	3.6	8.9	21.3	34.3	36.8	41.8	51.8	68.2	84.1	68.1	54.6
AL	15.7	4.8	7.3	20.9	40.1	53.3	53.0	54.1	59.7	60.4	82.3	75.7	58.5
TO	56.2	6.5	10.9	37.2	61.1	73.8	73.6	72.8	63.8	73.3	75.2	47.7	74.3
RR	34.6	6.4	8.5	16.8	52.3	55.2	45.9	54.9	44.1	21.3	82.5	84.0	70.5
RO	6.3	5.8	6.7	22.5	59.5	67.3	65.6	68.3	68.3	77.3	93.9	77.0	73.7
PA	30.9	4.7	8.7	18.8	33.7	44.2	47.6	59.6	53.6	35.4	55.1	36.3	61.0
AM	1.4	3.1	5.7	17.9	35.4	47.7	49.9	46.3	53.2	55.1	79.4	72.2	74.1
AP	3.2	2.9	6.6	22.4	47.5	51.7	49.0	48.1	55.6	47.0	71.1	67.2	82.4
AC	8.0	2.8	1.6	7.6	15.6	26.9	30.8	56.5	27.7	26.6	56.5	46.0	64.5
SP	94.3	0.2	0.2	4.3	13.3	24.6	26.5	59.8	17.9	74.9	94.7	86.4	76.4
RJ	14.0	6.3	8.7	21.8	43.0	53.2	50.2	55.4	57.9	66.2	91.3	82.3	71.0
MG	86.1	0.5	0.8	5.2	6.8	10.8	10.5	21.2	51.2	77.5	76.4	62.0	87.7
ES	53.7	4.4	6.0	24.0	58.5	77.0	71.1	72.3	62.4	84.3	86.8	74.8	77.6
SC	98.1	10.4	9.4	30.7	78.5	93.7	87.8	90.1	87.0	68.0	81.7	73.3	85.7
RS	77.0	8.5	9.5	23.5	45.1	54.4	53.3	62.5	63.1	64.0	77.2	55.0	75.3
PR	72.6	6.5	10.7										

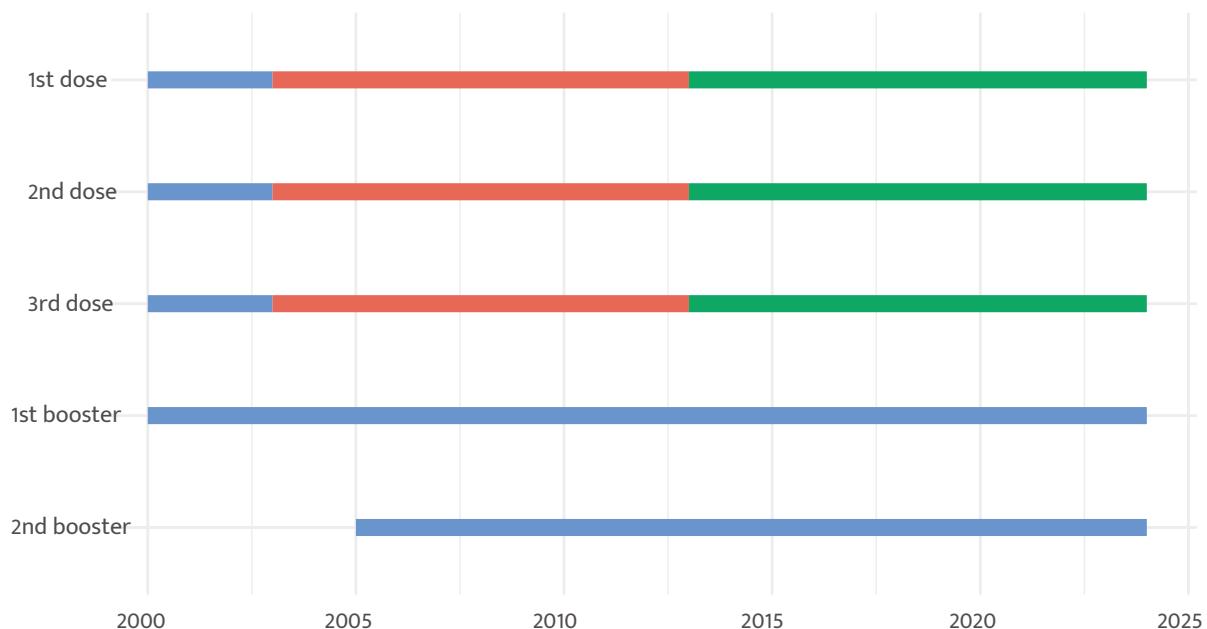
# DIPHTHERIA, TETANUS, AND PERTUSSIS

## History of diphtheria, tetanus, and pertussis vaccination

Pentavalent

Tetraivalent

DTP



Since the turn of the century, immunization against diphtheria, tetanus, and pertussis has been carried out with a single combined vaccine in Brazil. Over time, this vaccine (DTP) was replaced by the tetraivalent vaccine and this, in turn, by the pentavalent vaccine, which added antigens to cover *Haemophilus influenzae* type b and hepatitis B respectively. Although all three diseases preventable by the components of the DTP vaccine are caused by bacteria, they have distinct modes of transmission and clinical presentations.

Diphtheria, caused by *Corynebacterium diphtheriae*, primarily affects the tonsils, pharynx, larynx, and nose, causing fever, pain in the affected tissues, and, in some cases, swelling of the lymph nodes which drain the face. In more severe cases, the infection can spread to other tissues such as the skin, eyes, genitals, and myocardium; mortality rates can be as high as 10% in some outbreaks. It is transmitted through direct contact or airborne particles and is most common in autumn and winter, when dry air facilitates its spread.

Tetanus is the name given to infection with the bacterium *Clostridium tetani*. It is characterized by muscle spasms, which can be severe enough to fracture bones. In addition to spasms, the clinical presentation includes fever, high blood pressure, tachycardia, difficulty swallowing, and headache. *C. tetani* It is an anaerobic bacterium and its spores are found in various environments. Transmission occurs when open wounds come into contact with these spores, often through cuts or punctures in the skin. There is no direct human-to-human transmission.

Pertussis, or whooping cough, is an infectious disease caused by *Bordetella pertussis*, a bacterium that specializes in colonizing the human respiratory tract. The most common symptoms are fever, runny nose, and a moderate cough, with a characteristic “whoop” on inhalation. These symptoms may increase in intensity and last several weeks. Transmission occurs mainly through particles expelled during coughing and sneezing.

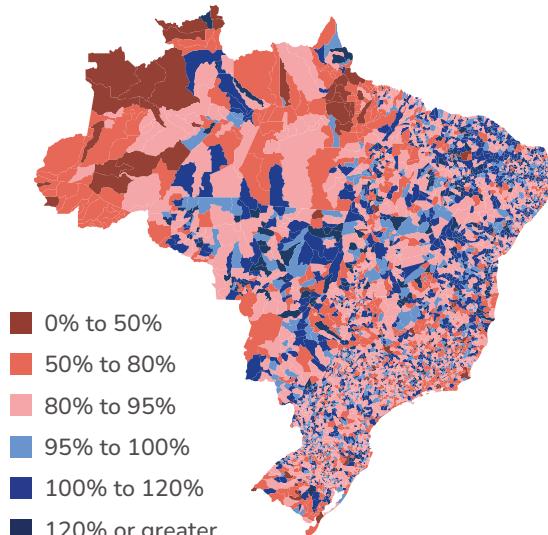
Dose	Target age	Vaccine
<b>1st dose</b>	<b>2 months</b>	<b>Pentavalent</b>
<b>2nd dose</b>	<b>4 months</b>	<b>Pentavalent</b>
<b>3rd dose</b> <small>Coverage reference</small>	<b>6 months</b>	<b>Pentavalent</b>
<b>1st booster</b>	<b>15 months</b>	<b>DTP</b>
<b>2nd booster</b>	<b>4 years</b>	<b>DTP</b>

As of 2023, the PNI childhood vaccination schedule included five doses of vaccines that prevent pertussis: three doses of the pentavalent vaccine as part of the primary vaccination series and two boosters with the DTP vaccine.

The vaccine currently available on the national vaccination schedule is the pentavalent (or 5-in-1), which contains diphtheria, tetanus, pertussis, *Haemophilus influenzae* type b, and hepatitis B components (DTP+Hib+HepB).

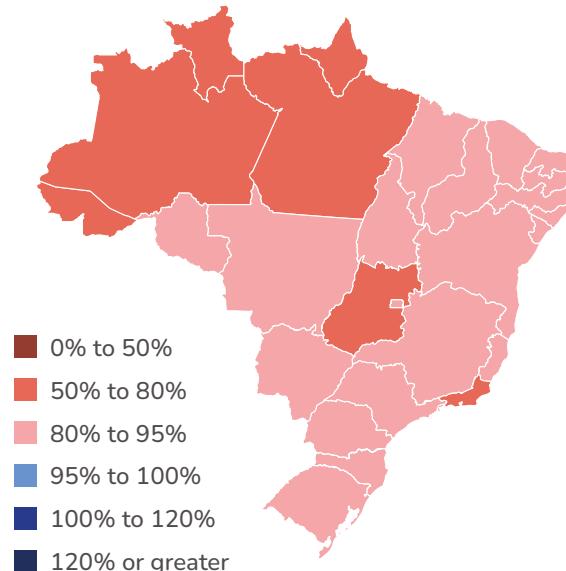
### Coverage for the 3rd dose of pentavalent vaccine

Children under 1, 2023, by municipality



### Coverage for the 3rd dose of pentavalent vaccine

Children under 1, 2023, by state



## Coverage for doses of vaccines containing a diphtheria, tetanus, and pertussis component

2023, by state, %

■ 0% to 50% ■ 50% to 80% ■ 80% to 95% ■ 95% to 100% ■ 100% to 120% ■ 120% or greater

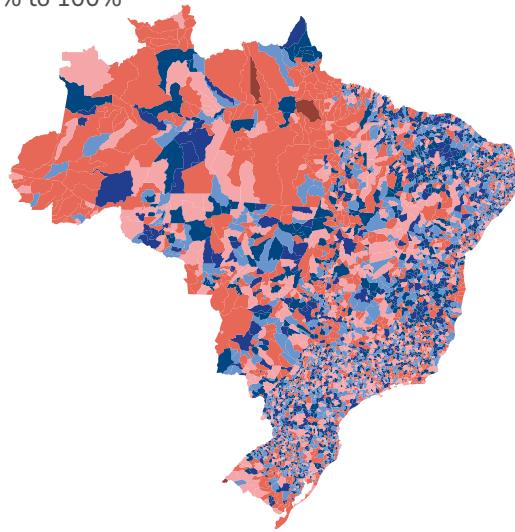
	1st dose	2nd dose	3rd dose	1st booster	2nd booster
MS	91.5	89.5	86.0	78.7	75.5
MT	94.7	91.6	86.6	78.6	81.9
GO	82.4	80.4	75.6	65.4	59.8
DF	86.6	85.5	80.9	73.8	71.7
SE	88.6	87.5	83.2	76.1	66.6
RN	91.0	87.9	82.3	74.0	63.2
PI	91.1	91.2	90.6	86.4	78.8
PE	85.3	83.6	80.4	68.0	59.4
PB	91.8	88.8	85.2	75.5	69.3
MA	91.2	88.4	84.6	72.1	57.9
CE	92.9	92.5	91.8	81.9	71.8
BA	90.9	90.3	86.8	77.7	66.7
AL	94.2	91.8	88.4	81.9	75.5
TO	95.1	92.8	87.4	83.4	82.2
RR	85.0	78.7	69.6	59.5	80.2
RO	96.4	93.6	89.4	77.5	72.9
PA	85.8	80.9	72.5	60.5	52.5
AM	89.1	84.7	79.9	73.5	69.3
AP	72.3	69.7	61.9	52.3	47.0
AC	87.3	81.6	72.2	65.4	60.0
SP	86.6	85.2	82.2	73.2	66.0
RJ	76.9	72.2	69.1	54.1	40.8
MG	83.6	83.3	81.2	71.6	69.4
ES	89.0	87.6	83.5	70.2	63.7
SC	88.2	87.1	85.0	72.9	78.8
RS	90.1	88.4	84.2	76.5	71.8
PR	88.0	87.1	85.1	77.2	75.3

As with most vaccines, coverage rates are higher for the first doses of the vaccination schedule. The second booster has coverage below 50% in Rio de Janeiro and Amapá. The downward trend in follow-up vaccination is observed in all federative units; among these, Tocantins stands out, with coverage rates above the national average for all doses.

## Dropout rate for the 3rd dose of pentavalent vaccine

Children under 1, 2023, by municipality

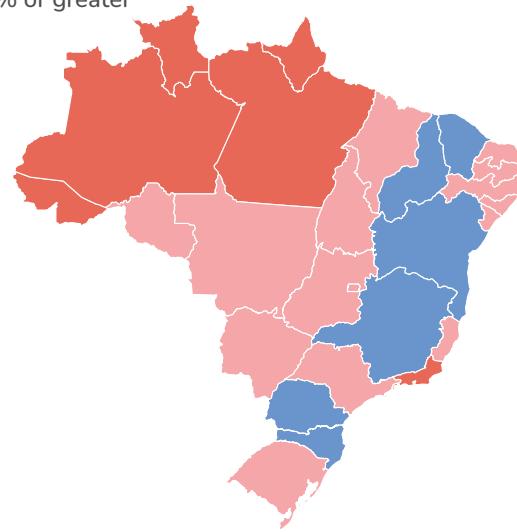
- -5% or less
- -5% to 0%
- 0% to 5%
- 5% to 10%
- 10% to 50%
- 50% to 100%



## Dropout rate for the 3rd dose of pentavalent vaccine

Children under 1, 2023, by state

- -5% or less
- -5% to 0%
- 0% to 5%
- 5% to 10%
- 10% to 50%
- 50% or greater

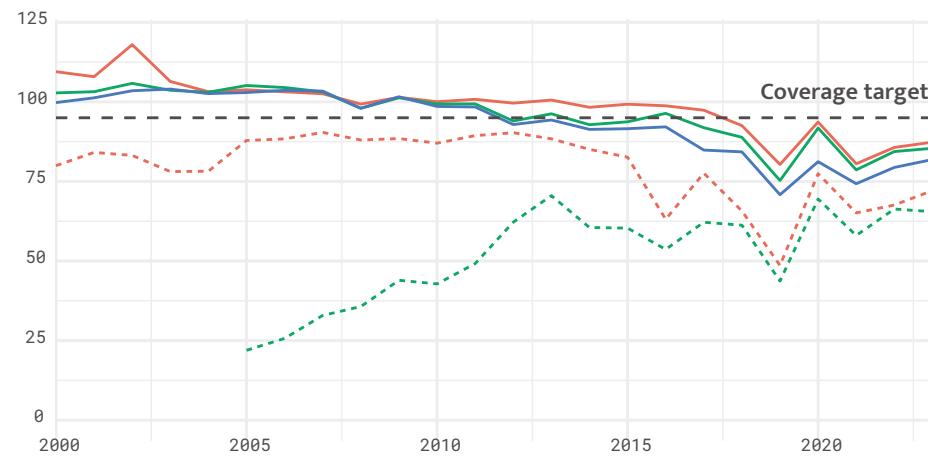


## Coverage for each dose of vaccines containing a diphtheria, tetanus, and pertussis component

Children under 1, Brazil, 2000 to 2023

By type of dose, %

- 1st dose
- 2nd dose
- 3rd dose\*
- 1st booster
- 2nd booster



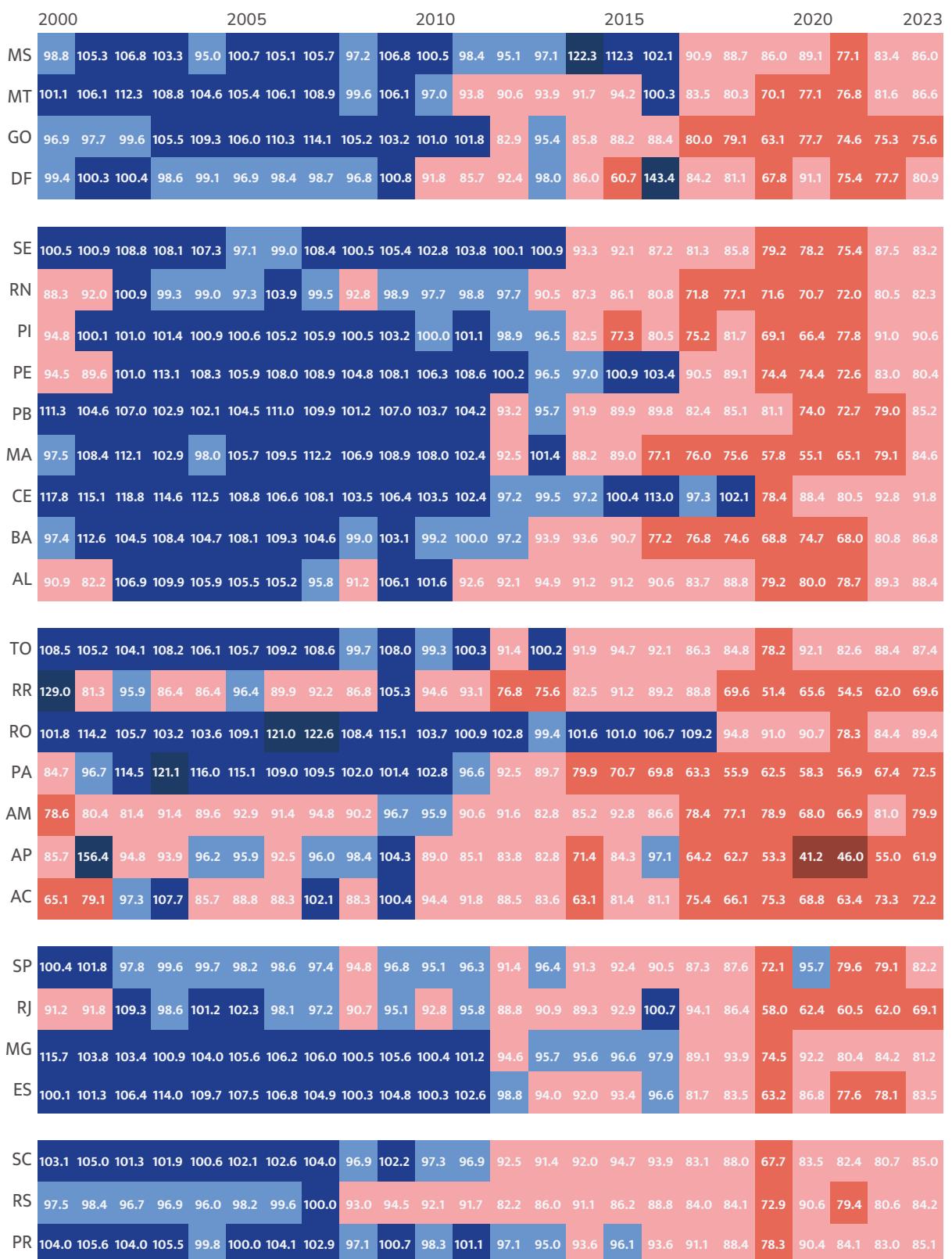
Coverage rates across the whole of Brazil showed a decline in all doses of the vaccination schedule between 2015 and 2019, during which there were periods of insufficient vaccine supply, followed by a sharp upturn in 2020—the first year of the Covid-19 pandemic.

This may have been due to an increased demand for vaccination services following resupply of vaccines in the network. Coverage rates for the second booster, introduced in 2004, in the population between 4 and 6 years of age took several years to reach values comparable to those of the other doses; 50% coverage was reached only in 2010, indicating either non-adherence to this dose or delayed uptake.

## Coverage for the last dose of vaccines containing a diphtheria, tetanus, and pertussis component

Children under 1, by state, 2000 to 2023, %

■ 0% to 50% ■ 50% to 80% ■ 80% to 95% ■ 95% to 100% ■ 100% to 120% ■ 120% or greater

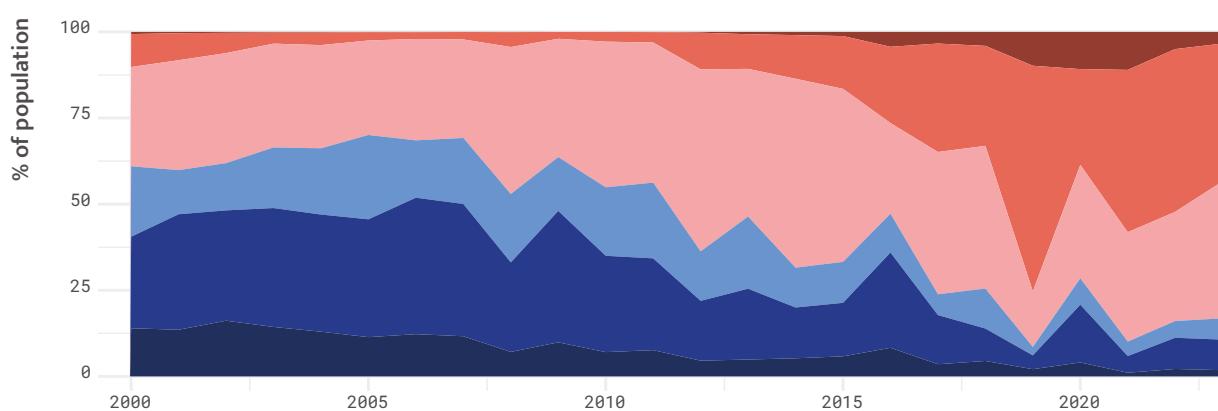


## Fraction of the Brazilian population living in municipalities in each vaccination coverage range for the 3rd dose of pentavalent vaccine

Children aged 1 year, Brazil, 2000 to 2023

### Vaccine coverage

■ 0% to 50% ■ 50% to 80% ■ 80% to 95% ■ 95% to 100% ■ 100% to 120% ■ 120% or greater

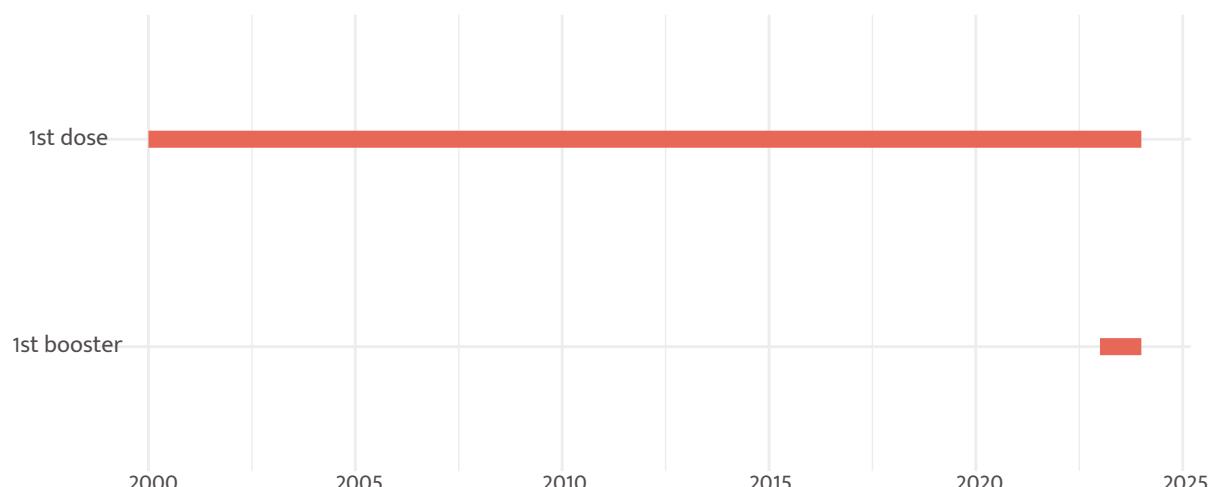


The graph shows the fraction of the Brazilian population living in municipalities within each range of vaccination coverage and reveals the extent of the decline in vaccination rates observed over the last decade. In 2023, almost half of the population resided in municipalities with less than 80% coverage for the third dose.

# YELLOW FEVER

## History of yellow fever vaccines

Yellow fever



Yellow fever is an acute viral febrile illness that remains a major public health problem in Brazil. It is caused by an arbovirus that is maintained in nature by transmission between monkeys and wild mosquitoes (the arthropod vector), mainly of the genera *Haemagogus* and *Sabathes*.

It is considered a sylvatic zoonosis and, therefore, is impossible to eliminate definitively, given its high epidemic potential, especially in areas with unvaccinated populations, densely populated, and infested by *Aedes aegypti*. However, it is preventable by the yellow fever vaccine, which was previously recommended only in endemic areas of the Amazon region.

However, with the spread of viral circulation to other regions in recent decades, leading to significant outbreaks, the area considered recommended for vaccination (ACRV) have gradually expanded over time; as of 2020, vaccination was recommended throughout Brazil for the population up to 59 years of age. Other age groups may be vaccinated depending on risk assessment.

Despite the expansion of vaccination recommendations nationwide, the number of deaths recorded in endemic regions remains a cause for concern, reinforcing the need to maintain and intensify vaccination and surveillance strategies.

Clinically, the disease manifests with jaundice and, in severe cases, bleeding from the gums, nose, gastrointestinal tract, and urine.

Dose	Target age	Vaccine
<b>1st dose</b> Coverage reference	<b>9 months</b>	<b>Yellow fever</b>
<b>1st booster</b>	<b>4 years</b>	<b>Yellow fever</b>

\* We thank Professor Maurício Nogueira of the São José do Rio Preto School of Medicine (Famerp) for his assistance in preparing this text.

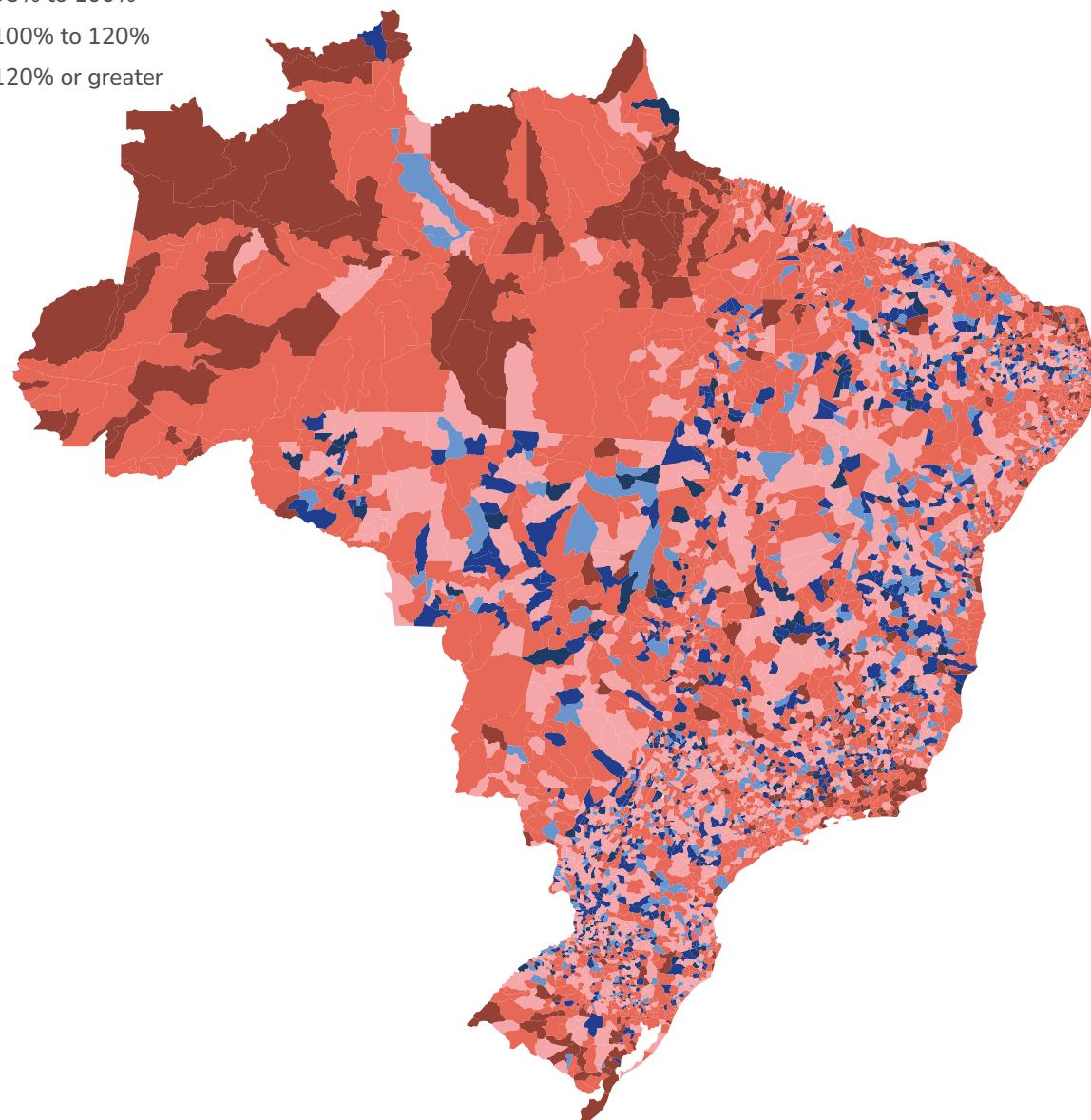
The yellow fever vaccine is one of the oldest vaccines available in Brazil, manufactured and registered since 1937. However, for many years, it was available routinely only for populations living in endemic areas or travelers to those areas.

Until May 2017, the Brazilian yellow fever vaccination scheme consisted of an initial dose at 9 months of age and subsequent booster doses every 10 years for residents of endemic areas and other specific cases (such as travelers to these areas). After that, the WHO recommendation was followed and a single-dose scheme was adopted. In 2020, a booster dose was included at age 4 for children. However, those who did not receive the vaccine according to the recommended schedule at 9 months and 4 years of age, or before the age of five, observing the minimum interval of 30 days between doses, should receive a dose at any age.

## Coverage for the 1st dose of yellow fever vaccine

Children under 1, 2023, by municipality

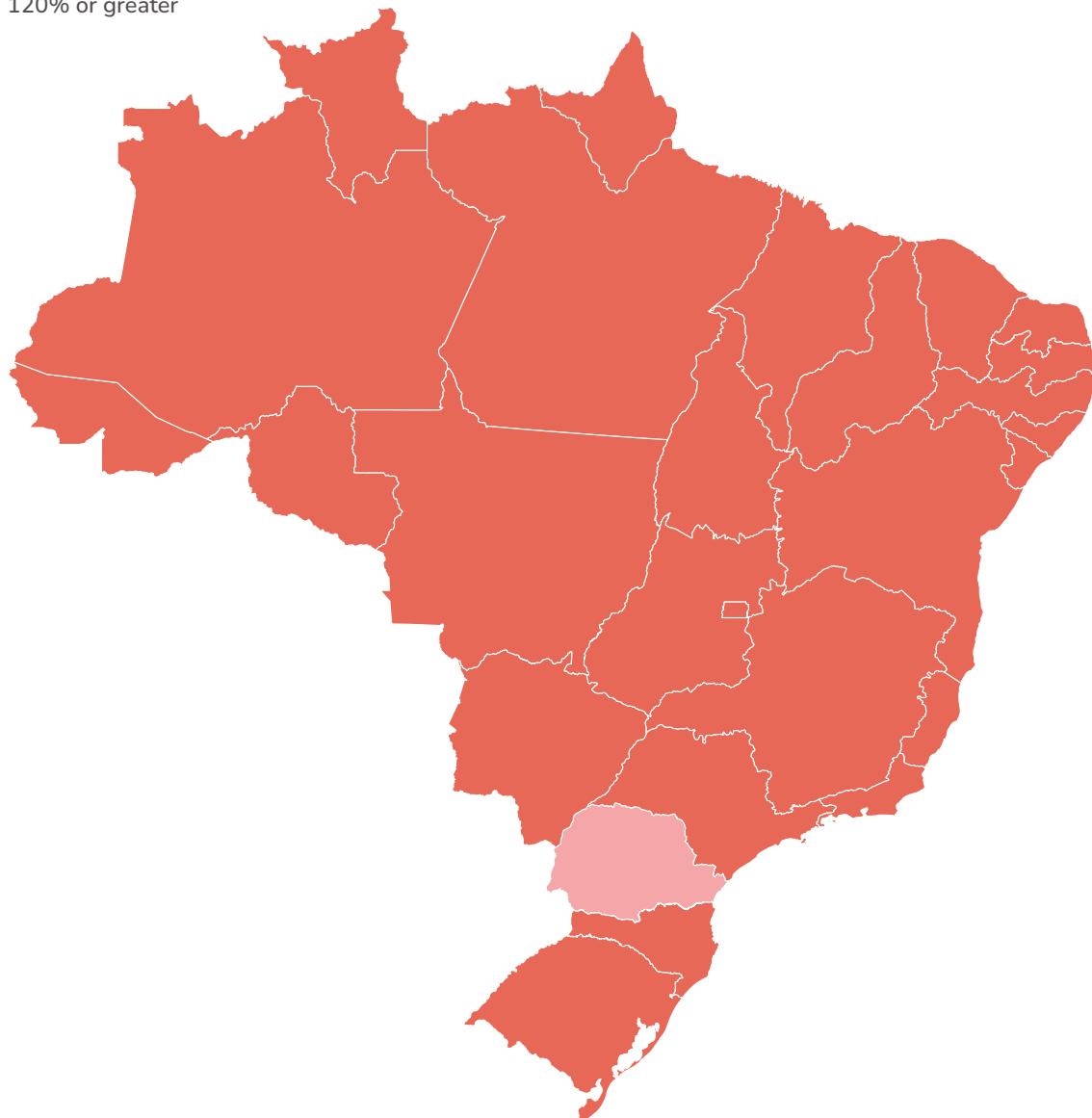
- 0% to 50%
- 50% to 80%
- 80% to 95%
- 95% to 100%
- 100% to 120%
- 120% or greater



## Coverage for the 1st dose of yellow fever vaccine

Children under 1, 2023, by state

- 0% to 50%
- 50% to 80%
- 80% to 95%
- 95% to 100%
- 100% to 120%
- 120% or greater



In the year 2023, coverage with the first dose of yellow fever vaccine for children under 1 year of age was below 80% in 25 states and the Federal District. Only Paraná reached 81% of the target population, with 16 states below 70%. These results are reflected at the municipal level, particularly in most municipalities of the North and part of the Northeast regions. On the other hand, coverage rates above 95% (the target) were more common in states of the Southeast and South regions.

## Coverage for doses of vaccines containing a yellow fever component

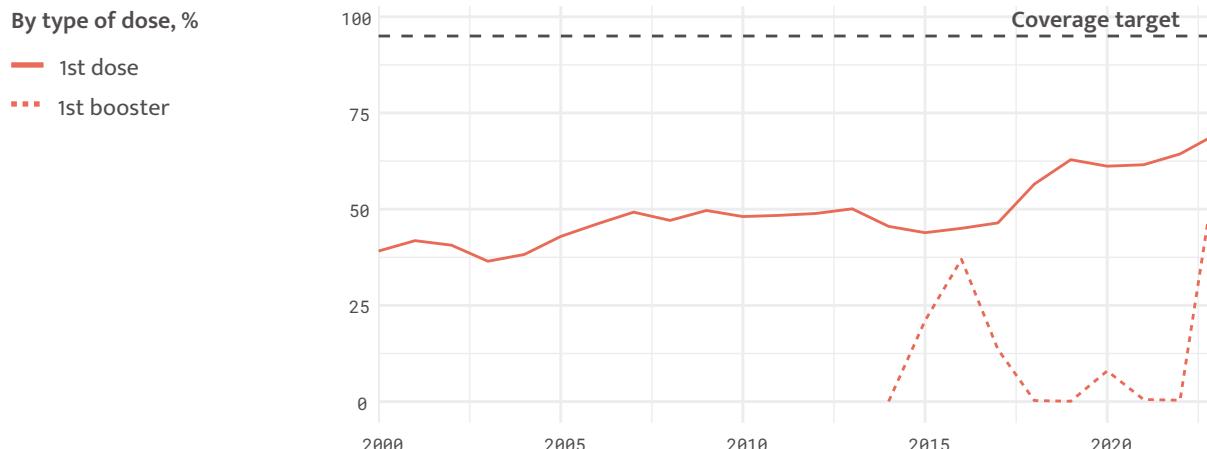
2023, by state, %

■ 0% to 50% ■ 50% to 80% ■ 80% to 95% ■ 95% to 100% ■ 100% to 120% ■ 120% or greater

	1st dose	1st booster
MS	76.0	74.3
MT	75.8	76.9
GO	64.2	62.1
DF	79.6	74.4
SE	62.2	44.7
RN	54.9	34.9
PI	77.6	71.4
PE	58.7	49.6
PB	66.4	59.5
MA	66.5	53.5
CE	67.1	51.5
BA	73.2	62.0
AL	67.6	60.9
TO	74.4	78.7
RR	51.0	76.9
RO	79.0	72.8
PA	54.7	46.1
AM	65.6	64.7
AP	53.5	44.7
AC	59.4	51.5
SP	75.4	64.5
RJ	51.5	36.7
MG	76.0	74.3
ES	72.8	73.3
SC	78.5	80.0
RS	68.4	64.3
PR	81.2	69.4

## Coverage for each dose of vaccines containing a yellow fever component

Brazil, 2000 to 2023



From 2000 to 2013, coverage remained below 50%. However, the data are not perfectly comparable with the post-2015 period, considering that there was significant variation in the context of the municipalities targeted for vaccination and the calculation considers all Brazilian municipalities. The area in which yellow fever vaccination was recommended was historically confined to Brazil's Legal Amazon and part of the Midwest region.

