Review Article
Artigo de Revisão
Artículo de Revisión

DOI: https://doi.org/10.12957/reuerj.2025.87682

Low vaccination coverage levels in the Brazilian population and associated factors: a scoping review

Baixas coberturas vacinais na população brasileira e fatores associados: revisão de escopo

Baja cobertura de vacunación en la población brasileña y factores asociados: revisión de alcance

Maria Clara Lélis Ramos Cardoso[I]; Jaceilde Mendes Nunes[II]; Victor Guilherme Pereira[I]; Mônica Thaís Soares Macedo[I]; Tatiana Almeida de Magalhães[III]; Carla Silvana de Oliveira e Silva[I]

[I]Universidade Estadual de Montes Claros. Montes Claros, MG, Brazil; [II]Prefeitura Municipal de Saúde de Montes Claros. Montes Claros, MG, Brazil; [III]Universidade Federal do Vale do Jequitinhonha e Mucuri. Diamantina, MG, Brazil

ABSTRACT

Objective: to investigate diverse evidence about the factors associated with the low vaccination coverage levels recorded in the Brazilian population. **Method:** a scoping review conducted in 2024 according to the Joanna Briggs Institute recommendations in the following databases: Medline, LILACS, Cochrane Library, Web of Science and Scopus. **Results:** in addition to individual health conditions such as smoking habit, depressive symptoms and physical activity, maternal health conditions such as multiparity or incomplete pre-natal care and vaccination, teenage mothers, smoking mothers, unintended pregnancies and conditions inherent to the services such as access to health professionals, health units in the neighborhood and availability, socioeconomic factors such as income, age, schooling, number of children living in the same house and marital status were associated with the vaccination coverage rates. **Final considerations:** the factors associated with the low vaccination coverage levels are complex and multifactorial, with the potential to undergo temporary transformations and requiring joined strategies from health authorities and professionals to monitor and mitigate the phenomenon.

Descriptors: Public Health; Immunization; Vaccination; Vaccination Coverage; Risk Factors.

RESUMO

Objetivo: investigar evidências sobre os fatores associados às baixas coberturas vacinais registradas na população brasileira. **Método:** revisão de escopo realizada em 2024 conforme as recomendações do Joanna Briggs Institute, nas bases de dados Medline, Lilacs, Cochrane Library, Web of Science e Scopus. **Resultados:** fatores socioeconômicos, como renda, idade, escolaridade, número de crianças no domicílio e situação conjugal, além de condições de saúde individual, como tabagismo, sintomas depressivos e prática de exercícios físicos, condições de saúde materna como multiparidade, pré-natal e vacinação incompletos, mãe adolescente, tabagismo materno, baixa escolaridade, gravidez não planejada e condições dos serviços tais como acesso a profissionais de saúde, presença de unidade de saúde no bairro e disponibilidade foram associados às taxas de coberturas vacinais. **Considerações finais:** os fatores associados às baixas coberturas vacinais são complexos e multifatoriais, com potencial de sofrer transformações temporais, exigindo estratégias conjuntas das autoridades sanitárias e profissionais de saúde para monitorar e mitigar o fenômeno.

Descritores: Saúde Coletiva; Imunização; Vacinação; Cobertura Vacinal; Fatores de Risco.

RESUMEN

Objetivo: investigar la evidencia sobre los factores asociados con las bajas tasas de cobertura de vacunación en la población brasileña. **Método:** Se realizó una revisión de alcance en 2024 siguiendo las recomendaciones del *Joanna Briggs Institute*, utilizando las bases de datos Medline, LILACS, *Cochrane Library*, *Web of Science* y Scopus. **Resultados:** factores socioeconómicos como ingreso, edad, educación, número de hijos en el hogar y estado civil, sumados a condiciones de salud individuales tales como tabaquismo, síntomas depresivos y ejercicio físico y a condiciones de salud materna como multiparidad, atención prenatal, vacunación incompleta, maternidad adolescente, tabaquismo materno, baja educación y embarazo no planificado, además de condiciones de servicio como el acceso a los profesionales de la salud, presencia de una unidad sanitaria en el vecindario y disponibilidad se asociaron con las tasas de cobertura de vacunación. **Consideraciones finales:** los factores asociados con la baja cobertura de vacunación son complejos, multifactoriales y pueden sufrir transformaciones temporales, lo que demuestra la necesidad de estrategias conjuntas de las autoridades sanitarias y los profesionales de la salud para monitorear y mitigar el fenómeno.

Descriptores: Salud Pública; Inmunización; Vacunación; Cobertura de Vacunación; Factores de Riesgo.

INTRODUCTION

Devised in 1973 in Brazil under due coordination by the Ministry of Health[1], the National Immunization Program (*Programa Nacional de Imunização*, PNI) is considered a global reference and a pioneer vaccination policy at the global level in incorporating various immunobiologicals to the vaccination schedule defined by the Unified Health System (*Sistema Único de Saúde*, SUS) and corresponds to one of the few territories in the world that offer an extensive and comprehensive vaccination list[2,3].

This study was supported in part by the *Fundação de Amparo à Pesquisa do Estado de Minas* Gerais – Brazil (FAPEMIG), Process code: APQ 0777-24.
Corresponding author: Maria Clara Lélis Ramos Cardoso. E-mail: mariaclara12@yahoo.com.br
Editor in Chief: Cristiane Helena Gallasch; Associate Editor: Mercedes Neto

Received: Oct 9th 2024 – Accepted: Nov 23rd 2025

Review Article
Artigo de Revisão
Artículo de Revisión

DOI: https://doi.org/10.12957/reuerj.2025.87682

The PNI was recognized as one of the most comprehensive vaccination programs in the world and has reached high collective immunization rates for many years due to its universal and free-of-charge access nature[2-4]. Throughout the years, the program has been subjected to important organizational and operational changes and advances, such as inclusion of new immunobiologicals, vaccination network expansion and investments in structure and international partnerships for the production of vaccines during the 50 years since the PNI was created[1,5].

Although the significant advances made in the PNI and in the scientific literature assert that vaccination represents the main tool for the primary prevention of diseases and is one of the most successful health promotion proposals in the Public Health context and the best cost-effective one[5,6], a number of studies have verified expressive reductions in the vaccination rates in Brazil, with determinants considered as multifactorial and complex[7-11].

Data from the Brazilian Ministry of Health (*Ministério da Saúde*, MS) indicate that the decline in the immunization rates started in 2012 and was accentuated from 2016 onwards, especially among the child population, which translates as high rates of unprotected people susceptible to immunopreventable diseases, with the possibility of outbreaks and of a high number of deaths[9-12].

