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Inequality dimensions of childhood vaccination coverage in Indonesia: a scoping review

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Abstract

Purpose: To map existing evidence on inequalities in childhood immunization coverage in Indonesia using the Social Determinants of Health and PROGRESS-Plus frameworks. **Methods:** This scoping review included original studies published between 2015 and 2025 that examined inequalities in childhood vaccination coverage in Indonesia. Searches were conducted in PubMed, Scopus, Google Scholar, and Garuda. The review followed PRISMA-ScR with consideration of the PRISMA-Equity extension. Data were charted using a standardized extraction form and synthesized descriptively using narrative and tabular approaches. **Results:** Of 910 records identified, ten studies met the inclusion criteria. All were cross-sectional, and most used nationally representative data from household surveys or administrative sources (n = 9). Inequalities related to parental socioeconomic characteristics were most frequently examined. No studies assessed disparities related to race, ethnicity, culture, or language, indicating substantial gaps across key equity dimensions. **Conclusion:** Evidence on childhood vaccination inequalities in Indonesia remains limited in scope and depth. Expanding equity-focused research, particularly on underexplored social and cultural determinants, is essential to support targeted policies and advance equitable immunization coverage in Indonesia.

Keywords: childhood; Indonesia; inequalities; vaccination coverage

INTRODUCTION

In low- and middle-income countries (LMICs), infectious diseases remain one of the leading causes of death among children, highlighting health inequities caused by economic disparities [1–3]. Vaccines have been recognized as among the most successful and cost-effective public health interventions, helping cut healthcare costs and reduce health inequities [4–7]. Although vaccinations are estimated to avert 51.5 (44.0 – 63.2) million deaths from vaccine-preventable infections between 2021 and 2030 [8], vaccine coverage was unequal between high-income countries and LMICs [4] and between rural and urban areas within countries [9].

The benefits of vaccination extend beyond individuals and communities. By averting childhood illness, vaccines contribute to more productive and meaningful lives in adulthood and also generate national-level benefits by preventing the exacerbation of poverty [10,11]. Unfortunately, the impact of childhood vaccination has also been unequal across population subgroups. Underserved populations that stand to benefit the most from immunization programs often receive the least coverage [10].

Inequalities in childhood vaccination coverage have been widely studied across countries. Globally, coverage for most childhood vaccines declined between 2019 and 2021, resulting in a rise in the number of unvaccinated children, particularly in LMICs [12]. According to a global analysis, measles vaccination,

particularly the second dose, showed the highest absolute and relative inequalities across different country income groups [12]. Not only cross-country differences but also substantial inequalities in vaccine coverage persist within countries [13–15].

Current research examining the potential drivers of inequalities in childhood vaccination coverage has explored multiple dimensions [16]. These dimensions captured differences operating at both the individual level and beyond. Inequities in vaccination coverage related to individual and subgroup characteristics can be understood using the PROGRESS-Plus framework [17]. In contrast, the interactions among determinants operating beyond the individual level can be elaborated using the Social Determinants of Health framework [18].

Itemizing potential drivers of inequality according to these frameworks can help identify research blind spots in the Indonesian vaccination landscape. Characteristics associated with differential childhood vaccination coverage, individual factors, and other factors have been widely studied globally, including in Indonesia [15]. However, to date, no study has comprehensively synthesized these characteristics across studies and timeframes within the Indonesian context.

Given Indonesia's large share of the global child population [19], addressing inequities in childhood vaccination coverage is critical not only for Indonesia but also globally. According to the 2023 Indonesian Health Survey, vaccination outcomes among children vary across socioeconomic and regional groups [20]. Moreover, regions with low pediatric immunization coverage have contributed to subsequent disease outbreaks in the country [21].

This study aims to synthesize existing evidence on the potential drivers of inequalities in childhood vaccination coverage within the Indonesian context, drawing on the frameworks described above, to identify research gaps that may guide future studies, allow targeted monitoring on inequalities, and inform the development of actionable policies aligned with the core principles of Immunization Agenda 2030 (IA 2030) which is to "leave no one behind" and Sustainable Development Goals (SDGs) 10 on reducing inequalities [22].

METHODS

Our scoping review examines the extent of academic research on unequal vaccine delivery, considering individual, maternal, paternal, household, and broader characteristics.

