Anti-Vaccine Movement and its Implications for Vaccination Coverage of the Brazilian Population: A Scoping Review

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Keywords: movement against vaccination; vaccination coverage; public health; systematic review.

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ANTIVACCINEMOVEMENTANDITSIMPLICATIONSFORVACCINATIONCOVERAGEOFTHEBRAZILIANPOPULATIONASCOPINGREVIEW

Strictly as per the compliance and regulations of:

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Results: Thirty-seven publications were selected as sources of evidence. Similitude analysis showed that the theme of the anti-vaccine movement was addressed in a tangential and peripheral manner, and the analysis of the categories signaled that most publications do not have a direct relationship with the theme of the anti -vaccine movement, nor does it mention implications for the population's vaccination coverage implications, Brazilian and/or general.

Conclusion: The number of scientific publications on the anti -vaccine movement and its implications for vaccination coverage of the Brazilian population, from March 2001 to March 2022, is scarce and peripherally figured on publications selected as sources of evidence in the present scoping review.

Keywords: movement against vaccination; vaccination coverage; public health; systematic review.

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I. Introduction

The so-called "Anti-Vaccine Movement" gained strength from a fraudulent study published in The Lancet in 1998. In that article, physician Andrew Wakefield described that, after vaccination with the Triple Virus, an intestinal inflammatory condition would occur that would make the individual susceptible to mercurial toxins, which would lead to autism. The fraud was exposed sometime later by the General Medical Council, but the theory had already gained supporters worldwide.[1]

Anti-vaccine movements are not recent and, as already mentioned, had their greatest demonstration over a century ago in Brazil, with similar episodes in different parts of the world such as England and the United States. Recently, worldwide cases of eradicated diseases have started to be reported. Like tetanus in children described in 2017 in Italy and the United States, generating in the latter an approximate cost of one million dollars spent on treatment, which could have been avoided with adequate vaccination, whose price revolves around thirty dollars.[2]

Failure to vaccinate has disastrous consequences[1] and is directly related to the concepts of vaccine hesitancy, vaccine refusal and the anti-vaccination movement itself,[3] which has resulted in a reduction in vaccine coverage in Brazil. For example, from 2015 to 2020, there was a reduction of 41.72%, and in 2018, seven of the eight mandatory vaccines for children did not reach their coverage target, with the exception of BCG (Bacillus Calmette-Guérin).[1]

According to Dubé *et al* (2014),[3] vaccine hesitancy consists of a heterogeneous group of individuals who demonstrate doubts about vaccination and therefore may delay, be reluctant, but still accept or refuse some or all vaccines. On the other hand, vaccine refusal, a term closely linked to the context, is related to the traditions, health and religion of a given population, and in low- and middle-income countries, it can be used to obtain other social services interventions that meet the needs of the community. The anti-vaccination movement, on the other hand, opposes any and all types of vaccination, including individuals who allocate

part of their time and resources to express, mainly through digital media, their position with regard to vaccines since this movement also has the aim to attract new fans. Still according to the authors, the participants call themselves defenders of freedom of choice in relation to getting vaccinated and the transparency of public information with an anti-vaccination rhetoric, addressing controversial issues to legitimize their decisions. With the assumption that if the subject is in high proportion in the media, there is greater generation of fear in the population, resulting in the decline of immunizations.

In the present scoping review, based on the assumption presented, our intention was to analyze the production on the anti-vaccination movement and its implications for vaccination coverage of the Brazilian population in the indexed scientific literature.

II. Methods

a) Search Strategy and Selection Criteria

The present systematic review was carried out in accordance with the guidelines of the Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR).[4] References included dates from March 2001 to March 2022 and were extracted from the electronic databases PubMed, Scopus, Web of Science, Embase, Lilacs/BVS and SciELO.

