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Effect of Low Measles, Mumps and Rubella Vaccination on Infant Mortality

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ABSTRACT

This study aims to investigate the impact of low MMR vaccination coverage on infant mortality. A descriptive, retrospective epidemiological study was conducted with a quantitative approach, using DATASUS data from 2020 to 2024. Hospitalizations for measles, mumps, and rubella in children aged 0 to 4 years were analyzed by year, region, sex, and race/color. A total of 2,629 hospitalizations were identified, with higher prevalence in the Southeast and Northeast regions of Brazil. The highest hospitalization rates were observed among brown children and boys, with misinformation and vaccine hesitancy being identified as contributing factors to low vaccination coverage. Low MMR vaccination coverage is directly associated with increased hospitalizations and infant mortality. Effective public health strategies are needed to improve vaccination adherence and reduce inequalities.

INTRODUCTION

Vaccination is widely recognized as one of the most effective public health interventions for the prevention of infectious diseases and the reduction of infant mortality. However, in recent years, the decline in vaccination rates has raised significant concerns regarding the reemergence of vaccine-preventable diseases, such as measles, mumps, and rubella. Measles, in particular, is a highly contagious and potentially fatal disease, especially in young children. The World Health Organization (WHO) reports a concerning increase in measles cases in several regions, primarily attributed to insufficient vaccination coverage (1).

Moreover, studies indicate that, despite progress toward eliminating the disease in various regions, such as in the study by Minta et al. (2), vaccination coverage still presents gaps that hinder the complete eradication of measles, highlighting the importance of increasing vaccination adherence.

This study aims to investigate the impact of low measles, mumps, and rubella (MMR) vaccination coverage on infant mortality, with an emphasis on the potential consequences of this reduction in vaccination rates, such as increased hospitalizations and mortality associated with these diseases. Vaccine hesitancy, driven by misinformation and distrust in vaccine safety, has been one of the main factors contributing to reduced adherence to vaccination campaigns (3). Additionally, the COVID-19 pandemic further exacerbated this situation, leading to the disruption of immunization programs and the redirection of health resources 4).

The objective of this study is to provide a detailed analysis of the available epidemiological data, assessing rates of hospitalization and infant mortality due to measles, rubella, and mumps in different regions of Brazil between 2020 and 2024. It is expected that the results of this study will provide crucial information for the formulation of public policies aimed at

improving vaccination adherence and combating misinformation.

METHODOLOGY

This study is a descriptive and retrospective epidemiological design with a quantitative approach. Secondary data were obtained from the Department of Informatics of the Unified Health System (DATASUS), accessing the TABNET database (https://datasus.saude.gov.br/informacoes-de-saude-tabnet/). Data collection was conducted in July 2024, covering data up to 2024, the last year with complete information.

The studied population included children aged 0 to 4 years who were hospitalized due to measles, rubella, or mumps in Brazil between 2020 and 2024. This age group was chosen due to its higher vulnerability to severe complications from these diseases. The sampling was census-based, covering all cases recorded in the SIH/SUS.

The data were organized in Microsoft Excel and analyzed with the Statistical Package for the Social Sciences (SPSS) version 26.0. Descriptive analysis was performed using absolute and relative frequencies. For inferential analysis, Pearson's Chi-square test ($\alpha = 0.05$) was applied.

RESULTS

The data analysis revealed a total of 2,629 hospitalizations due to measles, rubella, and mumps between 2020 and 2024. The Southeast and Northeast regions exhibited the highest hospitalization rates, with a particular focus on the North Region, which recorded 577 hospitalizations, with the state of Amapá contributing 242 cases. Table 1 shows the distribution of hospitalizations by federative units, highlighting significant temporal and geographical trends in the incidence of these diseases.

Table 1 also reveals regional disparities, with some federative units presenting higher hospitalization rates, suggesting geographical heterogeneity in access to vaccination and immunization programs. These data indicate that areas with lower vaccination coverage face greater challenges in controlling measles, rubella, and mumps, emphasizing the need to improve access to and adherence to vaccination in these regions.