## Coverage for single dose of vaccines containing a yellow fever component

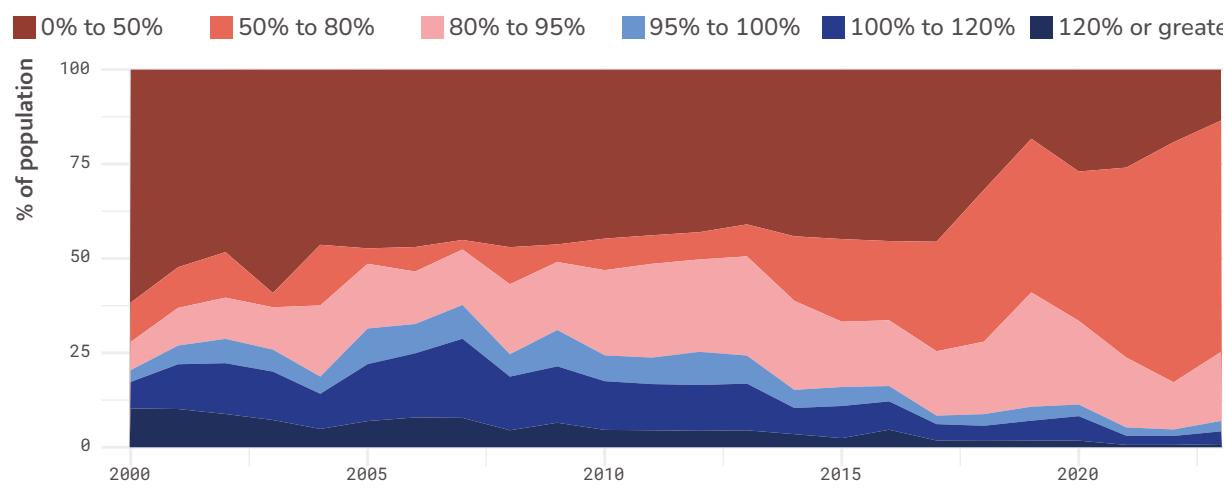
■ 0% to 50% ■ 50% to 80% ■ 80% to 95% ■ 95% to 100% ■ 100% to 120% ■ 120% or greater

	2000				2005				2010				2015				2020				2023				
MS	109.8	109.4	107.7	106.3	73.4	93.9	99.2	100.9	89.7	100.5	93.9	94.5	93.7	95.4	110.6	104.2	97.3	84.9	86.4	90.9	73.2	70.0	72.5	76.0	
MT	120.0	116.4	114.2	111.6	81.4	100.1	105.4	110.1	102.8	103.5	92.7	90.8	92.4	96.1	98.5	88.8	94.1	81.0	77.3	74.1	71.7	67.3	69.0	75.8	
GO	143.0	101.7	102.4	99.8	87.3	104.9	109.8	114.9	107.5	102.6	102.2	105.2	96.2	95.6	85.7	79.8	83.0	75.5	76.3	75.5	69.9	69.9	65.7	64.2	
DF	5.6	0.7	0.2	0.7	0.2	0.1	1.6	3.1	50.2	2.8	2.9	3.9	3.1	85.4	88.0	60.2	136.8	78.7	82.1	82.5	84.3	79.2	78.6	79.6	
SE	10.1	3.4	0.3	0.4		0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.3	0.4	0.3	0.7	0.7	0.6	1.6	22.0	62.2
RN	3.7	2.7	1.8	2.0	1.2	1.3	0.9	0.6	0.3	0.4	0.1	0.1	0.1	0.1	0.1	0.3	0.3	0.3	0.3	0.5	0.3	2.4	6.5	24.2	54.9
PI	71.4	61.4	86.0	92.8	93.8	94.6	99.7	103.7	98.4	100.0	96.8	94.4	103.6	96.9	76.5	69.9	73.0	69.1	73.1	74.4	68.5	64.3	75.7	77.6	
PE	9.0	7.8	8.1	8.6	8.8	1.2	0.3	0.4	0.5	0.4	0.3	0.4	0.3	0.4	0.3	0.5	0.5	0.7	0.7	0.7	29.6	50.6	57.2	58.7	
PB	0.4	0.4	0.1	0.3	0.3	0.3	0.3	0.4	0.5	0.4	0.3	0.4	0.5	0.6	0.5	0.4	0.4	0.5	0.5	0.5	13.4	48.9	56.5	66.4	
MA	131.8	121.5	119.3	110.2	91.9	102.3	106.8	114.1	100.2	102.8	108.1	103.6	107.2	104.3	87.7	85.2	72.6	68.0	67.8	66.0	55.4	54.3	63.0	66.5	
CE	32.4	5.6	0.9	0.2	0.1	0.1	0.3	0.1	0.2	0.1	0.2	0.1	0.2	0.2	0.3	0.4	1.3	0.8	0.4	9.3	28.2	56.2	67.1		
BA	84.8	99.1	98.3	100.4	99.3	102.5	103.7	101.2	94.8	100.5	96.7	93.4	94.7	95.8	88.2	81.9	70.8	72.7	66.9	68.5	67.3	57.8	65.5	73.2	
AL	1.4	0.3	0.2	0.0	0.1	0.1	0.1	0.2	0.2	0.3	0.3	0.3	0.3	0.4	0.4	0.5	0.5	0.8	2.1	1.8	9.0	44.2	57.8	67.6	
TO	108.7	105.1	112.7	108.3	85.3	99.9	100.7	102.7	93.9	100.4	94.8	92.9	95.9	95.7	84.8	80.0	80.7	73.6	76.5	78.2	75.3	71.5	72.9	74.4	
RR	141.3	92.3	103.9	96.2	71.0	95.2	90.8	96.0	91.8	100.2	89.8	90.2	76.2	73.5	82.9	88.7	85.8	91.5	60.7	55.8	43.3	41.0	46.5	51.0	
RO	112.8	124.9	107.6	104.0	75.9	105.2	119.7	115.0	104.4	102.3	98.7	97.6	101.3	105.8	99.3	102.7	118.1	108.2	85.5	83.1	77.0	72.7	72.2	79.0	
PA	106.8	115.5	110.9	111.0	92.8	103.2	98.6	107.8	100.0	107.6	102.2	96.4	98.3	91.1	67.7	55.8	62.0	60.8	60.9	62.6	51.7	47.0	51.9	54.7	
AM	105.7	109.8	101.4	97.2	73.5	89.1	92.1	97.8	87.5	94.4	90.5	89.2	91.5	88.0	88.2	91.1	79.8	72.7	68.3	74.5	62.3	54.4	64.5	65.6	
AP	92.8	178.1	99.0	97.9	74.5	89.8	85.9	88.0	85.7	88.5	78.5	76.4	81.1	75.9	65.0	76.5	95.6	65.7	65.4	68.7	39.5	39.5	47.4	53.5	
AC	90.0	102.5	101.2	95.4	68.3	78.4	83.8	97.6	86.3	97.0	93.2	91.2	95.3	86.3	57.2	66.8	69.6	65.3	63.1	68.5	53.4	50.6	56.6	59.4	
SP	8.6	7.4	8.7	10.1	10.2	10.5	11.5	11.8	13.4	17.2	19.1	20.1	19.9	20.4	19.3	19.0	19.2	24.5	59.2	75.9	76.9	73.3	69.2	75.4	
RJ	5.3	1.7	0.4	0.5	0.3	0.3	0.2	0.3	0.8	0.4	0.4	0.3	0.4	1.0	1.0	0.5	0.2	27.5	47.2	59.3	46.0	49.6	47.4	51.5	
MG	51.1	89.3	77.8	23.2	86.4	101.4	102.5	102.8	96.6	103.1	94.6	96.6	94.8	94.8	91.9	87.7	90.5	83.9	91.1	87.5	85.8	79.3	78.8	76.0	
ES	46.0	21.9	4.1	6.0	26.7	34.6	36.4	35.9	33.5	10.7	1.0	0.6	0.8	0.5	0.4	0.4	0.4	62.7	69.8	72.5	67.7	70.6	66.8	72.8	
SC	0.6	3.2	5.0	8.7	9.6	9.3	9.1	9.2	8.9	10.7	23.6	27.6	27.8	28.0	27.2	25.0	26.7	26.1	57.1	85.2	78.1	76.1	71.8	78.5	
RS	0.3	2.0	3.4	4.5	4.8	5.2	4.9	5.3	6.0	30.0	29.4	33.8	47.3	51.9	53.4	52.6	61.3	55.7	59.2	66.8	66.0	66.0	62.6	68.4	
PR	0.3	0.3	0.5	0.2	0.1	0.2	42.3	77.1	73.4	78.0	70.3	75.6	74.5	76.7	72.6	74.5	69.7	70.9	75.7	85.7	82.4	80.1	77.2	81.2	

At the turn of the century, the Ministry of Health gradually began to expand this recommendation to the Southeast and South regions, due to circulation of the virus in previously unaffected territories. Between 2008 and 2009, municipalities in São Paulo, Paraná, Santa Catarina, and Rio Grande do Sul were incorporated into the ACRV. During the 2017-2018 outbreaks, the recommendation was expanded on an emergency basis to practically all municipalities in the states of Minas Gerais, Espírito Santo, São Paulo, Rio de Janeiro, and Bahia. By 2019, the ACRV had been expanded to cover the whole of Brazil.

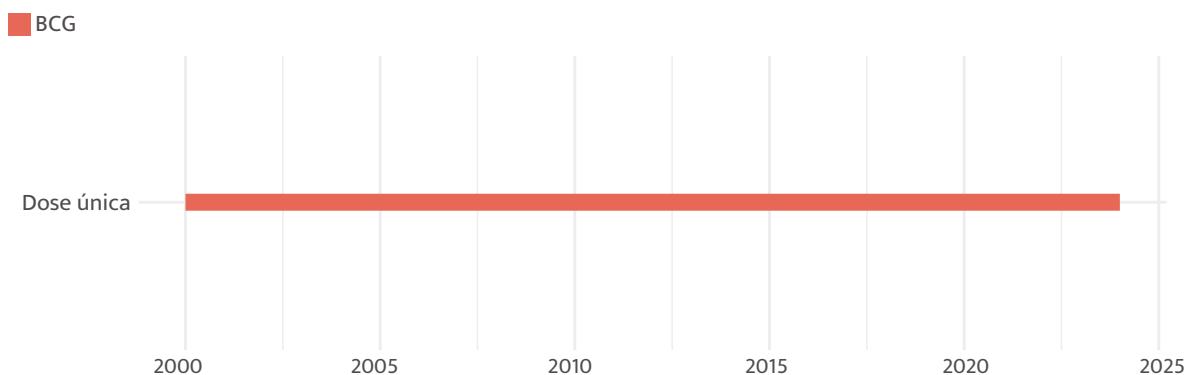
## Fraction of the Brazilian population living in municipalities in each coverage range for the last dose of vaccines containing a yellow fever component

Vaccination coverage, children under 1, Brazil, 2000 to 2023



# TUBERCULOSIS.

## History of vaccination for severe forms of tuberculosis



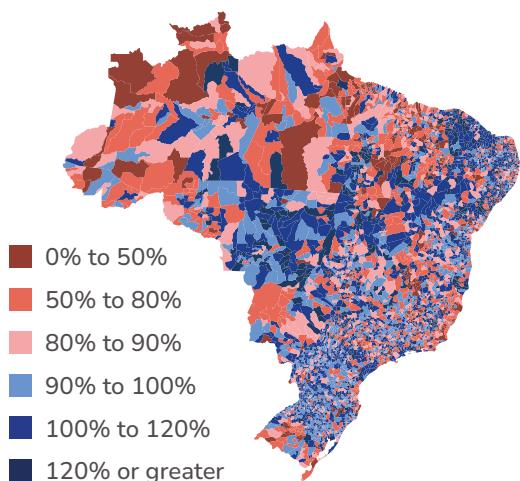
Tuberculosis (TB) is a contagious disease caused primarily by *Mycobacterium tuberculosis* (also known as Koch's bacillus), a highly infectious and communicable species of bacteria. The main symptoms are cough lasting three weeks or longer, afternoon or evening fever, night sweats, and weight loss. In 2023, the WHO considered TB to be the infectious disease responsible for the greatest number of deaths, accounting for more than 1 million fatalities worldwide.

Dose	Target age	Vaccine
<b>1st dose</b> Coverage reference	At birth	BCG

A single dose of the BCG (Bacillus Calmette-Guérin) vaccine protects against the most severe forms of TB. According to the child immunization schedule, it should be given at birth or up to age 5 years, but people who have never received a dose can be immunized at any age. The goal set by the PNI is 90% coverage of the target population.

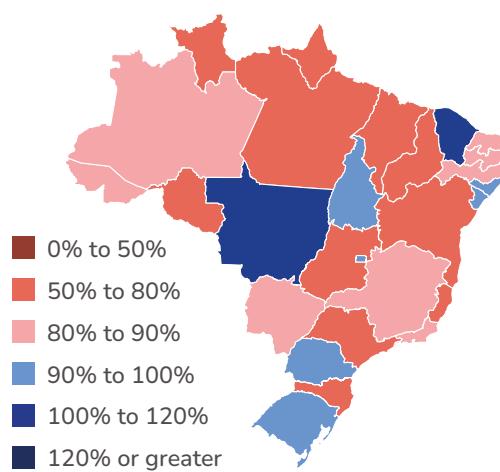
### Coverage for the single-dose BCG vaccine

Children under 1, 2023, by municipality



### Coverage for the single-dose BCG vaccine

Children under 1, 2023, by state



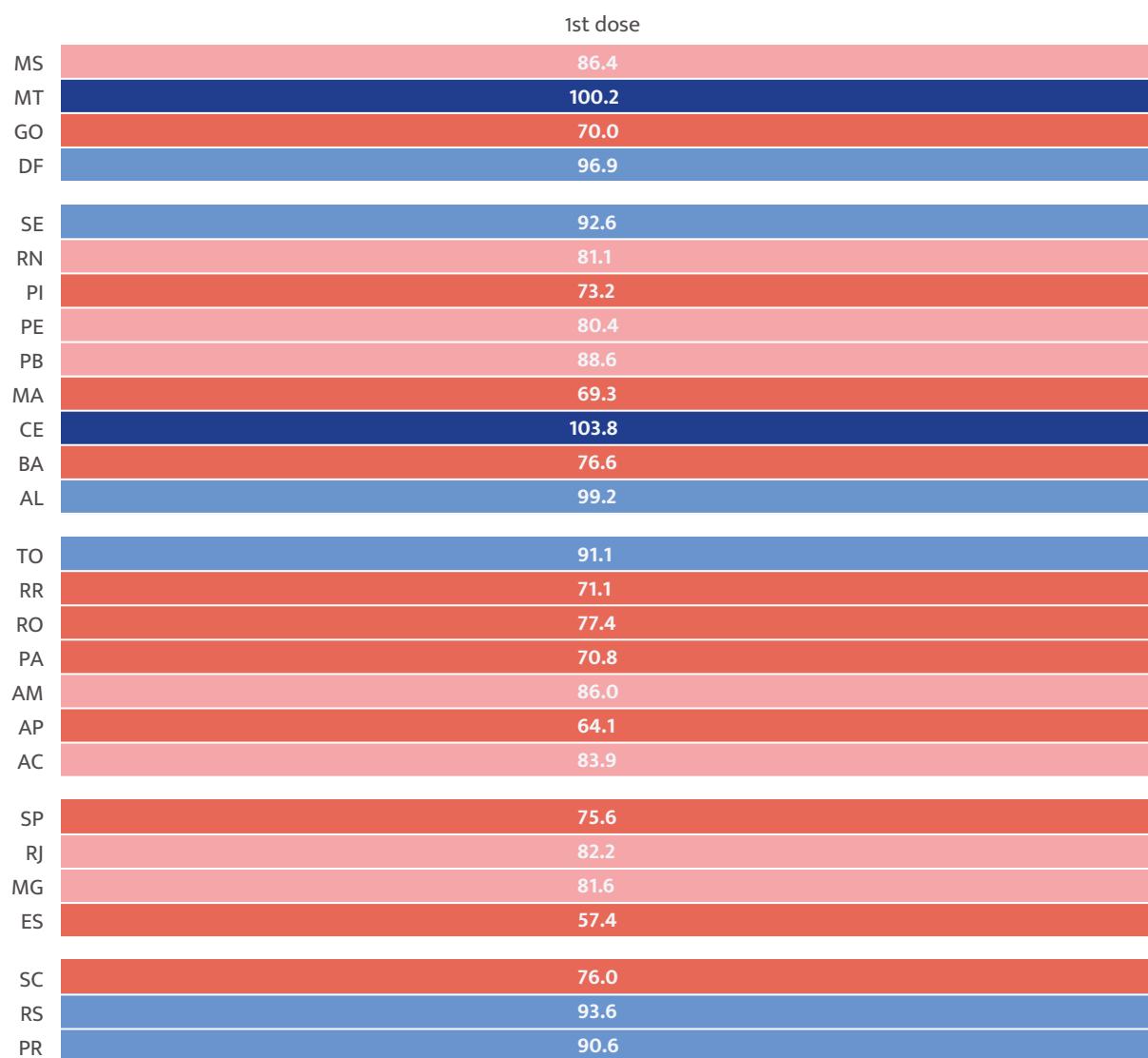
In 2023, the Federal District and seven states reached the BCG coverage target: Mato Grosso, Ceará, Alagoas, Sergipe, Tocantins, Paraná, and Rio Grande do Sul. Notably, there are no states in the 0–50% coverage range.

On the other hand, analysis of the situation at the municipal level reveals very wide variation in vaccination coverage across municipalities within the same state, which carries a risk of disease outbreaks in areas where a large percentage of the population is unvaccinated.

## Coverage for single-dose BCG vaccine

2023, by state, %

■ 0% to 50% ■ 50% to 80% ■ 80% to 90% ■ 90% to 100% ■ 100% to 120% ■ 120% or greater



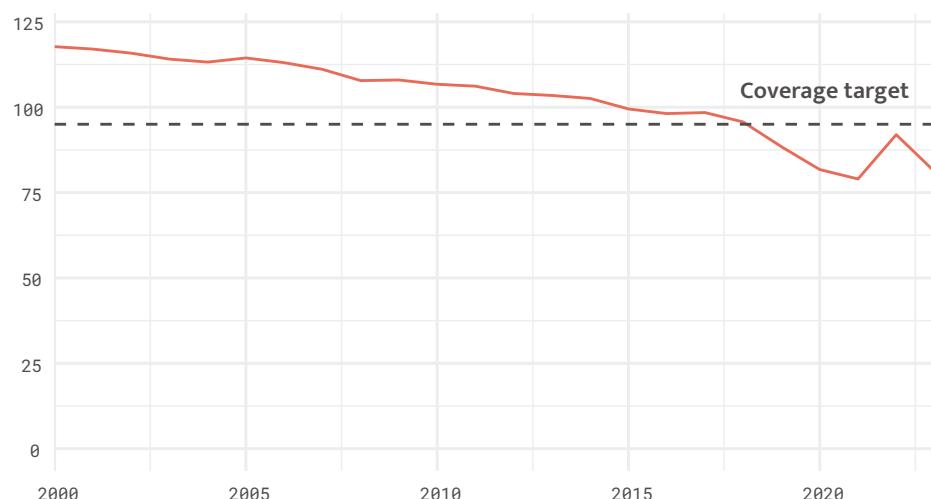
Among the vaccines analyzed for this report, the BCG generally achieved better coverage rates, surpassing the target (90%) until the year 2018, with a decline starting in 2019. This success can be attributed, among other reasons, to its being the first vaccine in the immunization schedule, administered at birth while the infant is still in the maternity ward, in addition to being a single-dose vaccine and thus not susceptible to dropout, as occurs with multi-dose immunizations. At the state level, in the year 2023, only eight states reached the vaccination coverage target, and eleven had rates below 80%.

## Coverage for the single-dose BCG vaccine

Children under 1, Brazil, 2000 to 2023

By type of dose, %

— 1st dose



## Coverage for the single-dose BCG vaccine

Children under 1, by state, 2000 to 2023, %

■ 0% to 50% ■ 50% to 80% ■ 80% to 90% ■ 90% to 100% ■ 100% to 120% ■ 120% or greater

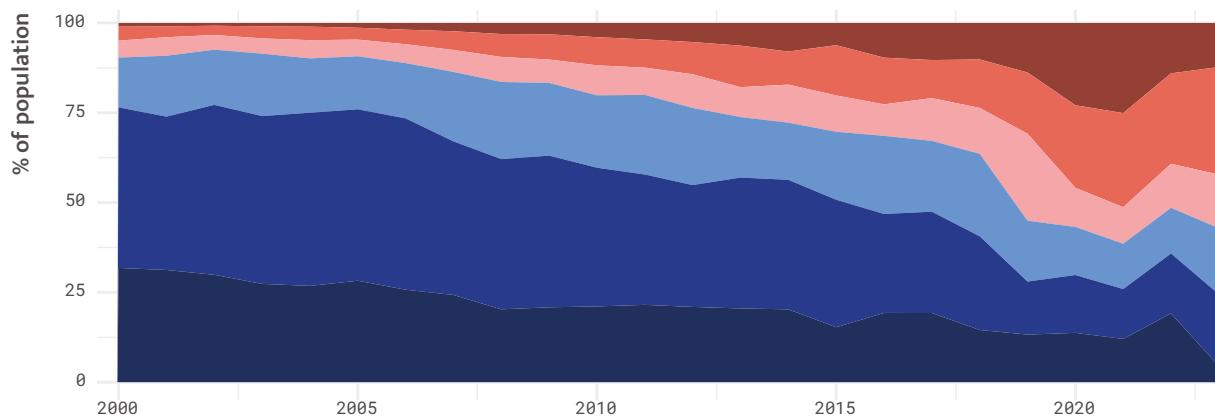
	2000	2005	2010	2015	2020	2023																		
MS	121.6	120.0	114.9	108.1	99.8	102.7	104.3	105.8	101.7	103.6	104.6	102.1	99.0	100.6	122.3	122.3	109.0	119.4	122.8	116.3	69.8	67.6	84.0	86.4
MT	122.0	121.6	120.4	115.8	111.6	113.9	112.0	117.6	112.3	110.9	97.4	98.5	100.8	100.1	99.8	101.1	100.6	94.2	96.0	87.4	85.2	83.0	92.0	100.2
GO	108.8	110.4	112.8	111.3	116.3	116.3	117.7	119.4	118.5	115.2	117.6	116.8	104.9	103.5	106.0	98.0	95.4	89.6	89.5	87.8	77.7	72.2	78.5	70.0
DF	128.7	122.9	116.9	115.7	115.4	109.3	109.4	106.7	107.9	110.7	112.4	99.0	107.4	128.7	108.4	74.7	140.9	93.5	86.3	97.0	106.0	117.5	130.5	96.9
SE	114.8	112.3	105.1	104.7	107.3	104.8	106.3	104.8	104.4	101.5	93.7	99.1	94.9	97.6	98.1	102.9	102.6	98.2	100.5	90.8	85.5	96.6	116.3	92.6
RN	103.4	107.3	114.2	113.3	111.6	112.3	117.7	113.4	107.3	108.3	114.3	116.6	115.3	108.0	102.8	97.5	91.1	67.1	99.5	89.6	90.7	94.5	109.4	81.1
PI	116.7	116.9	115.3	110.6	113.5	109.2	109.1	107.0	106.2	103.8	104.2	101.7	102.9	101.3	94.7	80.7	84.8	93.7	94.1	84.8	87.1	91.6	109.2	73.2
PE	124.8	118.8	123.9	126.0	121.6	117.1	116.6	114.4	109.7	112.0	110.5	111.2	105.8	102.3	103.9	104.5	106.9	101.0	99.5	91.9	84.4	88.5	105.1	80.4
PB	126.6	123.7	117.3	114.5	120.5	126.1	125.9	124.4	117.1	116.4	110.0	113.1	113.9	107.8	107.2	97.3	98.4	100.7	97.0	92.6	68.1	71.7	101.4	88.6
MA	161.8	158.8	143.7	135.2	129.8	133.0	138.5	141.5	132.5	131.1	127.4	123.9	118.9	114.8	105.2	99.5	94.7	108.1	97.6	81.9	69.4	73.0	85.8	69.3
CE	134.9	124.4	122.3	118.2	115.7	118.7	110.1	112.8	104.9	106.3	107.9	107.7	105.0	107.9	102.8	102.8	107.5	107.4	98.3	83.7	67.1	72.1	105.0	103.8
BA	121.1	132.2	120.8	120.7	123.3	123.1	119.0	114.2	105.0	105.9	108.5	106.1	101.6	102.7	102.1	99.3	84.7	86.2	81.0	80.4	83.8	69.5	89.6	76.6
AL	120.1	108.6	127.1	124.4	123.4	118.9	117.4	110.5	99.2	112.4	102.9	101.2	111.9	114.3	107.5	101.2	110.8	112.0	101.6	91.8	74.7	75.8	103.5	99.2
TO	119.1	120.7	117.4	109.1	109.3	110.9	111.6	109.1	103.4	102.5	101.3	100.5	99.6	91.3	98.0	102.3	103.1	105.8	97.0	114.6	96.5	93.2	124.6	91.1
RR	187.4	104.7	116.9	105.4	97.5	107.3	115.5	103.5	95.0	100.4	107.0	110.7	107.2	85.8	98.7	103.5	105.0	109.9	110.1	92.8	85.4	81.1	88.3	71.1
RO	110.8	125.0	109.9	108.0	106.6	109.8	121.2	114.1	105.7	106.8	103.2	99.2	102.9	107.4	105.1	104.7	108.2	96.5	87.6	89.5	80.1	77.6	104.6	77.4
PA	128.6	136.4	147.6	136.6	128.6	147.0	140.2	136.5	127.4	127.7	125.8	119.9	117.2	114.8	108.8	91.0	83.9	87.1	83.5	82.1	75.2	71.7	82.6	70.8
AM	124.4	120.3	121.5	126.6	118.6	130.5	127.5	125.3	120.7	119.5	118.0	115.8	120.0	111.9	113.5	107.5	100.3	96.5	94.4	93.5	94.7	94.4	118.4	86.0
AP	117.7	181.4	129.1	123.6	121.1	122.9	121.7	113.3	115.5	115.6	109.4	105.6	101.4	105.9	101.2	119.6	118.4	102.4	106.0	107.3	100.6	101.9	94.1	64.1
AC	112.3	135.0	132.9	121.1	114.9	109.1	116.0	122.5	107.6	107.7	116.4	103.5	101.8	105.7	100.3	104.4	106.3	99.8	96.2	94.4	78.2	72.1	80.6	83.9
SP	110.7	111.0	109.0	108.9	109.1	106.5	104.5	101.7	103.0	102.3	100.9	101.6	100.9	102.6	99.8	97.1	96.8	101.8	99.1	87.6	79.0	76.2	86.5	75.6
RJ	109.1	106.8	110.3	111.0	109.3	115.6	113.8	110.8	108.4	109.0	108.0	111.2	103.9	103.7	106.0	107.3	111.1	119.0	103.8	84.8	71.3	70.8	80.1	82.2
MG	123.7	109.8	110.3	105.3	108.0	108.5	106.8	104.7	103.3	102.5	100.3	99.4	99.6	95.4	96.3	97.5	92.8	95.9	96.5	89.8	86.7	82.1	95.0	81.6
ES	106.1	106.6	108.6	110.0	110.1	108.9	106.4	100.2	100.6	101.2	106.1	100.2	100.5	101.3	96.9	96.5	95.2	92.4	93.6	91.0	90.2	88.4	65.7	57.4
SC	106.2	104.3	102.8	102.0	103.8	103.2	101.8	100.8	100.4	101.9	101.6	101.2	97.7	95.9	100.4	101.2	98.8	81.7	88.0	83.2	83.2	72.1	82.9	76.0
RS	102.9	104.5	103.7	103.8	102.0	103.2	102.1	100.3	98.5	98.5	96.4	97.9	96.6	92.1	101.0	98.3	93.3	89.5	90.7	92.1	94.3	85.1	93.3	93.6
PR	111.2	112.4	106.8	105.9	104.8	104.4	104.4	102.8	102.6	103.0	101.6	103.7	100.1	102.4	102.1	101.5	96.4	97.0	96.6	93.3	94.6	86.6	90.0	90.6

The table above shows that, until 2015, BCG coverage exceeded 100% in most states, declining from 2016 onward, with the downward trend becoming more pronounced from 2019. Until 2007, all states of Brazil met the PNI coverage target. From 2010 onward, coverage began to decline, reaching its lowest levels in 2020 and 2021.

## Fraction of the Brazilian population living in municipalities in each vaccination coverage range for the single-dose BCG vaccine

Vaccination coverage, children under 1, Brazil, 2010 to 2023

■ 0% to 50% ■ 50% to 80% ■ 80% to 90% ■ 90% to 100% ■ 100% to 120% ■ 120% or greater



From 2000 to 2005, almost 90% of the Brazilian population lived in municipalities that met the vaccination target. However, a progressive decrease is observed until 2023, when this fraction reached approximately 48%.

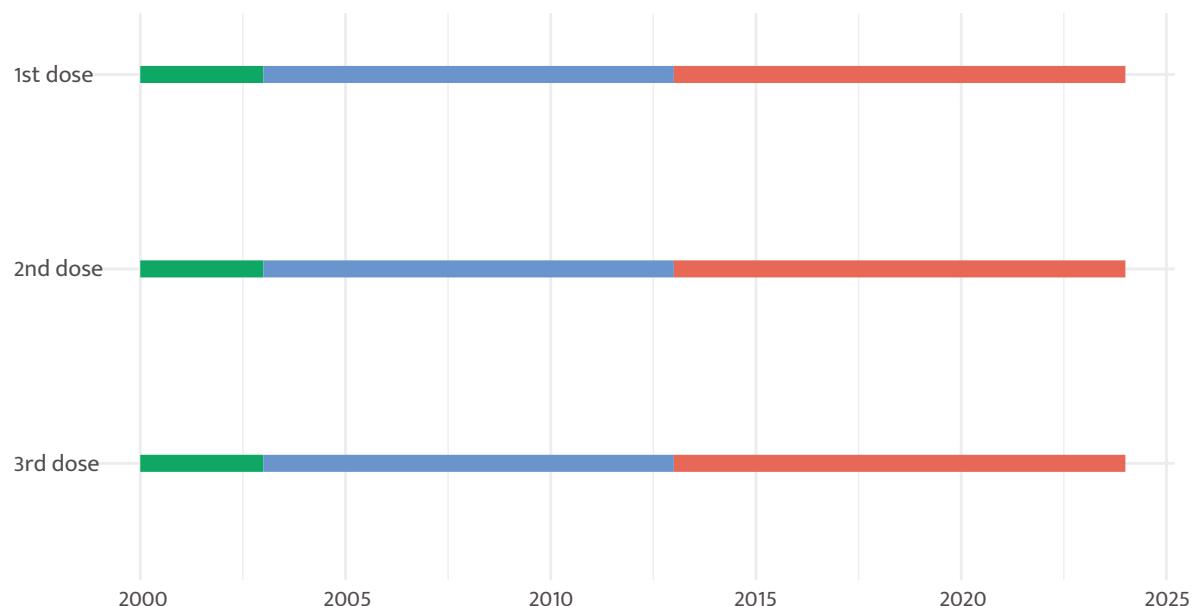
# HAEMOPHILUS INFLUENZAE TYPE B

## History of *Haemophilus influenzae* type b vaccines

■ *Haemophilus influenzae* type b

■ Pentavalent

■ Tetraivalent



*Haemophilus influenzae* type b (Hib) is a bacteria present in the throat that can be transmitted through respiratory droplets (saliva and secretions), expelled during coughing, sneezing, and breathing, even without causing disease in its carrier.

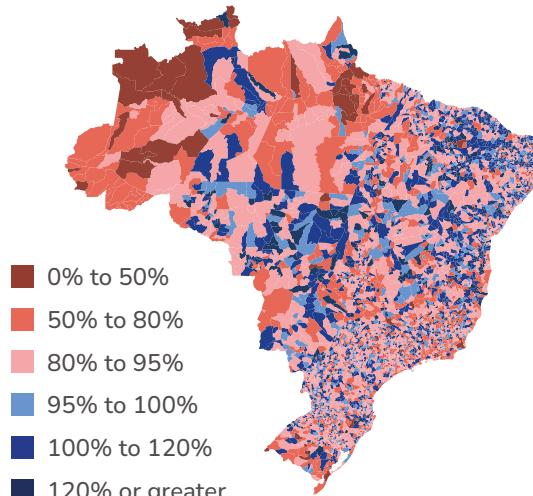
In non-immunized people, Hib can cause meningitis, pneumonia, inflammation of the throat, otitis, arthritis, pericarditis, and bone infection, among other serious conditions.

The *Haemophilus influenzae* type b vaccine was incorporated into the child vaccination schedule in 1999. In 2002 it was combined with the DTP vaccine as the tetraivalent DTP+Hib vaccine, and in 2012 the tetraivalent vaccine was combined with the hepatitis B vaccine to make up the pentavalent DTP+Hib+HepB vaccine. The vaccination schedule consists of three doses starting at 2 months of age.

Dose	Target age	Vaccine
<b>1st dose</b>	<b>2 months</b>	<b>Pentavalent</b>
<b>2nd dose</b>	<b>4 months</b>	<b>Pentavalent</b>
<b>3rd dose</b> Coverage reference	<b>6 months</b>	<b>Pentavalent</b>

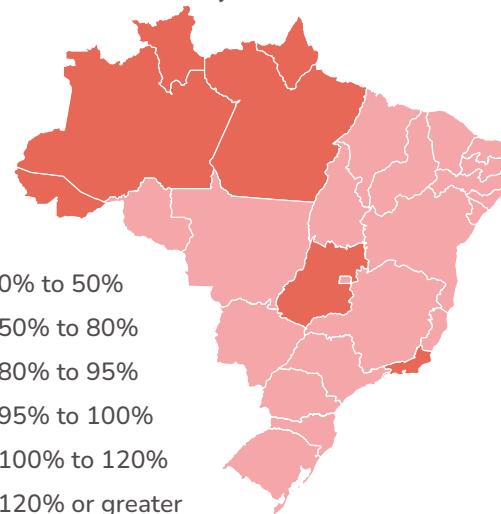
## Coverage for the 3rd dose of pentavalent vaccine

Children under 1, 2023, by municipality



## Coverage for the 3rd dose of pentavalent vaccine

Children under 1, 2023, by state



None of the Brazilian states managed to reach the vaccination coverage target in 2023. The situation in the North region is particularly striking, with only Rondônia and Tocantins having coverage rates above 80%. In the Southeast region, Rio de Janeiro has the worst indicator, with 69.1% coverage (more than 10 percentage points below the other states in the region).

## Coverage for doses of vaccines containing a *Haemophilus influenzae* type b component

2023, by state, %

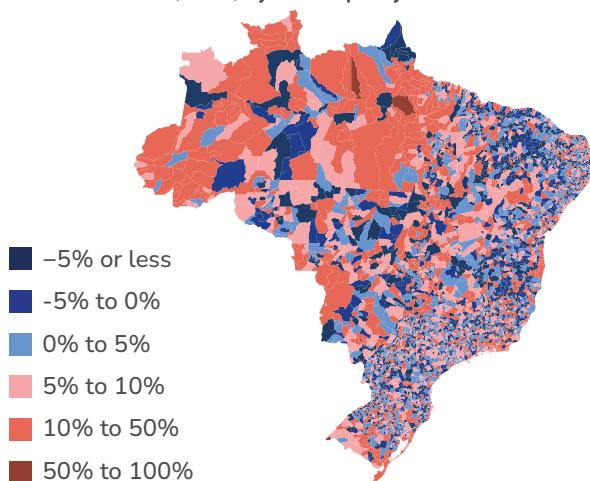
Legend: 0% to 50% | 50% to 80% | 80% to 95% | 95% to 100% | 100% to 120% | 120% or greater

	1st dose	2nd dose	3rd dose
MS	91.5	89.5	85.9
MT	94.7	91.6	86.6
GO	82.4	80.4	75.6
DF	86.6	85.5	80.9
SE	88.5	87.5	83.2
RN	91.0	87.9	82.3
PI	91.1	91.2	90.6
PE	85.3	83.6	80.4
PB	91.8	88.8	85.1
MA	91.1	88.4	84.6
CE	92.9	92.5	91.8
BA	90.9	90.3	86.7
AL	94.2	91.8	88.4
TO	95.1	92.8	87.4
RR	85.0	78.7	69.6
RO	96.0	93.2	89.1
PA	85.8	80.9	72.5
AM	89.1	84.7	79.9
AP	72.2	69.7	61.9
AC	87.3	81.6	72.2
SP	86.5	85.2	82.1
RJ	76.8	72.2	69.1
MG	83.5	83.3	81.2
ES	89.0	87.6	83.5
SC	88.2	87.1	85.0
RS	90.1	88.4	84.2
PR	88.0	87.1	85.1

The three-dose vaccination schedule poses a challenge to achieving the coverage target, with reductions in the vaccinated population for the second and third doses.

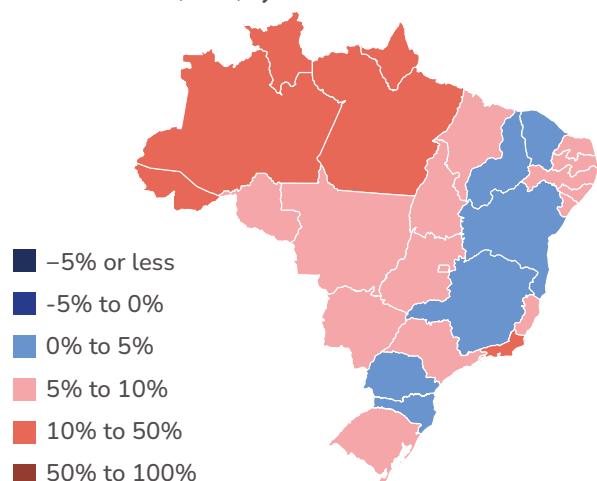
## Dropout rate for the 3rd dose of pentavalent vaccine

Children under 1, 2023, by municipality



## Dropout rate for the 3rd dose of pentavalent vaccine

Children under 1, 2023, by state



Vaccine dropout is a relevant management issue for the National Immunization Program. In the case of the pentavalent vaccine, analysis of Brazil at the municipal levels shows there is still a significant portion of municipalities that record high dropout rates, especially in the North and Midwest regions of the country.

In 2023, of the 5,570 Brazilian municipalities, 3,065 had dropout rates below 5%, while the rest (around 45% of municipalities) recorded moderate (5% to 10%) or high (greater than 10%) dropout rates. In other words, a significant proportion of children who started the vaccination scheme did not complete it.

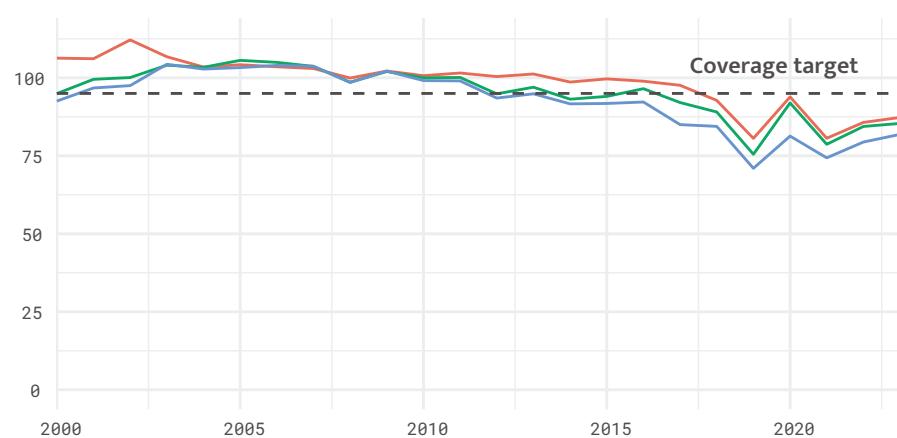
In the year 2023, twenty states reported a dropout rate above 5%; of these, six recorded a high rate (greater than or equal to 10%). Once again the Northern region stands out, with five of the seven states in the region in this range.

