



## Epidemiological profile and vaccination coverage of measles in Brazil

### *Perfil epidemiológico e cobertura vacinal do sarampo no Brasil*

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#### ABSTRACT

Objective: To verify the status and the immunization coverage of measles in Brazil. Method: It is a descriptive retrospective epidemiological study about the immunization coverage of measles in Brazil based on data provided by the Department of Informatics of the Unified Health System. Results: From the data analysis, there was a greater number of cases in the North region. The highest number of registered cases was in 2019. The most affected individuals were males. The age group  $\leq 1$  year old represented 41,12% of cases, and people of mixed color, 47% of cases. Six deaths occurred during the study period. Finally, in relation to vaccination coverage, with immunization with two doses of the MMR vaccine, there was greater coverage in 2019. Among the geographic regions, the highest coverage index was in the South region. Conclusion: There is a need to intensify awareness campaigns about the importance of vaccination.

**Keywords:** Epidemiology. Measles. Vaccination Coverage.

#### RESUMO

Objetivo: Verificar o perfil epidemiológico e a cobertura vacinal do sarampo no Brasil. Método: Foi realizado um estudo epidemiológico descritivo retrospectivo a respeito da cobertura vacinal do sarampo no Brasil a partir de dados disponibilizados pelo Departamento de Informática do Sistema Único de Saúde. Resultados: A partir da análise dos dados, observou-se maior número de casos na região Norte. O maior número de casos registrados foi no ano de 2019. Os indivíduos mais acometidos eram do sexo masculino. A faixa etária  $\leq 1$  ano representou 41,12% dos casos, e pessoas de cor parda, 47% dos casos. Foram registrados 6 óbitos no período estudado. Por fim, em relação à cobertura vacinal do imunizante tríplice viral, observou-se maior cobertura no ano de 2019. Dentre as regiões geográficas, o maior índice de cobertura foi na região Sul. Conclusão: Percebe-se a necessidade de intensificação de campanhas de conscientização sobre a importância vacinal.

**Palavras-chave:** Cobertura Vacinal. Epidemiologia. Sarampo.

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## INTRODUCTION

Measles virus infection can be considered a public health problem, as it constitutes one of the main causes of morbidity and mortality in children under five years of age. In addition, it affects, with some frequency, pregnant women and people with impaired nutrition, especially residents of underdeveloped countries. Measles is a highly contagious viral disease transmitted through direct or indirect contact with secretions from the upper airways of people infected with the virus.<sup>1,2</sup>

Based on the damage caused by the spread of several infectious diseases, including measles, in 1973, the Ministry of Health developed the National Immunization Program (NIP). Its main objective was to promote health through immunization and prevention of some immuno-preventable diseases by vaccinating the population, which improves the strengthening of the immune system. Moreover, the program aimed to coordinate and expand the vaccination campaigns available in health services, as well as to reach a wide vaccination coverage. Consequently, it would allow the control, or even the eradication of several immunopreventable diseases.<sup>3</sup>

Since the creation of the NIP, a significant reduction in injuries and morbimortality due to infectious diseases has been observed. However, due to the appearance of adverse events after vaccination concomitantly with the implementation of the program, there was also the emergence of anti-vaccination movements responsible for promoting a large number of vaccine refusals due to the spread of fear and questions about safety and the real need for vaccination, mainly through the dissemination of untrue or incorrect data on the subject.<sup>3</sup>

The increase in vaccination coverage against measles worldwide was also reflected in Brazil, which reached about 96% of vaccination coverage and allowed an excellent control of the disease. As a consequence of the high

immunization rate, the last cases of the disease in the country were registered in 2015, which guaranteed that Brazil, in 2016, received the measles eradication certificate granted by the World Health Organization (WHO).<sup>4,5</sup>