In this context, it is noted that none of the vaccines included in the children's and adolescents' schedules reached adequate vaccination coverage levels between 2009 and 2022[2,11,12], with a recommended target ≥95% for most immunobiologicals except for the Calmette-Guérin Bacillus (CGB) and rotavirus, whose recommended coverage target is ≥90%[11,13,14]. In addition to that, other Brazilian studies revealed that the vaccination coverage rates for influenza and COVID-19 presented considerable reductions in the last years, mainly among adults and aged individuals[15,16].

It is noted that collective vaccination is a Public Health practice that gained notoriety among the Sustainable Development Goals (SDGs), which offer pathways to face the contemporary changes involving complex issues and exert effects on human survival and on environmental preservation[17,18]. Related to vaccination, such objective includes reaching universal vaccination coverage levels and stimulating the production of new immunobiologicals, with a view to preventing new health events such as outbreaks and epidemics and to reducing the hospitalization rates due to immunopreventable diseases in the entire context linked to hospitalization. The aforementioned includes health-related costs and sequelae[18].

Given the above, the urgent need is noted for governmental health bodies, public services and health professionals to especially focus on fostering, planning, implementing and evaluating health promotion and protection policies and strategies by means of vaccination practices, with emphasis on detecting and intervening on the factors associated with the low vaccination coverage levels found in Brazil, always with the objectives of re-instituting universal vaccination coverage targets in the country and of acting in line with the SDGs set forth by the United Nations (UN)[17-19].

Although recent studies evaluate the factors associated with non-vaccination in specific population groups and certain immunobiologicals[8,9,15], it is noticed that few productions investigate the determinants of the low vaccination coverage level detected in the Brazilian general population. In addition to that, it is worth noting that the aspects influencing the collective immunization rates are translative[2,7,12,19] and demand continuous and expanded assessments, especially when the country has not been able to reach the vaccination targets recently[11-16].

In this sense, conducting a scoping review allows evaluating and recording a synthesis of the conditions related to the low vaccination coverage rates described in Brazilian studies in recent years, with a view to expanding knowledge about the theme by analyzing this phenomenon in different Brazilian population segments, showing the singular potential of presenting a transformation in these determinants according to the context assessed.

The objective of this study was to investigate diverse evidence found in the literature about the factors associated with the low vaccination coverage levels recorded in the Brazilian population.

METHOD

This is a scoping review conducted according to the methodological proposal suggested by the *Joanna Briggs Institute* (JBI)[20] and organized based on the *Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews* (PRISMA-ScR): *Checklist and Explanation*[21] recommendations. The research protocol was registered in the *Open Science Framework* (OSF) under its due Digital Object Identifier (DOI).

It is noted that this research method has been repeatedly applied in the Health Sciences scope and enables evaluating, determining and recording data available in the literature that support knowledge in a given axis, which assists in synthesizing important questions that ground employing Evidence-Based Practice (EBP) and contribute to recognizing and bridging eventual knowledge gaps[20-22]. In order to preserve reliability of the method adopted, this study was conducted based on the scheme represented by the following stages: (1) Defining the research question; (2) Searching for relevant studies in the literature; (3) Selecting the sample; (4) Extracting and analyzing the data selected; and (5) Synthesizing and presenting the review[20].

DOI: https://doi.org/10.12957/reuerj.2025.87682

Represented in this research as PCCo = Population (P): Brazilian population, Concept (C): Factors associated with low vaccination coverage levels; and Context (Co): Vaccination in Brazil, the PCC strategy was employed to support the "Defining the research question" stage[20] It is also noted that the research question was formulated along with professionals specialized in the area (Public/Collective Health and Immunization) and was therefore defined as follows: Which are the factors associated with the decline in the vaccination coverage levels in Brazil?

The search for studies in the national and international literature took place between January and February 2024. The following databases were consulted: *Medical Literature Analysis and Retrieval System Online* (MEDLINE), coordinated by the *National Library of Medicine* and accessed via PubMed, and the *Biblioteca Virtual em Saúde* (BVS) portal, coordinated by the Latin American and Caribbean Health Sciences Information Center (belonging to BIREME), selecting the following databases in the BVS search tools: *Literatura Latino-Americana e do Caribe em Ciências da Saúde* (LILACS) and MEDLINE; *Cochrane Library*; *Web of Science*; and *Scopus*.

The descriptors employed in the search for scientific productions are registered in the *Medical Subject Headings* (MeSH), namely: "*Vaccination*", "*Vaccination Coverage*", "*Brazil*" and "*Risk Factors*". When necessary, the search terms were adapted to the Portuguese language, by checking the Descriptors in Health Sciences (*Descritores em Ciências da Saúde*, DeCS), defined as follows: "*Vacinação*", "*Cobertura Vacinal*", "*Brasil*" and "*Fatores de Risco*". The "*AND*" and "*OR*" Boolean operators were used to join and combine subject matters in the advanced search for studies. The studies considered were those published in the last 10 years (from 2014 to 2024), period during which the reduction in the collective immunization rates was first recorded in research surveys[9-12]. In addition, no restrictions regarding the languages in which the studies were written were applied, in order to expand the search capacity.

This review included original articles, complete materials and available in full, published between 2014 and 2024 and whose outcome consisted in identifying factors associated with the low collective immunization rates detected in the Brazilian population. The productions excluded were as follows: course conclusion papers, monographies, dissertations, theses, review articles, books or book chapters, letters to the editor, case reports, opinion articles and abstracts.

A search equation was devised to map diverse evidence following a five-stage model: Extraction, Conversion, Combination, Construction and Use[23].

The procedure to select the studies found in the search was implemented with the aid of the *Rayyan* web software, developed by the *Qatar Computing Research Institute* (QCRI)[24]. All productions were imported into the instrument to ease the process to organize and select the articles. In addition to that, it is worth highlighting that the tool assists in screening studies, enabling blinding among the reviewers and timely identifying duplicates; consequently, it holds significant potential in reducing the researchers' workload and presents a high usability level. The *EndNote* software was used to manage the references. This program allows storing and organizing references.

The first selection stage (Screening) consisted in reading the titles and abstracts from the studies. Subsequently (in the second stage), the materials selected in the Screening phase were forwarded for full-reading to assess the pre-established eligibility criteria[20-21].