Table 1: Hospitalizations for measles, rubella, and mumps, according to the year of service and region/federative unit, enabling the identification of temporal and geographical trends in the incidence of these diseases.

Region/Federative Unit	**2020**	**2021**	**2022**	**2023**	**2024**	**Total**
North Region	165	215	94	72	31	577
Rondônia	2	6	13	15	5	41
Acre	4	8	2	5	1	20
Amazonas	4	12	21	12	8	57
Roraima	1	1	1	-	1	4
Pará	68	40	41	32	13	194
Amapá	85	145	10	2	-	242
Tocantins	1	3	6	6	3	19
Northeast Region	**88**	118	224	234	77	741
Maranhão	18	19	26	33	26	122
Piauí	3	5	18	19	4	49
Ceará	14	29	36	30	15	124
Rio Grande do Norte	-	2	5	4	2	13
Paraíba	6	7	3	15	1	32
Pernambuco	20	17	71	55	7	170
Alagoas	2	1	7	10	4	24
Sergipe	-	5	5	3	-	13
Bahia	25	33	53	65	18	194
Southeast Region	90	115	216	248	91	760
Minas Gerais	37	38	87	67	23	252
Espírito Santo	6	6	15	21	6	54
Rio de Janeiro	13	9	21	28	15	86
São Paulo	34	62	93	132	47	368
South Region	34	33	53	83	35	238
Paraná	13	11	18	43	12	97
Santa Catarina	11	15	13	19	9	67
Rio Grande do Sul	10	7	22	21	14	74
Central-West Region	26	51	128	81	27	313
Mato Grosso do Sul	2	8	34	20	3	67
Mato Grosso	3	8	27	23	11	72
Goiás	16	23	46	20	10	115
Distrito Federal	5	12	21	18	3	59
Total	**403**	**532**	**715**	**718**	**261**	**2629**

Source: Ministry of Health - Health Information System of the SUS (SIH/SUS) (5).

Figure 1 and Figure 2 illustrate the distribution of hospitalizations by age, sex, and color/race, highlighting the vulnerability of different groups, such as boys and children of mixed race. This allows us to observe that these variables directly influence hospitalization rates, while also reflecting racial and social disparities that affect vaccination adherence and disease control.

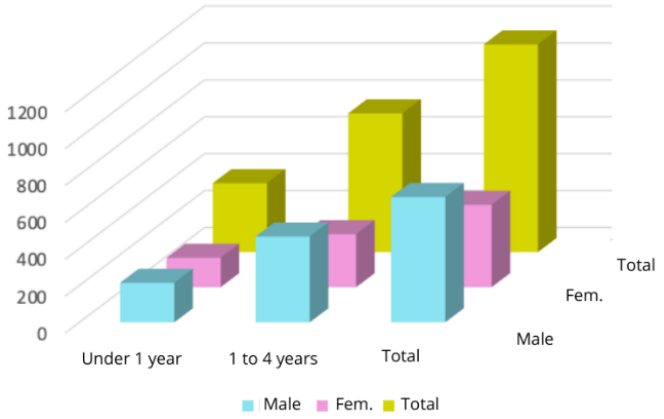

Figure 1: Hospitalizations for Measles, Rubella, and Mumps by age (0 to 4 years) by sex.

Source: Ministry of Health - Health Information System of the SUS (SIH/SUS) (5).

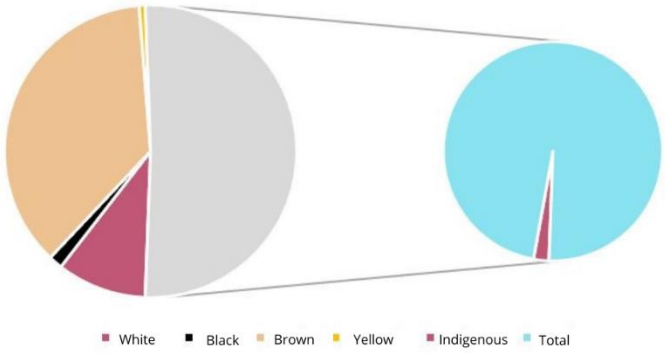

Figure 2: Hospitalizations for Measles, Rubella, and Mumps by color/race.