However, in 2017, there was a reappearance of measles in Brazil due to the low vaccination coverage in the period and the intense circulation of people in the country when compared to the previous two years, leading to the loss of the positive results achieved over the years. This can be explained by the political moment in Venezuela, which went through a measles outbreak and had a large part of its population migrating to Brazil illegally in search of shelter, which led to the re-emergence of the disease in the Brazilian territory.<sup>6,7</sup>

After the measles outbreak in the neighboring country and the reintroduction of the virus into Brazilian territory, the number of infections continued to grow in the following years. Between 2017 and 2018, more than 1.000 confirmed cases of measles were registered in Brazil. The numbers increased considerably in 2019 to more than 9.000 confirmed cases by the month of October, and around 50.000 suspected cases; in addition to 13 deaths, six of them were children under 1 year old.<sup>3,4,5</sup>

In Brazil, it is highlighted the need to intensify the vaccination campaigns against measles, especially in the North region, since a reduction in the vaccination coverage was observed in the region from 2010 to 2018. Thus, the aim is to maintain the good results achieved in the other states of Brazil.<sup>8</sup>

In view of this scenario, which has undergone major changes in recent years, it is important to continue studies on the subject in order to verify the epidemiological profile and the vaccination coverage of measles in Brazil. This study is justified by the importance of having a well-drawn epidemiological profile and of studying vaccination coverage as fundamental measures in public health. From this, it will be possible to

prevent diseases, monitor, identify population groups at risk, and develop strategies for health promotion in order to ensure protection against infectious diseases and enable early detection of possible outbreaks of infectious diseases.

## METHODOLOGY

A descriptive retrospective epidemiological study was carried out with data extracted from the SUS Hospital Information System (HIS/SUS) and the National Immunization Program Information System (SI-NIP) made available through the Department of Informatics of the Unified Health System (DATASUS). The study sample consisted of all reported cases of measles and information on vaccination coverage from 2016 to 2020 in Brazil. The study did not intervene in the participating cases and was limited to the analysis of data from DATASUS. Subsequent to data collection, the status and vaccination coverage of measles in Brazil from 2016 to 2020 was investigated. The cases of non-residents in Brazil and those who submitted blank data were excluded.

In order to develop the study, epidemiological variables related to the disease and to vaccination coverage were investigated, such as: region, year of care, age group, gender, color, number of deaths, and mortality rate. Then,

data referring to the period from January 2016 to December 2020 were extracted from DATASUS. The material was organized in graphs and tables by the authors, who used Microsoft Office Excel 2016 and TabWin software, and analyzed the data by using descriptive statistics.

Since this is a study whose data collection was performed in a public domain database, there was no need to submit the project to the Research Ethics Committee.

In the study, all measles cases and information on their vaccination coverage between the years 2016 to 2020 in Brazil were included. Incomplete or missing data posted by the information system were excluded.

## RESULTS

Regarding the number of cases notified between 2016 and 2020, the absolute value of 794.491,68 was found (Table 1). Furthermore, it was observed that the North region had the highest percentage of cases (42,18%), followed by the percentages of the Southeast (38%) and the Northeast regions (15,57%), totaling more than 95% of the cases that occurred in Brazil. In addition, in 2019, there was a greater number of notifications (353.974,89) compared to the previous and the subsequent years respectively: 2018 (249.988,68) and 2020 (132.938,61).

**Table 1.** Total number of cases according to region and year of care.

Variable	N	%
<b>Region</b>		
North	335.086,21	42,18
Northeast	123.680,70	15,57
Southeast	301.837,23	38
South	27.540,45	3,47
Midwest	6.347,09	0,78

(Conclusão)

Variable	N	%
<b>Year</b>		
2015	20.317,14	2,56
2016	17.209,96	2,17
2017	20.062,40	2,52
2018	249.988,68	31,46
2019	353.974,89	44,56
2020	132.938,61	16,73
<b>TOTAL</b>	<b>794.491,68</b>	<b>100</b>

SOURCE: Ministry of Health – SUS Hospital Information System (HIS/SUS)

Regarding the variables related to the epidemiological profile itself (Table 2), the disease was more prevalent in patients under 1 year old (41,12%), followed by the age group between 1-9 years old (30,4%), and less prevalent in those aged 80 years old or older (0,18%) and

60-79 years old (0,8%). Moreover, the disease was more prevalent in males (57,74%), in contrast to females (42,26%), and in mixed color individuals (46,7%), to the detriment of white individuals (20,35%).