The information from the studies included in the review synthesis was extracted with the aid of a validated instrument[22], whose adaptation for this review considered extracting the following data: study title, authors, journal, publication year, reference, study country, research design, instruments (questionnaires and scales), population, sample, statistical tests and main results.

The study selection process was in charge of three researchers that worked independently and with selection blinding, aiming to ensure clarity, transparency and traceability of the procedure, as well as to avoid selection biases[20-21]. Any and all disagreements were solved through consensus by reviewing the recommendations[20-22] (to provide precision and qualification in including the studies) and by consulting a fourth reviewer.

In order to define the levels of evidence corresponding to the studies chosen, a hierarchical classification based on their methodological designs was followed, in consonance with the proposal of this research, sorted as: (I) - Evidence from systematic reviews or meta-analyses of multiple controlled and randomized clinical trials; (II) - Findings from at least one controlled, randomized or well-designed clinical study; (III) - Findings from well-designed clinical trials with no randomization; (IV) - Evidence derived from well-designed cohort and case-control studies; (V) - Findings from systematic reviews through descriptive and qualitative methods; (VI) - Findings from a single descriptive or qualitative study; and (VII) - Recommendations from concepts set forth by authorities and/or reports by experts' committees[25].

In addition, *Grading of Recommendations Assessment, Development and Evaluation* (GRADE) was used to assess quality of the evidence and strength of the recommendations in the scientific productions[26]. The GRADE system is a manual to assist researchers in devising research studies with a variant called Evidence-Based Health (EBH). This instrument considers criteria such as methodological limitations, representativeness of the samples, consistency of the results and robustness of the

DOI: https://doi.org/10.12957/reuerj.2025.87682

outcomes/external validity, which enable determining the levels of evidence corresponding to the studies. It is noted that the level of evidence shows the confidence degree in the data contained in the productions, classified into four levels: (1) High; (2) Moderate; (3) Low; and (4) Very low[26].

As the current study is a literature review, uses information considered in the public domain and did not include primary or secondary data from human beings, it was not necessary to submit the research to appraisal by any Research Ethics Committee (*Comitê de Ética e Pesquisa*, CEP).

RESULTS

The study selection process followed the path shown in Figure 1, supported by PRISMA-ScR[21] and according to the JBI recommendations[20].

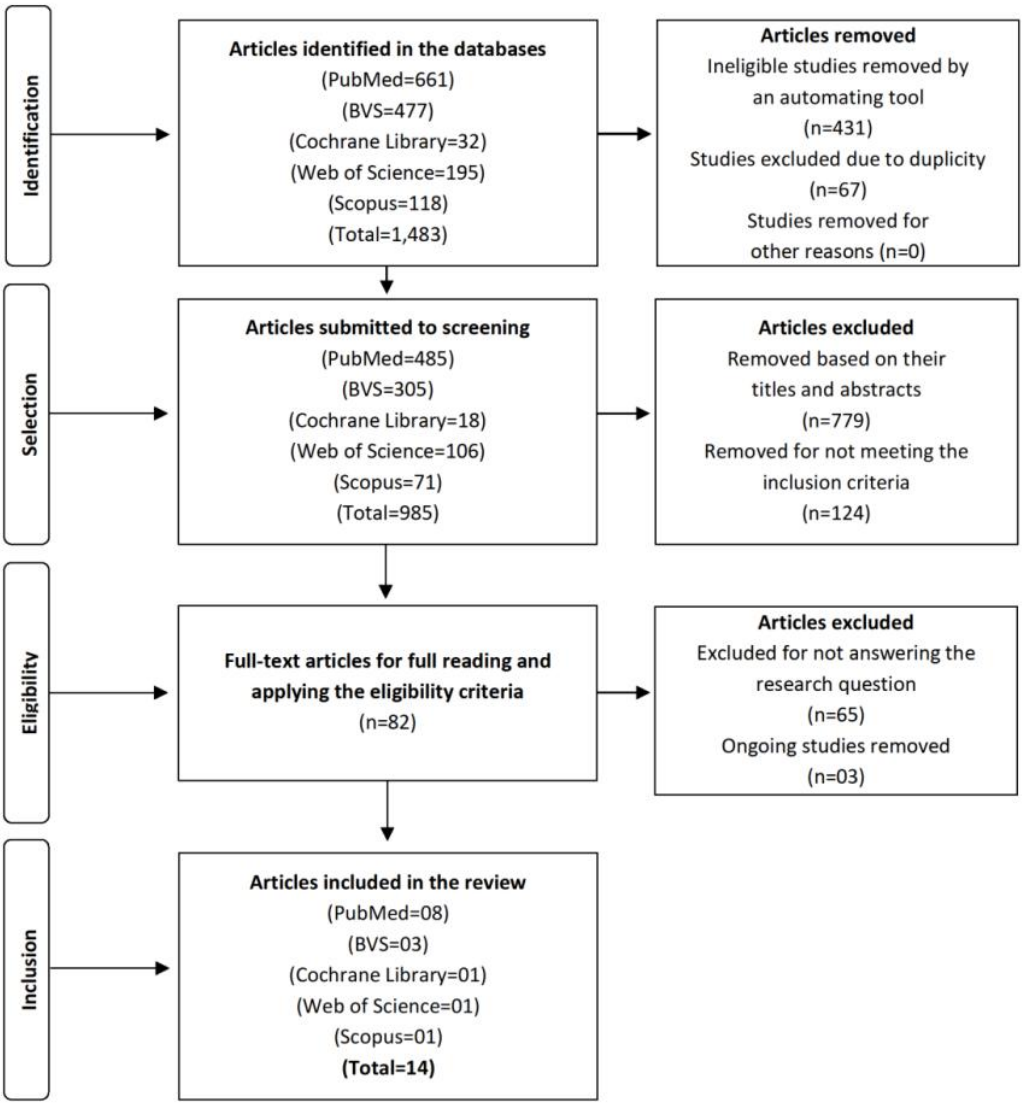

Figure 1: Flowchart showing the study selection process based on the *Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews* (PRISMA-ScR): *Checklist and Explanation*, as per the *Joanna Briggs Institute* recommendations. Montes Claros, MG, Brazil, 2024.

A total of 1,483 studies were identified in the databases proposed in this review, mostly indexed in PubMed (44.6%). In all, 431 articles were removed for not meeting the inclusion criteria and 67 for being duplicates.