## Coverage for each dose of vaccines containing a *Haemophilus influenzae* type b component

Children under 1, Brazil, 2000 to 2023

By type of dose, %

- 1st dose
- 2nd dose
- 3rd dose\*
- 1st booster



## Coverage for the 3rd dose of pentavalent vaccine

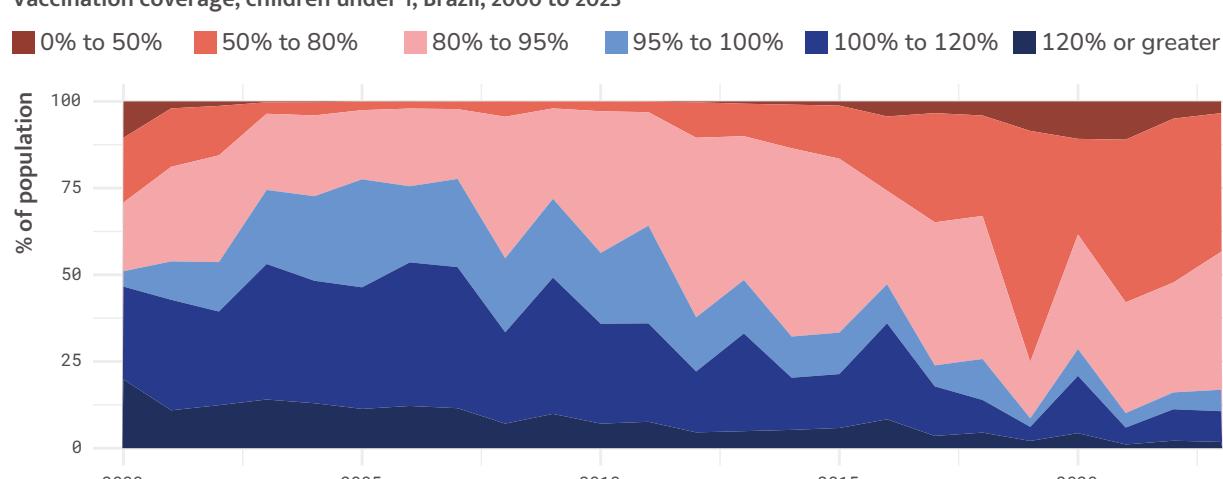
Children under 1, by state, 2000 to 2023, %

	2000	2005	2010	2015	2020	2023	0% to 50%	50% to 80%	80% to 95%	95% to 100%	100% to 120%	120% or greater												
MS	64.9	106.1	103.8	103.3	95.0	100.8	105.2	105.7	97.3	107.0	101.1	98.8	95.3	97.7	123.0	112.4	102.3	91.1	89.1	86.6	89.4	77.3	83.5	85.9
MT	80.6	99.2	106.2	108.8	104.6	105.4	106.1	109.0	99.6	106.1	97.0	93.9	90.5	93.9	91.7	94.2	100.3	83.5	80.4	70.2	77.1	76.8	81.6	86.6
GO	86.0	96.6	88.9	105.2	109.2	105.9	110.3	114.1	105.2	103.8	101.3	101.9	83.8	96.0	86.2	88.2	88.5	80.0	79.3	63.4	77.8	74.7	75.3	75.6
DF	107.3	101.9	101.3	100.1	101.0	97.9	99.7	100.3	99.0	102.5	93.7	87.1	94.2	101.0	87.6	60.7	143.6	84.5	81.5	68.5	91.7	75.5	77.7	80.9
SE	94.6	95.8	106.3	108.2	107.3	97.2	99.1	108.4	100.6	105.5	102.9	103.9	100.2	101.0	93.4	92.1	87.2	81.3	85.9	79.3	78.3	75.4	87.5	83.2
RN	56.3	81.3	91.6	99.2	98.5	97.1	103.9	99.0	92.6	98.6	97.5	98.7	97.6	90.4	87.4	86.1	80.8	71.9	77.1	71.7	70.8	72.1	80.5	82.3
PI	68.5	91.8	94.8	102.4	101.0	100.7	105.3	106.1	100.7	103.3	100.2	101.3	99.1	96.7	82.7	77.3	80.6	75.4	81.9	69.4	66.5	77.8	91.0	90.6
PE	78.7	77.7	91.1	113.1	108.3	105.9	108.1	108.9	104.8	107.9	106.1	108.4	100.1	96.4	97.0	101.0	103.4	90.5	89.1	74.4	74.5	72.6	83.0	80.4
PB	98.2	94.0	101.3	101.9	101.6	104.2	110.7	109.7	101.0	106.6	103.6	104.0	93.0	95.6	92.0	89.9	89.8	82.5	85.2	81.2	74.1	72.7	79.0	85.1
MA	33.3	91.4	96.3	105.5	97.9	105.5	108.9	111.5	106.8	108.7	107.9	102.4	92.4	101.4	88.4	89.0	77.1	76.1	75.6	57.9	55.1	65.1	79.1	84.6
CE	92.0	111.8	111.8	115.2	112.2	108.7	106.6	108.1	103.5	106.4	103.5	102.3	97.3	99.9	97.2	100.4	113.0	97.3	102.1	78.4	88.4	80.5	92.8	91.8
BA	76.6	101.7	88.5	107.4	104.4	107.7	108.8	104.3	98.8	103.0	99.1	99.9	97.0	93.9	93.6	90.7	77.2	76.8	74.6	68.9	74.7	68.0	80.8	86.7
AL	70.0	75.4	101.5	108.7	105.7	104.8	104.8	95.4	91.0	106.0	101.4	92.3	92.1	95.0	91.3	91.3	90.7	83.8	88.9	79.5	80.1	78.8	89.3	88.4
TO	85.2	98.6	99.6	107.8	105.8	105.5	108.8	108.1	99.6	107.9	99.2	100.2	91.3	100.3	91.9	94.8	92.1	86.3	84.9	78.3	92.3	82.7	88.4	87.4
RR	112.4	74.1	89.0	85.0	85.9	96.0	89.8	92.0	86.7	105.2	94.5	92.9	74.0	75.6	82.6	91.2	89.2	88.9	69.7	51.5	65.8	54.6	62.0	69.6
RO	97.3	112.8	106.2	103.2	103.4	108.8	120.5	122.1	107.8	115.1	103.5	100.8	102.2	99.2	101.6	101.0	106.7	109.2	94.9	91.1	90.8	78.4	84.4	89.1
PA	96.4	88.0	87.5	119.2	116.0	115.1	109.0	109.6	102.1	101.4	102.8	96.6	92.5	89.7	80.0	70.7	69.8	63.4	55.9	62.5	58.3	56.9	67.4	72.5
AM	66.5	72.7	75.3	90.5	88.5	92.2	91.3	94.8	90.1	96.7	95.9	90.5	91.1	82.6	85.2	92.8	86.7	78.4	77.2	79.0	68.1	67.0	81.0	79.9
AP	56.9	148.0	93.5	93.9	96.3	95.9	92.5	96.0	98.4	104.2	89.0	85.1	83.8	82.8	71.4	84.3	97.1	64.2	62.8	53.4	41.2	46.0	55.0	61.9
AC	15.9	63.2	83.1	105.2	85.7	88.8	88.4	102.3	88.6	100.6	94.7	92.0	88.7	83.8	63.1	81.4	81.2	75.5	66.2	75.6	68.9	63.5	73.3	72.2
SP	115.4	101.4	97.7	101.5	101.5	100.2	100.6	99.4	97.2	99.2	97.3	98.9	94.1	98.3	92.1	93.3	90.9	87.8	87.9	72.3	95.8	79.6	79.1	82.1
RJ	92.1	89.1	103.2	98.2	100.0	102.1	98.0	96.9	90.5	95.1	92.8	95.8	88.8	90.9	89.4	92.9	100.8	94.1	86.5	58.1	62.4	60.5	62.0	69.1
MG	106.1	102.2	102.1	101.0	103.8	105.7	106.2	105.9	100.5	105.6	100.5	101.3	94.7	96.0	95.8	96.6	98.0	89.2	94.0	74.8	92.4	80.5	84.2	81.2
ES	92.3	94.0	101.4	113.9	109.4	107.7	106.9	104.9	100.4	105.0	100.7	103.0	99.0	94.4	92.5	93.5	96.7	81.8	83.7	63.6	87.0	77.7	78.1	83.5
SC	106.9	105.0	100.9	102.5	100.8	102.3	102.9	104.1	97.3	102.7	97.8	97.4	93.0	92.0	92.5	94.8	93.9	83.2	88.2	67.9	83.6	82.4	80.7	85.0
RS	77.6	97.9	94.9	97.3	96.3	98.3	99.9	100.3	93.4	94.9	92.6	92.2	82.6	86.5	91.5	86.3	88.8	84.1	84.3	73.1	90.8	79.6	80.6	84.2
PR	107.6	103.8	103.2	106.2	99.9	100.2	104.2	103.0	97.3	100.8	98.5	101.3	97.3	95.2	93.6	96.2	93.6	91.2	88.5	78.6	90.6	84.2	83.0	85.1

Between 2003 and 2009, Hib vaccination coverage levels were high: in 2006, among the 26 states and the Federal District, only two (Roraima and Amapá) did not reach the target. Even so, both had coverage rates above 90%. A slight countrywide decline began in 2011, and intensified after 2016. Since 2021, coverage has recovered somewhat, but none of the states met the PNI target for the pentavalent vaccine in 2023. In 2006, 75% of the Brazilian population lived in municipalities that met the target of 95% coverage; by 2023, this had dropped to less than 20%.

## Fraction of the Brazilian population living in municipalities in each vaccination coverage range for the 3rd dose of pentavalent vaccine

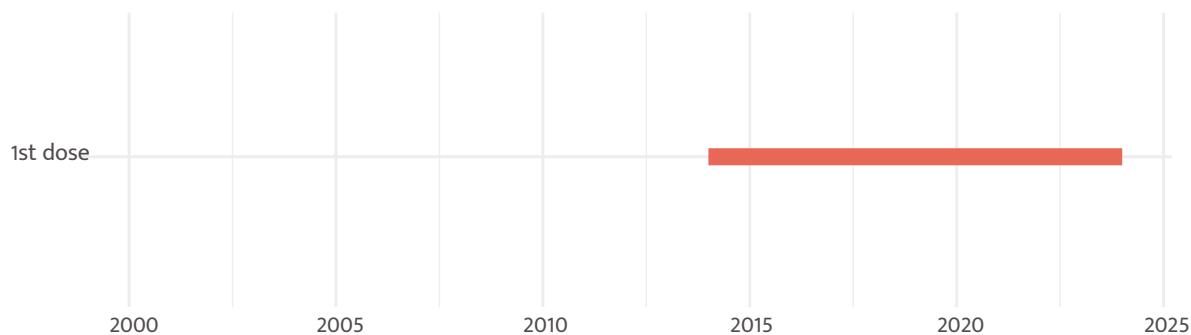
Vaccination coverage, children under 1, Brazil, 2000 to 2023



# HEPATITIS A

## History of hepatitis A vaccination

■ Hepatitis A



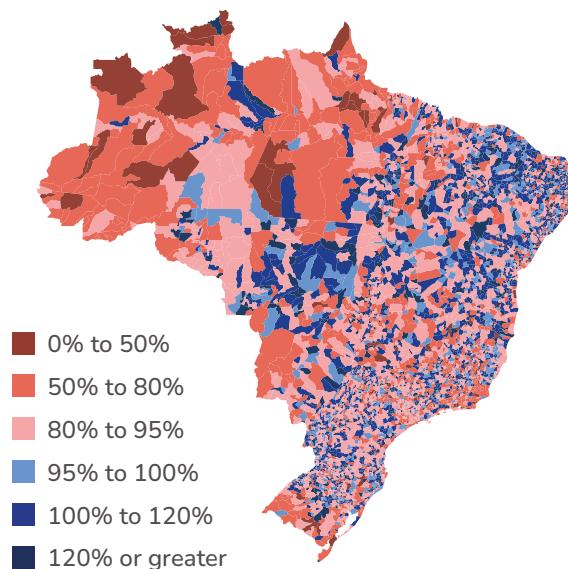
The hepatitis A virus causes inflammation in the liver, which can lead to fever, yellowing of the skin or eyes, loss of appetite, fatigue, abdominal pain, nausea, and vomiting. In children under 5, the disease may be asymptomatic. It is highly contagious: the virus, excreted in feces, can contaminate water and food and infect other people.

The PNI vaccination schedule consists of a single dose administered at 12 months of age.

Dose	Target age	Vaccine
<b>1st dose</b> Coverage reference	<b>15 months</b>	<b>Hepatitis A</b>

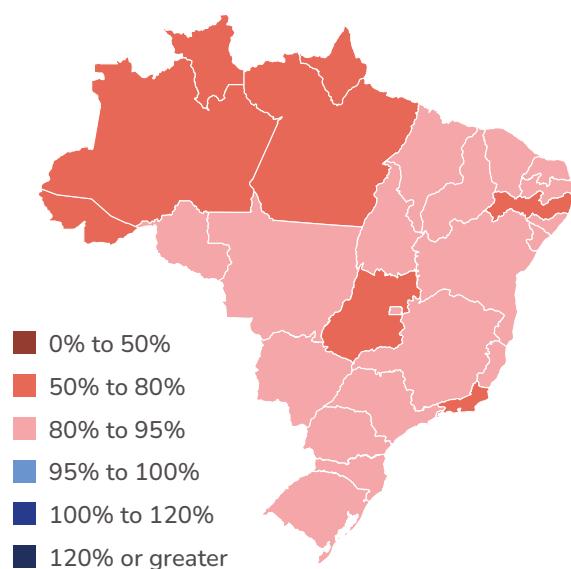
### Coverage for the 1st dose of hepatitis A vaccine

Children aged 1 year, 2023, by municipality



### Coverage for the 1st dose of hepatitis A vaccine

Children aged 1 year, 2023, by state



The first map shows vaccination coverage for hepatitis A at the municipal level. There are visible differences in recorded rates, with some municipalities not reaching 50% coverage of the target population. At the state level (including the Federal District), the average coverage was below the 95% target, with rates ranging from 50% to less than 95% in 2023. The North region again stands out for its low coverage rates, with only the states of Rondônia and Tocantins exceeding 80% coverage for the target population.

## Coverage for doses of vaccines containing a hepatitis A component

2023, by state, %

■ 0% to 50% ■ 50% to 80% ■ 80% to 95% ■ 95% to 100% ■ 100% to 120% ■ 120% or greater

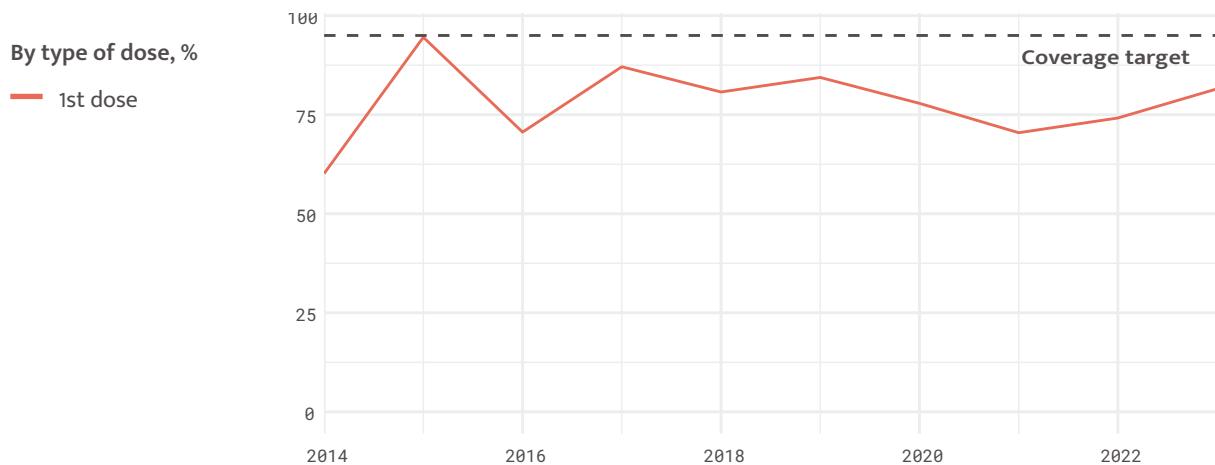
1st dose

MS	85.4
MT	86.4
GO	74.7
DF	82.9
SE	86.4
RN	83.9
PI	91.9
PE	78.8
PB	85.1
MA	80.9
CE	92.0
BA	84.6
AL	91.9
TO	89.9
RR	72.3
RO	83.5
PA	72.2
AM	79.6
AP	61.5
AC	70.4
SP	81.2
RJ	65.1
MG	82.1
ES	86.3
SC	88.3
RS	84.1
PR	88.2

Despite state-level coverage rates being consistently below target, most states are in the range of 80% to <95% coverage. Amapá and Rio de Janeiro are the only states with hepatitis A vaccination coverage below 70%.

## Coverage for each dose of vaccines containing a hepatitis A component

Children aged 1, Brazil, 2014 to 2023



## Coverage for the 1st dose of hepatitis A vaccine

Children aged 1 year, by state, 2014 to 2023, %

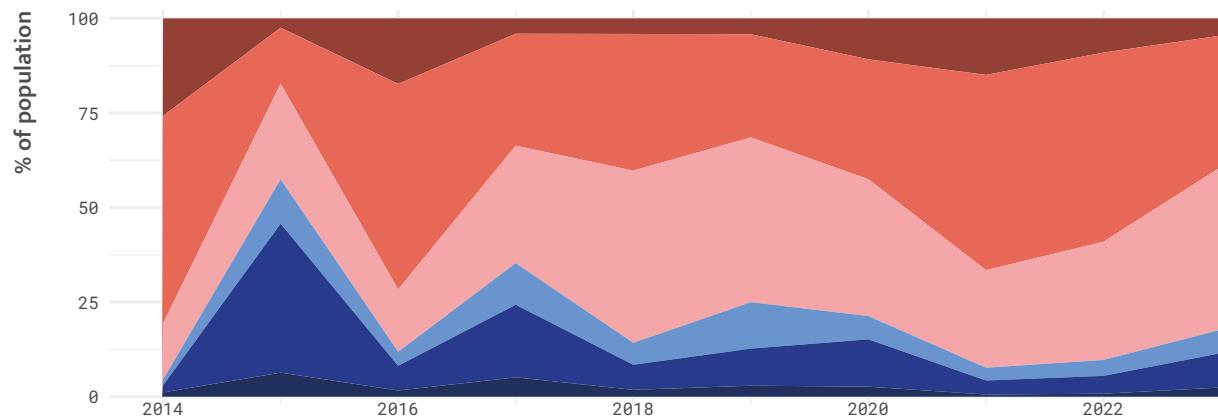
	0% to 50%	50% to 80%	80% to 95%	95% to 100%	100% to 120%	120% or greater			
2014									
MS	76.1	108.0	83.0	92.9	87.1	94.8	81.9	72.7	79.1
MT	56.7	93.3	78.1	89.9	77.7	81.2	79.2	72.4	78.2
GO	68.0	86.0	71.6	85.4	80.4	82.8	80.7	73.0	75.8
DF	81.0	74.3	103.7	88.8	82.9	88.2	82.6	78.7	80.7
SE	59.9	95.2	67.4	86.3	78.3	81.2	69.6	68.5	76.1
RN	41.3	85.4	61.9	71.7	75.8	78.2	76.2	65.5	71.0
PI	54.6	84.3	58.7	82.6	74.0	78.6	76.1	70.6	75.4
PE	54.9	95.2	75.5	94.4	79.3	84.5	72.0	65.8	70.7
PB	42.1	82.3	73.0	90.8	80.9	87.3	70.6	62.9	70.6
MA	43.9	89.9	56.2	77.8	68.5	70.7	58.4	57.2	61.8
CE	58.8	99.3	91.3	99.1	92.3	88.6	84.9	72.9	80.3
BA	63.9	94.0	59.7	78.8	71.4	74.4	71.4	60.5	69.0
AL	52.9	99.2	72.2	99.7	84.6	84.5	72.9	70.1	78.0
2016									
MS	76.1	108.0	83.0	92.9	87.1	94.8	81.9	72.7	79.1
MT	56.7	93.3	78.1	89.9	77.7	81.2	79.2	72.4	78.2
GO	68.0	86.0	71.6	85.4	80.4	82.8	80.7	73.0	75.8
DF	81.0	74.3	103.7	88.8	82.9	88.2	82.6	78.7	80.7
SE	59.9	95.2	67.4	86.3	78.3	81.2	69.6	68.5	76.1
RN	41.3	85.4	61.9	71.7	75.8	78.2	76.2	65.5	71.0
PI	54.6	84.3	58.7	82.6	74.0	78.6	76.1	70.6	75.4
PE	54.9	95.2	75.5	94.4	79.3	84.5	72.0	65.8	70.7
PB	42.1	82.3	73.0	90.8	80.9	87.3	70.6	62.9	70.6
MA	43.9	89.9	56.2	77.8	68.5	70.7	58.4	57.2	61.8
CE	58.8	99.3	91.3	99.1	92.3	88.6	84.9	72.9	80.3
BA	63.9	94.0	59.7	78.8	71.4	74.4	71.4	60.5	69.0
AL	52.9	99.2	72.2	99.7	84.6	84.5	72.9	70.1	78.0
2018									
MS	76.1	108.0	83.0	92.9	87.1	94.8	81.9	72.7	79.1
MT	56.7	93.3	78.1	89.9	77.7	81.2	79.2	72.4	78.2
GO	68.0	86.0	71.6	85.4	80.4	82.8	80.7	73.0	75.8
DF	81.0	74.3	103.7	88.8	82.9	88.2	82.6	78.7	80.7
SE	59.9	95.2	67.4	86.3	78.3	81.2	69.6	68.5	76.1
RN	41.3	85.4	61.9	71.7	75.8	78.2	76.2	65.5	71.0
PI	54.6	84.3	58.7	82.6	74.0	78.6	76.1	70.6	75.4
PE	54.9	95.2	75.5	94.4	79.3	84.5	72.0	65.8	70.7
PB	42.1	82.3	73.0	90.8	80.9	87.3	70.6	62.9	70.6
MA	43.9	89.9	56.2	77.8	68.5	70.7	58.4	57.2	61.8
CE	58.8	99.3	91.3	99.1	92.3	88.6	84.9	72.9	80.3
BA	63.9	94.0	59.7	78.8	71.4	74.4	71.4	60.5	69.0
AL	52.9	99.2	72.2	99.7	84.6	84.5	72.9	70.1	78.0
2020									
MS	76.1	108.0	83.0	92.9	87.1	94.8	81.9	72.7	79.1
MT	56.7	93.3	78.1	89.9	77.7	81.2	79.2	72.4	78.2
GO	68.0	86.0	71.6	85.4	80.4	82.8	80.7	73.0	75.8
DF	81.0	74.3	103.7	88.8	82.9	88.2	82.6	78.7	80.7
SE	59.9	95.2	67.4	86.3	78.3	81.2	69.6	68.5	76.1
RN	41.3	85.4	61.9	71.7	75.8	78.2	76.2	65.5	71.0
PI	54.6	84.3	58.7	82.6	74.0	78.6	76.1	70.6	75.4
PE	54.9	95.2	75.5	94.4	79.3	84.5	72.0	65.8	70.7
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MA	43.9	89.9	56.2	77.8	68.5	70.7	58.4	57.2	61.8
CE	58.8	99.3	91.3	99.1	92.3	88.6	84.9	72.9	80.3
BA	63.9	94.0	59.7	78.8	71.4	74.4	71.4	60.5	69.0
AL	52.9	99.2	72.2	99.7	84.6	84.5	72.9	70.1	78.0
2022									
MS	76.1	108.0	83.0	92.9	87.1	94.8	81.9	72.7	79.1
MT	56.7	93.3	78.1	89.9	77.7	81.2	79.2	72.4	78.2
GO	68.0	86.0	71.6	85.4	80.4	82.8	80.7	73.0	75.8
DF	81.0	74.3	103.7	88.8	82.9	88.2	82.6	78.7	80.7
SE	59.9	95.2	67.4	86.3	78.3	81.2	69.6	68.5	76.1
RN	41.3	85.4	61.9	71.7	75.8	78.2	76.2	65.5	71.0
PI	54.6	84.3	58.7	82.6	74.0	78.6	76.1	70.6	75.4
PE	54.9	95.2	75.5	94.4	79.3	84.5	72.0	65.8	70.7
PB	42.1	82.3	73.0	90.8	80.9	87.3	70.6	62.9	70.6
MA	43.9	89.9	56.2	77.8	68.5	70.7	58.4	57.2	61.8
CE	58.8	99.3	91.3	99.1	92.3	88.6	84.9	72.9	80.3
BA	63.9	94.0	59.7	78.8	71.4	74.4	71.4	60.5	69.0
AL	52.9	99.2	72.2	99.7	84.6	84.5	72.9	70.1	78.0
2023									
MS	76.1	108.0	83.0	92.9	87.1	94.8	81.9	72.7	79.1
MT	56.7	93.3	78.1	89.9	77.7	81.2	79.2	72.4	78.2
GO	68.0	86.0	71.6	85.4	80.4	82.8	80.7	73.0	75.8
DF	81.0	74.3	103.7	88.8	82.9	88.2	82.6	78.7	80.7
SE	59.9	95.2	67.4	86.3	78.3	81.2	69.6	68.5	76.1
RN	41.3	85.4	61.9	71.7	75.8	78.2	76.2	65.5	71.0
PI	54.6	84.3	58.7	82.6	74.0	78.6	76.1	70.6	75.4
PE	54.9	95.2	75.5	94.4	79.3	84.5	72.0	65.8	70.7
PB	42.1	82.3	73.0	90.8	80.9	87.3	70.6	62.9	70.6
MA	43.9	89.9	56.2	77.8	68.5	70.7	58.4	57.2	61.8
CE	58.8	99.3	91.3	99.1	92.3	88.6	84.9	72.9	80.3
BA	63.9	94.0	59.7	78.8	71.4	74.4	71.4	60.5	69.0
AL	52.9	99.2	72.2	99.7	84.6	84.5	72.9	70.1	78.0

In 2015, its second year on the PNI calendar, the hepatitis A vaccine achieved its highest coverage rate, with more than 95% of the target population being vaccinated in 13 states. From 2017 to 2021, this indicator saw a slight decline, bouncing back somewhat in 2022 and 2023.

## Fraction of the Brazilian population living in municipalities in each vaccination coverage range for the 1st dose of hepatitis A vaccine

Vaccination coverage, children aged 1 year, Brazil, 2014 to 2023

■ 0% to 50% ■ 50% to 80% ■ 80% to 95% ■ 95% to 100% ■ 100% to 120% ■ 120% or greater



Only 17.7% of the Brazilian population lives in municipalities that reached their hepatitis A vaccination coverage target in 2023. The majority of Brazilians live in areas where this coverage rate is between 80% and 95%.

# HEPATITIS B

## History of hepatitis B vaccines

■ Hepatitis B  
■ Pentavalent



Hepatitis B is a viral inflammation of the liver. Most cases are asymptomatic. When symptoms do appear, they may include muscle aches and abdominal pain, diarrhea, vomiting, fatigue, loss of appetite, and yellowing of the skin or eyes (jaundice). In some cases, hepatitis B can develop into cirrhosis or cancer.

Transmission occurs through bodily fluids, such as blood, saliva, vaginal secretions, and semen. Therefore, the most common forms of transmission are unprotected sexual intercourse, sharing of objects contaminated with blood, and mother-to-child transmission during childbirth or breastfeeding.

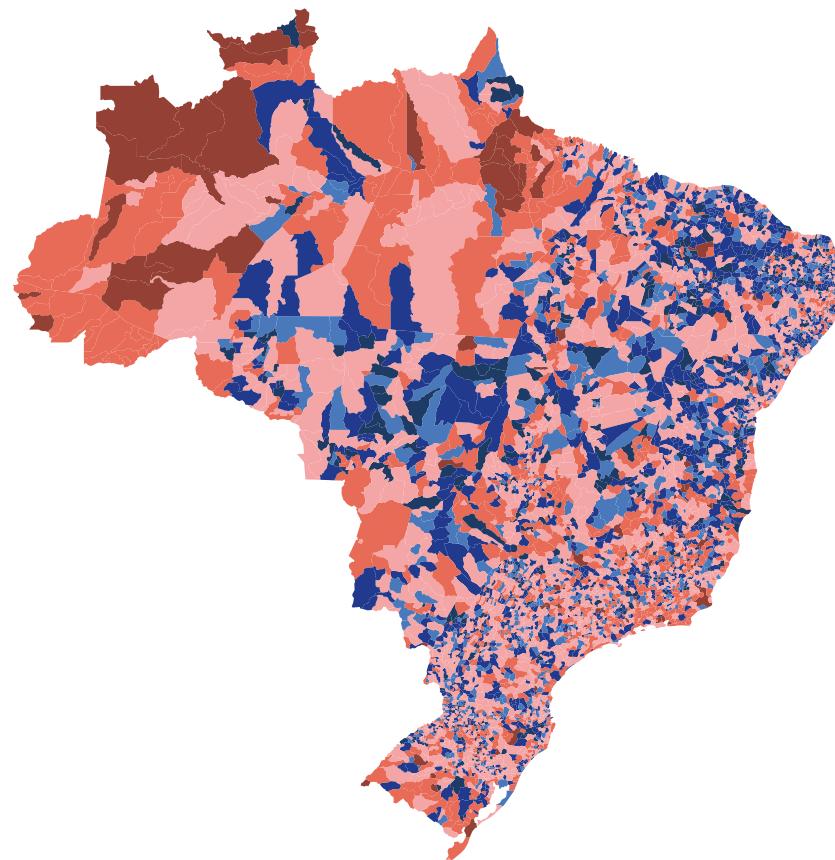
The younger the patient, the higher the risk of developing severe forms of the disease. Therefore, infants should be vaccinated as soon as possible, in the first months of life. The vaccination schedule consists of three doses.

Dose	Target age	Vaccine
<b>1st dose</b>	<b>2 months</b>	<b>Pentavalent</b>
<b>2nd dose</b>	<b>4 months</b>	<b>Pentavalent</b>
<b>3rd dose</b> <small>Coverage reference</small>	<b>6 months</b>	<b>Pentavalent</b>

The hepatitis B vaccine was combined with the tetravalent vaccine (DTP+Hib) to form the pentavalent vaccine (DTP+Hib+HepB), replacing the monovalent formulation in the children's schedule starting in August 2012. The monovalent vaccine remains in the National Immunization Program for other ages from 7 years onwards or for specific cases when the pentavalent vaccine is not recommended.

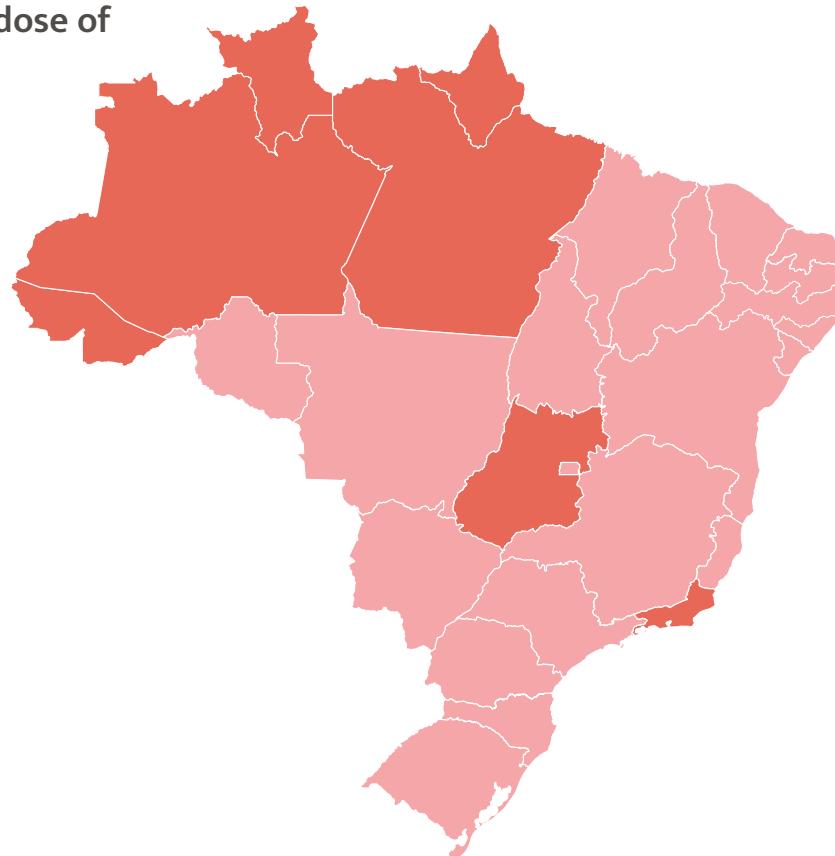
## Coverage for the 3rd dose of pentavalent vaccine

Children under 1  
2023, by municipality



## Coverage for the 3rd dose of pentavalent vaccine

Children under 1  
2023, by state



Despite many Brazilian municipalities having managed to reach the hepatitis B vaccination coverage target in 2023, aggregate data at the state level reveals rates below 95% in all states and the Federal District. Acre, Amazonas, Roraima, Pará, Amapá, Goiás, and Rio de Janeiro reported vaccination coverage below 80%.

## Coverage for doses of vaccines containing a hepatitis B component 2023, by state, %

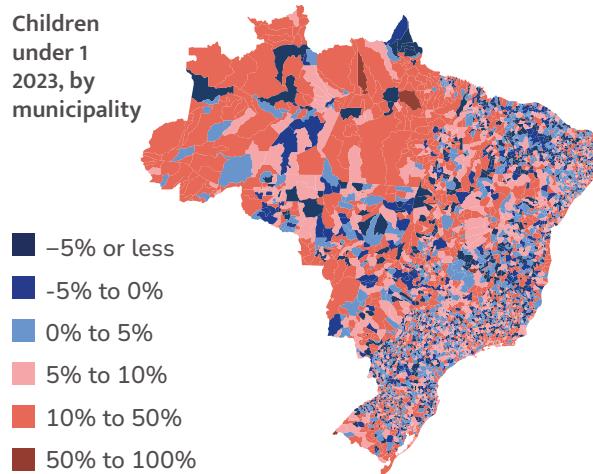
■ 0% to 50% ■ 50% to 80% ■ 80% to 95% ■ 95% to 100% ■ 100% to 120% ■ 120% or greater

	1st dose	2nd dose	3rd dose
MS	<b>93.5</b>	<b>89.7</b>	<b>86.0</b>
MT	<b>96.8</b>	<b>91.6</b>	<b>86.6</b>
GO	<b>83.6</b>	<b>80.5</b>	<b>75.7</b>
DF	<b>87.5</b>	<b>85.5</b>	<b>80.9</b>
SE	<b>90.2</b>	<b>87.7</b>	<b>83.3</b>
RN	<b>92.1</b>	<b>87.9</b>	<b>82.3</b>
PI	<b>93.0</b>	<b>91.2</b>	<b>90.7</b>
PE	<b>86.8</b>	<b>83.7</b>	<b>80.4</b>
PB	<b>94.1</b>	<b>88.9</b>	<b>85.2</b>
MA	<b>92.9</b>	<b>88.4</b>	<b>84.7</b>
CE	<b>95.4</b>	<b>92.5</b>	<b>91.8</b>
BA	<b>93.1</b>	<b>90.4</b>	<b>86.8</b>
AL	<b>96.4</b>	<b>91.8</b>	<b>88.4</b>
TO	<b>96.8</b>	<b>92.8</b>	<b>87.4</b>
RR	<b>85.8</b>	<b>78.8</b>	<b>69.6</b>
RO	<b>97.8</b>	<b>93.2</b>	<b>89.1</b>
PA	<b>87.6</b>	<b>81.0</b>	<b>72.5</b>
AM	<b>90.7</b>	<b>84.7</b>	<b>79.9</b>
AP	<b>73.5</b>	<b>69.8</b>	<b>61.9</b>
AC	<b>88.6</b>	<b>81.6</b>	<b>72.2</b>
SP	<b>87.4</b>	<b>85.2</b>	<b>82.2</b>
RJ	<b>78.2</b>	<b>72.2</b>	<b>69.1</b>
MG	<b>84.9</b>	<b>83.3</b>	<b>81.2</b>
ES	<b>89.6</b>	<b>87.7</b>	<b>83.6</b>
SC	<b>89.6</b>	<b>87.2</b>	<b>85.0</b>
RS	<b>91.9</b>	<b>88.5</b>	<b>84.2</b>
PR	<b>88.7</b>	<b>87.2</b>	<b>85.1</b>

As is also the case with other vaccines that require more than one dose, uptake decreases over the course of the vaccination schedule. Only two states (Amapá and Rio de Janeiro) failed to reach at least 80% coverage for the first dose of the hepatitis B vaccine. For the third dose, seven states are below this threshold.

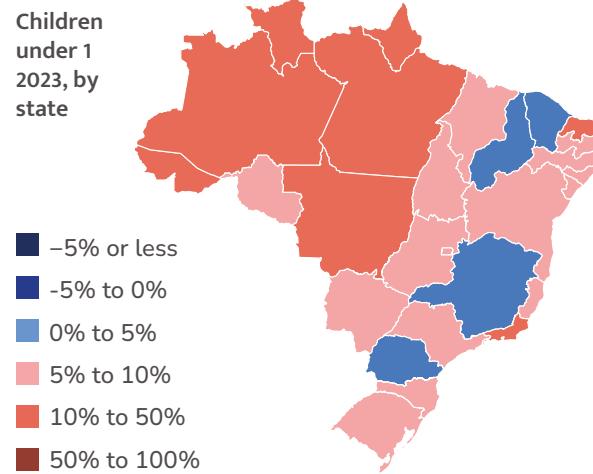
## Dropout rate for the 3rd dose of pentavalent vaccine

Children under 1 2023, by municipality



## Dropout rate for the 3rd dose of pentavalent vaccine

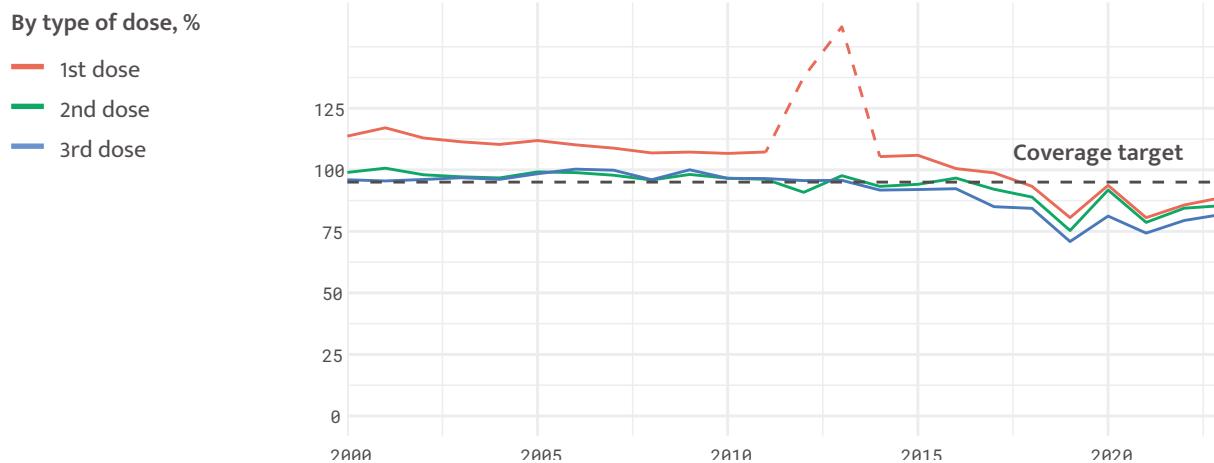
Children under 1 2023, by state



The maps above illustrate the reduction in vaccination uptake between the first and third doses of the pentavalent vaccine. In the states of the North region, except Rondônia, Rio Grande do Norte and Rio de Janeiro, dropout rates exceed 10%. In 2023, Rio de Janeiro and Amapá were the states with the lowest coverage in Brazil, with 69.1% and 61.9% coverage for the third dose, respectively.