**Table 2.** Total value according to age group, gender and color.

(Continua)

Variable	N	%
<b>Age</b>		
≤ 1 year old	331.352,68	41,12
1-9	244.977,42	30,4
10-19	78.308,38	9,4
20-39	114.969,70	14
40-59	34.507,83	4,1
60-79	8.800,43	0,8
≥ 80	1.595,24	0,18
<b>Gender</b>		
Male	458.758,46	57,74
Female	335.733,22	42,26
<b>Color/Race</b>		
White	161.299,58	20,3
Black	23.608,72	2,94
Mixed color	370.712,87	46,7

(Conclusão)

Variable	N	%
Yellow	4.897,79	0,62
Indigenous	2.775,78	0,34
No information	231.196,94	29,1
<b>TOTAL</b>	<b>794.491,68</b>	<b>100</b>

SOURCE: Ministry of Health – SUS Hospital Information System (HIS/SUS)

Table 3 shows the absolute mortality values according to the year of care. It is observed that, in 2018, there were a total of 4 deaths, out of a total of 6 that occurred (Table 3) between 2018

and 2020. In this sense, at the same time, there was the highest mortality rate (0,45%) within the evaluated period (Table 4).

**Table 3.** Number of deaths according to year of care

Year	N	%
2018	4	66,66
2019	1	16,66
2020	1	16,66
<b>TOTAL</b>	<b>6</b>	<b>100</b>

SOURCE: Ministry of Health – SUS Hospital Information System (HIS/SUS)

**Table 4.** Mortality rate according to year of care

Year	%
2018	0,45
2019	0,11
2020	0,20
<b>Average</b>	<b>0,25</b>

SOURCE: Ministry of Health – SUS Hospital Information System (HIS/SUS)

Regarding vaccination coverage for measles (Table 5), coverage with the MMR vaccine was evaluated. The year with the highest rate was 2016, with 86,06%, and the year with the lowest rate was 2020, with 71,13%. The regions with the

highest coverage were the South (87,42%), the Midwest (84,62%) and the Southeast (84,26%). Lower rates were observed in the North (73,27%) and in the Northeast (77,93%).

**Table 5.** Vaccination coverage according to year (Immuno: MMR vaccine D1, MMR vaccine D2)

Variable	
Year	%
2016	86,06
2017	79,59
2018	84,75
2019	87,33
2020	71,13
Region	%
North	73,27
Northeast	77,93
Southeast	84,26
South	87,42
Midwest	84,62

SOURCE: National Immunization Program Information System (SI-PNI/CGPNI/DEIDT/SVS/MS)

## DISCUSSION

It is necessary to keep in mind that the distribution of measles cases is not homogeneous in the various Brazilian demographic regions. The highest percentage of cases occurred in the North (42,18%), Southeast (38%) and Northeast (15,57%). One of the factors that reflects this situation is the vaccination coverage rate in these regions, which is directly related to population density and the educational level of each region.<sup>9,10</sup>

Furthermore, among the last 5 years, an exacerbated increase in measles cases (31,46%) was observed. It was also repeated in the following year, in 2019 (44,56%). In view of this, the years 2018 and 2019 experienced several health obstacles, such as the abrupt drop in vaccination coverage associated with low vaccination adherence. It was mainly caused by anti-vaccination movements and the increase in the migratory flow to Brazil, related, in most cases, to the refuge of immigrants from neighboring countries.<sup>11</sup>