To guide the question and objective of the research, we used the acronym PCC (Population, Concept and Context),[5] in which "Population" referred to publications that addressed the theme of the "Anti-Vaccine Movement," "Concept" to the dynamics of the "Anti-vaccine Movement" and the vaccination coverage in the population and "Context" indicates the geographic delimitation in the subject of the retrieved records (Brazil). Based on the definition of the PCC, the following guiding question was established: Do the publications mention the implications of the anti-vaccination movement in the vaccination coverage of the Brazilian population?

The following keywords (a combination of MeSH and non-MeSH terms) were used: PubMed - (Anti-Vaccination Movement[Mesh] OR Anti-Vaccination Movement*[tiab] OR Anti-Vaccination Movement*[tiab] OR Anti-Vaccine Movement*[tiab] OR Vaccination Refusal[mesh] OR Vaccination Refusal*[tiab] OR Vaccination Refusal*[tiab] OR Vaccination Hesitancy[tiab] OR Vaccine hesitancy[tiab]) AND (Public Health[Mesh] OR Public Health[tiab]); Embase - exp ('anti-vaccination movement'/exp OR 'vaccination refusal'/exp OR 'anti-vaccination movement' OR 'vaccination refusal' OR 'vaccine refusal' OR 'vaccination hesitancy' OR 'vaccine hesitancy': ab,ti) AND ('public health'/exp OR 'public health': ab,ti); LILACS - (Tw:"Vaccination Movement" OR "Vaccination Refusal" OR "Anti-Vaccination Movement" OR "Vaccination Refusal" OR "Vaccine Hesitancy" OR "Anti-Vaccine Movements") AND (tw:"Single Health System" OR "public health" OR "Public health" OR "Unified Health System" OR "SUS" OR "international health" OR "national health" OR "collective health");SCIELO - (Tw:"Movement against Vaccination" OR "Refusal of Vaccination" OR "Anti-Vaccination Movement" OR "Vaccination Refusal" OR "Vaccine Hesitancy" OR "Anti-Vaccine Movements") AND (tw:"Single Health System" OR "public health" OR "Public health" OR "Unified Health System" OR "SUS" OR "international health" OR "national health" OR "collective health");SCOPUS - TITLE-ABS-KEY("Public Health" OR "Unified Health System") AND ("Anti-Vaccination Movement" OR "Anti-Vaccination Movements" OR "Antivaccination Movements" OR "Antivaccination Movement" OR "Anti-Vaccine Movement" OR "Anti-Vaccine Movements" OR "Vaccination Refusal" OR "Vaccination Refusals" OR "Vaccine Refusals" OR "Vaccine Refusal" OR "Vaccination Hesitancy" OR "Vaccine hesitancy" OR "refusal of vaccination"); Web of Science - TS=("Anti-Vaccination Movement" OR "Anti-Vaccination Movements" OR "Antivaccination Movements" OR "Antivaccination Movement" OR "Anti-Vaccine Movement" OR "Anti-Vaccine Movements" OR "Vaccination Refusal" OR"Vaccination Refusals" OR "Vaccine Refusals" OR "Vaccine Refusal" OR "Vaccination Hesitancy" OR "Vaccine hesitancy" OR "refusal of vaccination") AND TS=("Public Health" OR "Unified Health System").

As for the eligibility criteria, only scientific articles from primary studies were considered eligible to compose our sample. Searches were not carried out in gray literature sources - OpenGray, Catalog of annals of events - CIN/CNEN, theses and dissertations - BDTD and general sources such as Google Scholar, as well as possible non-indexed works. Studies in English, Spanish and Portuguese were accepted, and there was no time frame in the present study.

b) Data Extraction and Analysis

Using the eligibility criteria, titles, abstracts and full-text articles were screened by the following researchers: MDS; ADS; RFG; CTW. Training exercises were performed with the four evaluators for each screening level. Subsequently, they selected citations and full articles for inclusion, in pairs of independent work and blindly. Discrepancies between the four evaluators were resolved by consensus meeting and validation for the final insertions were performed by the fifth evaluator and SMD specialist. The Rayyan[6] software was also used as a tool, which consists of a web application developed by QCRI (Qatar Computing Research Institute), which was responsible for the process of screening articles and removing duplicates.