Protocol development and registration

A protocol was developed prior to conducting this study; however, the scoping review protocol was not eligible for publication in PROSPERO.

Reporting guidelines

This scoping review was conducted and reported in accordance with the PRISMA-Scr guidelines for the overall structure and reporting [23]. To ensure the addressing of all potential sources of disadvantage in the population and equity impacts, we incorporate equity considerations from PRISMA-Equity [24]. We met all the requirements of the PRISMA scoping review checklist.

Eligibility criteria

Inclusion criteria: (1) peer-reviewed scientific journal articles, (2) examining childhood vaccination coverage, (3) among children aged five years or younger in Indonesia, (4) reporting inequalities dimensions comprised of socioeconomic, demographic, and geographic factors, (5) all papers published within the last 10 years (2015 - 2025).

Exclusion criteria: (1) focusing on older children, adolescents, or adults, (2) outcomes other than coverage: vaccine hesitancy or acceptance; timing of vaccination receipt; or composite indicators of child health, (3) did not report or analyze inequalities in vaccination coverage within Indonesia, such as multicountry analyses that included Indonesia but did not provide Indonesia-specific subnational inequality estimates, (4) reporting inequalities due to medical and clinical characteristic, (5) non-original research and other document types, including commentaries, editorials, letters, reviews, and exclusively qualitative studies.

While qualitative research is essential for understanding the mechanisms and lived experiences underlying inequities, this review focused on quantitative studies to examine population-level patterns and magnitudes of inequality in childhood vaccination coverage. As a consequence of adopting an equity perspective, the review was limited to observational study designs, as these factors cannot be ethically or feasibly examined in interventional studies. Childhood vaccine coverage was selected as the sole outcome of interest because it reflects unfair and avoidable differences in subsequent health and economic impacts that extend beyond genetic or biological factors.

Information sources and search strategies

A literature search was conducted across two scientific, bibliographic databases, including papers

from PubMed and Scopus. To include potential papers not indexed in these databases, complementary searches were conducted using Google Scholar and Garuda. The final searches were completed in November 2025. No authors were contacted during the paper retrieval process. The search strategy combined four key concepts: (1) children under five years of age, (2) immunization or vaccination, (3) health inequality or inequity, and (4) Indonesia. Both Medical Subject Headings (MeSH) and free-text terms were used, and search strategies were adapted for other databases. A more detailed list of PubMed search terms is available in Table 1. To reduce the risk of missing pertinent papers from the Indonesian context, we initially searched for research papers written in English and Bahasa Indonesia. Although all papers were screened in English and Bahasa Indonesia, none of the Bahasa Indonesia articles met the eligibility criteria. Consequently, only English-language publications were included at the final full-text review and extraction.

Table 1. Seach strategy

PubMed search strategy
(child*[Title/Abstract] OR infant*[Title/Abstract] OR newborn*[Title/Abstract] OR under-5[Title/Abstract] OR under five[Title/Abstract] OR preschool[Title/Abstract] OR pediatric[Title/Abstract] OR babies[Title/Abstract] OR neonat*[Title/Abstract] OR infant[MeSH Terms] OR infant, newborn[MeSH Terms] OR child[MeSH Terms] OR child, preschool[MeSH Terms])
AND
(inequ*[Title/Abstract] OR inequal*[Title/Abstract] OR disparit*[Title/Abstract] OR equit*[Title/Abstract] OR deprivation*[Title/Abstract] OR disadvantage*[Title/Abstract] OR underserve*[Title/Abstract] OR concentration index[Title/Abstract] OR health equity[MeSH Terms] OR healthcare disparities[MeSH Terms
OR health status disparities[MeSH Terms] OR health inequities[MeSH Terms] OR socioeconomic factors[MeSH Terms] OR poverty[MeSH Terms])
AND
(immuniz*[Title/Abstract] OR immunis*[Title/Abstract] OR vaccin*[Title/Abstract] OR immunization[MeSH Terms] OR vaccination coverage[MeSH Terms] OR immunization programs[MeSH Terms])
AND
(Indonesia[MeSH Terms] OR indonesia*[Title/Abstract] OR java[Title/Abstract] OR sumatra[Title/Abstract] OR sumatera[Title/Abstract] OR bali[Title/Abstract] OR borneo[Title/Abstract] OR papua[Title/Abstract])
NOT
(Papua New Guinea[MeSH Terms] OR PNG[Title/Abstract])

Screening and selection process

Data were charted in Microsoft Excel using a standardized extraction form. The process was carried out independently by BDP and subsequently double-checked by JHH. Extracted data included study characteristics (year of publication, study design, and data source); settings; population characteristics (children aged 0–59 months); vaccination outcomes (complete basic vaccination coverage); dimensions of inequality (individual, maternal, paternal, household, and district characteristics); analytical methods; measures of inequality (e.g. simple or complex, absolute or relative measures); and other relevant key findings.