## Coverage for each dose of vaccines containing a hepatitis B component

Children under 1, Brazil, 2000 to 2023

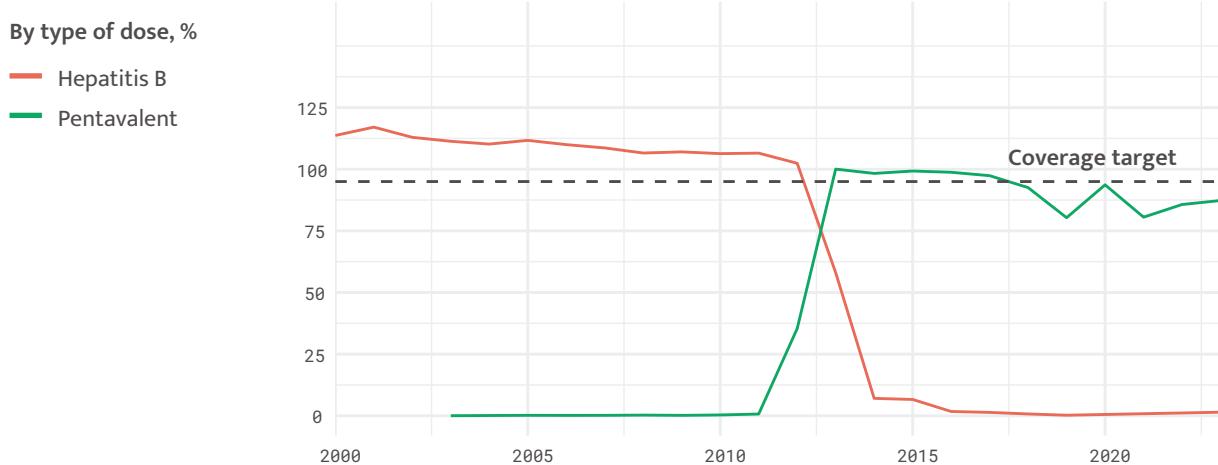


Brazil has had historically high hepatitis B vaccination coverage, with values close to or exceeding the 95% target between the years 2000 and 2016. Since then, however, coverage has been declining and, despite occasional improvements in 2020 and 2023, has remained below the target.

The overcoverage recorded in the years 2012 and 2013 is likely due to the overlap of recorded first doses of hepatitis B vaccine in the age range between zero and 30 days of life, which were added to the doses administered to babies aged between 31 days and one year. It is possible that during this period, due to limitations in the information system (which should only record doses of hepatitis B vaccine administered to children aged 31 days to less than one year), records of doses of the pentavalent and hepatitis B vaccines in children under 30 days of age were incorrectly included.

## Coverage for the 1st dose of the hepatitis B and pentavalent vaccines

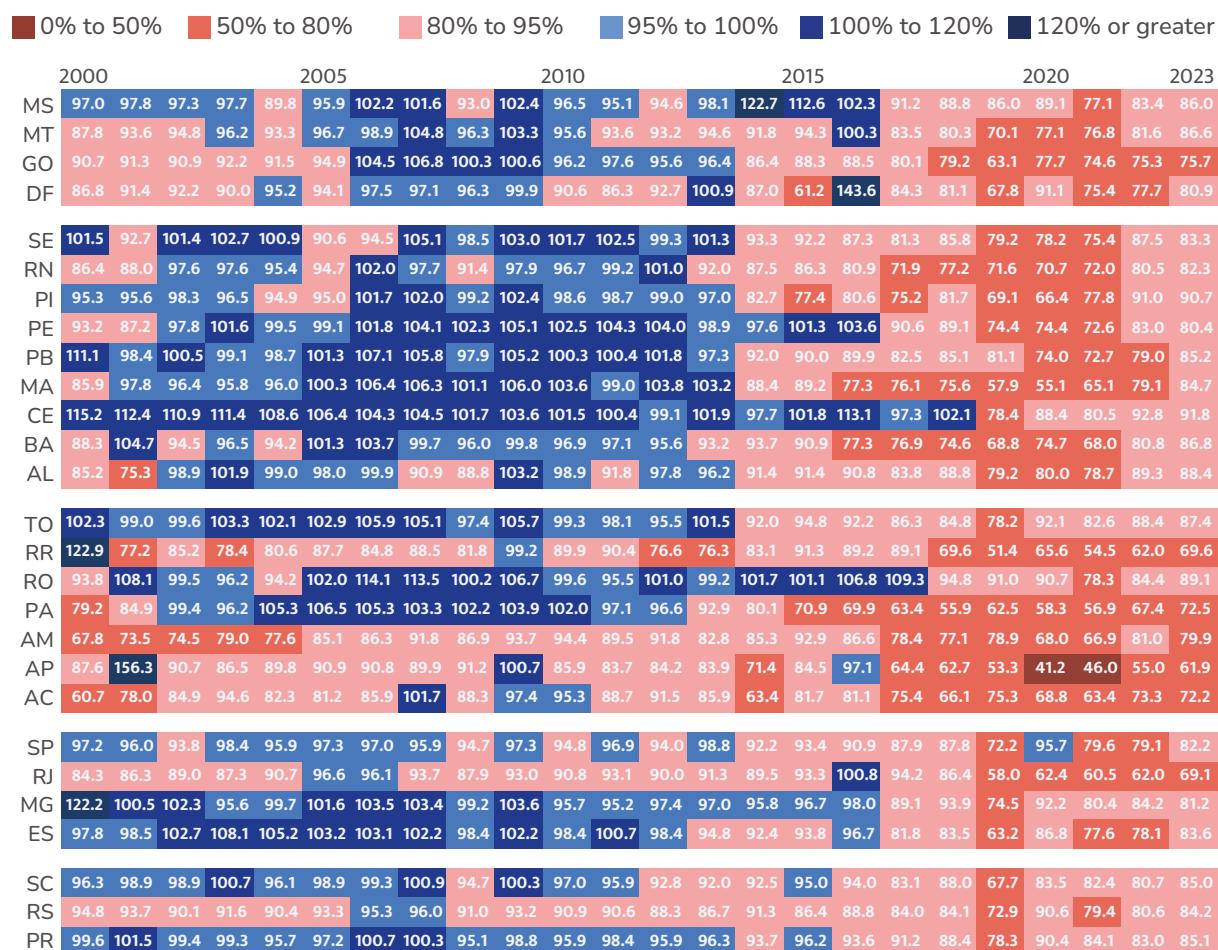
Children aged 1, Brazil, 2000 to 2023



Since mid-2012, with the replacement of the monovalent vaccine with the combined pentavalent vaccine including a hepatitis B component, coverage has been measured with the pentavalent vaccine.

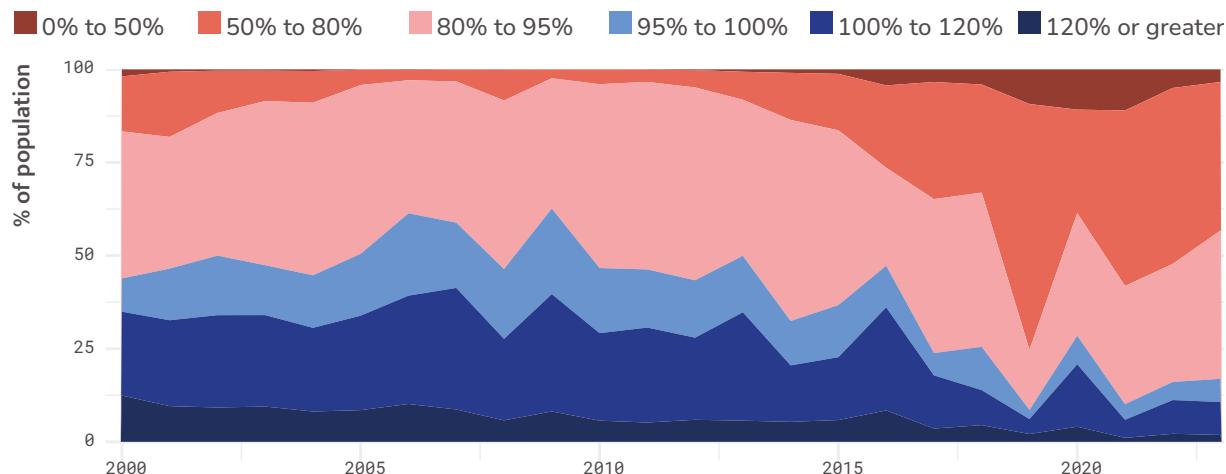
## Coverage for the 3rd dose of pentavalent vaccine

Children under 1, by state, 2000 to 2023, %



## Fraction of the Brazilian population living in municipalities in each vaccination coverage range for the 1st dose of hepatitis B vaccine

Vaccination coverage, children aged 1 year, Brazil, 2000 to 2023



The percentage of the population living in municipalities that meet the target fell from over 60% in 2009 to less than 10% in 2019. As of 2023, this percentage was 17%.

## Hepatitis B in children under 30 days of age

### History of hepatitis B vaccine (from 0 to 30 days of age)

■ Hepatitis B (0 to 30 days)



Since August 2012, with introduction of the pentavalent vaccine in the child vaccination schedule starting at age 2 months, the birth dose of hepatitis B vaccine (which can be administered up to age 30 days) also remained on the schedule, with the purpose of reducing the risk of vertical transmission of the disease to newborns.

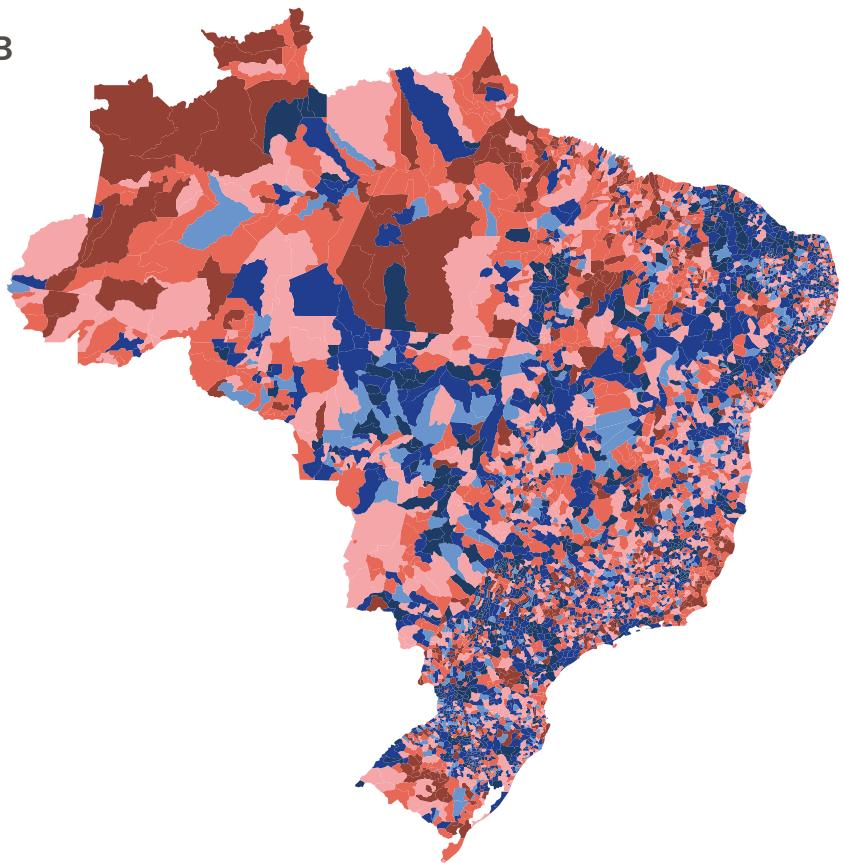
Administration of this dose does not obviate the need for all three doses of the pentavalent vaccine, as immunization in the first weeks of life only protects against vertical (mother-to-child) transmission and does not generate lasting immunity. Long-term immunization is achieved through the three-dose schedule.

Dose	Target age	Vaccine
Dose Coverage reference	At birth	Hepatitis B mono- valent

## Coverage for single-dose hepatitis B vaccination

Children up to 30 days old by municipality, 2023

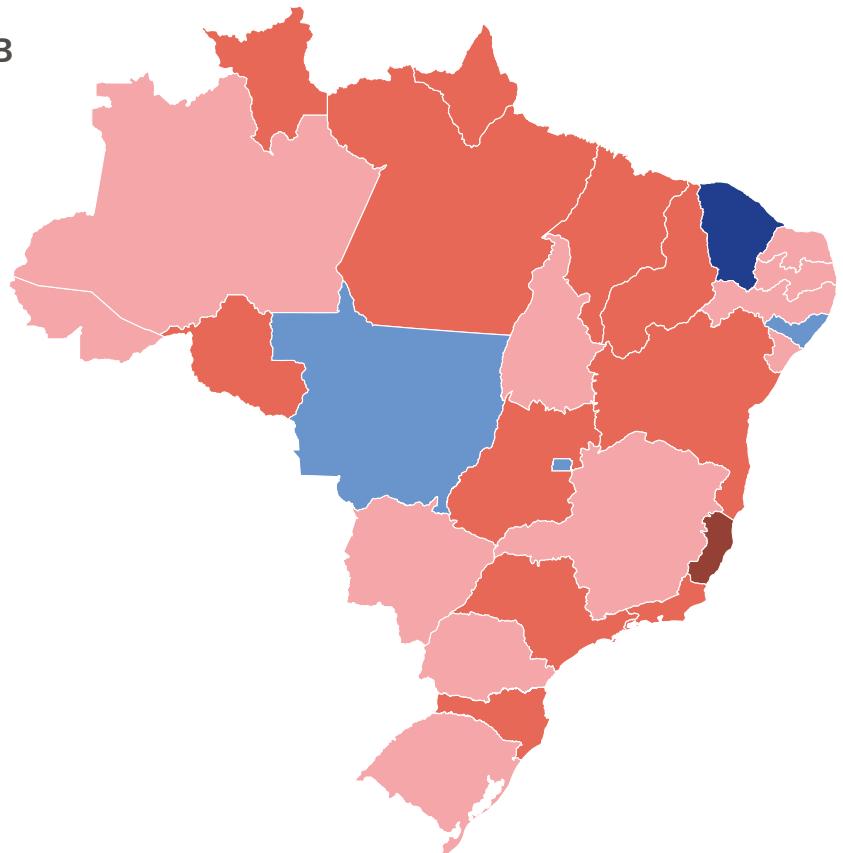
- 0% to 50%
- 50% to 80%
- 80% to 95%
- 95% to 100%
- 100% to 120%
- 120% or greater



## Coverage for single-dose hepatitis B vaccination

Children up to 30 days old by state, 2023

- 0% to 50%
- 50% to 80%
- 80% to 95%
- 95% to 100%
- 100% to 120%
- 120% or greater



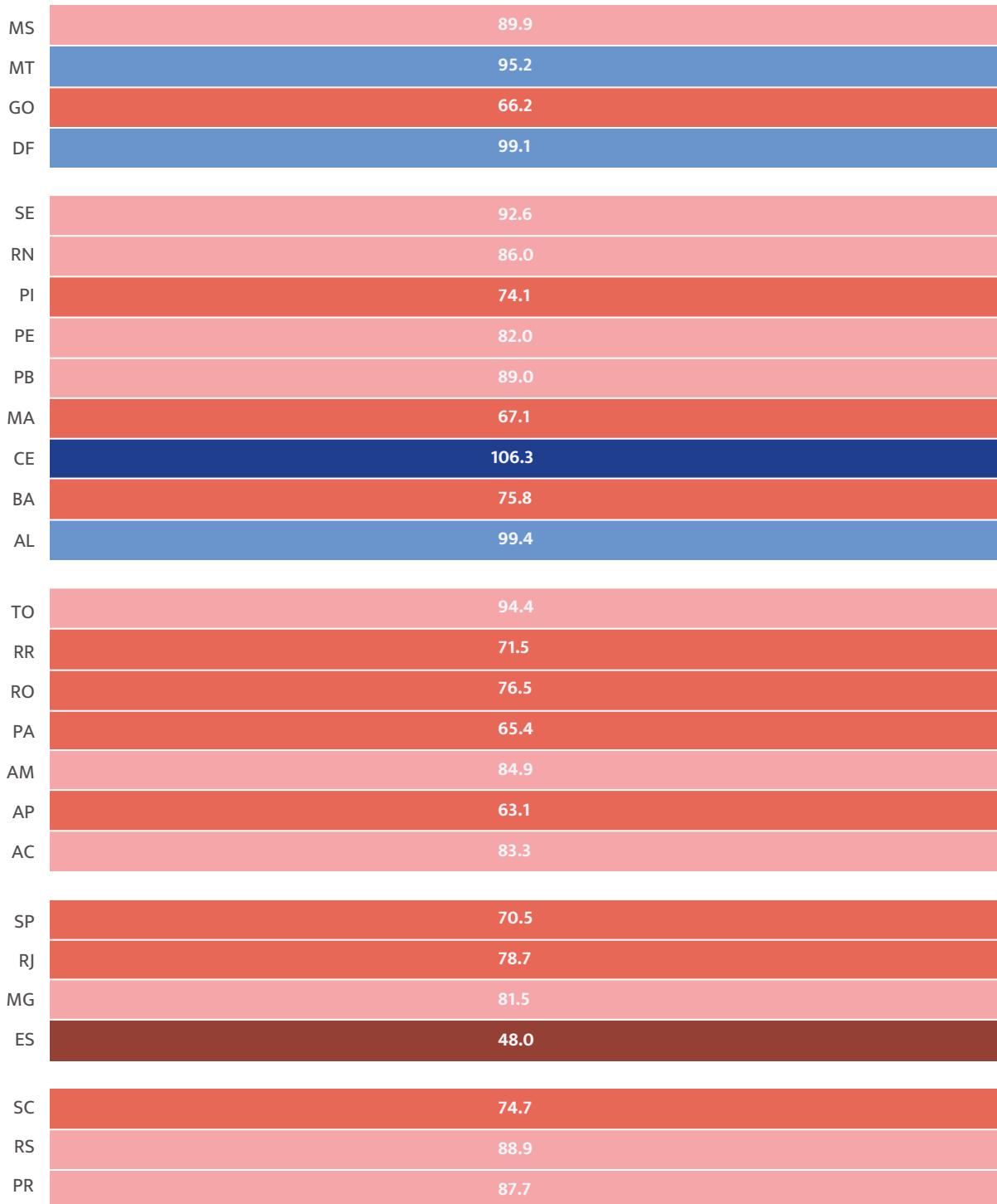
Only Mato Grosso, Ceará, Alagoas, and the Federal District reached the coverage target for the birth dose of hepatitis B vaccine in newborns. In the Southeast region, only Minas Gerais achieved coverage above 80%, while in Espírito Santo coverage did not reach 50% of the target population in 2023.

## Coverage for doses of vaccines containing a hepatitis B component

Children up to 30 days old, 2023, by state, %

■ 0% to 50% ■ 50% to 80% ■ 80% to 95% ■ 95% to 100% ■ 100% to 120% ■ 120% or greater

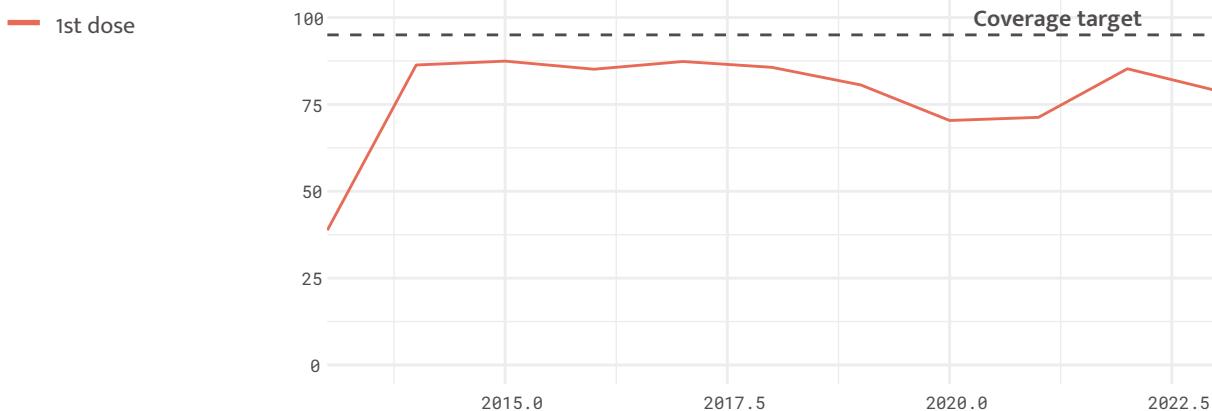
1st dose



## Coverage for each dose of vaccines containing a hepatitis B component

Children up to 30 days old, Brazil, 2014 to 2023

By type of dose, %



Since 2013, hepatitis B vaccination coverage rates in children up to 30 days old have remained below the PNI target. A slight recovery is noted in 2022; however, this was followed by a further decline in 2023.

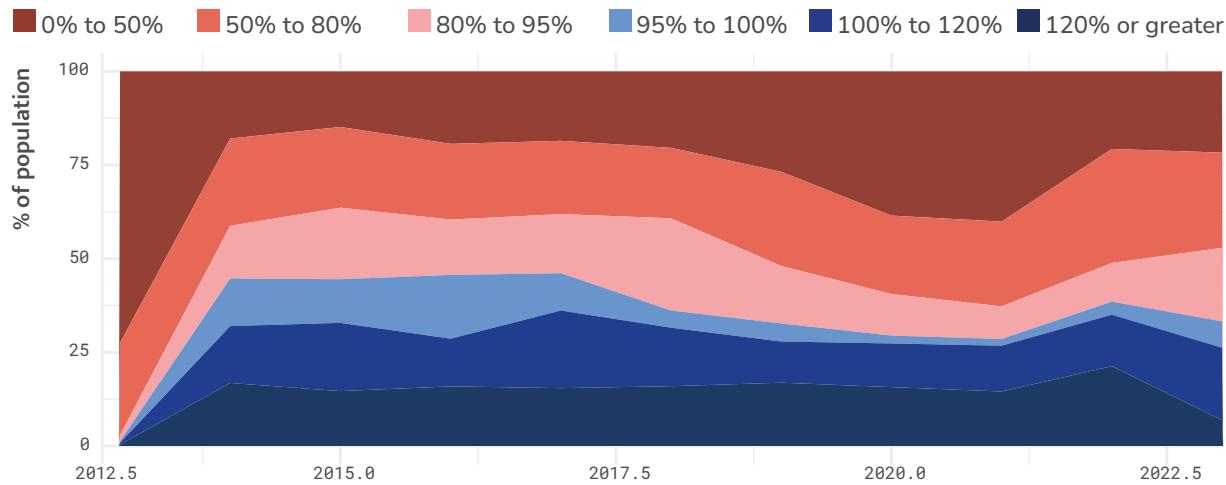
## Coverage for the single dose of hepatitis B vaccine

Children up to 30 days old, by state, 2000 to 2023, %

	0% to 50%	50% to 80%	80% to 95%	95% to 100%	100% to 120%	120% or greater					
	2013	2014	2016	2018	2020	2022	2023				
MS	30.2	102.5	111.0	102.1	101.5	119.7	114.0	63.9	61.4	76.8	89.9
MT	44.2	94.6	94.2	94.8	86.3	89.0	84.6	75.5	77.1	83.2	95.2
GO	37.5	73.3	77.7	71.6	72.3	76.2	76.3	66.5	66.5	72.8	66.2
DF	48.9	122.7	93.3	138.9	103.3	109.2	113.2	110.0	114.6	131.0	99.1
SE	45.2	124.4	108.4	100.9	96.0	103.7	90.0	84.7	93.2	106.9	92.6
RN	42.5	87.4	89.8	76.4	63.3	95.6	87.7	85.7	89.4	102.3	86.0
PI	45.4	89.3	76.3	70.3	88.2	88.6	84.1	82.6	89.4	100.9	74.1
PE	29.5	78.1	85.1	93.0	91.3	94.8	89.8	83.4	86.8	96.7	82.0
PB	46.1	90.3	83.8	77.2	85.1	92.0	85.7	64.6	69.0	90.0	89.0
MA	45.6	93.1	90.9	75.4	96.5	89.4	77.2	63.1	67.8	78.9	67.1
CE	38.9	84.9	91.1	98.6	99.6	92.8	78.0	67.9	75.9	113.6	106.3
BA	32.3	81.3	85.7	73.0	75.9	73.4	76.0	78.1	66.6	80.4	75.8
AL	44.0	87.7	93.5	87.5	93.9	89.2	84.6	66.2	71.5	92.7	99.4
TO	39.6	82.4	90.6	80.9	92.8	94.3	114.1	94.4	94.4	114.0	94.4
RR	8.9	69.8	70.3	78.0	107.8	109.4	92.9	82.9	82.2	84.8	71.5
RO	51.7	101.8	101.5	103.1	90.4	86.7	88.4	75.5	75.9	95.9	76.5
PA	46.3	90.4	79.0	57.5	76.8	74.7	74.7	65.2	63.9	73.7	65.4
AM	47.9	94.4	99.5	90.3	88.3	88.3	90.0	88.8	90.6	104.3	84.9
AP	45.3	83.8	97.5	90.0	91.1	94.9	97.9	93.4	98.4	92.9	63.1
AC	20.6	31.8	69.8	96.2	86.5	90.3	91.8	73.5	68.3	77.3	83.3
SP	40.5	90.5	89.1	93.4	93.7	89.5	81.5	59.8	61.8	78.1	70.5
RJ	38.9	80.4	82.8	91.5	99.0	81.3	54.5	50.4	59.3	74.1	78.7
MG	31.4	85.6	85.7	79.9	83.5	87.8	83.0	79.9	78.4	92.9	81.5
ES	42.4	83.7	89.4	84.5	84.2	86.2	84.7	72.4	76.0	52.0	48.0
SC	39.8	88.0	91.7	84.7	74.8	77.8	79.9	74.3	63.9	74.5	74.7
RS	35.4	78.6	78.7	73.6	77.0	76.7	82.3	79.6	74.9	87.8	88.9
PR	36.1	73.5	88.0	78.0	76.3	65.8	72.8	66.2	66.1	84.4	87.7

## Fraction of the Brazilian population living in municipalities in each vaccination coverage range for the single-dose hepatitis B vaccine

Vaccination coverage in children up to 30 days old in Brazil, 2012 to 2023

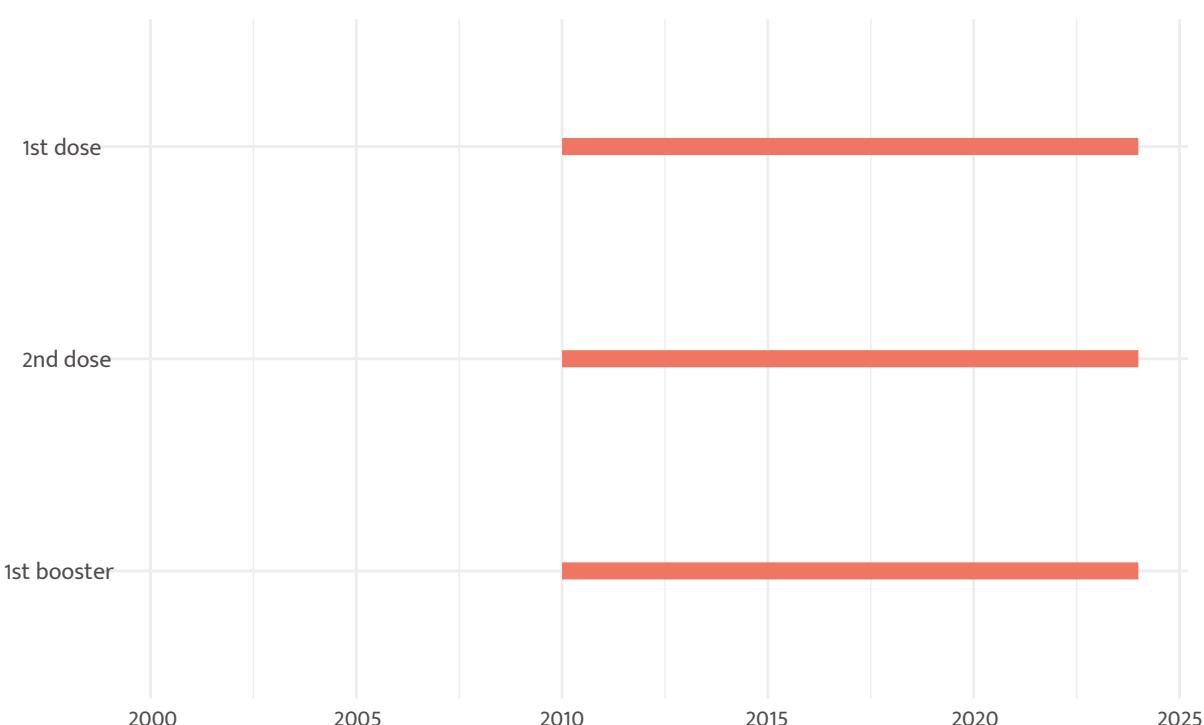


Since 2014, the percentage of the population living in municipalities that have met the hepatitis B vaccination target in children up to 30 days old has ranged from 50% to 30%.

# MENINGOCOCCAL C

## History of meningococcal C vaccines

■ Meningococcal C conjugate



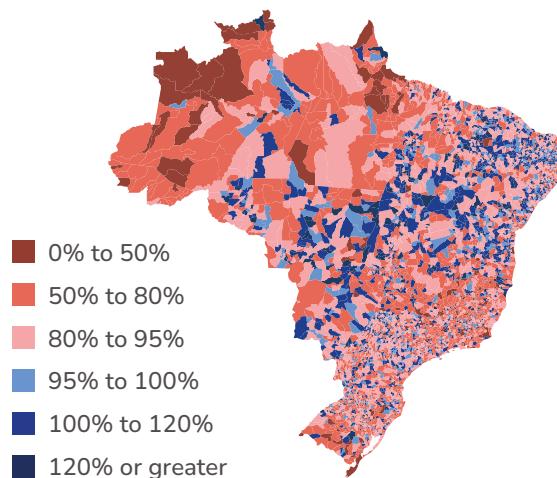
Meningococcal meningitis is characterized by the infection of the membranes that cover the brain (meninges). If left untreated, it can spread through the bloodstream and lead to meningococcemia, a widespread infection. It is caused by the *Neisseria meningitidis* bacterium, also known as the meningococcus.

The meningococcal C vaccine, which protects against serogroup C of the disease, was included in 2010 in the child vaccination schedule of the National Immunization Program (PNI). The scheme consists of two doses (at 3 and 5 months of age) and a booster dose at 12 months. Another vaccine for the prevention of meningitis is ACWY, offered to adolescents between 11 and 14 years of age, which provides immunity against three other serogroups (A, W, and Y) in addition to C.

Dose	Target age	Vaccine
<b>1st dose</b>	<b>3 months</b>	Meningococcal conjugate C (MnC)
<b>2nd dose</b> Coverage reference	<b>5 months</b>	Meningococcal conjugate C (MnC)
<b>1st booster</b>	<b>12 months</b>	Meningococcal conjugate C (MnC)

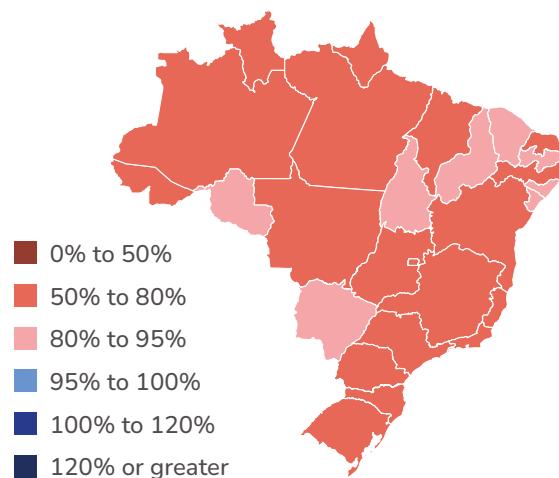
## Coverage for the 2nd dose of meningococcal conjugate C vaccine

Children under 1, 2023, by municipality



## Coverage for the 2nd dose of meningococcal conjugate C vaccine

Children under 1, 2023, by state



## Coverage for doses of vaccines containing a meningococcal C component

Em crianças de até 30 dias de idade em 2023, por estado, em %

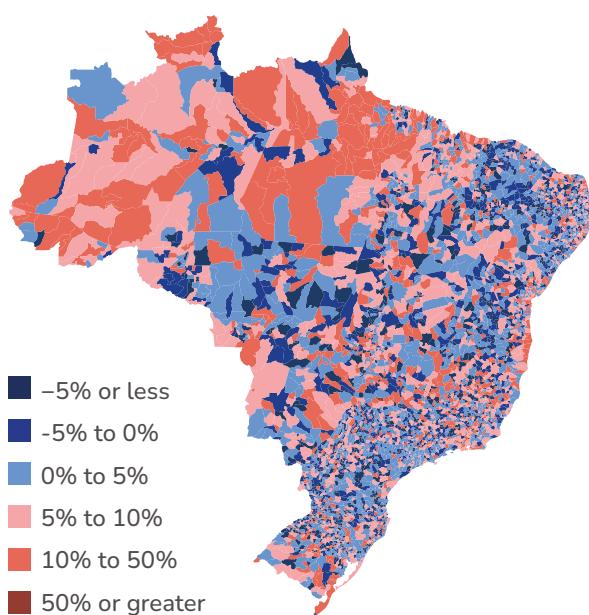
■ 0% a 50% ■ 50% a 80% ■ 80% a 95% ■ 95% a 100% ■ 100% a 120% ■ 120% ou mais

	1ª dose	2ª dose	1º reforço
MS	87,9	84,5	82,7
MT	83,2	78,6	76,8
GO	75,0	70,8	70,5
DF	79,4	76,6	74,3
SE	85,9	82,6	85,5
RN	85,0	78,7	81,1
PI	91,2	89,8	93,0
PE	81,8	77,6	80,7
PB	86,3	82,0	84,5
MA	85,3	78,9	81,0
CE	88,4	85,9	88,0
BA	84,3	80,0	79,4
AL	90,6	86,2	90,6
TO	94,5	90,0	93,0
RR	80,6	66,7	70,1
RO	93,6	89,8	83,6
PA	75,7	67,2	68,6
AM	81,0	75,1	76,7
AP	62,4	57,3	56,2
AC	79,2	71,0	69,6
SP	81,3	79,0	75,4
RJ	73,9	68,5	65,1
MG	68,7	65,2	60,5
ES	81,7	77,6	121,1
SC	76,4	74,3	71,3
RS	78,4	74,7	72,3
PR	79,5	77,7	74,7

The map of coverage at the municipal level shows that, in 2023, many municipalities managed to meet the meningococcal vaccination target. When stratifying by state, however, most show coverage rates below 80%. This is the case, for example, of all states in the South and Southeast regions. There are significant within-state coverage discrepancies as well, which creates islands of territory vulnerable to the disease.

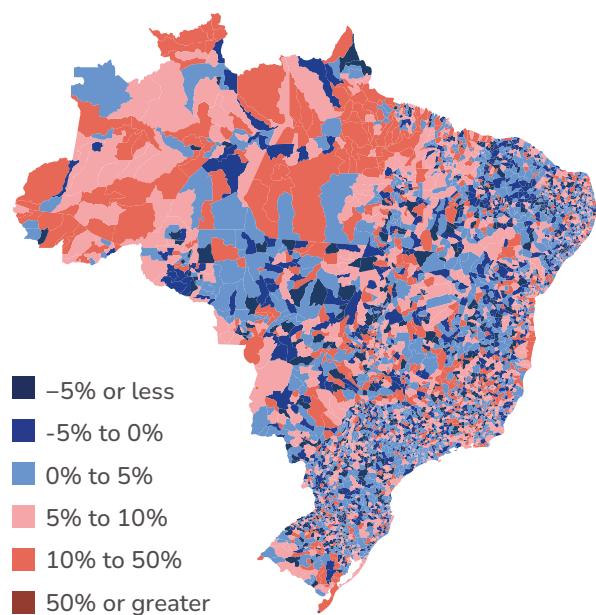
## Dropout rate for the 2nd dose of meningococcal conjugate C vaccine

Children under 1, 2023, by municipality



## Dropout rate for the 2nd dose of meningococcal conjugate C vaccine

Children under 1, 2023, by state



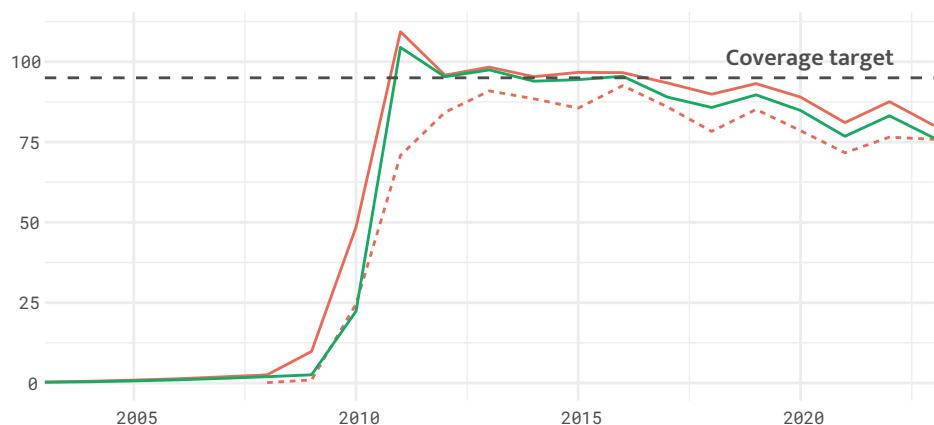
There is clear dropout over the course of the vaccination scheme, with a reduction in coverage between the first and second doses. However, as even the first dose already has low coverage (no state reached the 95% target), the dropout rate is below 5% in 13 states and between 5% and 10% in 11 others. Acre, Roraima, and Pará have dropout rates above 10%.