We entered all selected articles into a spreadsheet and extracted the following data: title of

publication, name of authors, title of journal, country of journal, original language of publication, year of publication, relation of publication to the theme of the anti-vaccine movement and vaccination coverage and, finally, whether the publication mentioned implications of the anti-vaccination movement on vaccination coverage of the Brazilian population and/or the general population. At the same time, we also built an excel spreadsheet with the summaries and conclusions from the studies selected as sources of evidence. Next, for data analysis, we categorized the publications included in the study according to the relationship with the theme (1- the publication has no direct relationship with the theme; 2- the publication has a partial relationship with the theme; 3- the publication presents direct relationship with the theme).

We also categorized the implications mentioned by the publications (1- the publication mentions implications in the vaccination coverage of the Brazilian population; 2- the publication mentions implications in the vaccination coverage of the general population; 3- the publication does not mention implications in the vaccination coverage of the Brazilian population and/or in general).

And finally, the file with the summaries and conclusions of the included studies were imported into the Iramuteq software,[7] through which the textual corpus analysis was carried out, specifically the similarity analysis, which is anchored in graph theory. Similarity analysis is defined mathematically as a probabilistic network represented by a graphic structure composed of relationships between words and their precepts. Each "node" in the graph represents a word, and the links between the nodes are the edges, which represent the probabilistic dependencies between the words (which, from a mathematical point of view are understood as variables).[8] Thus, it is possible to demonstrate the relational structures in the form of acyclic and directed graphs (DAG's), as well as their probabilistic dependencies between the words in the nodes,[9] from the co-occurrence (frequency of occurrence and co-occurrence), between the words.[10] The significance level was established at 5% in this analysis.

III. Results

Among the analyzed articles, 37 were included as sources of evidence (Figure 1).[3,11-46]
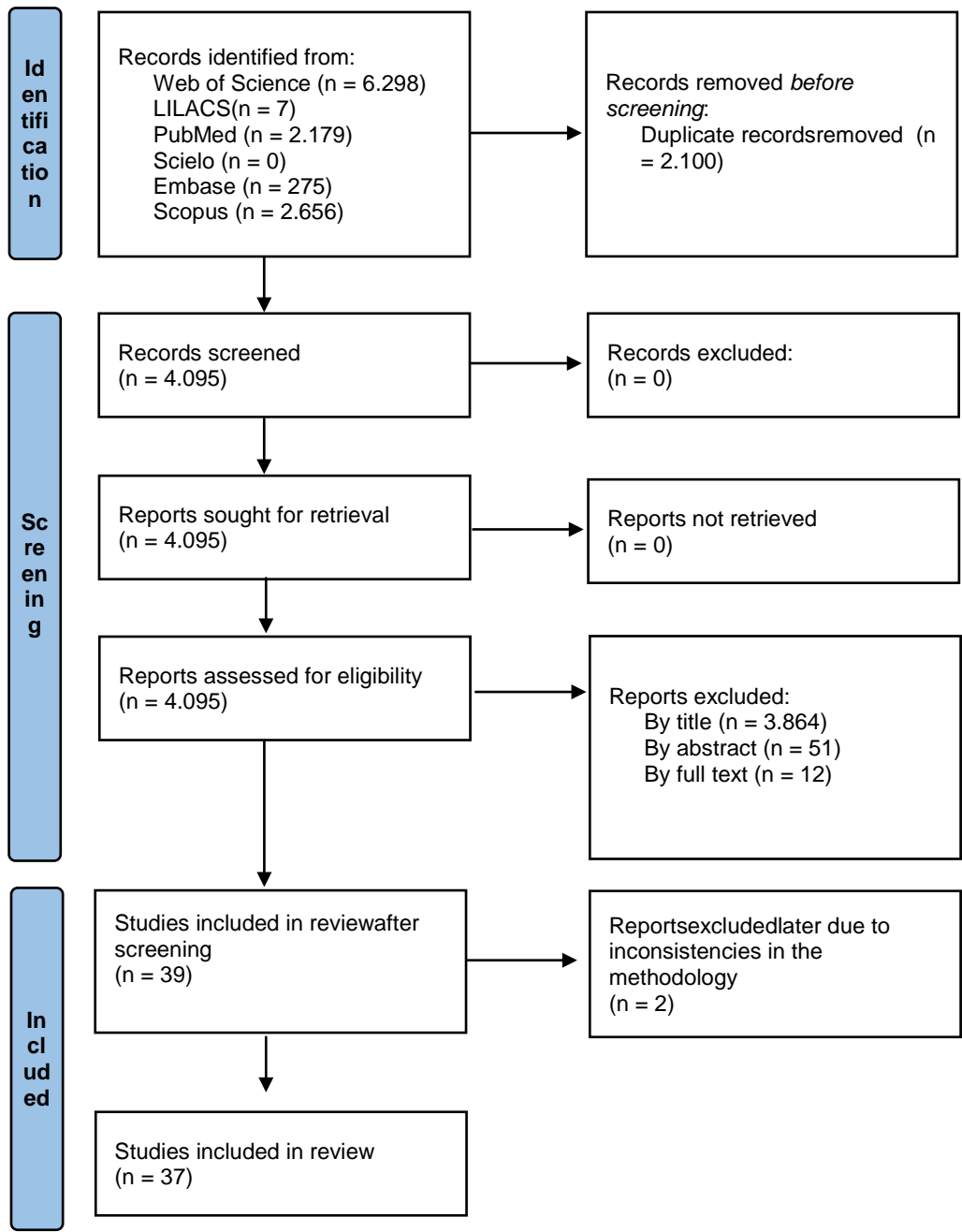
Figure 1: Flowchart demonstrating a selection process according to PRISMA-ScR guidelines.