Source: Ministry of Health - Health Information System of the SUS (SIH/SUS) (5).

Therefore, upon analyzing the demographic variables, it was observed that the highest incidence occurred among children of mixed race and boys. This may reflect social inequalities and limited access to healthcare services, suggesting that these groups are more vulnerable to severe complications from these diseases.

DISCUSSION

The data analysis revealed that the low measles, mumps, and rubella (MMR) vaccination coverage in Brazil has significant implications on the incidence of these diseases, particularly among children aged 0 to 4 years. The Southeast and Northeast regions exhibited the highest hospitalization rates, indicating an inequality in the distribution of vaccination and access to healthcare services. Therefore, geographic and racial disparities reflect the urgent need to increase vaccination coverage in these areas.

Furthermore, a higher incidence of hospitalizations was observed among children of mixed race and boys, which may be linked to socioeconomic factors and difficulties in accessing healthcare services. These findings corroborate previous studies that indicate vaccine hesitancy and the lack of accurate information can lead to outbreaks of previously controlled diseases. Thus, misinformation and distrust in vaccines, exacerbated by the COVID-19 pandemic, contributed to the decline in vaccination rates.

When comparing the results of this study with global data, it is observed that despite significant progress, as indicated by Minta et al. (2022), there are still areas with insufficient vaccination coverage, which facilitates the resurgence of diseases that were previously eradicated or controlled. Vaccine hesitancy and the lack of accurate information have been critical factors contributing to these outbreaks, supporting our findings on the importance of vaccination adherence. Misinformation and distrust in vaccines, exacerbated by the COVID-19 pandemic, contributed to the decline in vaccination rates.

Therefore, it is crucial for healthcare services to adopt more effective strategies to improve vaccination adherence, including educational campaigns, combating misinformation, and improving access to vaccines. Public policies focused on equity and universal access can help reduce infant mortality associated with vaccine-preventable diseases.

A limitation of this study was the reliance on secondary data from DATASUS, which may contain inconsistencies and delays in reporting. Therefore, future studies should integrate factors such as awareness campaigns, vaccine availability, and cultural attitudes to offer a more comprehensive view of the problem.

In conclusion, this study highlights that low MMR vaccination coverage is directly associated with increased hospitalizations and infant mortality. Thus, more effective health policies and targeted interventions are essential to combat inequalities and reduce the incidence of preventable diseases in Brazil.

This study revealed that low measles, mumps, and rubella (MMR) vaccination coverage has a significant impact on infant mortality, particularly in the Southeast and Northeast regions of Brazil. The data analysis highlighted notable disparities between different racial groups and sexes, underscoring inequalities in access to healthcare and vaccination adherence. Therefore, it is essential that public policies focused on equity are implemented to increase vaccination coverage.

The COVID-19 pandemic exacerbated the situation, diverting attention and resources away from vaccination programs. Thus, misinformation about vaccines and vaccine hesitancy are critical factors contributing to the resurgence of preventable diseases. Therefore, educational campaigns and strategies to combat misinformation are necessary to improve vaccination adherence.

Furthermore, the reliance on secondary data from DATASUS limited the analysis, highlighting the need for more consistent and updated data. Future studies should integrate other factors, such as awareness campaigns and vaccine availability, for a more comprehensive analysis of the problem.

In conclusion, effective public health policies and targeted interventions are essential to reduce infant mortality associated with vaccine-preventable diseases such as measles, mumps, and rubella, ensuring that all children have access to the necessary immunization to prevent future outbreaks.

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