Data extraction and synthesis

The synthesis focused on describing the frequency, scope, and types of equity dimensions assessed, rather than comparing effect sizes. Findings were synthesized descriptively using narrative and tabular formats. Variables related to inequality dimensions were mapped to the PROGRESS-Plus framework [17], the Social Determinants of Health framework [18], and WHO Inequality Monitoring in Immunization [25] to ensure comprehensive coverage of potential drivers of inequities. For each included study, measures of inequality were extracted in accordance with the WHO inequality monitoring manual [25], which covers both absolute and relative measures [25,26].

RESULTS

Records were retrieved from two scientific databases (PubMed and Scopus) and two grey literature databases (Google Scholar and Garuda), managed using Rayyan web-based software. A total of 220 duplicate records were removed, either manually or through Rayyan's duplicate detection. Two investigators (BDP and JHH) independently screened the remaining records, excluding 667 studies at the title and abstract stage. Full-text articles were then sought for potentially eligible studies. Twenty-three full-text articles were assessed for eligibility, of which thirteen studies were excluded due to the unavailability, wrong article type, wrong population, wrong outcome, between-country inequality only, and older publication. The scarcity of relevant studies may be due to limited data availability, as most data sources come from nationally representative datasets designed to produce national rather than region-specific estimates. Consequently, 10 studies met the inclusion criteria and were included in the final review. The final list of papers is depicted in Figure 1.

The ten included studies were conducted between 2017 and 2024 [15,27–35], with half (n = 5) published after 2020 [15,27,28,30,34], indicating sustained research on inequalities in childhood vaccination coverage in Indonesia over five years. All included publications were peer-reviewed journal articles employing a cross-sectional study design and quantitative analytical methods [15,27–35].

The majority of the data sources were household surveys, specifically the Indonesia Demographic and Health Survey (IDHS) [15,27–32,34,35], which were

used in seven studies. Two studies used multiple data sources [30,35], and a single study analyzed rapid survey data [32]. Only one study utilized routine administrative data, i.e., Village Potential Census [35]. The majority of the studies analyzed data from a single survey year (n = 7) [15,28–33], while three studies examined longer time frames using repeated cross-sectional data [27,34,35]; none employed a longitudinal design.

Childhood vaccination coverage was the main outcome across all studies, although the age range of the included children's sample varied. Seven studies focused on children aged 1–2 years [15,30–35], one on children aged 1–3 years [28], and two on children aged 1–5 years [27,29]. Most studies used nationally representative samples (n = 8). Two studies examined regional contexts: one in Java [33] and the other in Sumatra [30].

The types of vaccines analyzed included DPT and measles, each examined in an equal number of studies (n = 7) [15,27,29–32,34,35]. BCG, Polio, Hepatitis B, and Rubella vaccines were analyzed slightly less frequently (n = 6) [15,27–32]. One study may analyze more than one type of vaccine. The full description of the study summaries could be found in Table 2.