We characterized the 37 publications regarding the following information: publication title; authors' names; journal title; journal country; original language of publication; and year of publication (Table 1).

Table 1: Synthesis of publications selected as sources of evidence in the PubMed, Scopus, Web of Science, Embase, Lilacs/BVS and SciELO electronic databases.

Publication Title	Authors Name	Journal Title	Country of the Journal	Original Language of Publication	Year of Publication
Understanding those who do not understand: a brief review of the anti-vaccine movement	Poland GA, Jacobson RM	Vaccine	USA	English	2001
Anti-vaccinationists past and present	Wolfe RM, Sharp LK	The BMJ	USA	English	2002
Anti-vaccine activists, Web 2.0, and the postmodern paradigm--an overview of tactics and tropes used online by the anti-vaccination movement	Kata A	Vaccine	Canada	English	2012
Parents' Refusal to Vaccinate Their Children: An Increasing Social Phenomenon Which Threatens Public Health	Barbacariu CL	Procedia - Social and Behavioral Sciences	Romania	English	2014
Vaccine hesitancy, vaccine refusal and the anti-vaccine movement: influence, impact and implications	Dubé E, Vivion M, MacDonaldNE	Expert review of vaccines	Canada	English	2015
Vaccine hesitancy: understanding better to address better	Kumar D, Chandra R, Mathur M, Samdariya S, Kapoor N	Israel Journal of Health Policy Research	India	English	2016
Mapping the anti-vaccination movement on Facebook	Smith N, Graham T	Information, Communication and Society	Australia	English	2017
What do popular YouTubeTM videos say about vaccines?	Basch CH, Zybert P, Reeves R, Basch CE	Child: Care, Health and Development	USA	English	2017
The psychological roots of anti-vaccination attitudes: A 24-nation investigation	Hornsey MJ, Harris EA, Fielding KS	American Psychological Association (APA)	Australia	English	2018
The Anti-vaccination Movement: A Regression in Modern Medicine	Hussain A, Ali S, Ahmed M, Hussain S	Cureus	Aruba	English	2018