In the selection stage, 985 papers were submitted to screening, excluding 903 after reading their titles and abstracts. Subsequently, 82 studies were submitted to full-reading and applied the eligibility criteria. The materials excluded were 65 articles (for not answering the research question) and 03 ongoing research studies. Such being the case, the current

DOI: https://doi.org/10.12957/reuerj.2025.87682

research included 14 scientific productions (review sample), which evaluated and recorded factors correlated with the low vaccination coverage level in the Brazilian population.

The studies selected to comprise the review sample were published between 2014 and 2024. As for their research designs, nine (64.3%) productions were observational cross-sectional studies, four (28.6%) were cohort studies and one (7.1%) was an ecological study.

In relation to the hierarchical classification for the level of evidence, the studies classified as with level of evidence VI (71.4%) represented the majority. As for the assessment regarding quality of the evidence and strength of the recommendations in each study, the surveys were predominantly classified as with a high level of evidence (64.3%), with the remaining 35.7% rated as with a moderate level of evidence. Figure 2 presents a synthesis of all the information obtained from the studies selected.

Data and characteristics from the studies			**Classification levels**	
Year/*Locus*	**Study design**	**Factors associated with low vaccination coverage**	**Level of evidence**	**GRADE**
2024/ Fortaleza[27]	Longitudinal cohort study	Living in the same house with more than one brother/sister (p=0.010) and lower socioeconomic level (p<0.001).	IV	1 (High)
2023/ São Paulo[7]	Observational, cross-sectional study	Lower schooling level (p<0.001) and monthly incomes below one minimum wage (p=0.006).	VI	1 (High)
2022/ Mato Grosso[9]	Population-based cohort cohort study	Having a brother/sister in the same house (p<0.05) and not having received any visits from community health agents in the last 30 days (p<0.05).	IV	1 (High)
2022/ 133 Brazilian cities[33]	Ecological time series study	COVID-19 pandemic (p<0.05).	VI	2 (Moderate)
2021/ Rio Grande do Sul[34]	Population-based cross-sectional study	Young adults (p<0.01), lower socioeconomic level (p=0.06), smoking habit (p=0.02), not practicing periodic physical activity (p=0.04), depressive symptoms (p=0.02), not having seen a physician in the last 12 months (p<0.01) and not having any BHU in the neighborhood (p=0.07).	VI	2 (Moderate)
2021/ 133 Brazilian cities[30]	Observational, ecological and cross-sectional study	Lower socioeconomic level (p=0.01).	VI	1 (High)
2021/ São Paulo[31]	Observational, cross-sectional study	Not having received guidelines from health professionals (p<0.05) and reports about adverse reactions before vaccination (p<0.05).	VI	2 (Moderate)
2020/ Rio Grande do Sul[32]	Population-based cohort study	High parity (p<0.001), less than 06 pre-natal appointments (p<0.001), incomplete maternal vaccination during the pre-natal period (p<0.001), not having breastfed their children up to 12 months old (p<0.001) and not having resorted to public health services for childhood vaccination (p<0.001).	IV	1 (High)
2020/ São Paulo[8]	Population-based, observational and cross-sectional study	"No partner" as marital status (p<0.05), not practicing periodic physical activity (p<0.05) and not having seen any medical professional in the last 12 months (p<0.05).	VI	1 (High)
2020/ Recife[29]	Observational, cross-sectional study	Mothers' lower schooling level (p=0.006).	VI	2 (Moderate)
2018/ Maranhão[28]	Prospective cohort study	Lower socioeconomic level (p=0.019), mothers' lower schooling (p<0.001), more children living in the same house (p<0.001), teenage mothers (p<0.001), smoking mothers (p<0.001), unintended pregnancies (p=0.009), fewer pre-natal appointments (p<0.001), "no partner" as marital status (p=0.022); outpatient and/or in-hospital care not available for the children (p<0.001) vaccines not available in health services (p<0.001).	IV	1 (High)
2015/ Goiás[35]	Population-based, observational and cross-sectional study	Not having any private health plan (p=0.007).	VI	1 (High)
2015/ São Paulo[36]	Population-based, cross-sectional and epidemiological study	Hospitalization in the last year (p<0.05).	VI	1 (High)
2014/ Acre[37]	Observational, cross-sectional study	Lower family incomes (p=0.030) and mothers' low schooling level (p=0.01).	VI	2 (Moderate)

Figure 2: Synthesis of all the information from the studies selected that assessed factors correlated with the low vaccination coverage levels in the Brazilian population (n=14) Montes Claros, MG, Brazil, 2024.

Review Article
Artigo de Revisão
Artículo de Revisión

DOI: https://doi.org/10.12957/reuerj.2025.87682

The factors associated with the population groups that presented low vaccination coverage levels in Brazil included socioeconomic and demographic aspects, health conditions and behaviors, conditions referring to accessing health services and the COVID-19 pandemic context.

The socioeconomic and demographic aspects encompassed income levels, schooling, age, household arrangements and marital status. The health conditions and behaviors included the following: smoking habit, practicing physical activity, psychological symptoms, history of adverse reactions to vaccines, history of hospitalizations in the last year, incomplete care and vaccination during the pre-natal period, unintended pregnancies, maternal age during pregnancy, parity (number of births with ≥20 gestational weeks) and breastfeeding. In turn, the conditions referring to accessing health services were as follows: having seen a medical professional in the last year, having a Basic Health Unit (BHU) in their neighborhood, not having received guidelines on vaccination from health professionals, unavailable health services and vaccines, not having received any visits from Community Health Agents (CHAs) in the last 30 days and not having any health plan.

DISCUSSION

Vaccination is considered the main strategy for the primary prevention of communicable diseases at the global level and is one of the most successful and cost-effective proposals in the Public Health context[38-48]. In Brazil, it is widely related to the reduction in the childhood mortality rates and its expansive coverage in the country promoted eradication and control of immunopreventable diseases such as poliomyelitis, smallpox and measles[33].

Despite that, a number of Brazilian studies have recorded a considerable decline in the vaccination coverage rates in recent years[7-16], which underscores a significant challenge for the Brazilian National Immunization Program (PNI) and health services, as involution or abandonment of all the advances made in combating immunopreventable diseases represents an incommensurable threat to the Health System[38-45].

Given this, an expressive branch of research studies produced in the country has sought to identify the determinants correlated with these low vaccination coverage levels[7-9,27-37], aiming to offer aids to health services, managers and professionals for the development of customized strategies with the objectives of mitigating the incidence of these factors and of significantly increasing vaccination coverage in the community.