## Coverage for each dose of vaccines containing a meningococcal C component

Children aged 1, Brazil, 2000 to 2023

By type of dose, %

- 1st dose
- 2nd dose
- - - 1st booster



## Coverage for the 2nd dose of meningococcal conjugate C vaccine

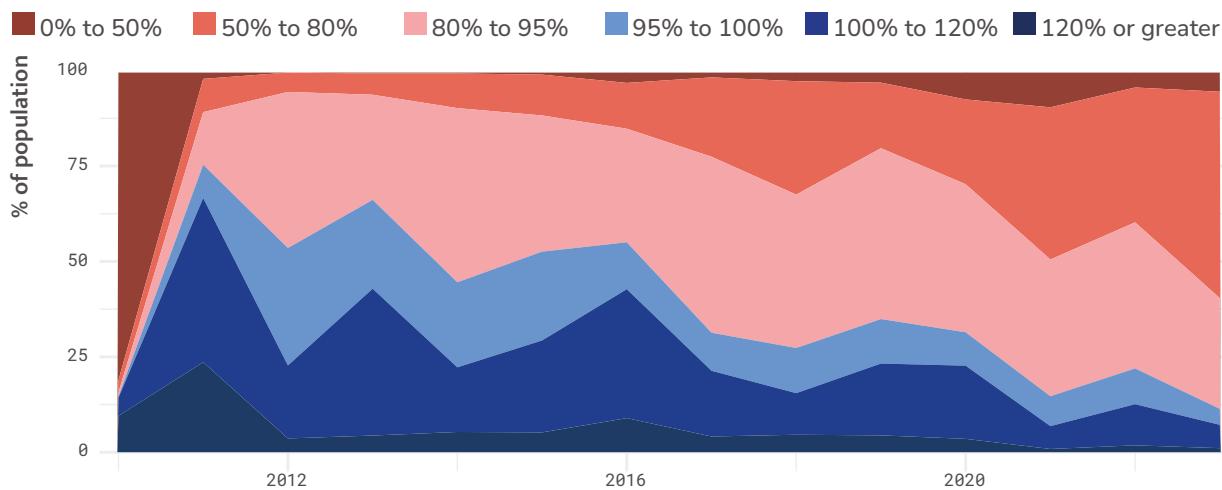
Children under 1, Brazil, 2010 to 2023

	0% to 50%	50% to 80%	80% to 95%	95% to 100%	100% to 120%	120% or greater	2010	2012	2016	2020	2023			
MS	2.9	108.2	95.8	98.8	125.1	115.4	105.3	92.5	90.7	99.5	93.1	79.6	90.1	84.5
MT	1.7	101.3	93.2	95.7	91.0	96.2	100.9	85.8	81.1	87.8	85.7	79.0	85.5	78.6
GO	8.8	120.4	95.1	96.9	91.3	91.0	91.5	86.5	85.0	87.6	86.2	79.3	82.5	70.8
DF	21.3	109.9	93.8	108.8	95.4	67.6	153.4	84.8	87.0	89.5	94.0	84.9	88.7	76.6
SE	0.1	103.4	100.9	98.3	91.8	91.1	90.6	84.7	84.7	90.2	77.4	77.7	90.2	82.6
RN	0.8	91.9	99.1	95.0	89.3	90.6	84.3	74.4	79.6	89.5	79.7	74.6	83.9	78.7
PI	0.1	110.3	103.2	100.3	84.6	82.4	81.4	80.4	80.0	86.6	82.1	76.2	92.3	89.8
PE	2.2	109.5	101.1	98.3	96.7	100.0	105.5	90.4	89.1	90.4	79.8	73.0	82.9	77.6
PB	0.5	84.4	91.8	94.1	91.0	90.6	91.5	85.5	88.3	96.3	78.3	72.7	79.5	82.0
MA	0.7	71.9	95.0	97.6	87.5	90.2	80.9	80.6	73.4	77.1	67.9	66.5	78.6	78.9
CE	23.5	101.1	99.8	102.0	98.3	103.7	118.1	104.5	110.3	96.3	96.4	80.7	92.6	85.9
BA	66.1	94.6	95.8	98.1	93.9	92.2	79.3	81.9	75.7	80.9	79.7	67.8	82.2	80.0
AL	3.1	90.0	98.1	96.7	94.9	95.7	96.4	92.4	91.9	92.4	79.3	80.0	90.2	86.2
TO	4.4	117.8	98.9	99.6	91.7	94.8	96.6	90.4	74.6	95.5	91.1	84.6	92.1	90.0
RR	5.0	91.0	77.0	76.2	82.2	90.3	95.4	86.3	68.6	66.7	67.4	58.0	65.5	66.7
RO	4.9	113.1	101.4	100.5	101.7	100.8	109.2	95.6	95.0	94.5	91.1	81.5	88.5	89.8
PA	0.4	61.9	88.2	89.7	80.1	74.1	75.4	73.9	62.9	77.3	68.1	61.4	72.0	67.2
AM	1.3	82.7	85.7	83.2	83.9	93.5	87.2	84.0	77.4	89.7	79.5	70.8	83.3	75.1
AP	0.2	70.7	83.3	82.6	75.0	88.4	100.7	76.1	68.0	87.0	52.4	52.6	60.2	57.3
AC	0.4	71.1	83.9	81.3	65.9	88.8	85.2	81.8	71.8	89.7	71.8	68.1	77.1	71.0
SP	10.6	119.7	95.8	102.1	95.9	95.0	94.1	91.7	88.0	92.2	92.0	82.7	83.7	79.0
RJ	8.4	104.9	91.9	96.5	94.1	98.3	104.8	95.4	87.2	82.4	64.9	61.9	65.8	68.5
MG	129.0	103.0	97.5	98.8	96.9	99.6	99.7	91.6	94.6	93.2	92.0	81.0	86.9	65.2
ES	25.2	118.6	98.4	97.2	94.7	94.7	99.4	84.3	84.6	92.5	88.0	82.7	82.4	77.6
SC	5.6	125.0	98.0	95.9	98.4	100.3	98.6	93.1	89.3	98.3	91.7	86.2	89.4	74.3
RS	2.8	113.6	90.8	88.2	95.0	91.0	92.4	89.1	83.3	95.5	95.1	84.4	87.4	74.7
PR	4.2	117.5	96.8	99.0	97.6	99.4	96.5	93.4	91.0	95.7	96.0	89.2	89.7	77.7

Vaccination coverage against meningococcus has declined since 2014, with this decline accelerating after 2016. In 2022, there was a slight recovery, but rates then fell again in 2023. For comparison, in 2013 only 6 states failed to meet the vaccination target. In 2023 (as in 2021 and 2022), none of the 26 states, nor the Federal District, reached the target.

## Fraction of the Brazilian population living in municipalities in each vaccination coverage range for the 2nd dose of meningococcal conjugate C vaccine

Children aged 1, Brazil, 2010 to 2023

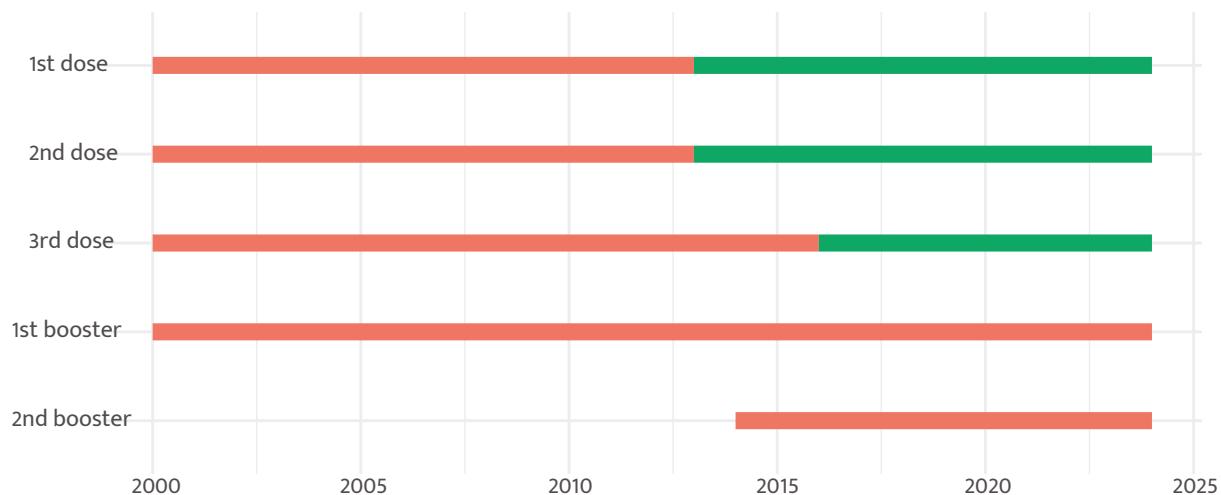


The reduction in meningococcal vaccination has led to a significant increase in the number of people living in areas that did not meet the coverage target. Whereas in 2011 only 25% of the population lived in municipalities with vaccination coverage below the PNI target, in 2023, almost 90% of Brazilians resided in municipalities that did not reach the target.

# POLIO

## History of polio vaccines

- Oral polio
- Inactivated polio



Poliomyelitis, most commonly known as polio, is an infectious disease caused by serotypes of the poliovirus, a subtype of the species Enterovirus C. Although the vast majority of infections are asymptomatic, in some cases (less than 3%), the virus reaches the central nervous system, causing muscle weakness, paralysis, and even death. Due to the high rate of asymptomatic cases and the fecal-oral transmission route of the virus, polio eradication is a difficult, time-consuming process that can be achieved only through high vaccination coverage.

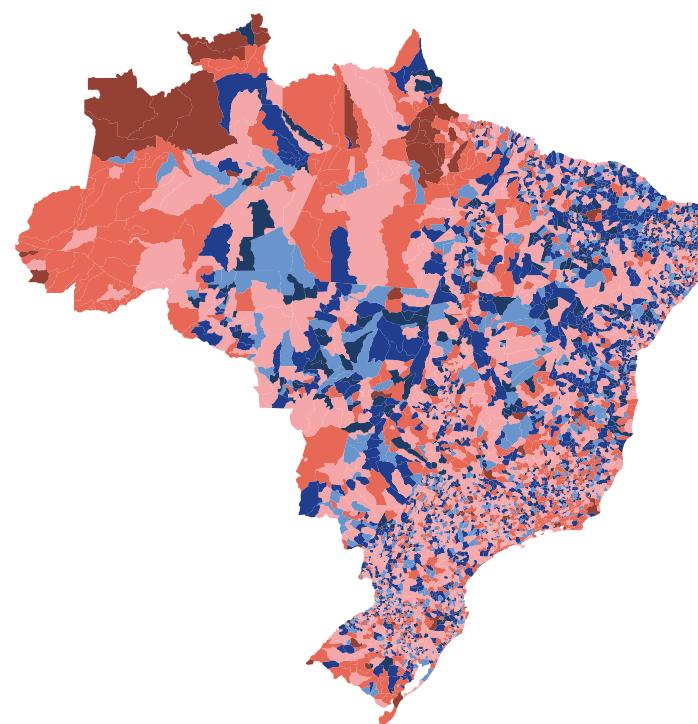
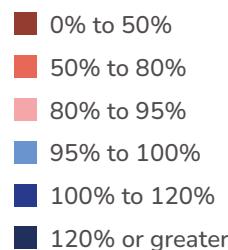
Despite this, since 1994 polio has been considered eradicated in the Americas, thanks to the high vaccination coverage achieved mainly through campaigns on national vaccination days instituted in 1980.

Dose	Target age	Vaccine
<b>1st dose</b>	<b>2 months</b>	Inactivated poliovirus vaccine (IPV)
<b>2nd dose</b>	<b>4 months</b>	Inactivated poliovirus vaccine (IPV)
<b>3rd dose</b> Coverage reference	<b>6 months</b>	Inactivated poliovirus vaccine (IPV)
<b>1st booster</b>	<b>15 months</b>	Oral polio vaccine (OPV)
<b>2nd booster</b>	<b>4 years</b>	Oral polio vaccine (OPV)

The oral polio vaccine (OPV) has been part of the Brazilian immunization system since before the first official vaccination schedule was published in 1977. The inactivated vaccine (IPV) was first incorporated by the PNI for its Referral Centers for Special Immunobiologics (CRIE); only in August 2012 did the IPV replace the first two doses of OPV on the regular schedule. In 2016, the entire primary vaccination scheme (doses 1, 2, and 3) became IPV-based, with use of the OPV retained only for boosters 1 and 2, at 15 months and 4 years of age, respectively. In November 2024, the OPV was completely removed from the vaccination schedule.

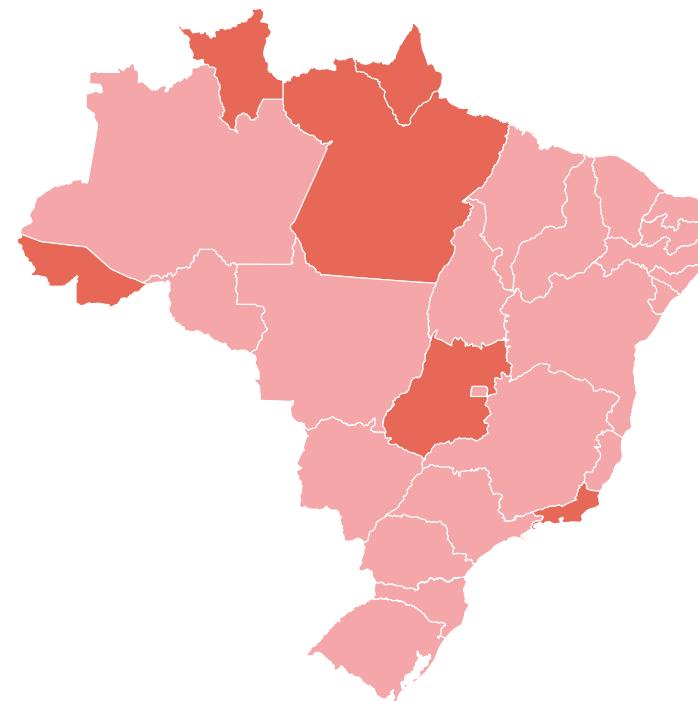
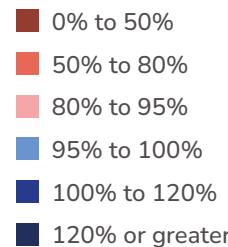
## Coverage for the 3rd dose of polio vaccine, inactivated

Children under 1, 2023, by municipality



## Coverage for the 3rd dose of polio vaccine, inactivated

Children under 1, 2023, by state



In 2023, no Brazilian state reached the polio vaccination target, set at 95% coverage. The states of Acre, Roraima, Pará, Amapá, Goiás, and Rio de Janeiro all had rates below 80%. As shown on the map depicting coverage at the municipal level, some municipalities did not reach the 50% threshold.

## Coverage for doses of vaccines containing a poliovirus component

2023, by state, %

■ 0% to 50% ■ 50% to 80% ■ 80% to 95% ■ 95% to 100% ■ 100% to 120% ■ 120% or greater

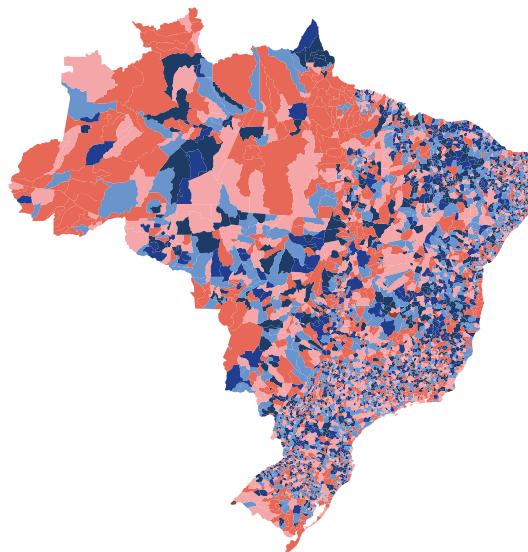
	1st dose	2nd dose	3rd dose	1st booster	2nd booster
MS	91.8	90.0	86.3	80.2	76.1
MT	95.1	92.4	88.0	78.7	80.8
GO	82.7	80.8	76.3	69.2	62.7
DF	86.4	84.4	81.0	73.6	70.1
SE	89.0	87.6	83.5	77.4	66.6
RN	91.2	88.6	83.0	75.0	62.3
PI	92.2	92.5	92.1	86.2	77.1
PE	85.7	84.2	81.1	68.5	57.7
PB	92.4	89.5	85.9	77.1	68.8
MA	91.6	89.6	86.0	71.7	55.6
CE	93.1	92.8	92.2	87.0	75.1
BA	91.4	91.1	87.7	76.4	64.0
AL	94.5	92.2	88.7	82.2	72.9
TO	95.7	93.3	88.1	82.0	77.9
RR	85.7	79.7	70.6	59.2	77.5
RO	96.2	93.6	89.6	76.9	70.7
PA	87.2	82.9	75.2	65.7	55.2
AM	90.9	87.7	82.8	75.4	69.9
AP	72.9	71.6	63.6	54.5	46.9
AC	88.3	82.7	73.8	59.0	52.3
SP	86.8	85.2	82.6	75.7	68.1
RJ	79.2	74.3	71.4	57.8	43.1
MG	83.8	83.7	81.6	75.9	73.5
ES	89.3	88.1	84.3	80.7	74.2
SC	88.5	87.3	85.3	78.9	85.7
RS	90.1	88.6	84.2	78.4	72.5
PR	88.2	87.3	85.4	80.2	77.1

Vaccination uptake declines in all states over the course of the vaccination schedule, which consists of three doses plus two boosters. For calculation of the coverage indicator, however, uptake only up to the third dose is taken into account. For the first dose, vaccination reaches the highest percentage of the target population; nevertheless, coverage over 95% is achieved in just three states: Mato Grosso, Tocantins, and Rondônia. For the third dose, no state met the target set by the PNI.

## Dropout rate for the 3rd dose of inactivated polio vaccine

Children under 1, 2023, by municipality

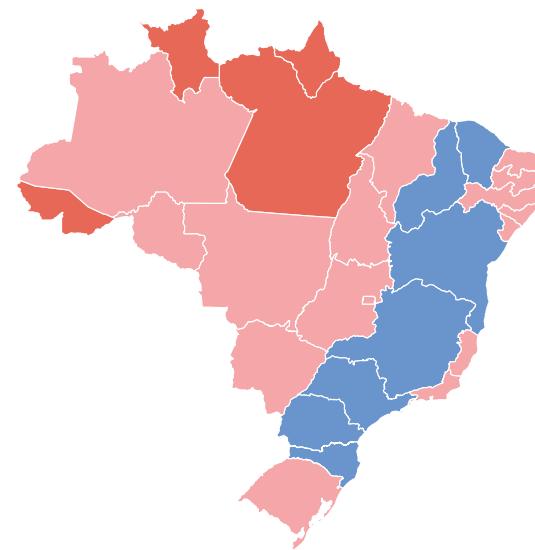
- -5% or less
- -5% to 0%
- 0% to 5%
- 5% to 10%
- 10% to 50%
- 50% or greater



## Dropout rate for the 3rd dose of inactivated polio vaccine

Children under 1, 2023, by state

- -5% or less
- -5% to 0%
- 0% to 5%
- 5% to 10%
- 10% to 50%
- 50% or greater

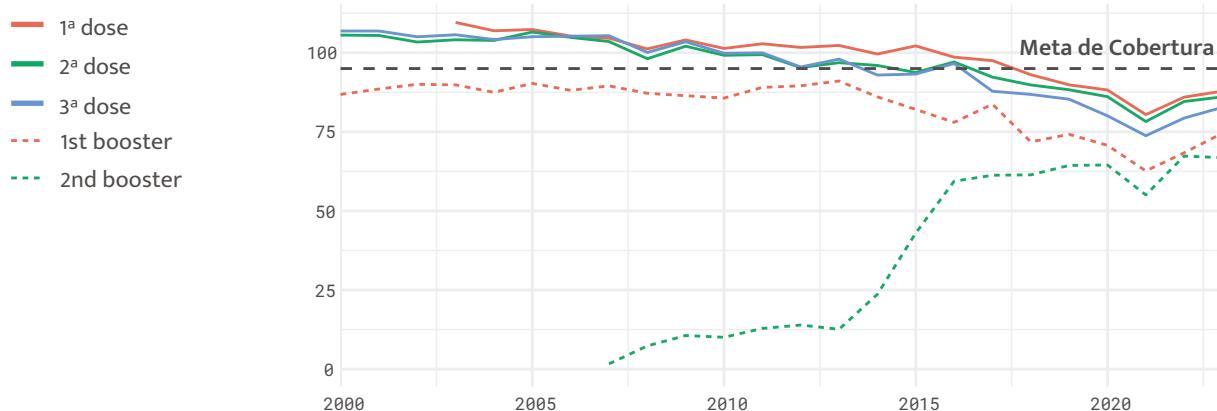


The dropout indicator for polio vaccination takes into account the difference between the first and third doses. The four states with a dropout rate higher than 10% are located in the North region: Acre, Roraima, Pará, and Amapá.

## Coverage for each dose of vaccines containing a poliovirus component

Children aged 1, Brazil, 2000 to 2023

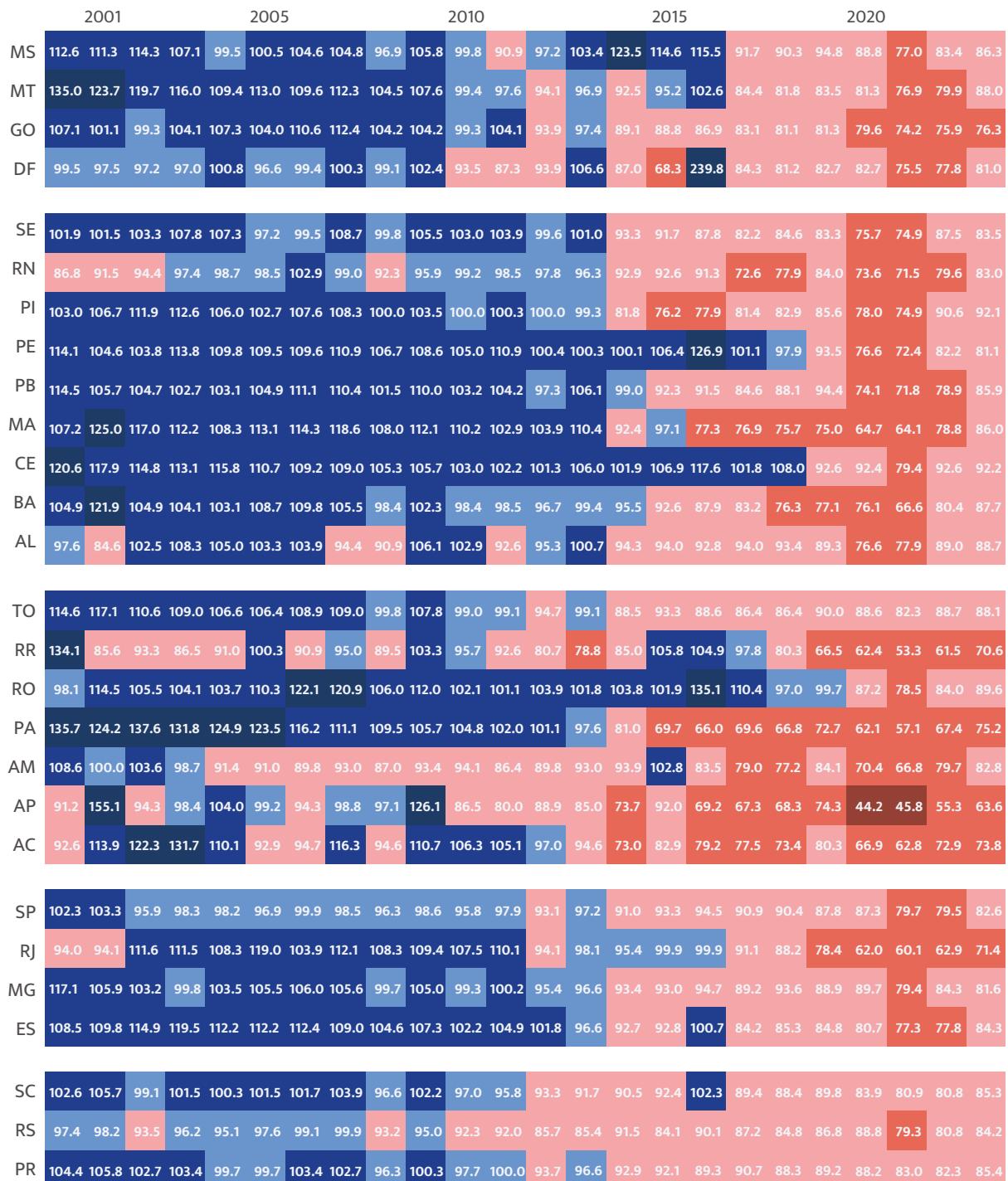
Por tipo de dose, em %



## Coverage for the last dose of vaccines containing polio

Children under 1, by state, 2000 to 2023, %

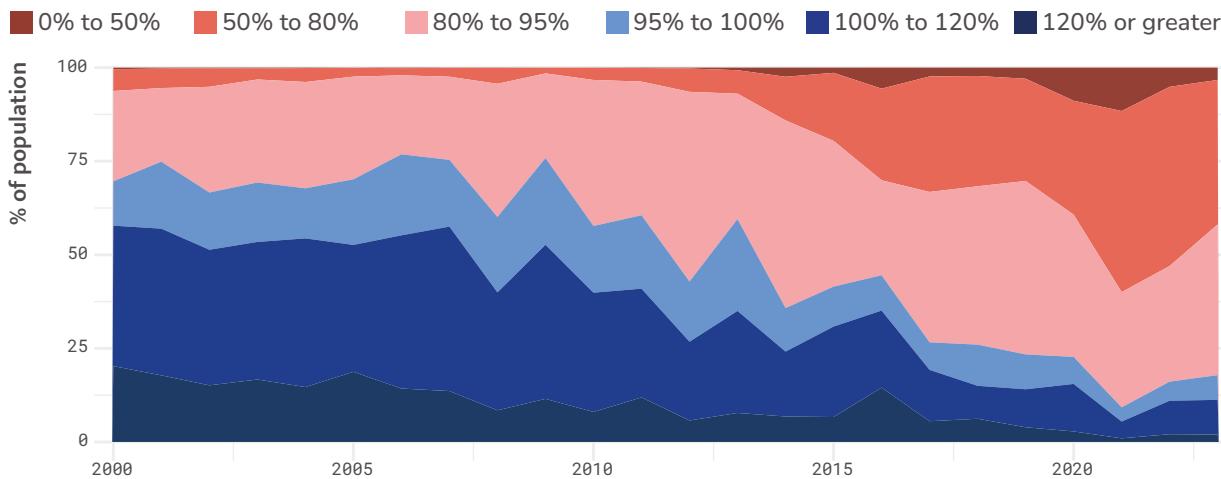
■ 0% to 50% ■ 50% to 80% ■ 80% to 95% ■ 95% to 100% ■ 100% to 120% ■ 120% or greater



Until 2016, the majority of states met the polio vaccination target, as did the aggregate coverage for the country as a whole. Since then, there has been a decline in vaccination, most markedly in 2020 and 2021—the worst period of the Covid-19 pandemic. Coverage bounced back in 2022 and 2023, but has yet to reach pre-pandemic levels.

## Fraction of the Brazilian population living in municipalities in each vaccination coverage range for the last dose of vaccines with a polio component

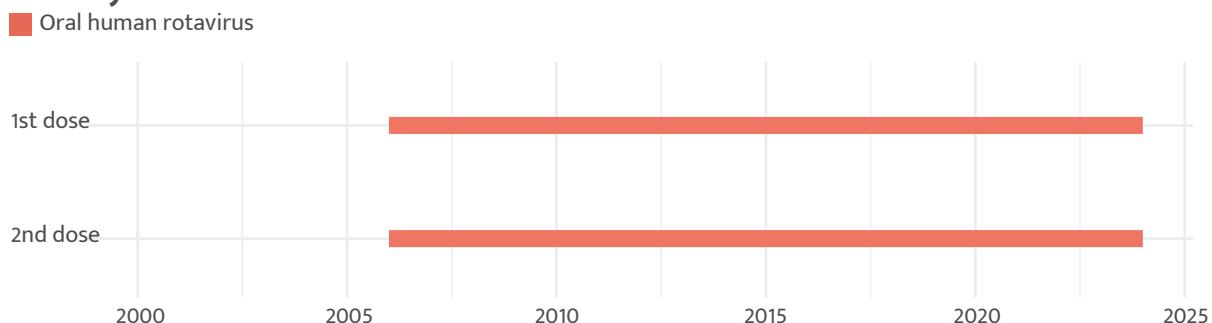
Vaccination coverage, children under 1, Brazil, 2000 to 2023



In 2023, less than 20% of the Brazilian population lived in municipalities that met the polio vaccination target. This fraction ranged from 60% to 75% in the decade 2001–2010.

# ROTAVIRUS

## History of human rotavirus vaccines



Rotavirus can cause severe gastroenteritis (diarrhea and vomiting), especially in children under 5 years of age. Transmission occurs through the virus being eliminated in feces, which persists even after symptoms have cleared, contaminating the environment.

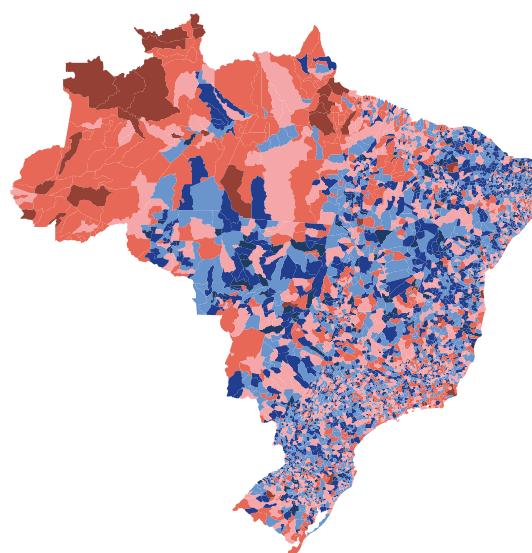
Dose	Target age	Vaccine
<b>1st dose</b>	<b>2 months</b>	<b>Oral Human Rotavirus Vaccine</b>
<b>2nd dose</b> Coverage reference	<b>4 months</b>	<b>Oral Human Rotavirus Vaccine</b>

The vaccine adopted by the PNI is the oral monovalent human rotavirus vaccine, administered in two doses, at 2 and 4 months of age (until 2024, dose 1 could also be administered up to age 3 months 15 days, and dose 2, up to age 7 months 29 days). The vaccination coverage target is 90% for children under 1 year of age. Children not vaccinated within the recommended period can receive the first dose up to age 11 months 29 days and the second dose up to age 23 months 29 days, with a minimum interval of 30 days between doses.

## Coverage for the 2nd dose of oral human rotavirus vaccine

Children under 1, 2023, by municipality

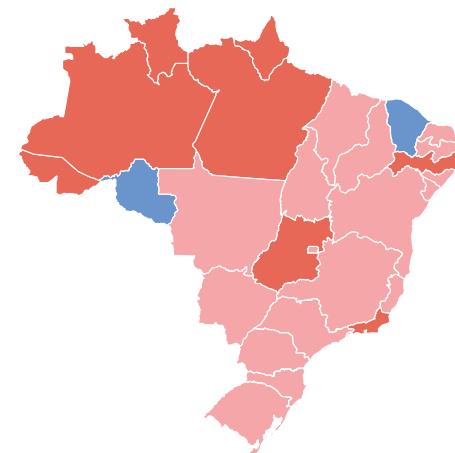
- 0% to 50%
- 50% to 80%
- 80% to 90%
- 90% to 100%
- 100% to 120%
- 120% or greater



## Coverage for the 2nd dose of oral human rotavirus vaccine

Children under 1, 2023, by state

- 0% to 50%
- 50% to 80%
- 80% to 90%
- 90% to 100%
- 100% to 120%
- 120% or greater



Most Brazilian states reached at least 80% coverage against human rotavirus in 2023. However, only Rondônia and Ceará reached the 90% target. Acre, Amazonas, Roraima, Pará, Amapá, Pernambuco, Goiás, and Rio de Janeiro had coverage rates below 80%.

## Coverage for doses of vaccines containing a human rotavirus component

2023, by state, %

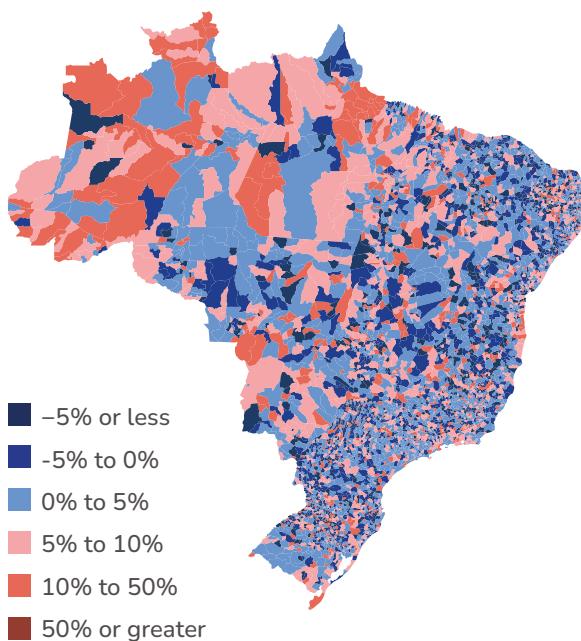
- 0% to 50%
- 50% to 80%
- 80% to 90%
- 90% to 100%
- 100% to 120%
- 120% or greater

	1st dose	2nd dose
MS	90.9	88.0
MT	92.6	88.5
GO	80.8	77.9
DF	86.1	83.6
SE	86.6	84.5
RN	89.2	85.5
PI	90.0	89.4
PE	82.6	79.7
PB	88.6	84.5
MA	86.2	82.2
CE	91.3	90.2
BA	88.0	86.7
AL	91.6	88.2
TO	92.9	89.1
RR	75.8	66.5
RO	93.8	90.3
PA	80.9	75.2
AM	83.0	77.3
AP	67.3	63.9
AC	82.9	75.4
SP	86.3	83.9
RJ	74.4	70.0
MG	84.0	83.3
ES	87.9	85.9
SC	89.6	88.1
RS	89.9	87.6
PR	88.8	87.3

As observed with other vaccines, there is a decline in uptake for the second dose, which is the reference for calculating the vaccination coverage indicator. Whereas only three states failed to reach 80% coverage for the first dose, eight failed to do so for the second dose, five of them in the North region.

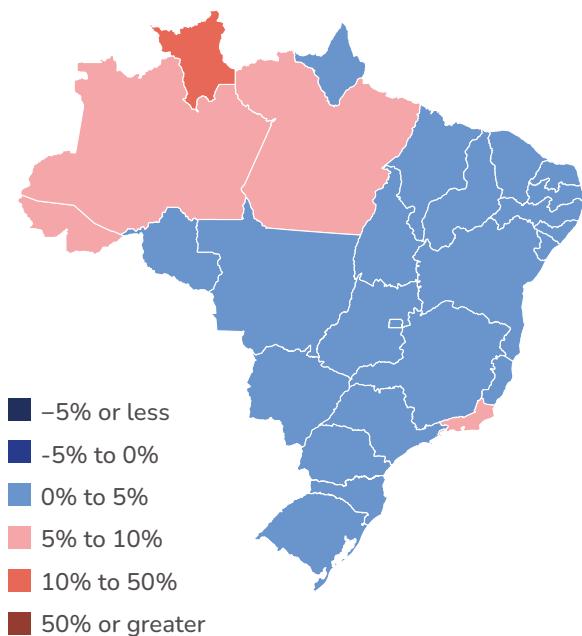
### Dropout rate for the 2nd dose of oral human rotavirus vaccine

Children under 1, 2023, by municipality



### Dropout rate for the 2nd dose of oral human rotavirus vaccine

Children under 1, 2023, by state



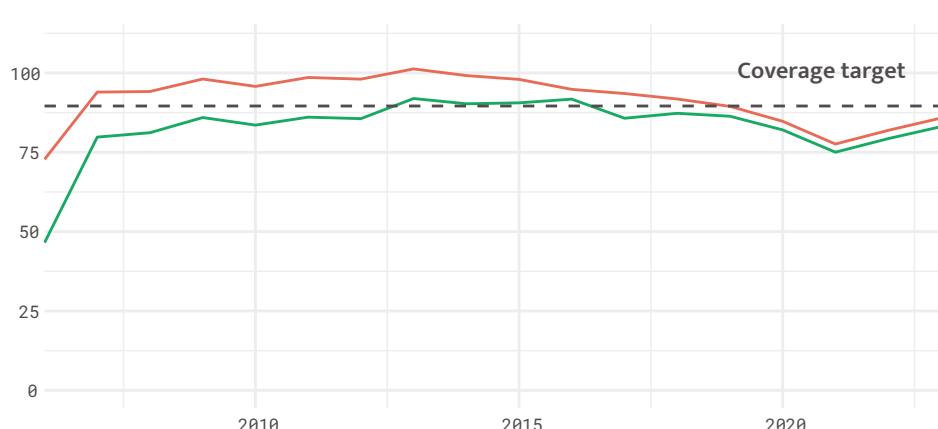
In most Brazilian municipalities and states, the dropout rate for this vaccine is less than 5%. Roraima is the only state where the difference in uptake between the first and second doses is greater than 10%.

### Coverage for each dose of vaccines containing a human rotavirus component

Children under 1, Brazil, 2003 to 2023

By type of dose, %

— 1st dose  
— 2nd dose



## Coverage for the 2nd dose of oral human rotavirus vaccine

Children under 1, by state, 2006 to 2023

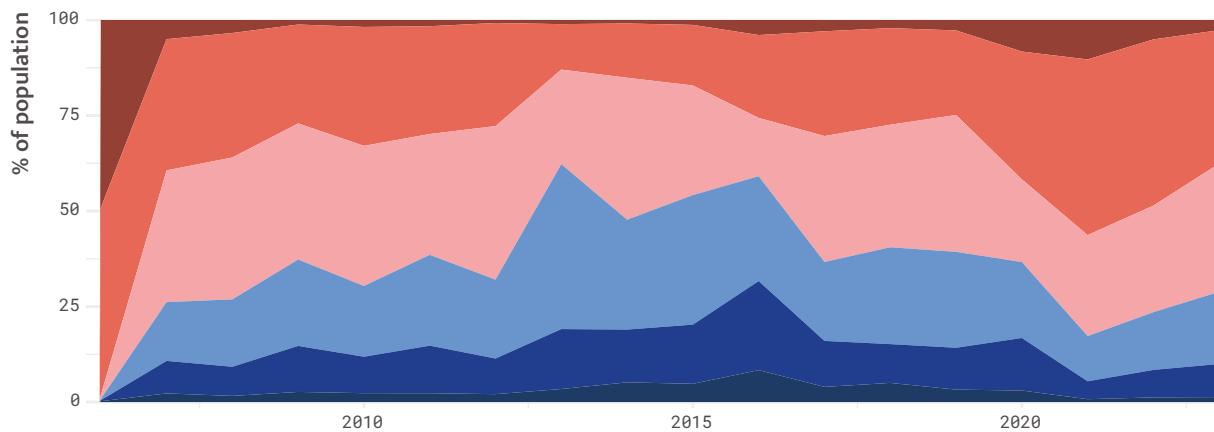
	0% to 50%	50% to 80%	80% to 90%	90% to 100%	100% to 120%	120% or greater	2006	2010	2015	2020	2023							
MS	55.3	86.6	84.8	91.6	87.9	88.9	87.1	95.6	122.5	111.7	100.4	90.9	91.3	95.4	90.1	77.7	83.3	88.0
MT	28.8	74.5	81.8	89.6	84.8	83.6	85.2	90.2	88.5	92.1	95.3	81.4	82.7	83.5	81.8	78.0	79.5	88.5
GO	33.8	85.3	85.5	88.5	86.5	90.1	84.8	94.4	89.8	91.0	91.5	85.3	83.9	83.7	82.4	76.4	78.2	77.9
DF	58.4	88.7	87.3	92.9	88.4	79.2	86.7	99.9	86.4	60.1	130.7	85.2	84.4	85.6	85.7	79.2	81.0	83.6
SE	52.0	92.6	88.2	92.2	92.3	95.5	92.3	100.7	94.1	90.8	89.9	83.1	87.5	84.7	76.0	76.7	86.6	84.5
RN	35.2	67.5	71.8	76.4	77.7	83.9	86.8	88.4	86.0	84.7	81.0	72.3	81.1	88.3	77.5	74.2	80.5	85.5
PI	37.7	79.4	84.1	89.8	82.7	86.5	91.9	95.2	82.2	80.5	80.1	76.5	81.0	83.4	79.3	73.8	87.5	89.4
PE	43.3	81.3	85.3	90.7	86.4	90.9	90.8	94.0	95.7	98.2	102.8	87.8	89.6	87.9	77.8	72.2	78.6	79.7
PB	54.4	83.1	82.8	87.4	78.8	86.2	84.2	88.7	91.2	88.9	91.2	84.8	89.3	94.7	77.3	72.9	77.5	84.5
MA	32.9	63.0	69.2	78.2	75.3	79.4	84.3	92.6	86.9	88.0	78.0	74.3	77.8	76.9	66.3	65.7	73.2	82.2
CE	41.7	85.7	88.8	91.0	89.4	90.4	91.8	97.4	94.6	98.3	112.5	102.7	110.6	93.0	94.7	80.3	89.5	90.2
BA	40.8	72.2	74.3	79.9	74.0	78.9	80.5	89.0	88.8	86.6	75.4	75.4	77.4	77.5	77.7	67.0	79.0	86.7
AL	31.3	61.7	68.1	79.4	76.6	71.4	79.8	87.6	86.7	89.7	88.8	87.0	89.2	89.1	78.7	80.1	86.6	88.2
TO	48.5	83.4	81.4	88.0	85.1	85.9	84.9	91.5	89.9	93.8	95.1	89.5	88.0	90.8	88.2	82.4	88.0	89.1
RR	36.9	65.3	66.1	75.4	70.9	70.7	67.0	65.9	82.7	89.1	84.2	87.7	76.9	63.2	64.1	54.2	59.3	66.5
RO	51.0	90.0	80.8	88.7	85.5	83.4	88.0	98.2	99.0	100.3	107.9	94.9	91.7	90.2	88.5	79.6	85.2	90.3
PA	26.5	56.4	62.2	69.7	67.8	71.8	76.6	85.5	79.0	70.2	72.1	67.2	69.0	75.9	65.6	60.6	68.5	75.2
AM	33.2	60.3	57.8	64.9	59.8	63.7	66.4	73.1	79.1	87.1	78.8	76.8	78.1	82.8	73.7	65.3	74.4	77.3
AP	34.3	63.2	68.1	78.4	70.0	64.4	69.6	70.5	70.8	82.0	99.7	75.8	76.3	80.6	50.2	52.4	57.6	63.9
AC	17.6	51.5	55.2	68.5	68.2	68.4	74.5	75.0	64.5	82.7	83.1	79.1	78.0	84.0	70.8	65.4	71.6	75.4
SP	56.2	86.5	86.9	89.6	88.8	92.1	88.9	96.8	90.2	90.8	91.7	90.5	89.1	88.9	87.9	80.2	80.2	83.9
RJ	48.6	76.9	76.2	80.2	79.4	83.9	80.3	89.4	88.6	92.5	99.0	85.7	87.9	79.6	64.0	61.3	63.7	70.0
MG	57.2	91.8	91.5	95.2	92.2	93.4	90.8	94.8	95.8	97.8	96.8	91.1	95.9	91.3	92.3	80.7	85.3	83.3
ES	59.6	91.1	90.8	94.5	90.4	94.2	91.9	94.8	91.7	93.0	96.9	85.7	87.3	87.1	82.3	77.7	79.1	85.9
SC	57.6	91.6	88.6	94.0	92.1	92.3	90.6	91.9	94.3	98.0	95.0	91.3	89.7	94.0	89.2	83.6	84.5	88.1
RS	44.8	78.2	80.7	83.9	82.4	81.6	80.8	82.0	90.6	86.2	88.7	84.9	88.0	89.7	90.1	81.9	82.6	87.6
PR	50.1	83.5	85.7	89.6	89.9	90.9	88.8	93.9	93.8	94.8	92.1	89.8	90.3	91.1	91.6	85.5	84.3	87.3

Once the human rotavirus vaccine was included in the childhood immunization schedule, its coverage slowly expanded until 2015. Coverage then began to decline between 2016 and 2021, with a slight recovery in 2022 and 2023.