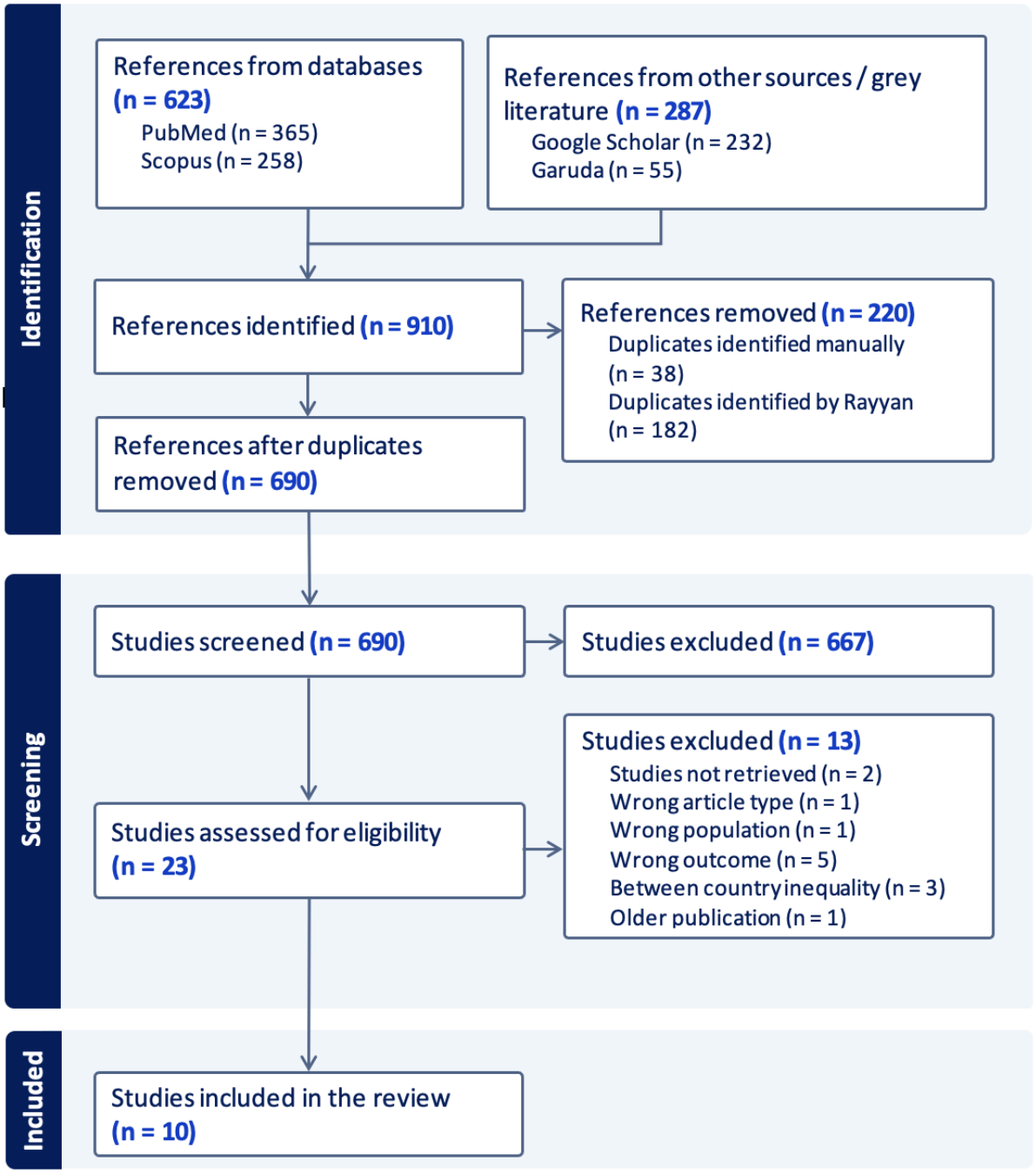

Figure 1. PRISMA flow diagram of study selection procedure for scoping review

Table 2. Description of included studies (n = 10 studies)

Characteristics	Quantity
Data source*	
Household data survey	9
Routine administrative data	1
Other	1
Year round	
Single year	7
Multiyear	3
Sample size	
<1000	1
1000 - 10000	5
>10000	4
Children's age group (years)	
1 - 2	7
1 - 3	1
1 - 5	2
Settings	
National	8
Java	1
Sumatra	1
Vaccine types*	
BCG	6
DPT	7
Polio	6
Hepatitis B	6
Measles	7
Rubella	6

*studies counted more than once per category

The dimensions of inequality examined in this scoping review were categorized into the following themes: individual, maternal, paternal, household, and district characteristics. Maternal characteristics constituted the largest category of inequalities (n = 13) [15,27–32,34–35] followed by household characteristics (n = 11) [15,27–32,34–35] and individual characteristics (n = 7) [15,27–32,34–35], meanwhile paternal and district characteristics were examined in an equal number of studies (n = 5 each) [15,27–30,32–33,35]. Across all categories, maternal-related variables were discussed most frequently (n = 42) [15,27–32,34–35], followed by individual (n = 23) [15,27–30,32–33,35] and household variables (n = 22) [15,27–32,34–35], with paternal and district variables appearing at similar frequencies (n = 8 each) [15,27–30,32–33,35]. Some dimensions of inequality and their constituent variables overlapped across studies, reflecting variations in how inequalities were conceptualized and classified. The full list of inequality dimensions was presented in Table 3.