In this direction, an observational study conducted in 133 Brazilian cities revealed that lower socioeconomic levels were associated with population groups that presented reduced collective immunization rates (p=0.01)[30]. Other research studies conducted in the state of Acre (OR=2.12; CI=95%: 1.06-4.21; p=0.030)[37], Fortaleza (p=0.006)[27], Maranhão (PR=1.20; CI=95%: 1.06-1.35; p=0.019)[28], Rio Grande do Sul (PR=1.28; CI=95%: 1.05-1.26; p=0.06)[34] and São Paulo (p<0.001)[7] also found that worse family income conditions were related to the population segments that presented lower vaccination coverage rates. The researchers warn that such factor can make it difficult for families to attend vaccination and health services, especially in places where the latter are far away or hard to access, such as in areas with geographical barriers[7,27-28,30,34,37].

Schooling levels were described as an important factor capable of shaping and influencing health behaviors and adherence to immunobiologicals in this population segment. In this sense, a cross-sectional research study developed in São Paulo highlights that individuals with lower schooling levels were correlated with insufficient vaccination rates (p<0.001)[7]. In addition to that, some productions conducted in Acre (OR=2.60; CI=95%: 1.28-5.29; p=0.011)[37], Maranhão (PR=1.58; CI=95%: 1.21-2.06; p<0.001)[28] and Recife (p=0,006)[29] showed that low schooling among the mothers was associated with lower immunization rates in the children.

Such finding is one of the factors already consolidated in the scientific literature; furthermore, the studies highlight that lower schooling can impair health literacy and the ability to recognize false information in relation to immunobiologicals, in addition to potentially increasing hesitation or distrust in relation to vaccines and the concerns about side effects[7,27-29,37].

Other Brazilian research studies point to the correlation between sociodemographic aspects and Public Health immunization rates[8,9,27,28,34]. Younger adults (PR=2.06; CI=95%: 1.57-2,69; p<0.01)[34] and "no partner" as marital status (PR=1.25; CI=95%: 1.06-1.48; p=0.022[28]; and p<0.05[8]) were pointed out in the literature as determinants affecting vaccination coverage. In addition, studies developed in Fortaleza (p=0.010)[27], Maranhão (PR=1.81; CI=95%: 1.41-2.33; p<0.001)[28] and Mato Grosso (OR=3.18; CI=95%: 1.75–5.76; p<0.05)[9] showed that families with two or more children living in the same house were associated with low vaccination rates.

It is noted that health conditions and behaviors are also reported as determinants linked to the collective immunization rates in the national literature. From this perspective, a number of observational studies conducted in Rio Grande do Sul (PR=1.18; CI=95%: 1.01-1.38; p=0.04)[34] and São Paulo (p<0.05)[8] verified that people not in the habit of practicing physical activity presented lower vaccination rates.

DOI: https://doi.org/10.12957/reuerj.2025.87682

Such productions also revealed that not having seen a physician in the last 12 months was a health behavior associated with population groups that presented lower immunization indices (PR=1,54; CI=95%: 1.36-1.75; p<0.01[34] and p<0.05[8], respectively). The authors point out that people who do not indulge in physical activity and do not see health professionals periodically are considered less prone to adopting and maintaining health prevention and promotion habits[8,34].

In a cross-sectional research study, the smoking habit was described as a condition that was correlated with individuals that presented worse vaccination adherence rates (PR=1.27; CI=95%: 1.04-1.54; p=0.02)[34]. That association is reasserted in a prospective cohort study which demonstrates that the childhood vaccination levels were lower in children whose mothers self-declared as smokers (PR=1.52; CI=95%: 1.28-1.82; p<0.001)[28].

Other maternal conditions (recorded in prospective cohort studies conducted with children) that were associated with low childhood vaccination coverage rates stand out, namely: unintended pregnancies (PR=1.18; CI=95%: 1.05-1.31; p=0.009); teenage mothers (PR=1.26; CI=95%: 1.10-1.45; p<0.001); high parity (PR=1.52; CI=95%: 1.35; 1.71; p<0.001); less than 06 pre-natal appointments (PR=1.39; CI=95%: 1.24-1.56; p<0.001); incomplete maternal vaccination during the pre-natal period (PR=1.18; CI=95%: 1.07-1.29; p<0.001); and not having breastfed their children up to 12 months old (PR=1.24; CI=95%: 1.12-1.37; p<0.001)[28.32]. The research studies underscore that women with many children or who failed to attend pre-natal appointments tend not to present suitable vaccination situations and do not frequently take their children to health and vaccination services[28,32].

Other conditions noticed in individuals with inadequate vaccination conditions were reported in nationwide research studies, such as aspects correlated with the reductions in the vaccination coverage rates, for example: depressive symptoms (PR=1.23; CI=95%: 1.03-1.46; p=0.02); reports about adverse reactions before vaccination (p<0.05); hospitalization during the last year (p<0.05); and COVID-19 pandemic (p<0.05)[31,33,36].

In addition, a number of research studies highlighted that factors related to access and availability in terms of health and vaccination services are associated with worse collective vaccination indices, namely: not having any BHU in the neighborhood (PR=1.19; CI=95%: 0.99-1.43; p=0.07); not having received any visits from community health agents in the last 30 days (OR=1.93; CI=95%: 1.04–3.57; p<0.05); not having received any guidelines from health professionals (p<0.05); not having resorted to public health services for childhood vaccination (PR=1.22; CI=95%: 1.06-1.39; p<0.001); outpatient and/or in-hospital care not available for the children (PR=1.20; CI=95%: 1.04-1.38; p<0.001); vaccines not available in health services (PR=1.28; CI=95%: 1.12-1.46; p<0.001); and not having any private health plan (p=0.007)[9,28,31,32,34,35].

In addition to the aforementioned factors, it is necessary to highlight another aspect both in the country in the world: the Anti-vaccine movements. They are characterized as movements that are against vaccination, intensified and materialized by vaccination-related hesitation and with no scientific grounds warranting such behavior. Their main strategy is to disseminate and share knowingly false data about alleged harms associated with immunization via video platforms and social networks. Fake news employ contents that can trigger doubts as for how safe immunobiologicals are and question their effectiveness with no significant evidence. Few research studies were developed about theme in the Brazilian context; however, the topic gained notoriety as a subject matter that triggers concerns that are relevant for Public Health services[8-10,12,15].

Study limitations

The results obtained in this review should be considered in the light of some limitations. It is noted that the restriction in the number of data sources consulted (which only partially represent the entire national literature on Health Sciences) limited the research and access to other potential scientific productions that evaluate the factors associated with Brazilian population groups with low vaccination coverage rates. It is also worth noting the limitation regarding the number of studies published on the subject matter. Therefore, the suggestion is to develop new review studies with expanded scopes about the theme and prospective surveys addressing strategies to detect and intervene on these determinants that can impair adherence to immunobiologicals in the community.