## Fraction of the Brazilian population living in municipalities in each coverage range for the 2nd dose of oral human rotavirus vaccine

Vaccination coverage in children under 1, by state, 2006 to 2023

0% to 50% 50% to 80% 80% to 90% 90% to 100% 100% to 120% 120% or greater

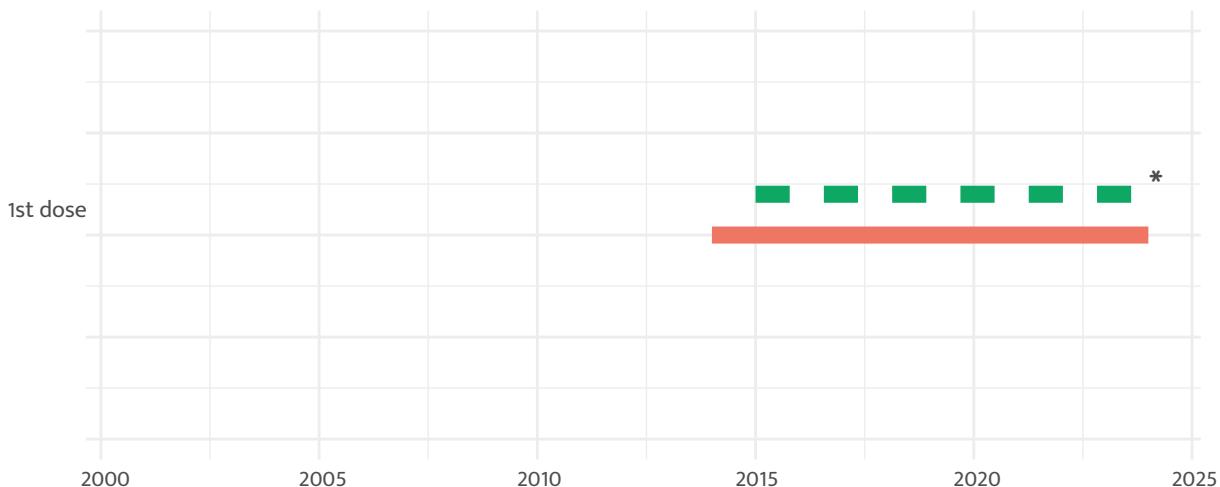


In 2023, 71% of the Brazilian population lived in municipalities with less than 90% coverage for the human rotavirus vaccine. This indicator has been much lower in the past (only 37.7% as of 2014).

# VARICELLA

## History of varicella vaccines

■ MMRV  
■ Varicella



\* The monovalent varicella vaccine is now recommended due to a shortage of the MMRV vaccine.

Varicella, commonly known as chickenpox, is an infection caused by the varicella zoster virus. It is highly contagious, being transmitted through contact with saliva or respiratory secretions, skin and mucous membrane lesions, and contaminated objects. The disease is easily diagnosed by its characteristic skin rash, starting as small, itchy red spots which then progress to blisters (vesicles). Although generally benign in children, chickenpox can develop into a bacterial infection due to wounds caused by scratching and, more rarely, into pneumonia and nervous system involvement.

	Target age	Vaccine
<b>1st dose</b> Coverage reference	<b>15 months</b>	<b>Monovalent varicella</b>
<b>2nd dose</b> Coverage reference	<b>15 months</b>	<b>MMRV</b>

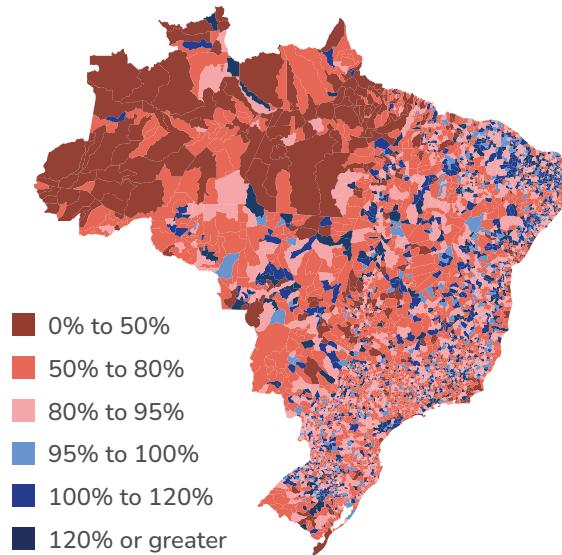
Immunization against varicella was introduced into the Brazilian childhood vaccination schedule with the adoption of the MMRV (measles, mumps, rubella, and varicella) vaccine in the last quarter of 2013, indicated for children aged 15 months who have already received the first dose of the MMR vaccine. However, due to insufficient supply of the MMRV vaccine in subsequent years, the recommendation has changed to administering the monovalent varicella vaccine at 15 months of age, along with the second dose of the MMR vaccine.

Coverage for the first dose of varicella vaccines is calculated as the sum of records of single doses and first doses of the MMRV vaccine plus records of the first dose of the monovalent varicella vaccine—all in children aged 1 year. The coverage target established by the PNI is 95%.

\*This chapter was updated on July 7, 2025. There are minor differences compared to the version originally published on June 17, 2025, resulting from a new review of the data.

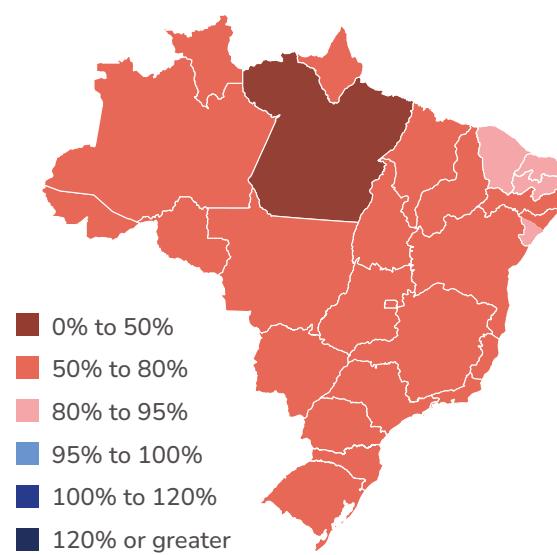
## Coverage for the 1st dose of vaccines containing a varicella component

Children aged 1 year, 2023, by municipality



## Coverage for the 1st dose of vaccines containing a varicella component

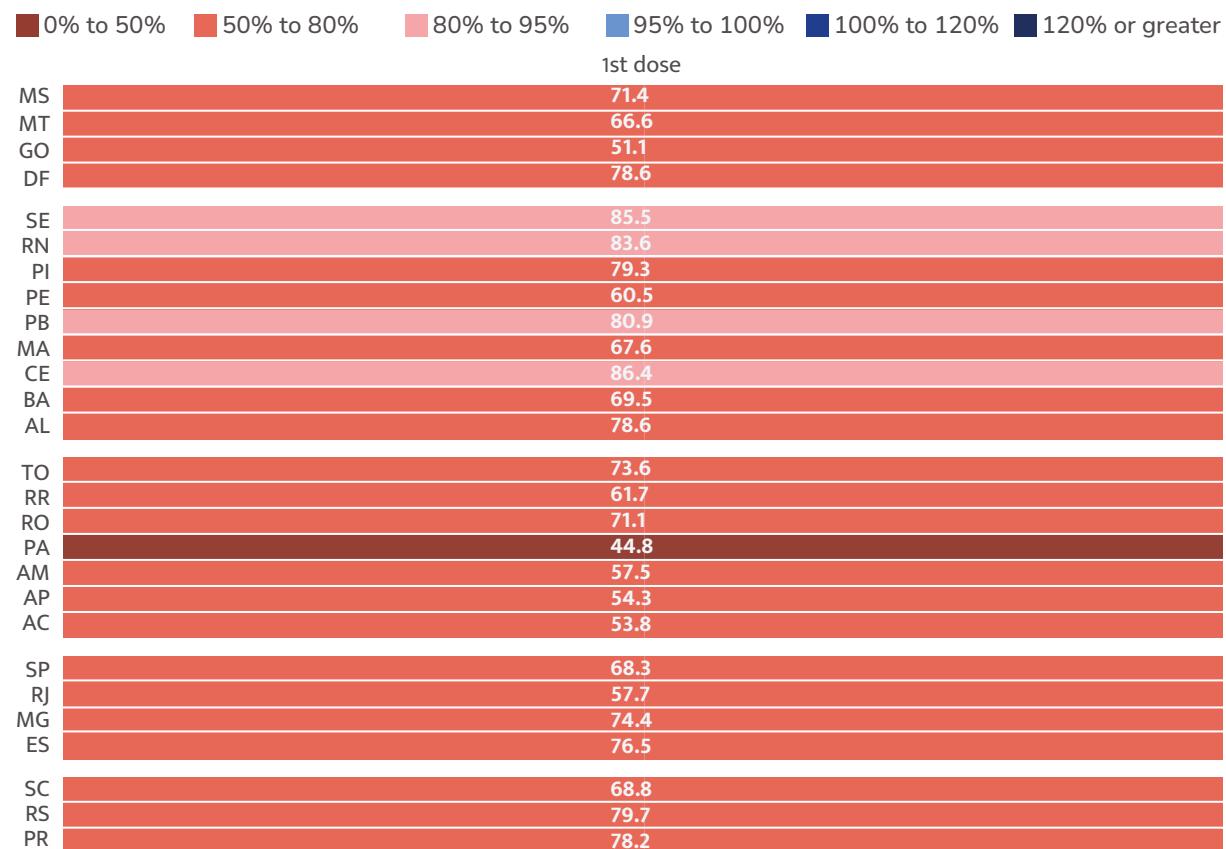
Children aged 1 year, 2023, by state



Few Brazilian municipalities reach the target for varicella vaccination in 1-year-old children. At the state level, coverage is below 95% in all states, and below 50% in Pará.

## Coverage for doses of vaccines containing a varicella component

Children aged 1 year, 2023, by state, %

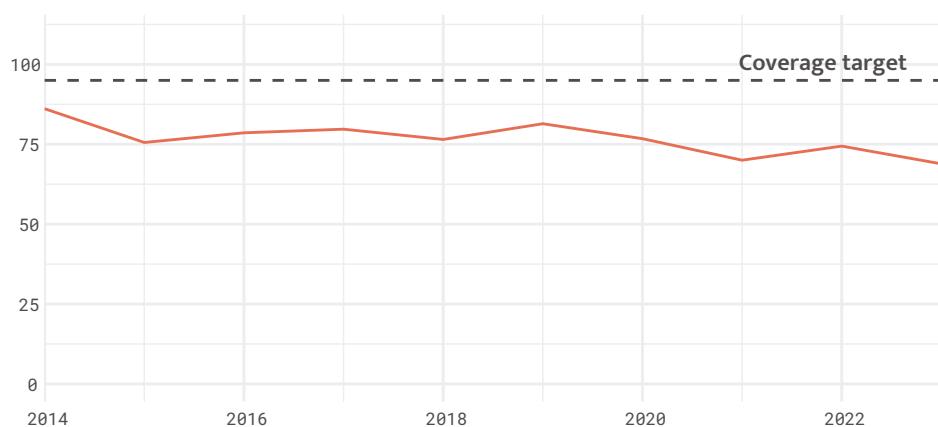


## Coverage for the 1st dose of vaccines containing a varicella component

Children aged 1, Brazil, 2014 to 2023

By type of dose, %

— 1st dose

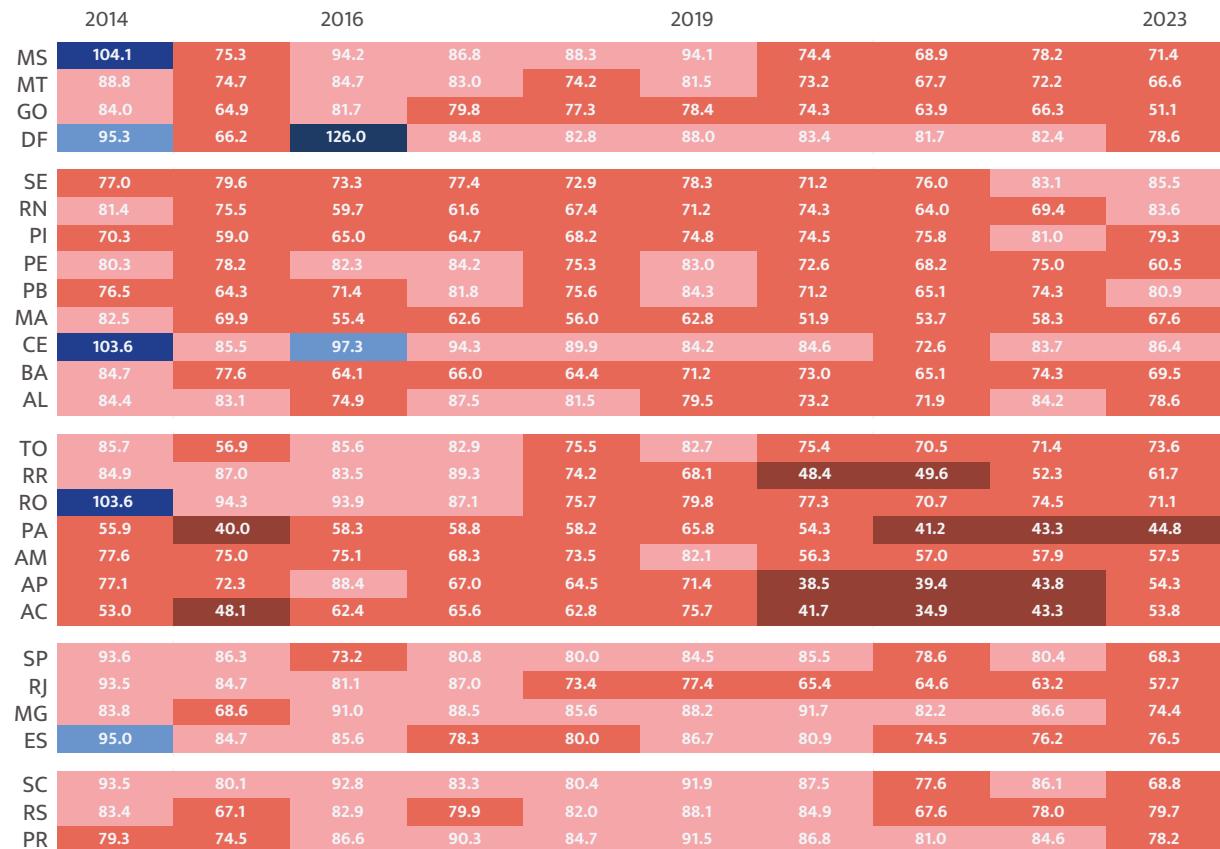


Since introduction of the vaccine into the childhood immunization schedule, coverage against varicella has remained below the PNI target, with minor fluctuations followed by a more significant decline after 2020. In 2023, the state with the highest vaccination coverage was Ceará, with 86.4%, followed by Sergipe (85.5%), Rio Grande do Norte (83.6%), and Paraíba (80.9%).

## Coverage for the 1st dose of vaccines containing a varicella component

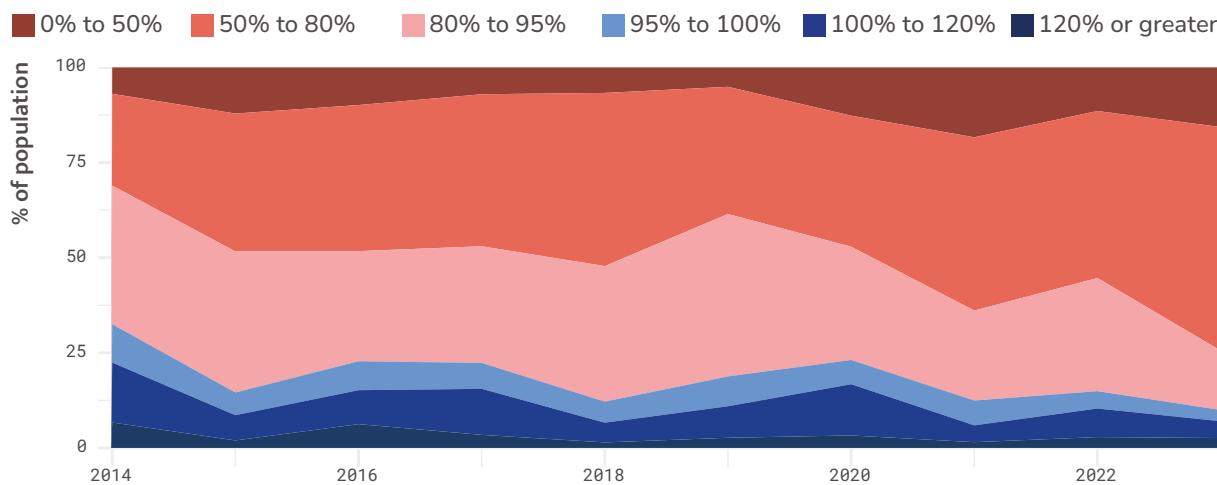
Children aged 1, Brazil, 2014 to 2023

■ 0% to 50% ■ 50% to 80% ■ 80% to 95% ■ 95% to 100% ■ 100% to 120% ■ 120% or greater



## Fraction of the Brazilian population living in municipalities in each vaccination coverage range for the 1st dose of vaccines containing a varicella component

Vaccination coverage in children aged 1, Brazil, 2014 to 2023

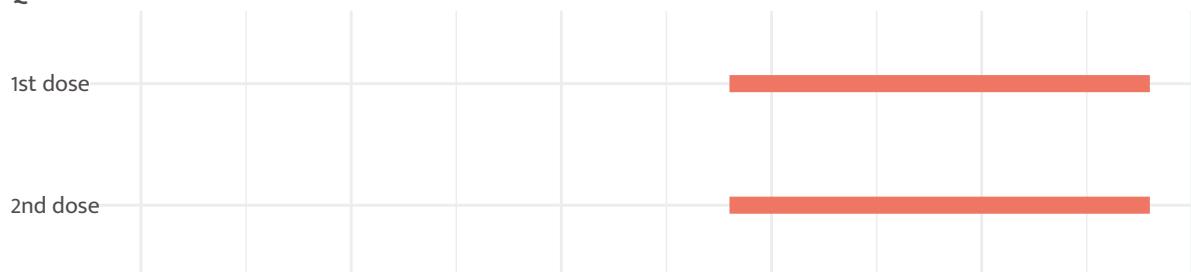


In 2023, only 9.9% of the Brazilian population lived in municipalities that achieved 95% vaccination coverage against varicella in 1-year-olds. Although this vaccine has never reached the target set by the PNI at the national level, this is the lowest coverage rate since records began. There was also a reduction in the range of municipalities with vaccination coverage between 80% and 95%, which historically encompassed 25% to 30% of the Brazilian population. In 2023, this percentage dropped to 15.6% of the country's total population, while there was a substantial increase in the population living in areas with less than 80% coverage.

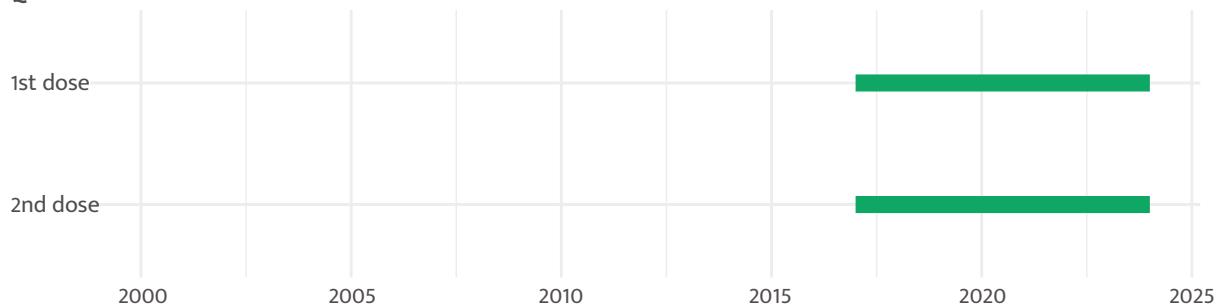
# HPV

## History of vaccines for HPV infection

### Quadrivalent HPV – Females



### Quadrivalent HPV – Males



The human papillomavirus (HPV) is a pathogen that attacks the skin and mucous membranes. HPV infection is one of the most common sexually transmitted infections worldwide. Several HPV types are associated with cervical, anal, penile, oral, and throat cancer, and vaccination is the most effective form of prevention.

The HPV vaccine has been offered by the Brazilian Unified Health System as part of the adolescent immunization schedule since 2014, initially for females aged 11 to 13 years, in a three-dose scheme, with doses given 2 and 6 months apart. In 2014, shortly after introduction, the schedule was abbreviated to two doses given 6 months apart. In 2017, the vaccine was incorporated into the vaccination schedule for male adolescents aged 11 to 14 as well.

Currently, the target group for vaccination is the population aged 9 to 14 years of either sex, as part of routine immunization. In 2024, the vaccination scheme was changed to a single dose, and the coverage target set by the PNI, previously 80%, was increased to 90%. Individuals aged 15 to 45 years with special clinical conditions may receive the vaccine at Referral Centers for Special Immunobiologics.

Dose	Target age	Vaccine
<b>1st dose</b>	<b>9 to 14 years</b>	<b>Quadrivalent HPV</b>
<b>2nd dose</b> Coverage reference up to 2023	<b>9 to 14 years</b> (6 months after the 1st dose)	<b>Quadrivalent HPV</b>

## Coverage for doses of vaccines containing an HPV component

Teenagers turning 15 years old in 2024, by state, %

■ 0% to 50% ■ 50% to 80% ■ 80% to 90% ■ 90% to 100% ■ 100% to 120% ■ 120% or greater

HPV infections – Females		
	1st dose	2nd dose
MS	95.1	76.4
MT	86.0	75.4
GO	86.7	74.3
DF	99.0	82.8
SE	83.9	74.1
RN	86.9	70.2
PI	91.4	76.3
PE	93.7	75.1
PB	100.0	82.0
MA	88.7	71.6
CE	109.0	86.5
BA	86.2	71.3
AL	92.9	71.9
TO	92.4	84.7
RR	111.1	74.4
RO	93.3	78.1
PA	86.3	67.0
AM	107.6	92.1
AP	101.2	74.3
AC	61.1	43.2
SP	97.3	83.1
RJ	80.7	58.3
MG	106.0	93.1
ES	104.7	92.7
SC	96.4	89.8
RS	95.5	83.0
PR	113.1	99.3

HPV infections – Males		
	1st dose	2nd dose
	70.2	48.5
	76.8	54.9
	64.9	45.2
	78.7	56.2
	65.4	48.2
	64.1	43.2
	68.7	51.0
	64.2	44.8
	63.9	46.4
	53.4	39.2
	66.6	48.2
	57.4	42.7
	62.7	42.9
	77.8	56.9
	74.2	39.1
	72.5	49.6
	48.7	35.1
	81.0	58.5
	46.2	31.7
	25.5	16.3
	73.9	54.6
	54.4	35.9
	78.9	64.0
	85.4	73.2
	83.8	68.4
	77.1	55.0
	82.7	80.1

Vaccination coverage with the first dose of the HPV vaccine in female adolescents who turned 15 in 2024 exceeded 80% in 25 of the 26 states and in the Federal District, except Acre, where coverage remained at 61%. For the second dose, the scenario is quite different: only nine states and the Federal District have achieved coverage above 80%, most of them in the Southeast and South regions of the country. Only Paraná exceeded 90% coverage.

Coverage for male adolescents receiving their first dose at the age of 15 exceeded 80% in only four states: Amazonas in the North region, Espírito Santo in the Southeast, and Santa Catarina and Paraná in the South. All nine states of the Northeast region had coverage below 70%, as did Goiás, in the Midwest. Uptake of the first dose in the states of Pará, Acre, and Rio de Janeiro is strikingly low, with coverage below 50%.

For the second dose, all states had vaccination coverage below 80%, with 16 of them below 50%. Only Paraná achieved 80% coverage with the second dose of HPV vaccine among male adolescents who turned 15 in 2024.

## Coverage for the 1st dose of quadrivalent HPV vaccine

In adolescents turning 15 years old, by state, 2020 to 2023, %

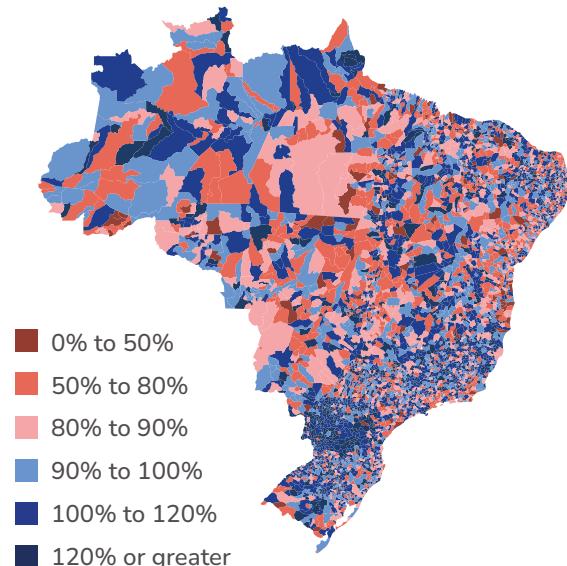
■ 0% to 50% ■ 50% to 80% ■ 80% to 90% ■ 90% to 100% ■ 100% to 120% ■ 120% or greater



## In female adolescents

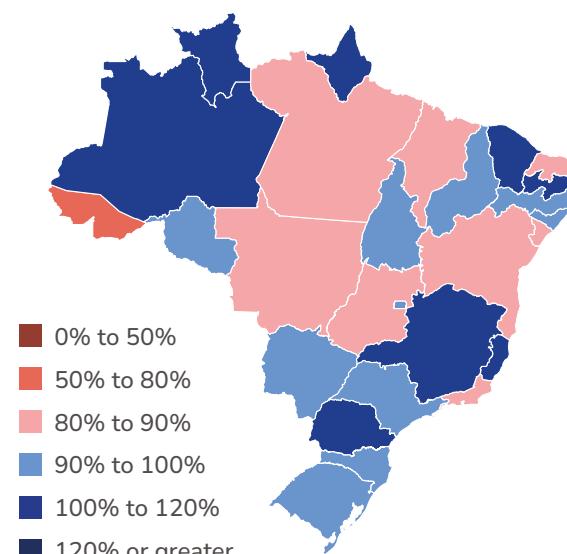
### Vaccination coverage for the 1st dose of quadrivalent HPV vaccine in female adolescents

Among those turning 15 in 2024, by municipality



### Vaccination coverage for the 1st dose of quadrivalent HPV vaccine in female adolescents

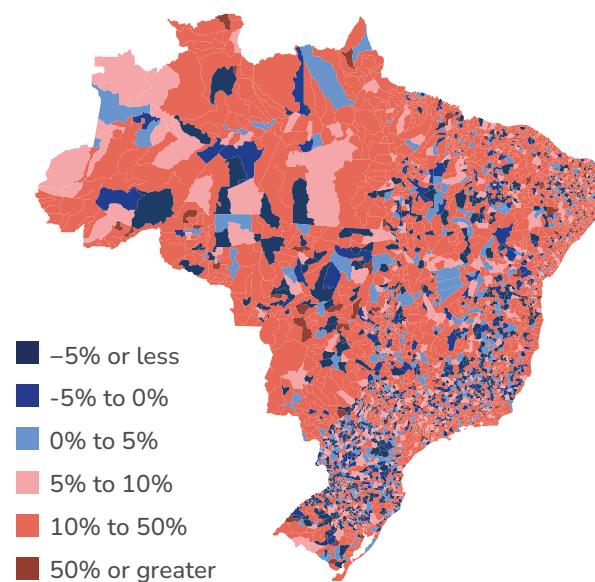
Among those turning 15 in 2024, by state



At the municipal level, first-dose coverage for 15-year-old female adolescents proved heterogeneous, with a concentration of higher rates in municipalities of the South and Southeast regions. On the other hand, vaccination coverage in the ranges of 50% to 80% and 80% to 90% was notably more prevalent in municipalities of states in the Midwest, Northeast, and some states in the North region, such as Pará.

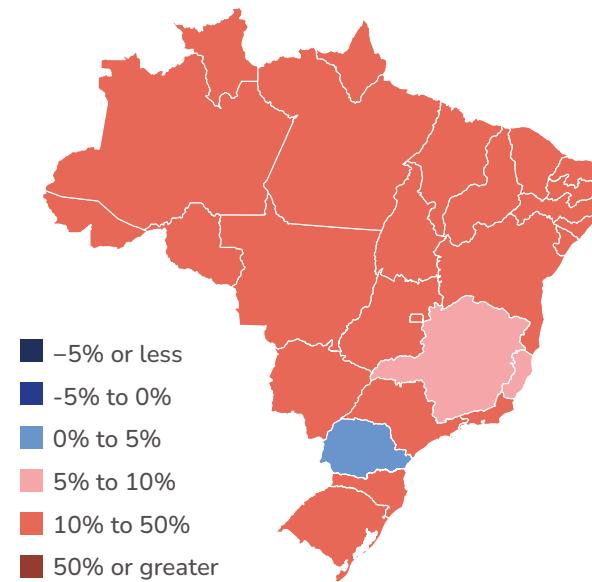
### Dropout rate for the 2nd dose of quadrivalent HPV vaccine

In female adolescents turning 15 years old in 2024, by municipality



### Dropout rate for the 2nd dose of quadrivalent HPV vaccine

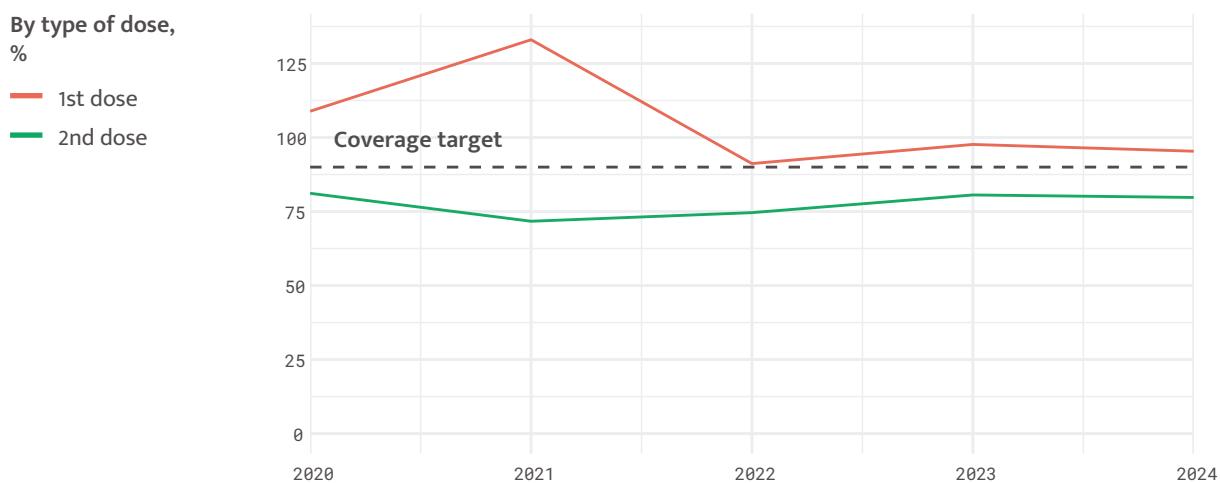
In female adolescents turning 15 years old in 2024, by state



In the target population of female adolescents, the average coverage for the first dose exceeded 90% in 15 states and in the Federal District, with the following states remaining below this threshold: Acre, Pará, Mato Grosso, Maranhão, Rio Grande do Norte, Sergipe, Bahia, Rio de Janeiro, and Goiás.

## Coverage for each dose of vaccines containing an HPV component

Female adolescents turning 15 years of age, Brazil, 2020 to 2023

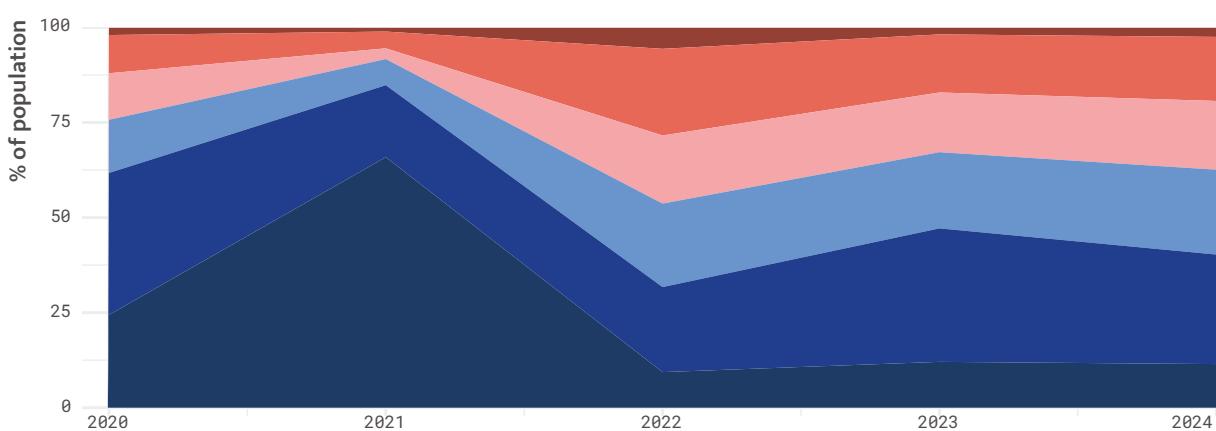


Country-wide, coverage with the first dose of the HPV vaccine among female adolescents who turned 15 between the years 2020 and 2024 was overrecorded, exceeding 100% until 2022 and remaining around 100% until 2024. The opposite was observed with the second dose. Coverage rates were below 75% in 2021, rising to around 80% subsequently.

## Fraction of the Brazilian population living in municipalities in each vaccination coverage range for the 1st dose of quadrivalent HPV vaccine

In female adolescents turning 15 years of age, 2020 to 2024

■ 0% to 50% ■ 50% to 80% ■ 80% to 90% ■ 90% to 100% ■ 100% to 120% ■ 120% or greater

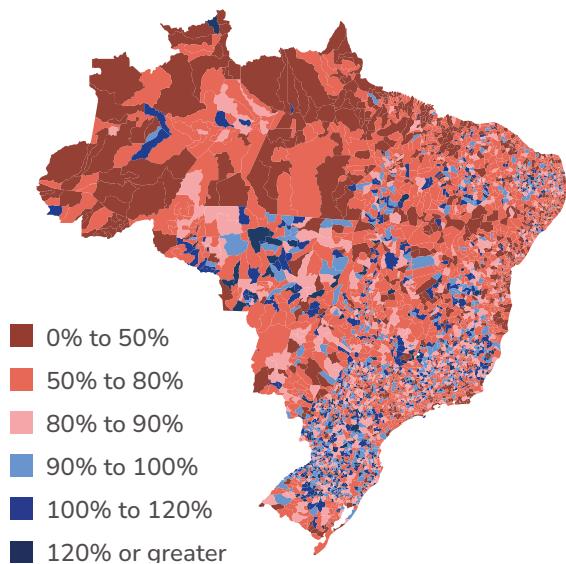


As of 2024, approximately 60% of the Brazilian population lived in municipalities with adequate coverage (greater than or equal to 90%) for the first dose of the HPV vaccine in female adolescents who turned 15 years old between 2020 and 2024. In 2021, this figure was quite higher (approximately 80%).

## In male adolescents

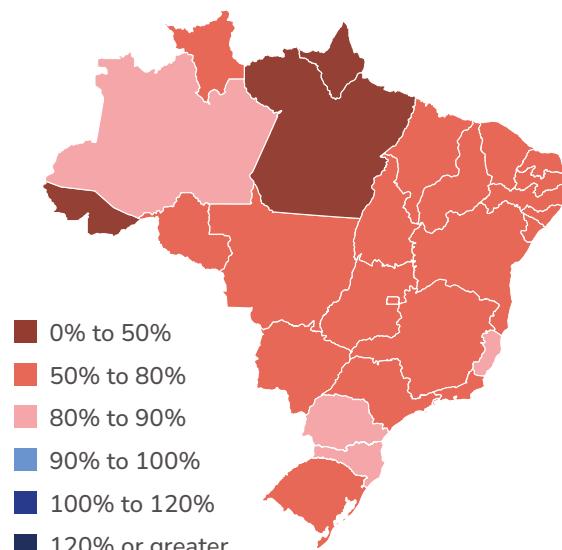
### Coverage for the 1st dose of quadrivalent HPV vaccine in male adolescents

Among those turning 15 years of age in 2024, by municipality\*



### Coverage for the 1st dose of quadrivalent HPV vaccine in male adolescents

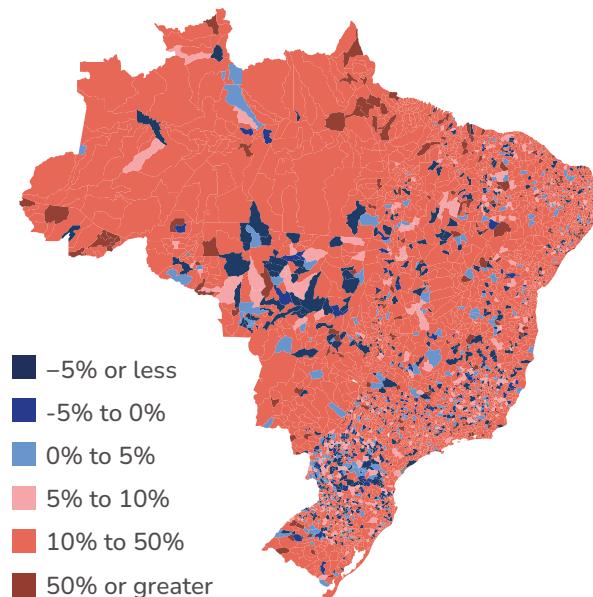
Among those turning 15 years of age in 2024, by state\*



For males, the coverage scenario among 15-year-old adolescents has changed significantly compared to coverage among female adolescents. There is a concentration of low coverage (less than 80%) in most municipalities across all regions.