The analyses used in the studies included in this scoping review were grouped into five categories. Multilevel logistic regression and multivariable logistic regression were the most frequently employed methods (n = 4 each) [17,30,32,35]. At the same time, other analytical approaches included ordered probit models, chi-square tests, and multivariable binomial regression (n = 1 each) [27,33–34]. Measures of inequality were predominantly regression-based odds ratios (n = 8) [17,28–32,34–35], whereas beta coefficients and prevalence ratios were each used in only one study [27,33]. Odds ratios represent a simple relative measure of inequality. However, none of the included studies employed complex inequality measures (e.g., concentration indices or slope indices of inequality) that could provide a more comprehensive assessment of the magnitude and distribution of inequalities across population subgroups [26].

Table 3. Dimensions of inequalities of childhood vaccine coverage in Indonesia (n = 10 studies)

Characteristics	Quantity
Individual (7 variables)	
Sex	6
Age	3
Birth order	4
Health insurance	2
Place of delivery	5
Immunization card	1
Professional birth attendance	2
Maternal (13 variables)	
Age	9
Education level	9
Marital status	2
Occupation	5
Employment	2
Number of antenatal care (ANC)	5
Postnatal care	2
Number of children	1
Wealth status	1
Exposure to media	3
Religion	1
Children's health book ownership	1
Tobacco use history	1
Paternal (5 variables)	
Age	2
Education level	5
Marital status	1
Occupation	5
Number of children	1
Household (11 variables)	
Household head's sex	1
Household income	1
Wealth index	7
Economic status (capita/poverty line)	1
Urban/rural	6
Health insurance	1
Number of children	1
Number of children under 5	1
Maternal healthcare decision-making	1
Child healthcare decision-making	1
Family size	1
District (5 variables)	
Geographic region	2
Province	1
Island	1
Proportion of primary health care (PHC)	1
Health service capacity	3

*Each study may include more than one dimension of inequalities

DISCUSSION

Evidence on landscape and gaps

The findings of this study provide insights into the current state of inequalities in childhood vaccination in Indonesia, as well as the volume and scope of existing research conducted over the last decade. Despite Indonesia's large child population and extensive

geographic diversity, which may severely predispose the country to health outcome disparities [36], the available research evidence on vaccination inequalities remains limited. By comparison, several other low- and middle-income countries have produced substantially more studies within a similar timeframe [16].

Patterns of vaccination inequalities

Household and parental characteristics were consistently associated with incomplete vaccination [11,25]. Most studies identified maternal education as one of the most frequently examined variables associated with child health outcomes [16,31,35]. However, findings differed regarding whether maternal or paternal factors exerted a greater influence on children's health [17,37,38]. A qualitative study in Banten province, Indonesia, showed that parental vaccine refusal due to religion, trust issues, and misinformation were prominent reasons for vaccine hesitancy among parents of unimmunized children [38]. Addressing this issue is critical to designing culturally appropriate vaccine-delivery interventions that aim to reduce parental resistance driven by sociocultural determinants of health.

Conceptual gaps using the PROGRESS-Plus framework

Synthesizing the evidence using the PROGRESS-Plus framework reveals the important gap in how inequalities are conceptualized and measured in Indonesia. Although PROGRESS-Plus is widely used to examine individual-level drivers of health inequalities [17], none of the included studies assessed childhood vaccination in relation to race, ethnicity, culture, or language. This represents a major gap in a country with substantial sociocultural diversity and may obscure key drivers of inequality.

Strengthening equity-focused, mixed-methods research could support a deeper examination of whether observed disparities are equitable or inequitable and inform more actionable, evidence-based policies [38,39]. Omitting sociocultural dimensions may limit the identification of disadvantaged subgroups and constrain the design of culturally tailored interventions, underscoring the need for closer collaboration between researchers and government institutions. Table 4 summarizes the PROGRESS-Plus dimensions assessed across included studies.