FINAL CONSIDERATIONS

The results underscore that the factors associated with the low vaccination coverage levels are complex and reinforce the need to develop customized vaccination strategies targeted at the population segments that presented lower immunization indices and are more vulnerable to immunopreventable diseases, belonging to lower socioeconomic levels, with lower schooling, younger, with two or more children living in the same house, people who do not practice physical activity and do not see health professionals periodically, smokers, individuals with a history of hospitalization in the last year or of adverse reactions to immunobiologicals, women with more children, pregnant women not attending care and vaccination appointments during the pre-natal period, women with unintended pregnancies, mothers that breastfeed less and people

DOI: https://doi.org/10.12957/reuerj.2025.87682

with difficulties accessing care provision centers or individuals in contexts with unavailable health and vaccinations services, aiming to re-institute adequate vaccination coverage levels in Brazil, especially after the COVID-19 pandemic.

Such data are essential to devise specific and targeted actions, capable of overcoming these barriers and of increasing vaccination coverage, thus promoting better protection against preventable diseases in the population. Thus, the study reiterates the urgent need for integrated interventions that involve health prevention and promotion, education, effective communication and social support, contributing to reducing inequalities and to strengthening the immunization system in the country.

REFERÊNCIAS

1. Domingues CMAS, Maranhão AGK, Teixeira AM, Fantinato FFS, Domingues RAS. 46 anos do Programa Nacional de Imunizações: uma história repleta de conquistas e desafios a serem superados. Cad Saúde Pública. 2020 [cited 2024 Oct 1]; 36:e00222919. DOI: https://doi.org/10.1590/0102-311X00222919.
2. Homma A, Maia MLS, Azevedo ICA, Figueiredo IL, Gomes LB, Pereira CVC *et al.* Pela reconquista das altas coberturas vacinais. Cad Saúde Pública. 2023 [cited 2024 Oct 1]; 39(3):e00240022. DOI: https://doi.org/10.1590/0102-311XPT240022,
3. Castro MC, Massuda A, Almeida G, Menezes-Filho NA, Andrade MV, Souza Noronha KVM *et al.* Brazil's Unified Health System: the first 30 years and prospects for the future. Lancet. 2019 [cited 2024 Oct 1]; 394(1)345-56. DOI: https://doi.org/10.1016/S0140-6736(19)31243-7.
4. Marinho CV, Queiroz RCS, Araujo WRM, Tonello AS, Thomaz EBAF. Indicators of the National Immunization Program for children under one year old: time trend in Maranhão, Brazil, 2010 to 2021. Ciênc. Saúde Coletiva. 2023 [cited 2024 Oct 1]; 28(8):2335–46. DOI: https://doi.org/10.1590/1413-81232023288.07312023.
5. Pércio J, Fernandes EG, Maciel EL, Lima NVT. 50 years of the Brazilian National Immunization Program and the Immunization Agenda 2030. Epidemiol. Serv. Saúde. 2023 [cited 2024 Oct 2]; 32(3):e20231009. DOI: https://doi.org/10.1590/S2237-96222023000300001.EN.
6. World Health Organization. Immunization coverage. Genebra: World Health Organization; 2021 [cited 2024 Mar 14]. Available from: https://www.who.int/news-room/fact-sheets/detail/immunization-coverage.
7. Olbrich Neto J, Olbrich SRLR. Attitudes, hesitancy, concerns, and inconsistencies regarding vaccines reported by parents of preschool children. Rev paul pediatria. 2023 [cited 2024 Aug 15]; 41:e2022009. DOI: https://doi.org/10.1590/1984-0462/2023/41/2022009.
8. Sato APS. Pandemic and vaccine coverage: challenges of returning to schools. Rev Saude Publica. 2020 [cited 2024 Aug 17]; 54:115. Available from: https://www.scielo.br/j/rsp/a/FkQQsNnvMMBkxP5Frj5KGgD/?format=html&lang=en.
9. Lemos PL, Oliveira Júnior GJ, Souza NFC, Silva IM, Paula IPG, Silva KC *et al*. Factors associated with the incomplete opportune vaccination schedule up to 12 months of age, Rondonópolis, Mato Grosso. Rev paul pediatr. 2022 [cited 2024 Aug 15]; 40:e2020300. DOI: https://doi.org/10.1590/1984-0462/2022/40/2020300.
10. Donalisio MR, Boing AC, Sato APS, Martinez EZ, Xavier MO, Almeida RLF *et al*. Vaccination against poliomyelitis in Brazil from 2011 to 2021: successes, setbacks, and challenges ahead. Ciênc. Saúde Coletiva. 2023 [cited 2024 Oct 1]; 28(2):337-39. DOI: https://doi.org/10.11606/s1518-8787.2020054003142.
11. Ministério da Saúde (BR). Coordenação-Geral do Programa Nacional de Imunizações, Departamento de Imunização e Doenças Transmissíveis, Secretaria de Vigilância em Saúde, Ministério da Saúde. Informe técnico campanha nacional de vacinação contra a poliomielite e multivacinação para atualização da caderneta de vacinação da criança e do adolescente. Brasília (DF): Ministério da Saúde; 2022 [cited 2024 Mar 14]. Available from: https://www.gov.br/saude/pt-br/vacinacao/informes-e-notas-tecnicas/informe-tecnico-campanha-nacional-de-vacinacao-contra-a-poliomielite-e-multivacinacao-para-atualizacao-da-caderneta-de-vacinacao-da-crianca-e-do-adolescente.
12. Melo-Júnior EB, Almeida PD, Pereira BM, Borges PTM, Gir E, Araújo TME. Vaccination hesitation in children under five years of age: a scoping review. Rev Bras Enferm. 2023 [cited 2024 Mar 14]; 76(5):e20220707. DOI: https://doi.org/10.1590/0034-7167-2022-0707.
13. World Health Organization. The thirteenth general programme of work, 2019-2025. Genebra: World Health Organization; 2022 [cited 2024 Mar 15]. Available from: https://apps.who.int/gb/ebwha/pdf_files/EB152/B152_28-en.pdf.
14. World Health Organization. Ten threats to global health in 2019. Genebra: World Health Organization; 2019 [cited 2024 Mar 16]. Available from: https://www.who.int/news-room/spotlight/ten-threats-to-global-health-in-2019.
15. Luchesi BM, Azambuja HCS, Rossignolo SCO, Martins TCR. Vacinação contra influenza em idosos no contexto da pandemia da COVID-19: situação atual e perspectivas futuras. Rev Bras Med Fam Comunidade. 2022 [cited 2024 Oct 1]; 17(44):3355-9. DOI: https://doi.org/10.5712/rbmfc17(44)3355.
16. Kupek E. Low COVID-19 vaccination coverage and high COVID-19 mortality rates in Brazilian elderly. Rev Bras Epidemiol. 2021 [cited 2024 Aug 12]; 24:e210041. DOI: https://doi.org/10.1590/1980-549720210041.
17. Organização das Nações Unidas. Objetivos de Desenvolvimento Sustentável [Site Internet]. Brasil: ONU; 2024 [cited 2024 Mar 14]. Available from: https://brasil.un.org/pt-br/sdgs/3.
18. Organização das Nações Unidas. Estratégia de vacinação da ONU quer salvar mais de 50 milhões de pessoas [Site Internet]. Brasil: ONU; 2021 [cited 2024 Mar 16]. Available from: https://brasil.un.org/pt-br/125790-estrat%C3%A9gia-de-vacina%C3%A7%C3%A3o-da-onu-quer-salvar-mais-de-50-milh%C3%B5es-de-pessoas.
19. Osingada CP, Porta CM. Nursing and Sustainable Development Goals (SDGs) in a COVID-19 world: The state of the science and a call for nursing to lead. Public Health Nurs. 2020 [cited 2024 Aug 12]; 37(5):799-805. DOI: https://doi.org/10.1111/phn.12776.