Regarding the age group, it can be seen that the pediatric age group is the most heavily

affected (especially children under one year old). This fact can be explained by an incomplete vaccination coverage.<sup>12</sup> This data is relevant because measles is one of the important causes of hospitalization and morbimortality in childhood; and the outcome for death may be related to the socioeconomic development of the affected individuals, as well as to appropriate hygiene, nutrition and health care standards.<sup>13</sup>

With regard to gender distribution, it was observed that the distribution of measles cases was almost equivalent between both genders, with a higher prevalence in males, a fact that is present in other studies, which may be related to the higher negligence for the search for vaccination by this population.<sup>12,14,15</sup>

Although the disease has no predilection for color/race, most cases were in mixed color people (46,7%), and less frequent in indigenous people (0,34%). Such statistics can be explained by the fact that the Brazilian population has a significant amount of people self-declared as mixed color (47%) according to data from the National Household Sample Survey (continuous PNAD) conducted by the IBGE.<sup>16</sup> Besides the

epidemiological pattern of epidemics among indigenous people, for example, this aspect is the result not only of biological factors, but of an interaction of social, cultural and anthropological aspects.<sup>17</sup>

Regarding the absolute number of deaths, 6 deaths were recorded. The majority (66,6%) of cases occurred in 2018. This number was reached due to numerous complications in hospitalized patients, which are more frequent in unvaccinated individuals or in people with unknown vaccination status. Therefore, it shows a direct cause and effect relationship between the number of deaths and the vaccine failure.<sup>18</sup>

According to the mortality rate, 2018 was the year with the highest rate (0,45%), almost twice as high as the average (0,25%). This aspect is in line with global statistics, which had a significant increase between 2017 and 2018, as warned by the WHO in January 2019. This emphasizes the consequences arising from anti-vaccination movements caused by ignorance of the disease and/or other reasons which influenced individuals not to be vaccinated, which generates a serious public health problem globally. Thus, there is a significant contribution of non-medical reasons to the increase in the mortality rate.<sup>19</sup>

In contrast, while, in some countries, sparse outbreaks of the disease are understood because of the decision not to vaccinate their children, in poor countries, the reality is completely different. Such countries have weak and underfunded health systems that have difficulty vaccinating the population in need. Coupled with this, now with the new Coronavirus pandemic, the trend is unfavorable as measles vaccination campaigns will have to be suspended with the global pandemic in effect.<sup>20</sup>

It is also important to highlight that factors such as socioeconomic conditions, nutritional status and the immune system of each individual are determining factors and relevant to the incidence and the lethality of measles in

Brazil. Another factor that may be associated with low vaccination coverage is the scarce knowledge regarding vaccines and vaccine-preventable and transmissible diseases.<sup>21</sup>

Regarding vaccination coverage according to regions, it can be seen that the North and the Northeast were the regions with the lowest vaccination coverage. It shows one of the most relevant factors for the large number of measles patients in the region, and it reveals the importance of a vaccination campaign that includes as many individuals as possible considering that less efficient vaccination campaigns imply directly in the increase of hospitalization costs.<sup>14,22</sup>

With regard to vaccination coverage per year, it was observed that, in the analyzed period, coverage did not exceed 95%. This is worrying data, since non-vaccination can lead to the resurgence of previously controlled diseases, such as measles.<sup>23</sup> In addition, this scenario is being greatly influenced by refusal groups in Brazil, that disseminate superficial content on social networks which affect the reliability and the acceptance of the vaccine by the population.<sup>3</sup>

## CONCLUSION

It is concluded that, based on the exposed epidemiological profile and the vaccination coverage, there was an increase in the number of measles cases in Brazil, in addition to the decline in immunoprevention in the last six years. From this, it is recommended to intensify awareness campaigns about the importance of vaccination, the expansion of accessible locations and times, with greater precision by knowledge of the epidemiology of the disease in the country. Finally, larger studies should be encouraged by using epidemiological surveillance to better promote, prevent, and educate in health.

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