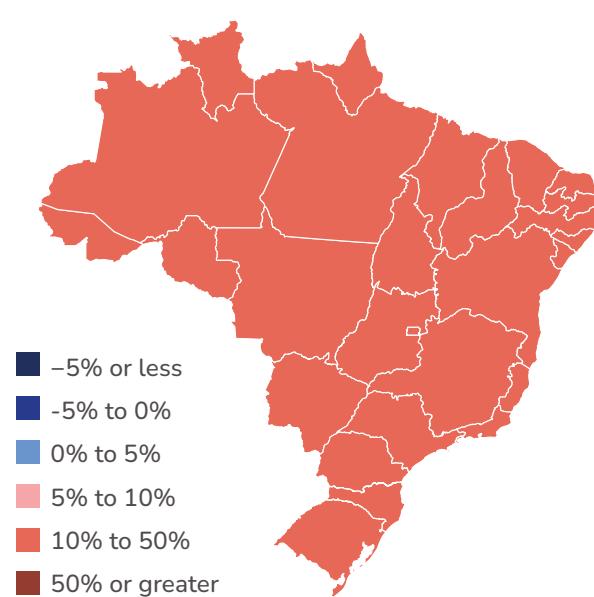
### Dropout rate for the 2nd dose of quadrivalent HPV vaccine

In male adolescents turning 15 years old in 2024, by municipality



### Dropout rate for the 2nd dose of quadrivalent HPV vaccine

In male adolescents turning 15 years old in 2024, by state



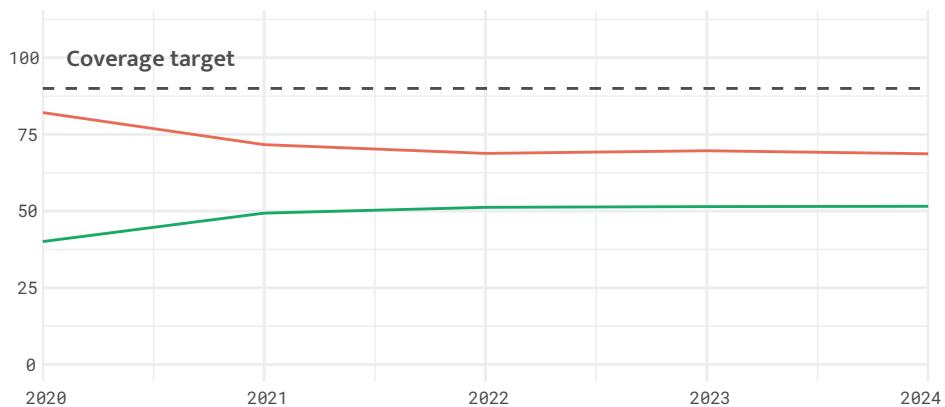
Regarding state averages, in Acre, Pará, and Amapá coverage for male adolescents was below 50% even when only the first dose was considered.

## Coverage for each dose of vaccines containing an HPV component

Male adolescents turning 15 years of age, Brazil, 2020 to 2024

By type of dose,  
%

- 1st dose
- 2nd dose

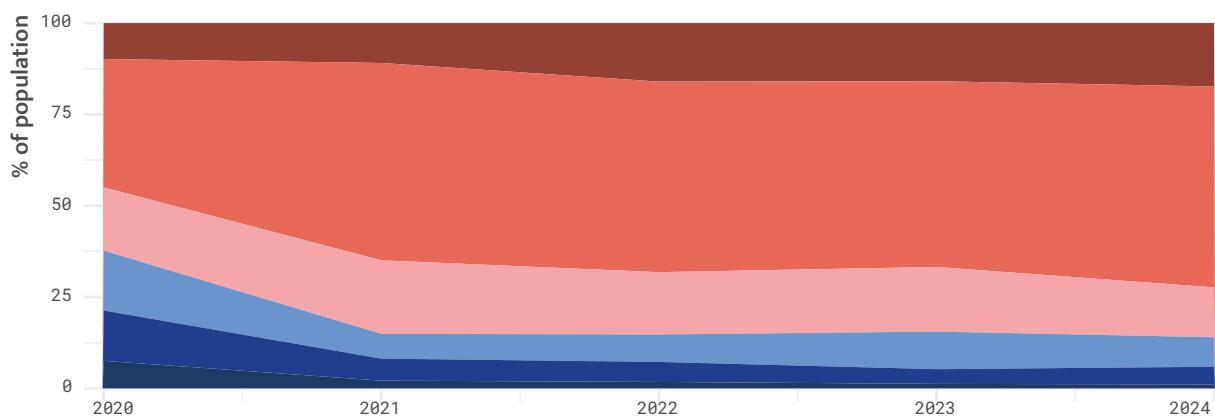


Coverage for the first dose among 15-year-old male adolescents was above 75% in 2020 and below 50% for the second dose. Rates have remained stable since 2021, at around 65% for dose 1 and 50% for dose 2.

## Fraction of the Brazilian population living in municipalities in each vaccination coverage range for the 1st dose of quadrivalent HPV vaccine

In male adolescents turning 15 years of age, 2020 to 2024

■ 0% to 50% ■ 50% to 80% ■ 80% to 90% ■ 90% to 100% ■ 100% to 120% ■ 120% or greater



The proportion of the Brazilian population living in municipalities with coverage equal to or greater than 90% for the first dose of the HPV vaccine in male adolescents was approximately 35% in 2021, dropping to approximately 20% in 2024.

# ARTICLES

# DIFFICULTIES IN ACCESSING AND ANALYZING VACCINATION DATA IN BRAZIL

**Gabriel Maia** is a data scientist currently studying Oceanography at the University of São Paulo (USP). He was a data journalist at *Nexo Jornal* from 2018 to 2022, during which time the team was recognized with awards such as the Cláudio Weber Abramo Prize for Data Journalism and the Malofiej Award.

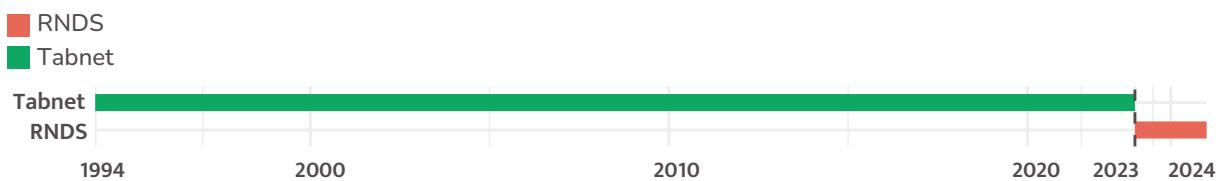
**Victor Moura** holds a bachelor's degree in Molecular Sciences from USP, having conducted his research in neutrino oscillation. He has worked as a data scientist at Instituto Questão de Ciência and is currently studying Economics, with a focus on statistical inference and information theory.

In order to have objective criteria for evaluating public policies and knowing where they should be headed in the future, it is essential not only that data exist but also that they are accessible. One of the areas where this need is most evident and critical is vaccination. The eradication of diseases such as polio, measles, and rubella in Brazil shows just how important this is.

Although the National Immunization Program was created in 1973, the availability of vaccination data in Brazil is recent, dating back to the mid-1990s, and is still beset by difficulties in access.

The leading platform for accessing immunization data in Brazil over the last 30 years has been Tabnet, created in 1991 by the National Health Foundation (Funasa) and the Unified Health System Department of Information Technology (DataSUS), which only began to provide data in 1994. In addition to the doses administered of each vaccine, the platform also consolidates data on vital statistics, demographics, vaccination coverage, and other indicators. Non-expert users, however, face a huge barrier to the extraction, visualization, and interpretation of historical data on the platform, since the user must know how to set up the desired table on the platform and, once it has been obtained, how to transform the resulting dataset into information and intelligence.

## Timeline of vaccine data platforms



Several other issues in the system require detailed, extensive work to overcome them. These include the absence of a dataset (in the form of a .csv, .ods, or .xls spreadsheet) containing all available vaccination information for Brazil, covering all years, vaccines, and diseases. This would not only standardize the existing data set, but also facilitate analyses involving different vaccines. Of course, this would carry the tradeoff of the costs of processing and storing a single file, but the implementation of consolidated data management practices would be enough to optimize the workflow.

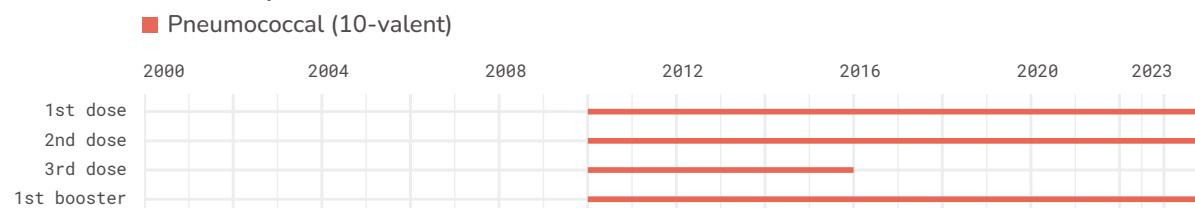
Each vaccine has its own history within the healthcare system, which needs to be tracked and compiled. The inactivated polio vaccine (IPV) and oral polio vaccine (OPV) are examples of this: the IPV was implemented in Brazil in 2012, replacing the OPV for the first and second doses, while the OPV continued to be used for the third dose and for boosters. In 2016, the primary schedule switched exclusively to IPV, while OPV remained in use for boosters; it is expected that, by 2025, the entire polio vaccination scheme will be carried out with IPV. The absence of official documentation and history for each of the vaccines and diseases covered is another obstacle that can obscure any analysis.

Although such information can at times be extracted from ordinances and other official documents, the availability of a single source material that condenses this entire history of changes would facilitate use of these data by interested parties.

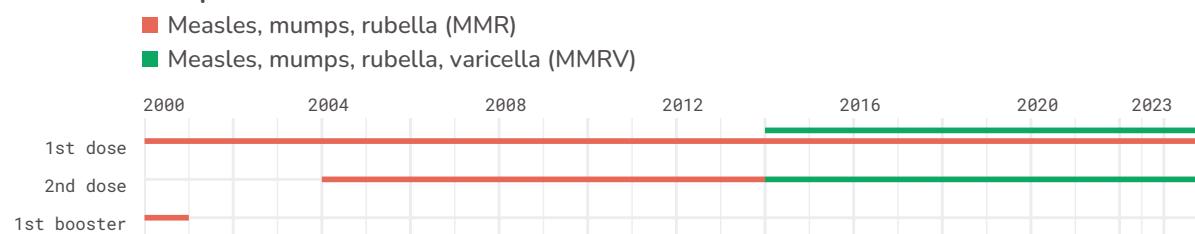
As changes accrue over time and without an appropriate venue to centralize this information, the long-term trend is that information on the country's vaccination history will be restricted to a circle of experts. Which vaccines were on the official calendar each year and which were used to immunize against each disease (such as IPV and OPV against polio)—all of this could be lost or, at least, become inaccessible to a wider audience. The collation of information contained in official documents to enable advances in current studies, and accurate recording of the current history for future studies, should be a priority.

## Timeline of vaccines administered against each disease

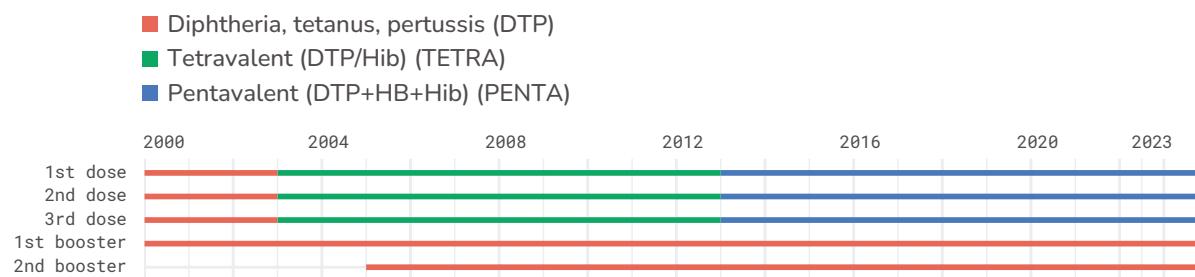
### 10-valent pneumococcal



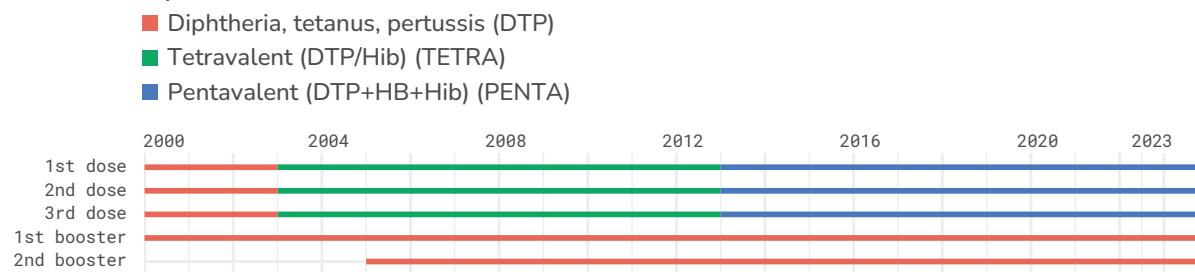
### Mumps



### Pertussis



### Diphtheria

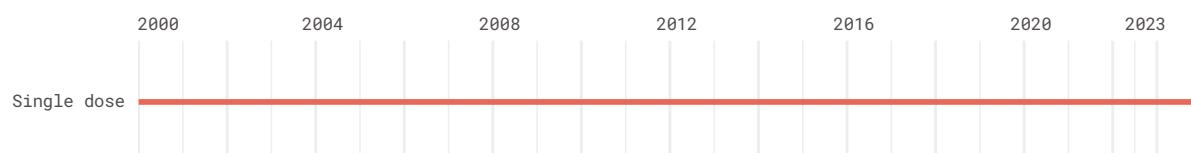


**History of yellow fever vaccines**

■ Yellow fever

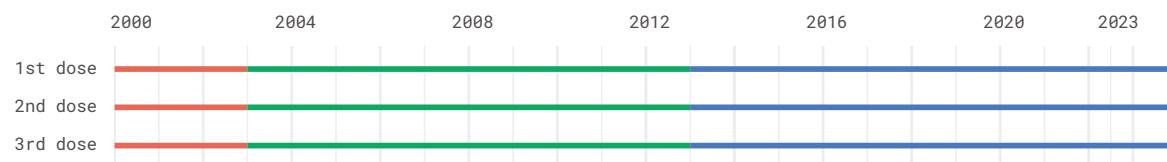
**History of vaccination for severe forms of tuberculosis**

■ BCG

**History of *Haemophilus influenzae* type b vaccines**■ *Haemophilus influenzae* type b

■ Tetravalent

■ Pentavalent

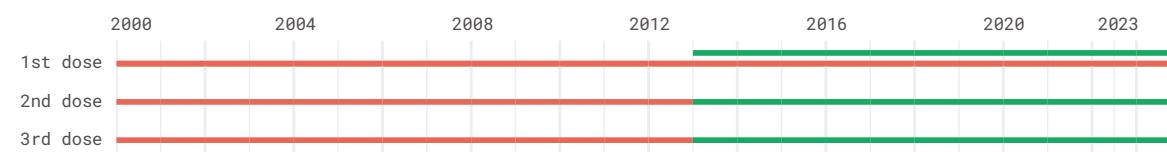
**History of hepatitis A vaccines**

■ Hepatitis A

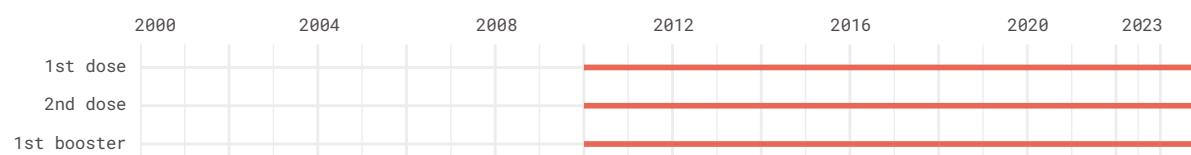
**History of hepatitis B vaccines**

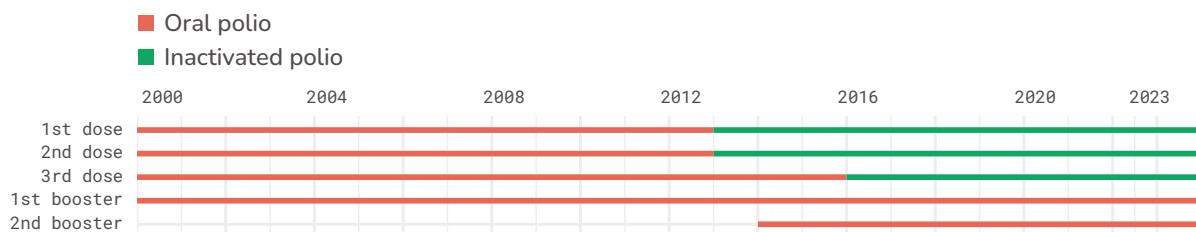
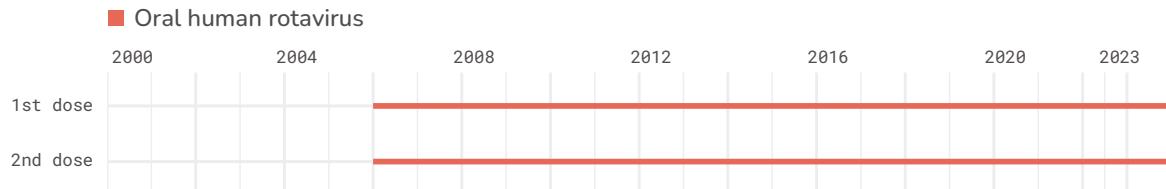
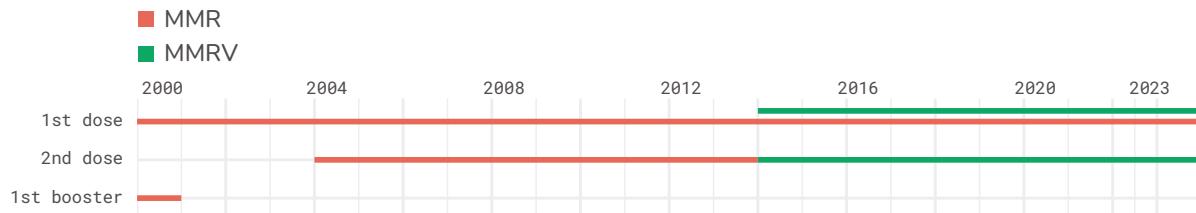
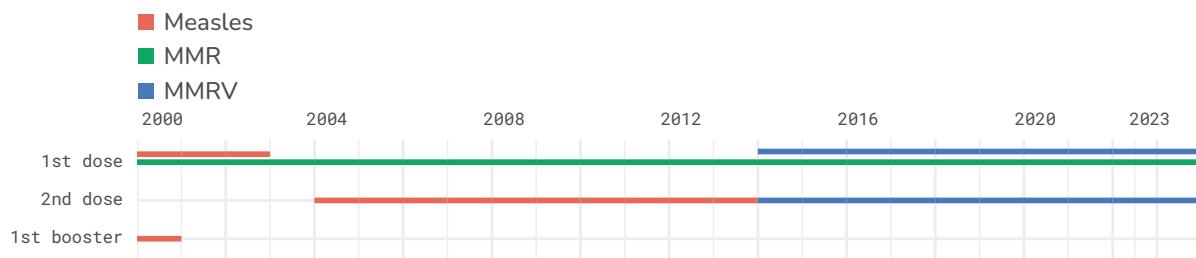
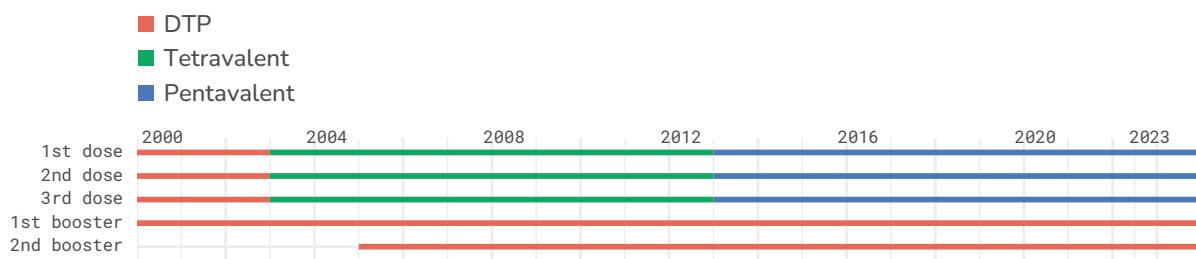
■ Hepatitis b

■ Pentavalent

**History of meningococcal C vaccines**

■ Meningococcal C conjugate



**History of polio vaccines****History of human rotavirus vaccines****History of rubella vaccines****History of measles vaccines****Tetanus****History of varicella vaccines**

Another crucial indicator in immunization research is vaccination coverage, which shows the percentage of the target population administered a specific vaccine. It is vaccination coverage that ensures the immunity of a population, allowing disease prevention or even eradication. Vaccination coverage also allows one to infer the effectiveness of vaccination campaigns carried out by the executive branch. Tabnet provides vaccination coverage data directly, but there are no published details on the methodology used in their calculation to allow assessment, replication, or review of the available data for purposes of transparency and reproducibility. In VacinaBr, the methodology is described on the platform itself.

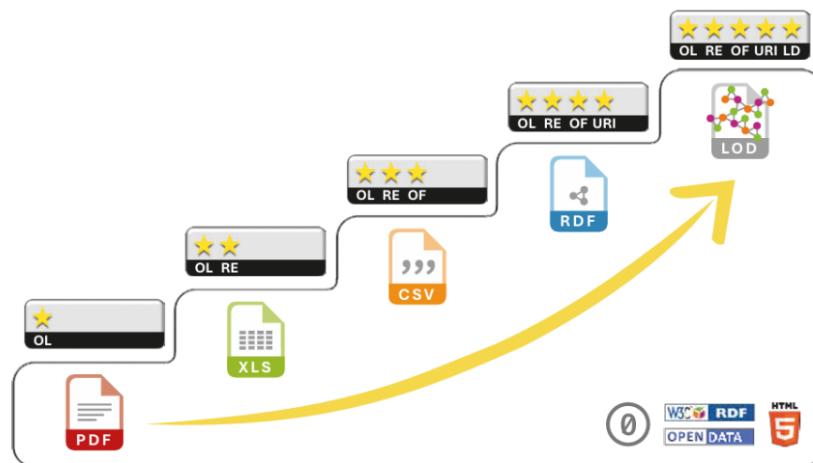
This is not a trivial matter, so much so that coverage for each vaccine on our platform differs by up to several percentage points from the values published by the Ministry of Health.

In 2020, the National Health Data Network (RNDS) was established as a DataSUS initiative with the goal that, by 2028, it would be established and recognized as the go-to digital platform for innovation, information, and health services for all of Brazil, to the detriment of Tabnet, which is no longer the current platform. Since 2023, vaccination data has been available on the new platform, which enables better data analysis, including information on the system of origin and transcription of data from vaccination cards.

The [Ministry of Health Open Data Plan 2024-2026](#) also contains some advances. It lists more than 200 databases cataloged and prioritized according to criteria of relevance, encouragement of social control, legal status (mandatory or otherwise), and promptness with which data are made available. The database of doses administered by the PNI ranks eighth in priority, with the highest possible score for five criteria: degree of relevance; legal status (mandatory); strategic government project; direct results; and the possibility of contributing to society by fostering new businesses.

A monitoring report was expected to be published in August 2025, and the Ministry of Health uses Tim Berners-Lee's maturity model as a reference for improving open data. This model classifies the available data into categories, from simplest (one star) to most complete (five stars). A one-star rating indicates resources merely available under an open license, regardless of file format, which could be a .pdf file that hinders data processing; a two-star rating denotes structured data, such as a spreadsheet. A three-star rating denotes publication of data in a nonproprietary format, such as a .csv file, which allows data manipulation without requiring specific software. To date, there are no vaccination data assigned four- or five-star ratings, which would denote ability to reference from and be referenced on the web, have granular control over each item, optimize access, and combine with other data securely.

**Figura 3** - Escala de maturidade do órgão em relação a prática de dados abertos.



Fonte: Open Knowledge Brasil. [Maturidade em Dados Abertos: Entenda as 5 estrelas](#). Disponível em: <https://ok.org.br/noticia/maturidade-em-dados-abertos-entenda-as-5-estrelas/>. Acesso em: 27 fev. 2024.

These advances notwithstanding, some old problems persist even as new ones arise. One is the difference in data availability patterns as compared to Tabnet, which hinders integration of platforms to obtain a countrywide unified vaccination history. The RNDS also makes no provision for a single file with all available data, lacks documentation, and has no published methodology for its vaccination coverage calculations.

Many of these issues were addressed by VacinaBr, although not fully resolved. Any user can access all data on the platform at once by clicking the "Download" icon at the bottom right corner of the page, and viewing the methodology is as simple as clicking a link on the website header. Details about each vaccine are available through the "About the Vaccines" icon. Each generated graph is accompanied by a blue mark on a timeline corresponding to the period during which each vaccine was active on the national vaccination schedule. Finally, the map and chart visualizations make it easier to read and interpret data, thus democratizing access to information.

Brazil needs to know itself. Access to information, and not only data on vaccination, is a matter of national sovereignty. It is key to ensuring the country's epidemiological security and the social control and efficiency of public policies; to driving innovation and economic development; to fostering scientific research; and to strengthening democracy.

# VACCINE RISK COMMUNICATION AND ITS ROLE IN BUILDING TRUST IN PUBLIC HEALTH

**André Bacchi** holds master's and doctorate degrees in Pharmacy from the State University of Londrina (UEL). He teaches Pharmacology and Clinical Epidemiology at the Federal University of Rondonópolis School of Medicine and coordinates its Study Group on Evidence-Based Medicine and Science Communication.

Communication of the risk associated with vaccines is a sensitive endeavor, comprising many technical, regulatory, sociocultural, and linguistic layers. In an era marked by an abundance of all types of information, amplified and distorted by digital channels on a global scale, clear and honest communication is essential to maintaining public trust in vaccination. Vaccines, after all, are not mere pharmaceutical products: they are bridges that connect scientific knowledge to public health policies; tools that, throughout their history, have saved countless lives by drastically reducing the incidence of infectious diseases.

Nevertheless, the topic of vaccination is now fraught with tension. While vaccines offer undeniable benefits, they also raise concerns, often inflated by the way information is conveyed, processed, and reinterpreted.

To a certain extent, every contemporary health system is a hostage to its own achievements, especially when in the field of prevention: diseases prevented by vaccines become rare, and the perception of the danger they pose fades from the public consciousness. The risk—however remote—of adverse effects from vaccines then moves to occupy this space in the public imagination, with disproportionate intensity.

In this context, making the conceptual distinction between “hazard” and “risk” is essential.<sup>1</sup> Hazard is the inherent capacity of something to cause harm, regardless of the likelihood of such harm occurring under real-world conditions. A substance present in the formulation of a vaccine, for instance, may have the theoretical potential to trigger a serious adverse reaction. Risk, on the other hand, is the result of weighing up the likelihood of an undesirable event occurring and the severity of that event.

When analyzing vaccines, risk involves a more rigorous and less obvious assessment: what is the likelihood, among so many vaccinated individuals, of an adverse effect occurring? And, if such an effect occurs, how severe will its impact be?

This exercise in reasoning, that of benefit–risk assessment, is at the methodological and regulatory heart of decision-making in public health. The introduction of any vaccine into the market is based on a rigorous analysis of epidemiological data and a commitment to post-marketing surveillance. The objective is to assess the extent to which it provides protection against the target disease and the consequent reduction of its impacts in terms of potential risks and costs.

From a regulatory standpoint, agencies such as Anvisa (the Brazilian National Health Surveillance Agency) and its counterparts, the U.S. Food and Drug Administration (FDA) and the European Medicines Agency (EMA), systematically use clinical trials, epidemiological data, and post-marketing surveillance to quantify these risks.

This surveillance is, in part, carried out through adverse event reporting systems, such as the Vaccine Adverse Event Reporting System (VAERS) in the U.S. or the WHO-coordinated, worldwide VigiBase, which includes the Brazilian VigiMed. These are digital interfaces that allow any citizen, healthcare professional, or company to report suspected vaccine adverse effects.

However, precisely because they rely on spontaneous reporting, their data are subject to biases: not only may the reporter lack detailed and accurate information, but the very act of reporting can

be driven by emotional factors, personal beliefs, or even particular interests (e.g., lawyers seeking out cases for litigation). These systems do not provide a verdict on vaccine safety; rather, they offer starting points for more detailed investigations and hypotheses that need to be refined and tested using other methodologies.<sup>2</sup>

Inadequate interpretation of this information occurs when raw data are regarded as evidence of causality. If, after the introduction of a new vaccine, the number of spontaneous reports of a certain adverse event increases, this may simply reflect the rise in vaccination coverage, greater awareness of the importance of reporting, or perhaps media attention on the subject. Often, the expected incidence of the same event in the unvaccinated population is not taken into account, nor are the consequences and adverse events associated with unprotected exposure to the pathogen. This is why adverse event reports are not suitable tools for inferring risk.<sup>3</sup>

At various points in history, particularly during the introduction of new vaccines, anti-vaccine groups and influencers have taken advantage of this raw data to make sensationalist claims that a particular vaccine is causing some serious adverse effect, such as reduced fertility, changes in children's neurological development, or even mass deaths.<sup>4</sup>

In this process, the fact that many of these effects can be attributed to common causes in the population—which would occur even in the absence of vaccination—is often overlooked. The issue is a complex one: while reporting systems are designed to broaden the spectrum of surveillance, ensuring that early warning signs of potential issues are detected and investigated, their misuse can lead to false alarms, widespread confusion, and irreparable damage to trust in vaccines, contributing to the phenomenon of vaccine hesitancy.

In light of this, health authorities need to reiterate that each report of an adverse event requires subsequent analyses, taking into account incidence rates in the unvaccinated population, individual health history, and supplemental investigations to rule out possible coincidences. Even so, the damage is only partially reversed: the fear and doubt already sown jeopardize the perception of vaccine safety.

Such risk perception is not neutral ground. It fluctuates under the influence of cultural, emotional, and cognitive variables. We generally tend to overestimate the risks associated with technologies that are new, poorly understood, or emotionally charged, even when the actual likelihood of any harm occurring is low.

Vaccines, because they are administered to healthy people, can be seen as an "unjustified risk," since the benefit they offer—prevention of a disease that might not be on our immediate horizon—is less tangible than the possibility, albeit very low, of an undesirable effect. This paradox fuels anti-vaccination narratives. In this context, a rare adverse effect may receive outsized attention, while the actual risk of the disease prevented by the vaccine is minimized or ignored entirely.

The success of vaccination does not depend solely on technological sophistication or a robust regulatory system, but rather on the ecosystem of mutual understanding between science and society. It is vital that information about vaccine risks be communicated with honesty, rigor, and humanity, so that we can understand the extraordinary value of vaccines, maintain the necessary trust to face new epidemiological threats, and, thus, ensure that the legacy of immunization continues to light the way for public health.

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- [4] Dubé, E., Vivion, M., Macdonald, N. E. Vaccine hesitancy, vaccine refusal and the anti-vaccine movement: influence, impact and implications. *Expert Review of Vaccines*, v. 14, n. 1, pp. 99–117, 2 Jan 2015.

# THE ON-AGAIN, OFF-AGAIN QUEST TO ELIMINATE MEASLES IN BRAZIL

**Carla Magda Allan Santos Domingues** is an epidemiologist with a doctorate in Tropical Medicine and a bachelor's degree in Social Sciences from the University of Brasília (UnB). She was the coordinator of Brazil's National Immunization Program from 2011 to 2019.

**Antonia Maria da Silva Teixeira** is a public health nurse. She holds a specialist diploma in Epidemiology and Public Health from the Federal University of Rio Grande do Norte (UFRN) and a master's degree in Public Health from the Federal University of Bahia (UFBA). She worked as a technical consultant for general coordination of the National Immunization Program.

**Regina Celia Mendes dos Santos Silva** is a public health nurse. Trained at the Federal University of Piauí (UFPI), she is part of the technical team for immunization and surveillance of vaccine-preventable diseases at the Brazilian Ministry of Health's Department for Indigenous Health.

Measles is one of the leading causes of death among young children worldwide, and humans are the only hosts maintaining transmission of the measles virus. Before the measles vaccine became available, epidemics occurred every two or three years, resulting in approximately 2.6 million annual deaths. Since the advent of the vaccine in 1963, this mortality has declined sharply; 60 million deaths were prevented between the years 2000 and 2023 alone. Despite the vaccine being safe, effective, and inexpensive, there were still 107,500 measles deaths worldwide in 2023.<sup>1</sup>

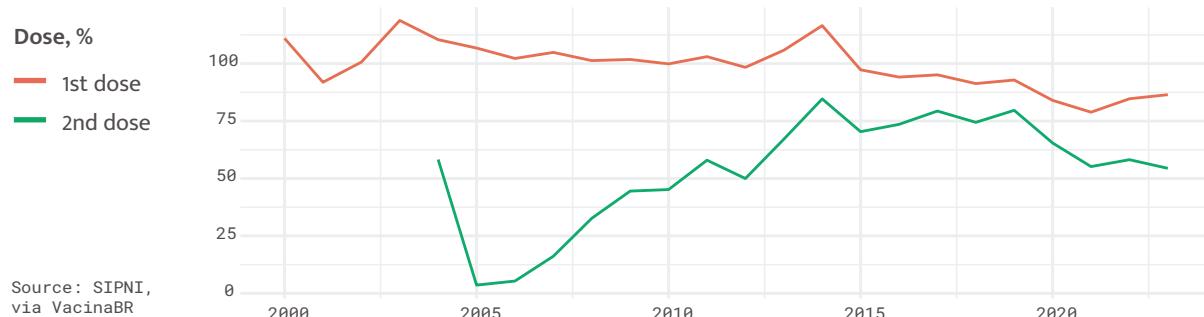
In Brazil, the monovalent vaccine was introduced in the 1960s through the initiative of some state governments, but given only intermittently. At that time, more than 95% of the population between the ages of 15 and 18 years had already been infected (measles became a notifiable disease in 1968).<sup>2</sup>

Vaccination coverage (VC) with the monovalent vaccine fluctuated between 60% and 70% throughout the 1980s, but a real impact on the disease was only seen from 1992 onwards, with implementation of the National Measles Elimination Plan (PNES for its Portuguese acronym), which targeted the population between 9 months and 14 years of age.<sup>2</sup>

The failure to maintain high VC rates after implementation of the PNES culminated, in 1997, in a resurgence of the disease, with 53,000 confirmed cases in Brazil. In the following years there was a low incidence, and in 2000, the last indigenous case of measles was detected in Brazil. Between 2000 and 2016, the only outbreaks were the result of imported cases—thanks to a coverage rate above 95%, the resurgence of endemic transmission was avoided. In 2016, Brazil was certified as measles-free by an International Expert Committee convened by the Pan American Health Organization (PAHO).<sup>3</sup>

## Coverage for the measles vaccine (in all its formulations) in Brazil, 2000 to 2023

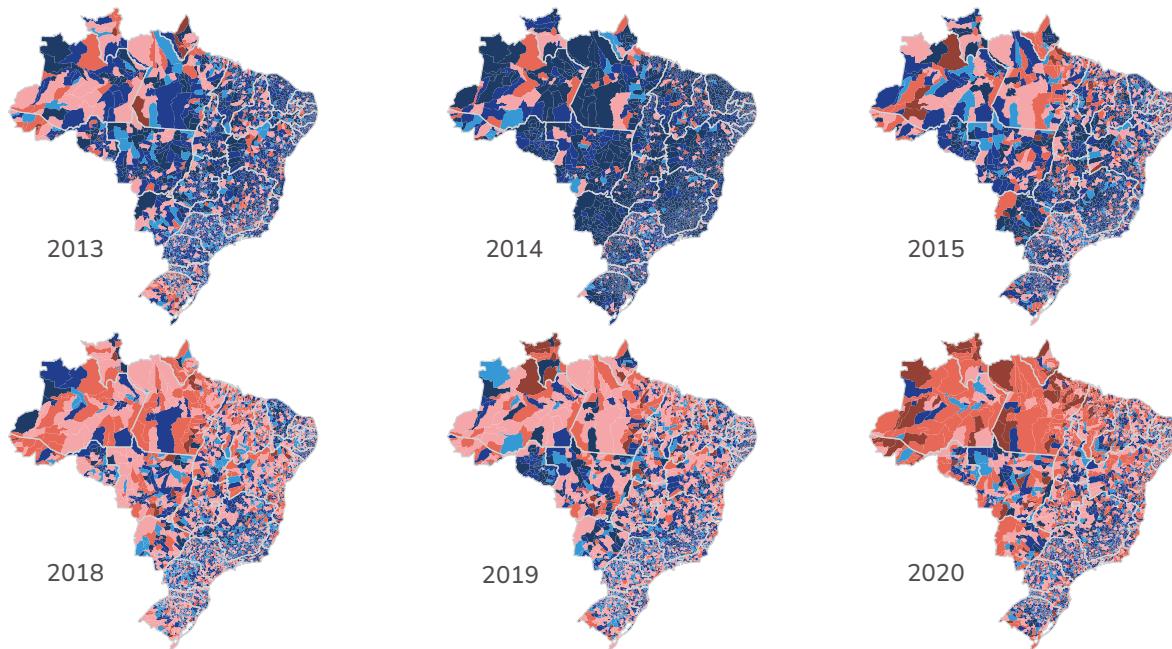
Includes all doses of vaccines containing a measles component administered to children aged 1 year



## Coverage for the MMR vaccine

By municipality, children aged 1 year, 2013 to 2020

■ 0% to 50% ■ 50% to 80% ■ 80% to 95% ■ 95% to 100% ■ 100% to 120% ■ 120% or greater

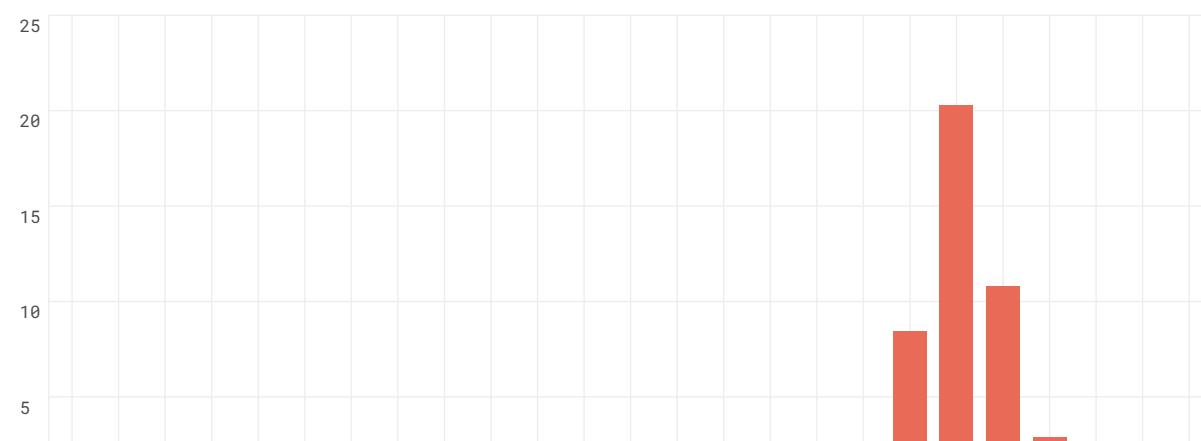


Source: SIPNI, via VacinaBR

Since 2015, however, the coverage rate of the MMR vaccine (measles, mumps, and rubella) in 1-year-old children had been noticeably declining. Low coverage rates, especially in 2018 (92.6% for the first dose and 76.9% for the second dose), contributed to a growth in the population susceptible to measles. This scenario, which also included an intense flow of migrants into the country, culminated in the reemergence of measles virus circulation in Brazil, with consequent loss of “measles-free country” certification in 2018.<sup>4</sup>

## Cases of measles recorded in Brazil

Thousands, per year, 2000 to 2024

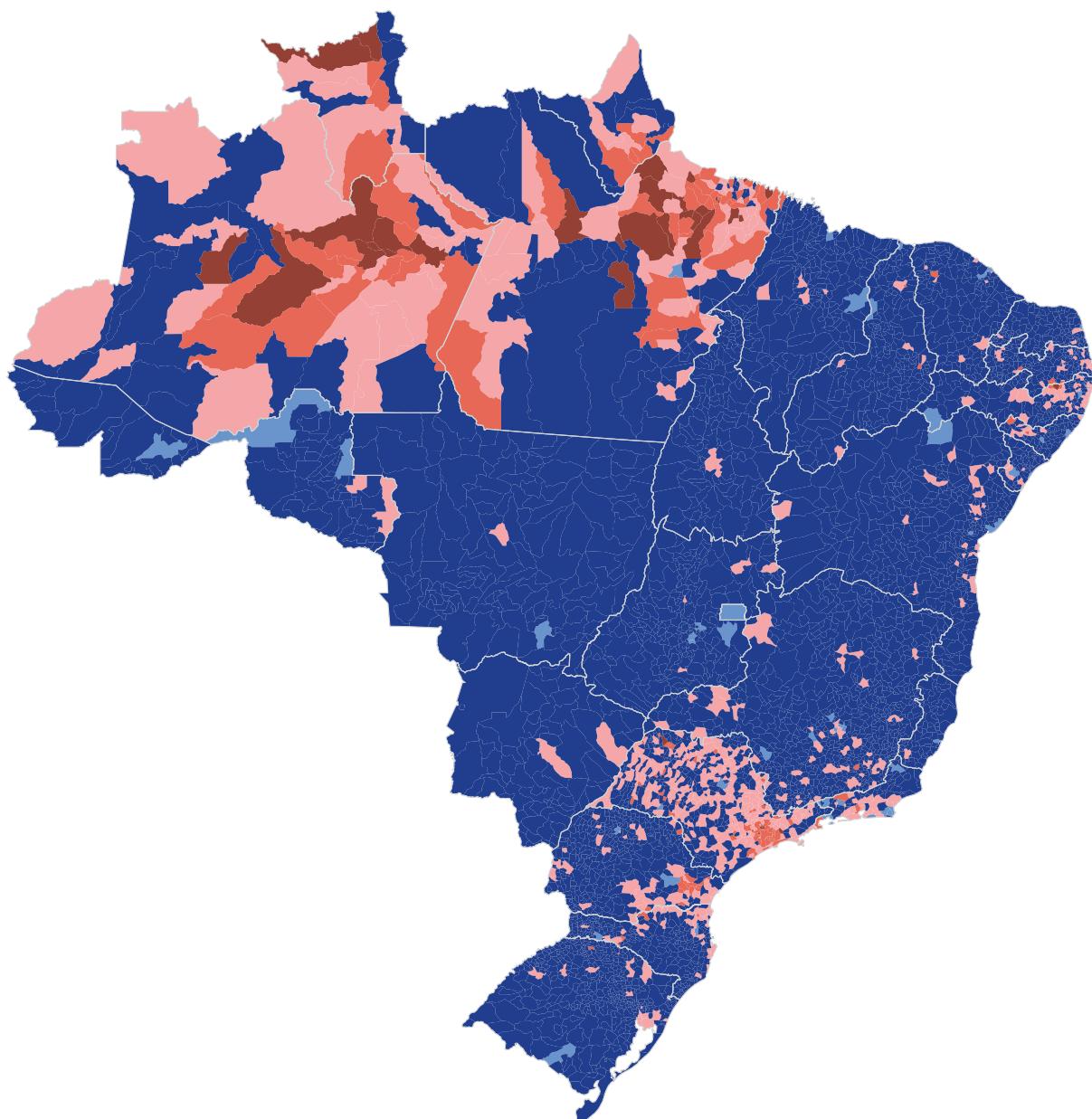


Between 2018 and 2022, approximately 40,000 cases were confirmed in Brazil. In 2022, after enormous efforts by the three levels of management of the Brazilian Unified Health System (SUS), the last indigenous case in the country was recorded, and in 2024, Brazil was once again certified by PAHO as a measles-free country.