20. Peters MDJ, Godfrey C, McInerney P, Soares CB, Khalil H, Parker D. Chapter 11: Scoping Reviews. In: Aromataris E, Munn Z (Editors). Joanna Briggs Institute Reviewer's Manual. The Joanna Briggs Institute; 2017 [cited 2024 Mar 18]. Available from: https://reviewersmanual.joannabriggs.org/.
21. Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D *et al.* PRISMA Extension for Scoping Reviews (PRISMA-ScR): checklist and explanation. Ann Intern Med. 2018 [cited 2024 Aug 12]; 169(7):467-73. DOI: https://doi.org/10.7326/M18-0850.
22. Ferraz L, Pereira RPG, Pereira AMRC. Tradução do conhecimento e os desafios contemporâneos na área da saúde: uma revisão de escopo. Saúde Debate. 2019 [cited 2024 Aug 12]; 43(2):200-16. DOI: https://doi.org/10.1590/0103-11042019S215.
23. Araújo WCO. Recuperação da informação em saúde. ConCI. 2020 [cited 2024 Mar 12]; 3(2):100–34. DOI: https://doi.org/10.33467/conci.v3i2.13447.
24. Ouzzani M, Hammady H, Fedorowicz Z, Elmagarmid A. Rayyan-a web and mobile app for systematic reviews. Syst Rev. 2016; 5(1):210. DOI: https://doi.org/10.1186/s13643-016-0384-4.
25. Melnyk B, Fineout-Overholt E. Evidence-based practice in nursing & healthcare: a guide to best practice. 4th ed. Philadelphia: Wolters Kluwer; 2019.
26. Ministério da Saúde (BR). Diretrizes metodológicas: Sistema GRADE – Manual de graduação da qualidade da evidência e força de recomendação para tomada de decisão em saúde. Brasília (DF): Ministério da Saúde; 2014. Available from: https://bvsms.saude.gov.br/bvs/publicacoes/diretrizes_metodologicas_sistema_grade.pdf.
27. Araújo DABS, Correia LL, Lima PLGSB, Vasconcelos SC, Farias-Antunez S, Gomes YVC, et al. Coverage and determinants of childhood vaccination during the COVID-19 pandemic in Fortaleza, Northeastern Brazil: a longitudinal analysis. Cad Saúde Pública. 2024 [cited 2024 Aug 15]; 40(1):e00074723. DOI: https://doi.org/10.1590/0102-311XEN074723.
28. Silva FS, Barbosa YC, Batalha MA, Ribeiro MRC, Simões VMF, Branco MRFC *et al*. Incomplete childhood immunization with new and old vaccines and associated factors: BRISA birth cohort, São Luís, Maranhão State, Northeast Brazil. Cad Saúde Pública. 2018 [cited 2024 Aug 15]; 34(3):e00041717. DOI: https://doi.org/10.1590/0102-311X00041717.
29. Veras AACA, Lima EJF, Caminha MFC, Silva SL, Castro AAM, Bernardo ALB *et al.* Vaccine uptake and associated factors in an irregular urban settlement in northeastern Brazil: a cross-sectional study. BMC Public Health. 2020 [cited 2024 Aug 12]; 20(1):1152-9. DOI: https://doi.org/10.1186/s12889-020-09247-7.
30. Silveira MF, Tonial CT, Goretti KMA, Teixeira AMS, Hallal PC, Menezes AMB *et al.* Missed childhood immunizations during the COVID-19 pandemic in Brazil: Analyses of routine statistics and of a national household survey. Vaccine. 2021 [cited 2024 Aug 15]; 39(25):3404-9. DOI: https://doi.org/10.1016/j.vaccine.2021.04.046.
31. Garcia EM, Nery Teixeira Palombo C, Waldman EA, Sato APS. Factors associated with the completeness of the vaccination schedule of children at 12 and 24 months of age in a Brazilian medium-size municipality. J Pediatr Nurs. 2021 [cited 2024 Aug 15]; 60(12):e46-e53. DOI: https://doi.org/10.1016/j.pedn.2021.02.028.
32. Buffarini R, Barros FC, Silveira MF. Vaccine coverage within the first year of life and associated factors with incomplete immunization in a Brazilian birth cohort. Arch Public Health. 2020 [cited 2024 Aug 15]; 78(1):21-9. DOI: https://doi.org/10.1186/s13690-020-00403-4.
33. Silva TMRD, Sá ACMGN, Beinner MA, Abreu MNS, Matozinhos FP, Sato APS, et al. Impact of the COVID-19 Pandemic on Human Papillomavirus Vaccination in Brazil. Int J Public Health. 2022 [cited 2024 Mar 15]; 31(67):160-9. DOI: https://doi.org/10.3389/ijph.2022.1604224.
34. Meneghini KFD, Hood CF, Menezes LO, Mendoza-Sassi RA, Dumith SC. Influenza vaccination coverage in elderly and high-risk adults: characterization of associated factors. Einstein (São Paulo). 2021 [cited 2024 Mar 15]; 19(1):100-10. DOI: https://doi.org/10.31744/einstein_journal/2021AO5830.
35. Saraiva FO, Minamisava R, Vieira MA, Bierrenbach AL, Andrade AL. Vaccination Coverage and Compliance with Three Recommended Schedules of 10-Valent Pneumococcal Conjugate Vaccine during the First Year of Its Introduction in Brazil: A Cross-Sectional Study. PLoS One. 2015 [cited 2024 Mar 15]; 10(6):e0128656. DOI: https://doi.org/10.1371/journal.pone.0128656.
36. Moura RF, Andrade FB, Duarte YAO, Lebrão ML, Antunes JLF. actors associated with adherence to influenza vaccination among non-institutionalized elderly in São Paulo, Brazil. Cad Saúde Pública. 2015 [cited 2024 Mar 15]; 31(10):2157–68. DOI: https://doi.org/10.1590/0102-311X00065414.
37. Branco FL, Pereira TM, Delfino BM, Braña AM, Oliart-Guzmán H, Mantovani AS *et al.* Socioeconomic inequalities are still a barrier to full child vaccine coverage in the Brazilian Amazon: a cross-sectional study in Assis Brasil, Acre, Brazil. Int J Equity Health. 2014 [cited 2024 Mar 15]; 27(13):118-28. DOI: https://doi.org/10.1186/s12939-014-0118-y..
38. European Centre for Disease Prevention and Control. Catalogue of interventions addressing vaccine hesitancy: technical report [Internet]. Copenhagen: ECDC; 2017 [cited 2024 Mar 13]. Available from: https://ecdc.europa.eu/sites/portal/files/documents/Catalogue-interventionsvaccine-hesitancy.pdf.
39. The Lancet Child Adolescent Health. Vaccine hesitancy: a generation at risk. Lancet Child Adolesc Health. 2019 [cited 2024 Mar 15]; 3(5):281-9. DOI: https://doi.org/10.1016/s2352-4642(19)30092-6.
40. World Health Organization. Immunization coverage [Site Internet]. Genebra: World Health Organization; 2021 [cited 2024 Mar 13]. Available from: https://www.who.int/news-room/fact-sheets/detail/immunization-coverage.
41. Brito, WI, Souto FJD. Universal hepatitis A vaccination in Brazil: analysis of vaccination coverage and incidence five years after program implementation. Rev Bras Epidemiol. 2020 [cited 2024 Mar 15]; 23(1):100-10. DOI: https://doi.org/10.1590/1980-549720200073.
42. Ministério da Saúde (BR). Departamento de informática do sistema único de saúde. Informações de saúde (tabnet). Epidemiológicas e morbidade. Brasília: Ministério da Saúde; 2021 [cited 2024 Mar 13]. Available from: https://datasus.saude.gov.br/informacoes-de-saude-tabnet/.