Implications for policy and practice

Drawing on patterns of inequality across socioeconomic, demographic, and geographic factors, the literature offers several policy recommendations to address these inequalities. First, to improve access and education by enhancing coordination between government, healthcare providers, and caregivers [36], increasing the number of healthcare centers in rural areas [15], and implementing public health education campaigns and engaging religious leaders to address vaccine hesitancy and misinformation [39]. Second, to address socio-economic barriers, focus policies that target disadvantaged populations [40], and provide public health interventions to parents with a high probability of having unvaccinated children [41]. Third, to mitigate the pandemic by strengthening strategies for the delivery of vaccination services during pandemics and other disruptions [42] and by promoting trust in healthcare systems through culturally sensitive public health campaigns [43].

Table 4. PROGRESS-Plus characteristics and their frequency of reporting (n = 10 studies)

Dimensions of Inequalities	Subcategories	Frequency of reporting
Place	Place of delivery	5
	Urban/rural	6
	Geographic region	2
	Province	1
	Island	1
Race, ethnicity, culture, and language	None	0
Occupation	Occupation	10
	Employment status	2
Gender/sex	Sex	7
Religion	Religion	1
Education	Education level	14
Socioeconomic status	Income	1
	Wealth status	1
	Economic status	1
	Wealth index	7
Social capital	Birth order	4
	Marital status	3
	Family size	1
	Number of children	3
Plus		
Age	Age	13
Disability	None	0
Immigration/citizenship status	None	0
Insurance status	Health insurance	3
Sexual orientation	None	0

*Each study may include more than one dimension of inequalities according to the PROGRESS-Plus Framework

While this review aimed to map the current evidence and characteristics of inequalities in childhood vaccination, we did not do critical appraisals of the included studies. In addition, most of the included studies employed cross-sectional designs, often based on single-year data, which limits the ability to infer causal relationships between social determinants and vaccination outcomes.

Limited heterogeneity was observed in the measurement and reporting of results, with most reporting only simple relative measures of inequality. None of the included studies reported complex

summary measures of inequality, which limits the ability to capture a more nuanced distribution of inequality. Moreover, the relatively small number of studies, limited variation in data sources, and restricted use of analytical methods and inequality measures may bias findings toward particular datasets. It may not fully capture the depth and complexity of vaccination inequalities in Indonesia.

Finally, the complete exclusion of qualitative research and several PROGRESS-Plus dimensions absent from the included literature may lead to an incomplete understanding of the drivers of inequality in the Indonesian context. Despite these limitations, this review provides a comprehensive overview of the available evidence and highlights critical gaps to inform future research and policy development.

CONCLUSION

This scoping review mapped the breadth and depth of existing evidence on inequalities in childhood vaccination in Indonesia. The dimensions of inequality most frequently examined were demographic (e.g., sex and age), socioeconomic (e.g., education, occupation, and social capital), and geographic factors. At the same time, characteristics related to race, ethnicity, culture, and language were notably absent. This gap limits the current evidence base's ability to fully explain how social determinants are associated with disparities in vaccination outcomes and how these determinants produce differential impacts across population subgroups.

A more comprehensive examination of demographic, socioeconomic, and geographic characteristics can help elucidate the micro-level mechanisms underlying unequal childhood vaccination outcomes. In turn, such evidence can inform understanding of meso- and macro-level factors that can be leveraged to reduce, and ultimately eliminate, these unfair structural conditions. Strengthening this evidence base is essential for developing equitable policies that ensure appropriate population-level interventions and resource allocation, thereby reducing social gradients in health and improving overall population health.

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Authors' contribution
B.D.P.: Conceptualization, Methodology, Visualization, Writing—original draft; J.H.H.: Validation, Visualization, Writing—original draft; F.N.: Writing—review & editing. All authors approved the final manuscript.

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Data availability
Data supporting this study are available from the corresponding author upon request.

Ethics statement
This scoping review does not require ethical approval.

Conflicts of interest
The authors declare no conflict of interest regarding the publication of this article.

Use of artificial intelligence (AI)
Parts of the manuscript were edited using AI-assisted tools to improve grammar and clarity. All AI-assisted content was reviewed and validated by all authors. We take full responsibility for the final manuscript.

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