## Incidence of measles

Cases per 100,000 population, by municipality, 2018 to 2020

- 0 cases
- 0 to 1 case
- 1 to 25 cases
- 26 to 100 cases
- More than 100 cases



Source: Sinan

Attempts to contain the disease through one-off or nationwide campaigns in recent years have generally failed to result in adequate vaccine uptake by the population. Given the flow of tourists and trade across countries, if high VC is not ensured, especially through routine immunization, the measles virus could be reintroduced into the country, with a consequent increase in mortality, social and financial costs, and burden on the health services.<sup>56</sup>

It is essential that local strategies be implemented to reach the unvaccinated population, such as extended vaccination hours, opening vaccination centers on weekends, door-to-door vaccination in hard-to-reach areas, and mobile vaccination in areas lacking vaccination facilities, among others, in order to reach groups with lower vaccine uptake rates.<sup>7</sup>

It is worth noting that many once-common diseases are now unknown; as a result, the population has no notion of their severity, nor of the risk of reintroduction of already eradicated diseases.

This scenario is further fueled by the spread of disinformation—particularly on social media—about the harm vaccines can cause, partial shortages of some vaccines, and operational problems in properly implementing vaccinations, including inadequate data recording and barriers to accessing healthcare facilities. Understanding these factors is key when seeking new paths to restore the high vaccination coverage rates which were achieved as recently a few years ago.<sup>57</sup>

To overcome these challenges, the National Immunization Program (PNI) needs to be increasingly integrated into all spheres of SUS management, as well as with other areas of the health, social, and education sectors. Above all, involvement of the healthcare providers who actually carry out vaccination activities is essential.

Vaccinators, who are largely responsible for the success achieved, must return to their commitment to engaging and mobilizing the population, but must also be assured adequate conditions for carrying out their activities, considering the increasingly insufficient staffing of vaccination facilities and the growing complexity of the National Vaccination Schedule in recent years.

Effective communication, with the involvement of healthcare providers, is essential to tackling misinformation and disinformation about the importance of vaccines and restoring values regarding vaccination in the public consciousness, which formed the cornerstone of this success story and have thus helped preserve all that has been achieved today as a result of vaccination.

There needs to be a wide-ranging debate in Brazilian society regarding which path will be followed to ensure high vaccine coverage and thus prevent the return and spread of measles, holding firmly to the goal of elimination and avoiding an increase in morbidity and mortality from this preventable disease. This should ensure that the achievements of the past are not lost, which would be an unacceptable setback to Brazil's public health.

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## Vaccines and immunization campaigns targeting measles in Brazil

### 1967

Introduction of the monovalent measles vaccine, but only in states with reported cases

### 1977

Ordinance No. 452 establishes the first National Vaccination Schedule, including the measles vaccine, for all states, in the first year of life.

### 1992

Implementation of the PNES. The vaccine is now universally indicated at 12 months of age, as well as offered to all those aged 14 years or younger who were not vaccinated in the annual campaign.

### 2000

Measles eliminated nationwide for the first time

### 2001–2002

Campaign targeting women aged 12 to 49. Coverage reaches 95.7%

### 2003

The monovalent vaccine is definitively replaced with the MMR for routine immunization through Ordinance No. 597/2004. The first dose is given at 12 months and a second dose between 4 and 6 years of age.

### 2006

GM Ordinance No. 1,602 extends vaccination to the population up to 19 years of age. It also provides for a dose of MMR or MR for all women up to 49 and men up to 39 years of age.

### 2008

Campaign targeting the 12–39 age group in five states and the 20–39 age group in 22 states, for a total of 70 million people (rubella elimination strategy). Results in 96.8% coverage (though heterogeneous)

### 2010

GM Ordinances No. 3,318 and 1,946 recommend two doses of MMR vaccine for indigenous people aged 12 months to 49 years and a second MMR dose at age 4 years

### 2013

The MMRV (measles, mumps, rubella, and varicella) is included in the national vaccination schedule at age 15 months, replacing the second dose of MMR at age 4 years.

### 2016

Brazil is verified as a measles-free country. Ordinance No. 1,533 is published, mandating two doses of MMR for ages 12 to 19 and one dose for ages 20 to 49.

### 2017

Recommendation changed to two doses for unvaccinated people up to age 29.

### 2018

Virus circulation reestablished, with an increase in incidence.

### 2020

One dose of vaccine is recommended for unvaccinated people aged 50 to 59.

### Since 2023

Measles incidence is back at zero, but a risk of reintroduction remains due to low vaccination coverage.

Source: Brazilian Ministry of Health

# HPV VACCINE HESITANCY: A HEALTH HAZARD FOR CHILDREN AND ADOLESCENTS THAT OPENS THE DOOR TO CANCER

**Ana Goretti Kalume Maranhão** is a pediatrician for the National Immunization Program at the Brazilian Ministry of Health and has been in charge of HPV vaccination since 2014. She has led such initiatives as the Child Health Technical Area, the Child Health Program, and Brazil Forward (Avança Brasil).

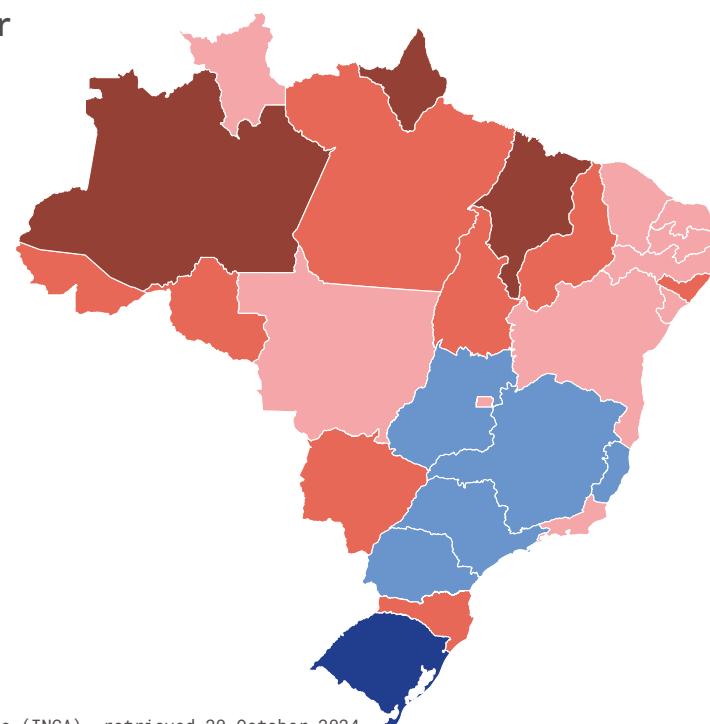
**Mateus de Paula von Glehn** is a specialist family and community health nurse with the Federal District Department of Health. He holds a master's degree in tropical medicine from UnB and has published studies in the field of infectious diseases and public health.

HPV (human papillomavirus) infection is the most prevalent sexually transmitted infection worldwide. The lifetime probability of being infected by the virus can be as high as 90%.<sup>1</sup> Although most HPV infections are asymptomatic and transient, the virus is associated with several types of cancer: cervical, penile, anal, and oropharyngeal (throat). Cervical cancer is the most prevalent—and 100% of cases are attributable to HPV.

## Incidence of cervical cancer by state in 2023

Number of new cases per 100,000 women, adjusted by population structure

- 0 to 7.5
- 7.5 to 10
- 10 to 15
- 15 to 20
- 20 or more

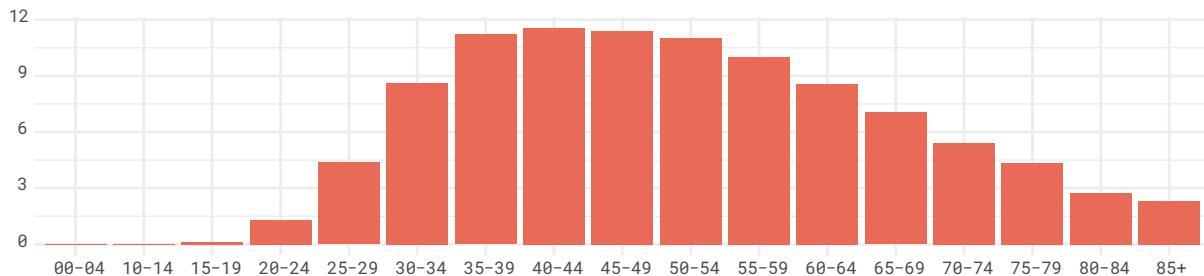


Source: Brazilian National Cancer Institute (INCA), retrieved 20 October 2024

New annual cases exceed the 17,000 mark,<sup>2</sup> with more than 7,000 deaths.<sup>3</sup> The uneven distribution across regions is striking: between 2000 and 2021, the mortality rate more than doubled in the North and Northeast regions of Brazil, with a significant increase among younger women aged 20 to 39.<sup>4</sup>

## Distribution of cervical cancer cases by age range

Percentage of total cases recorded between 2000 and 2020



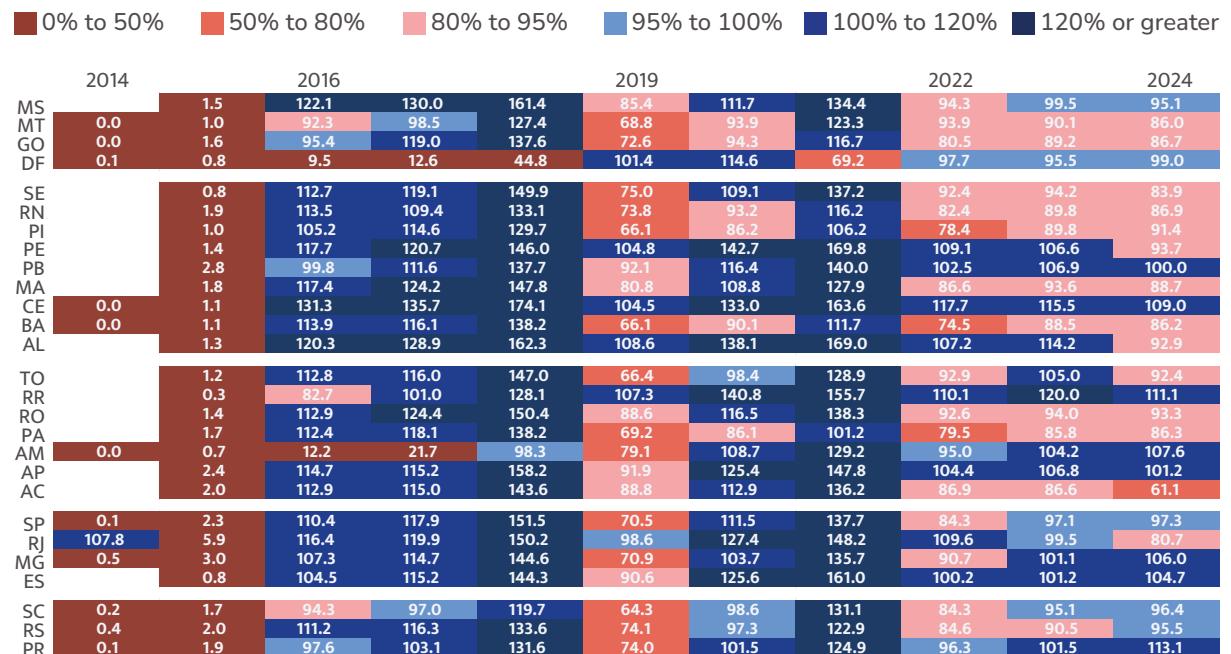
Source: Brazilian National Cancer Institute (INCA), retrieved 20 October 2024

It is well known that the risk factors for incidence and mortality from this type of cancer are interdependent and act synergistically, with socioeconomic status being an important social determinant. Of the more than 200 known types of HPV, 13 are considered high-risk, with two of these, HPV16 and HPV18, accounting for more than 70% of cervical cancer cases. Both are covered by the quadrivalent vaccine, available in Brazil's national vaccination schedule.

HPV vaccination has become established as an effective preventive measure, recommended by the WHO and adopted in public health programs across more than 140 countries. Vaccination can significantly reduce rates of infection and, consequently, the incidence of HPV-associated cancers. However, HPV vaccination coverage remains suboptimal.<sup>5</sup> Reasons include logistical issues, socioeconomic barriers, and, especially, vaccine hesitancy.

## Coverage for the first dose of quadrivalent HPV vaccine in girls turning 15 years old

Calculated from doses administered between 9 and 14 years of age, by state, 2014 to 2024, %



Source: SIPNI, via VacinaBR - retrieved 24 June 2024

\* Vaccination coverage can exceed 100% when the number of doses administered surpasses the population estimate of the target group. This can happen due to inaccuracies in census data, migration of individuals between municipalities, vaccination of individuals outside the recommended age range, or delayed updating of population records.

The phenomenon of vaccine hesitancy is multifactorial. A study by the Federal University of the São Francisco Valley revealed a direct association between vaccine hesitancy in Brazil and social vulnerability, lower levels of educational attainment, non-white ethnicity, and living in areas with limited access to information and public health measures.<sup>67</sup>

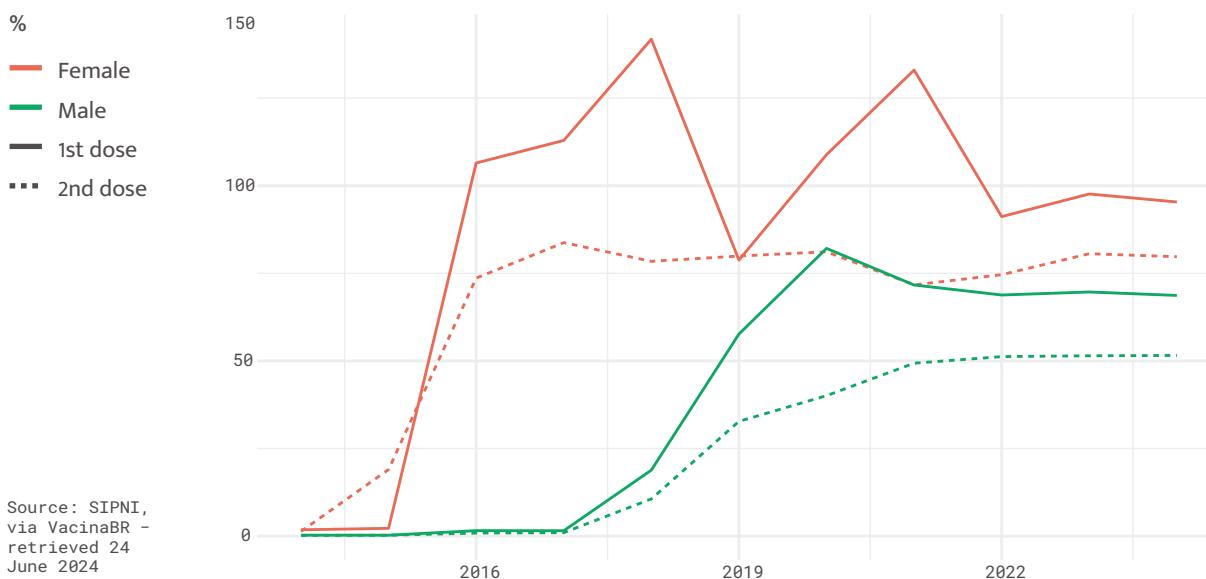
Negative perceptions regarding vaccine safety and controversies over the alleged relationship between the HPV vaccine and the onset of seizures contribute to this hesitancy,<sup>8</sup> as happened in the state of Acre in 2018 and 2019. Rigorous investigations concluded that these were psychogenic nonepileptic seizures, a manifestation of the so-called immunization stress-related response (ISR).<sup>9</sup>

ISR occurs when individuals, especially adolescents, experience emotional or psychological reactions following vaccination, such as anxiety, fainting, and nausea, which can cause concern among family members and caregivers.<sup>10</sup>

This phenomenon, although transient and having no serious physical consequences, has the potential to stoke fear and hinder vaccine uptake, especially during mass vaccination campaigns. Cases of ISR have been recorded in Colombia,<sup>11</sup> France,<sup>812</sup> Denmark, and in several states across Brazil.<sup>911</sup> This legitimate concern of the population is often exploited as an argument in anti-vaccination discourse, which appeals to emotions and lacks any grounding in scientific fact, but is still able to affect vaccination coverage.

## Coverage for the quadrivalent HPV vaccine in girls and boys turning 15 years old

Calculated from doses administered between 9 and 14 years of age, by dose and sex, 2014 to 2024



Low HPV vaccine coverage rates (especially among boys, which remain in the 50% range for the second dose) have created a public health challenge. This scenario calls for strategies that not only increase awareness about the importance of vaccination but also address the negative perceptions and emotional concerns related to the HPV vaccine.

Initiatives to increase engagement among teenagers are also essential. The adoption of a single-dose regimen for the HPV vaccine since April 2024 will certainly contribute to this, as well as measures involving teachers and families to encourage vaccination in schools.

A valuable experience in school vaccination is the School Vaccine Program, implemented in the city of Rio de Janeiro in 2023 pursuant to Municipal Law No. 7,920. The initiative aims to restore vaccination coverage in children and adolescents, including against HPV, through actions across all public schools (as well as private schools that choose to join the program). In addition to vaccination

per se, awareness-raising activities are also conducted among students, teachers, and families to highlight the importance and safety of the vaccine.

Integrated public policies that promote health education, adopt transparent communication, and involve the community are essential to tackle vaccine hesitancy and thus expand the reach of protection offered by the HPV vaccine, enabling a future generation free from vaccine-preventable cancers, while also reinforcing the importance of all vaccines present in the National Vaccination Calendar.

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# LESS THAN ONE-THIRD OF MUNICIPALITIES REACH THE VACCINATION TARGET OF THE BRAZILIAN INTERFEDERATIVE PACT

**Antonia Maria da Silva Teixeira** is a public health nurse. She holds a specialist diploma in Epidemiology and Public Health from the Federal University of Rio Grande do Norte (UFRN) and a master's degree in Public Health from the Federal University of Bahia (UFBA). She worked as a technical consultant for general coordination of the National Immunization Program.

As an additional incentive for municipalities and federative entities to perform well in health surveillance activities, the Brazilian Ministry of Health launched the Health Surveillance Activities Quality Improvement Program (PAQVS) in 2013. Membership is voluntary, with annual renegotiation of indicators and targets. Each participating entity that complies with the agreement receives up to 20% of the annual fixed health surveillance investment floor—amounting to R\$182 million in 2023.<sup>1</sup>

Among the Program's 14 indicators,<sup>2</sup> two are related to immunization:

- **Indicator 3:** Proportion of active vaccination facilities registered in the National Registry of Health Facilities (CNES) reporting monthly vaccination data. The monthly target is at least 80%.
- **Indicator 4:** Proportion of vaccines that reached the 95% coverage target among the four selected vaccines that make up the National Vaccination Schedule for children under 1: pentavalent (third dose), polio (third dose), 10-valent pneumococcal (second dose) and, at 1 year of age, MMR (first dose).

The selection of vaccines for indicator 4 was based on the epidemiological relevance of the diseases they prevent, with an emphasis on the polio and MMR vaccines, due to the international commitment to control and eliminate polio, measles, and rubella, respectively. The pentavalent vaccine, in turn, is an indicator allowing international comparison of vaccination performance. Finally, inclusion of the 10-valent pneumococcal vaccine is justified by the disease burden resulting from pneumococcal pneumonia.<sup>3</sup>

Assessment of targets is carried out by extracting data from the national information system corresponding to each indicator and quantifying it according to a stratification based on the resident population of each municipality, as estimated by the Brazilian Institute of Geography and Statistics (IBGE).

This article analyzes performance for indicator 4 of the PAQVS (coverage greater than or equal to 95% for each of the four vaccines) in the 5,570 municipalities of Brazil, its 27 federal units (states plus Federal District), and in the country as a whole, with the agreed target being all four vaccines reaching 95% coverage or greater in their target populations. Data on doses recorded by vaccine and year were extracted from the National Immunization Program information system (SI-PNI),<sup>4</sup> while data on births were obtained from the Live Birth Information System (Sinasc), as compiled by the VacinaBR platform.

Considering the definition of indicator 4, the only possible results are 0% (no vaccine with coverage equal to or greater than 95%), 25% (one vaccine with such coverage), 50% (two vaccines), 75% (three vaccines), or 100% (all four vaccines).

Since 2013, the percentage of municipalities achieving the coverage target has never reached 43%. As of 2023, the last year for which data were available at the time of writing, this figure was 32% (1,783 municipalities). This represents the second consecutive year of recovery from the worst historical rate (18.8% in 2021).

## Municipalities with coverage greater than or equal to 95% for vaccines included in Indicator 4 of the Health Actions and Surveillance Quality Improvement Program

	Polio (D3)		Pentavalent (D3)		Pneumococcal (D2)		MMR (D1)		All vaccines	
	No.	%	No.	%	No.	%	No.	%	No.	%
2013	3,603	64.7	3,275	58.8	3,700	66.4	4,152	74.5	2,351	42.2
2014	3,110	55.7	3,120	56	3,236	58.1	4,453	79.9	2,183	39.1
2015	3,023	54.3	3,128	56.2	2,860	51.4	3,090	55.5	1,754	31.5
2016	2,932	52.6	3,193	57.3	3,777	67.8	3,252	58.4	2,221	39.9
2017	2,669	47.9	2,565	46	3,403	61.1	3,746	67.3	2,046	36.7
2018	2,607	46.9	2,567	46.1	3,182	57.1	3,192	57.3	1,805	32.4
2019	2,647	47.6	1,566	28.1	3,248	58.3	3,341	60	1,257	22.6
2020	2,576	46.3	2,797	50.2	3,001	53.9	2,843	51	1,774	31.9
2021	1,701	30.6	1,809	32.5	2,025	36.4	2,175	39.1	1,048	18.8
2022	2,583	46.4	2,567	46.1	3,047	54.7	2,879	51.7	1,596	28.7
2023	2,651	47.6	2,559	45.9	2,906	52.2	3,154	56.6	1,783	32

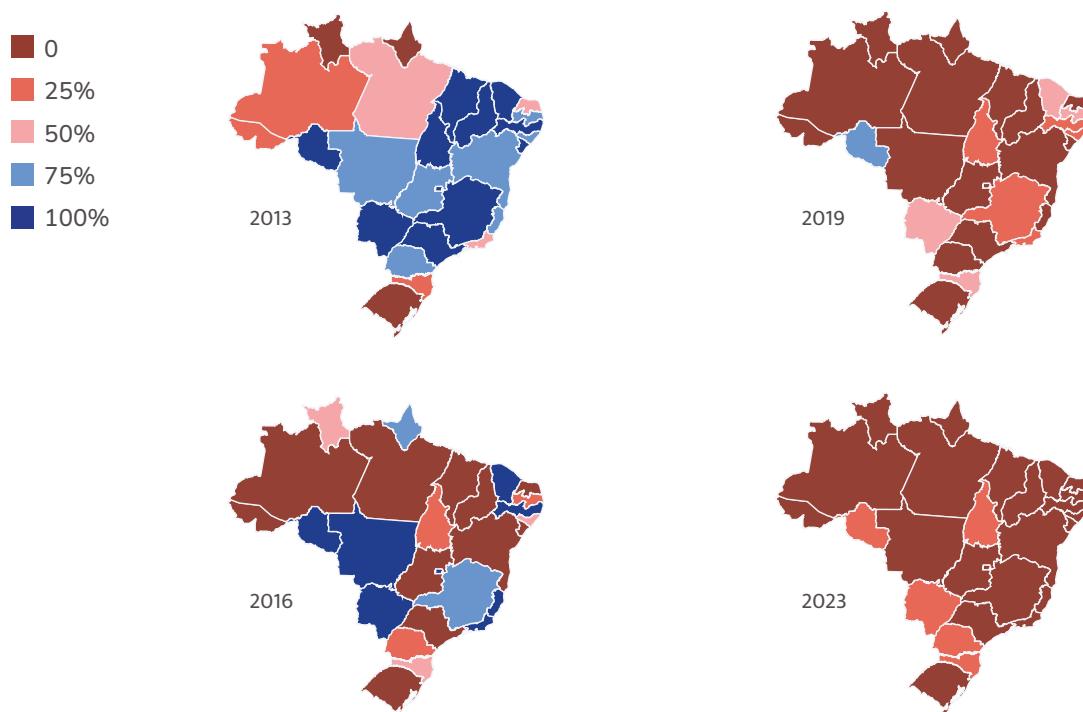
Source: SIPNI, via VacinaBR, as of 29 October 2024

Since 2013, all 27 federative units have consistently performed poorly on this indicator: none met the target during this period.

In 2013, 11 of the 27 states and Federal District achieved coverage  $\geq 95\%$  for all vaccines, with poorer performance in the Northern states, Rondônia performing best among these. In 2023, rates in the 27 federative units ranged from 0 to 25% of vaccines reaching the target. Only Tocantins, Rondônia, Mato Grosso do Sul, Paraná, and Santa Catarina reached 95% coverage for one vaccine, with zero vaccines reaching the target in the other states.

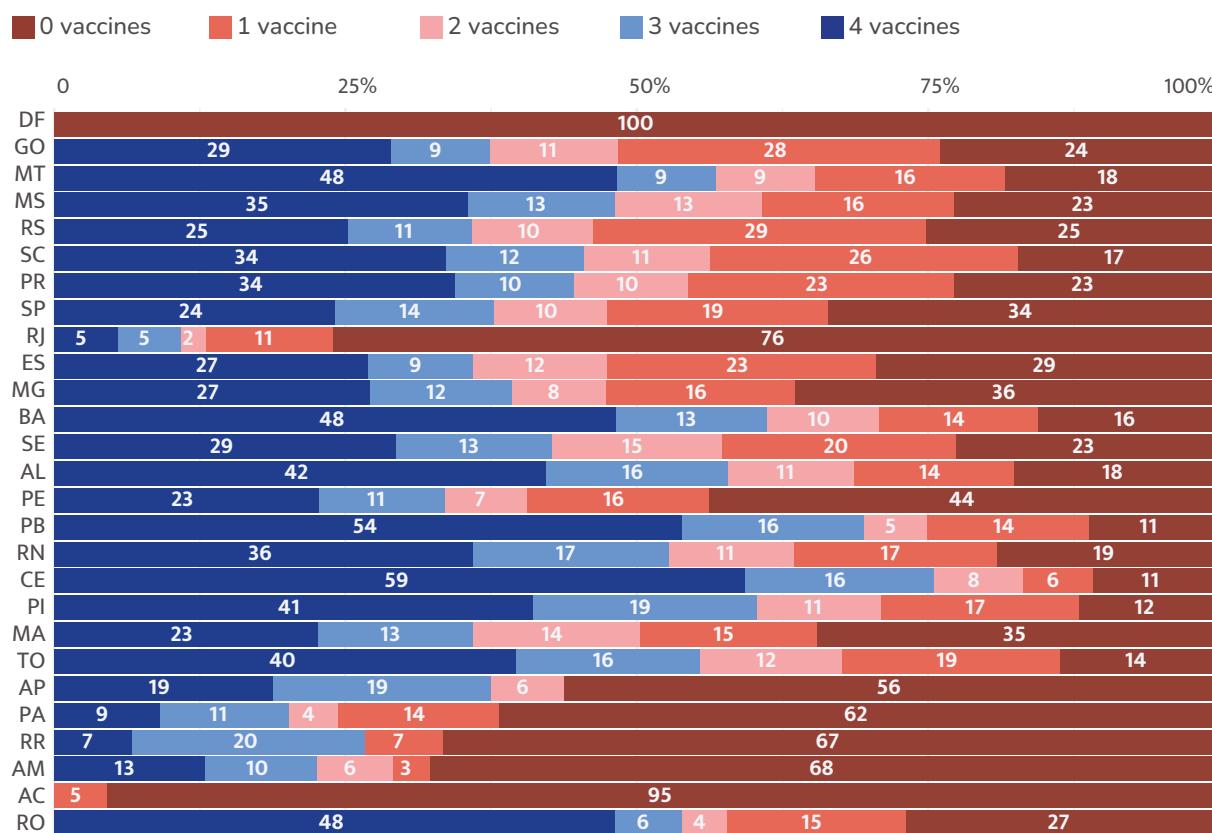
## Indicator 4 of the Health Surveillance Activities Quality Improvement Program

By state, proportion of vaccines reaching the 95% target: 3rd dose penta and polio, 2nd dose PCV-10 in children under 1, and 1st dose MMR at 1 year of age



In 2023, a large portion of municipalities showed adequate coverage for the "zero vaccine" level, especially in the North region: 95% of municipalities in Acre (21 out of 22) and 56% (9 out of 16) in Amapá, as well as 76% (70 out of 92) of municipalities in the state of Rio de Janeiro (Southeast). The best performance (100% of vaccines with  $\geq 95\%$  coverage) was observed in Ceará, with 59% of municipalities (109 out of 184), followed by Paraíba and Bahia, with 53.8% (120 out of 223) and 48% (201 out of 417) respectively, all in the Northeast, and Mato Grosso in the Midwest, with 48% (68 out of 141).

## Percentage of municipalities in each federative unit achieving each level of PQAVS Indicator 4 in 2023



Source: SIPNI, via VacinaBR - retrieved 3 September 2024

In figures 2 and 4, light blue and dark blue respectively indicate when three and four vaccines had their targets achieved. This pattern predominated in 2013 and 2016, disappearing in 2023, replaced by shades of red and brown, denoting two, one, or zero vaccines with adequate coverage, highlighting the difficulties municipalities face in achieving the desired coverage rates. In the North region, one of the determining factors which compromise adherence to the vaccination schedule is the difficulty of geographic access.

Regarding individual vaccines, the best performance was achieved for the first dose (D1) of the MMR vaccine, with more than 70% of municipalities having vaccination coverage greater than or equal to 95% in the first two years of the series. This highlights a significant percent difference—around 20%—in relation to vaccines administered to children under 1 year of age. It is likely that measles outbreaks in states like Pernambuco and Ceará in 2014 and 2015, even if less severe than elsewhere, have driven vaccination efforts in an attempt to contain the increase in cases.

On the other hand, for the pentavalent, polio (third dose), and pneumococcal (second dose) vaccines, less than 70% of municipalities had adequate coverage overall. In 2019, a shortage in supply of the pentavalent vaccine resulted in the worst recorded performance to date. However, the restoration of supply in the subsequent years, despite the Covid-19 pandemic, allowed for a recovery

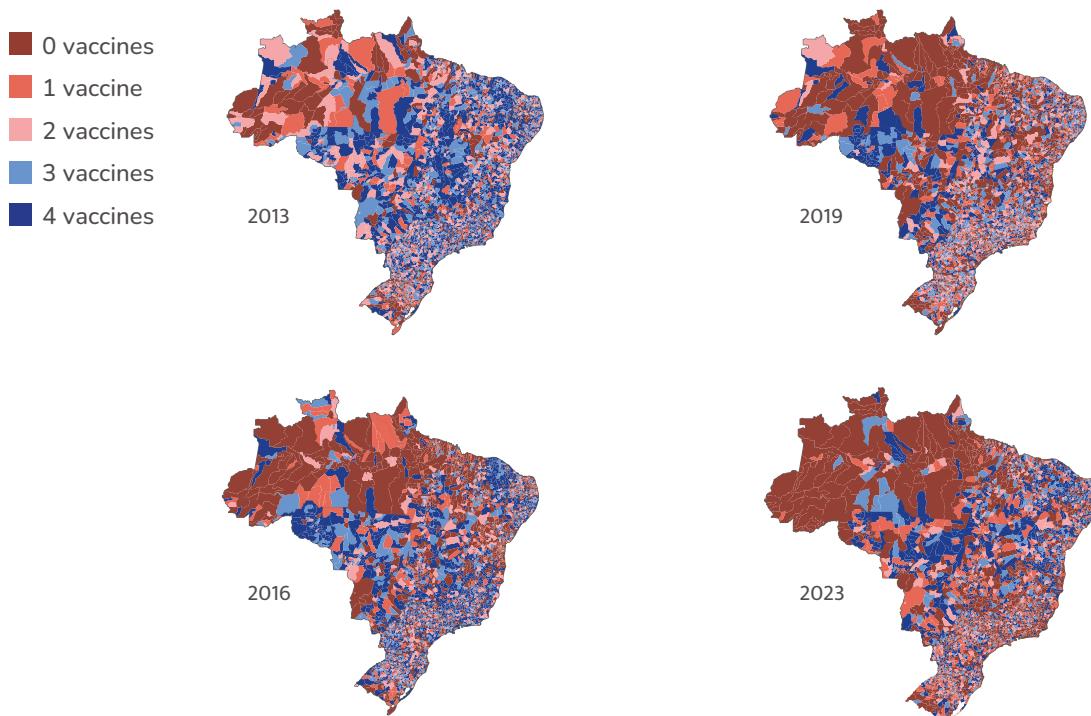
of coverage rates above historical averages.

Considering the purpose of the PQAVS to strengthen health surveillance actions through provision of additional financial resources to municipalities and states that meet targets, the low percentage of target achievement is still alarming. Moreover, the discrepancy in the data presented by the VacinaBR platform in 2023 (1,783 municipalities) and by the National Immunization Program of the Ministry of Health (2,245 municipalities) raises questions that cannot be explained solely by database updates. Inconsistencies between reports of doses administered and doses used for calculation of vaccination coverage extracted from the National Health Data Network indicate a need for clarification regarding differences in these databases to allow a better understanding of the processes involved.

Finally, although federal financial transfers to states and municipalities have increased from R\$136.3 million to R\$182.8 million, the results achieved still do not reflect any substantial improvements in vaccination coverage. This highlights the need for integrated, contextualized strategies to overcome regional and logistical barriers and ensure sustainable advances in public vaccination policies.

## Indicator 4 of the Health Surveillance Activities Quality Improvement Program

By municipality, proportion of vaccines reaching the 95% target: 3rd dose penta and polio, 2nd dose PCV-10 in children under 1, and 1st dose MMR at 1 year of age



Source: SIPNI, via VacinaBR, retrieved 24 June 2024

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