DOI: https://doi.org/10.12957/reuerj.2025.87682

43. Ministério da Saúde (BR). DATASUS. Informações de Saúde (TABNET): imunizações – cobertura – Brasil [Internet]. Brasília, DF: DATASUS; 2020 [cited 2024 Mar 13]. Available from: http://tabnet.datasus.gov.br/cgi/dhdat.exe?bd_pni/cpnibr.def.
44. Organização Pan-Americana da Saúde. OPAS pede que países mantenham programas de vacinação durante pandemia de COVID-19. Brasília, DF: OPAS; 2020 [cited 2024 Mar 13]. Available from: https://www.paho.org/bra/index.php?option=com_content&view=article&id=6152:opas-pede-que-paises-mantenham-programas-de-vacinacao-durante-pandemiade-covid-19&Itemid=820
45. Moura ADA, Braga AVL, Carneiro AKB, Alves ECS, Bastos CMM, Nunes IH, et al. Rapid Monitoring of Vaccination to prevent measles in Ceará State, Brazil, 2015. Epidemiol. Serv. Saúde. 2018 [cited 2024 Mar 15]; 27(2):e2016380. DOI: https://doi.org/10.5123/S1679-49742018000200017.
46. Lazarus JV, Ratzan SC, Palayew A, Gostin LO, Larson HJ, Rabin K, et al. A global survey of potential acceptance of a COVID-19 vaccine. Nat Med. 2020 [cited 2024 Mar 15]; 20(2):1-4. DOI: https://doi.org/10.1038/s41591-020-1124-9.
47. Malik AA, McFadden SAM, Elharake J, Omer SB. Determinants of COVID-19 vaccine acceptance in the US. EClinicalMedicine. 2020 [cited 2024 Mar 13];26(1):100495-99. DOI: https://doi.org/10.1016/j.eclinm.2020.100495.
48. World Health Organization. Ten threats to global health in 2019 [Site Internet]. Geneva: WHO; 2020 [cited 2024 Mar 13]. Available from: https://www.who.int/news-room/spotlight/ten-threats-to-global-health-in-2019.

Authors' contributions

Concepção, M.C.L.R.C, J.M.N., V.G.P., M.T.S.M., T.A.M. e C.S.O.S.; metodologia, M.C.L.R.C, J.M.N., V.G.P., M.T.S.M., T.A.M. e C.S.O.S.; análise formal, M.C.L.R.C, J.M.N., V.G.P., M.T.S.M., T.A.M. e C.S.O.S.; investigação, M.C.L.R.C, J.M.N., V.G.P., M.T.S.M., T.A.M. e C.S.O.S.; redação, M.C.L.R.C, J.M.N., V.G.P., M.T.S.M., T.A.M. e C.S.O.S.; revisão e edição, M.C.L.R.C, J.M.N., V.G.P., M.T.S.M., T.A.M. e C.S.O.S.; visualização, M.C.L.R.C, J.M.N., V.G.P., M.T.S.M., T.A.M. e C.S.O.S.; supervisão, M.C.L.R.C, J.M.N., V.G.P., M.T.S.M., T.A.M. e C.S.O.S.; administração do projeto, M.C.L.R.C, J.M.N., V.G.P., M.T.S.M., T.A.M. e C.S.O.S.Todos os autores realizaram a leitura e concordaram com a versão publicada do manuscrito. All authors read and agreed with the published version of the manuscript.

Use of Artificial Intelligence tools

Authors declare that no Artificial Intelligence tools were used in writing the manuscript entitled "*Low vaccination coverage levels in the Brazilian population and associated factors: a scoping review*".