Polarization of the vaccination debate on Facebook	Schmidt AL, Zollo F, Scala A, Betsch C, Quattrociocchi W	Vaccine	Italy	English	2018
What is the importance of vaccine hesitancy in the drop of vaccination coverage in Brazil?	Sato APS	Revista de Saude Publica	Brazil	English	2018
The Influence of Antivaccination Movements on the Re-emergence of Measles	Patricia CRN, Zulay JPY, Carlos RLJ, Alejandra CM, Cristina JSR, Josefina RV	J. Pure Appl. Microbiol.	Mexico	English	2019
The anti-vaccination debate and the microbiome: How paradigm shifts in the life sciences create new challenges for the vaccination debate	Guttinger S	EMBO Rep.	UK	English	2019
Temporal trends in anti-vaccinediscourse on Twitter	Gunaratne K, Comoes EA, Haghbayan H	Vaccine	Canada	English	2019
An analysis of pro-vaccine and anti-vaccine information on social networks and the internet: Visual and emotional patterns	Cuesta-Cambra U, Martínez-Martínez L, Niño-González JI	El profesional de la información	Spain	Spanish	2019
Analysis of the Anti-Vaccine Movement in Social Networks: A Systematic Review	Ortiz-Sánchez E, Velando-Soriano A,Pradas-Hernández L, Vargas-Román K, Gómez-Urquiza JL,Cañadas-De la Fuente GA e Albendín-García L	International Journal of Environmental Research and Public Health	Spain	English	2020
#Antivaccination on Instagram: A Computational Analysis of Hashtag Activism through Photos and Public Responses	Kim Y, Song D, Lee YJ	International Journal of Environmental Research and Public Health	Korea	English	2020
Parental autonomy in health and anti-vaccine movement conformation in the post-truth scenario	Borges GS, Cervi TD, Piaia TC	Revista Jurídica	Brazil	Portuguese	2020

'Should I vaccinate my child?' comparing the displayed stances of vaccine information retrieved from Google, Facebook and YouTube	ElkinLE, PullonSRH, Stubbe MH	Vaccine	New Zealand	English	2020
Fact vs Fallacy: The Anti-Vaccine Discussion Reloaded	Stolle LB, Nalamasu R, Pergolizzi Jr JV, Varrassi G, Magnusson P, LeQuang J, Breve F, The NEMA Research Group	Advances in therapy	USA	English	2020
Anti-vaccine movements - a form of social activity for health care, ignorance or diversion aimed at destabilizing the health situation? Part 1. Epidemiological safety. Vaccinations - pros and cons	Kołłątaj WP, Kołłątaj B, Panasiuk L, Sobieszczański J, Karwat ID	Annals of Agricultural and Environmental Health	Poland	English	2020
Anti-vaccine movements - health care, ignorance or a diversion aimed at destabilizing the health situation? Part 2. Contemporary conditions for the functioning and development of anti-vaccination movements	Kołłątaj BM, Kołłątaj WP, Karwat ID, Sobieszczański J, Panasiuk L	Annals of Agricultural and Environmental Health	Poland	English	2020
Characteristics of Antivaccine Messages on Social Media: Systematic Review	Wawrzuta D, Jaworski M, Gotlib J, Panczyk M	Journal of Medical Internet Research	Poland	English	2021
Covid-19, the anti-vaccine movement and immunization challenges in Brazil: a review	Bivar GCC, Aguiar MESC, Santos RVC, Cardoso PRG	Scientia Medica	Brazil	English	2021
Understanding Anti-Vaccination Attitudes in Social Media	Mitra T, Counts S, Pennebaker JW	Proceedings of the Tenth International AAAI Conference on Web and Social Media (ICWSM 2016)	Georgia	English	2021
Vaccine fake news: an analysis under the World Health Organization's 3Cs model	Frugoli AG, Prado RS, da Silva TMR, Matozinhos FP, Trapé CA, Lachtim SAF	Journal of School of Nursing – University of São Paulo	Brazil	English	2021

Vaccine Hesitancy, Acceptance, and Anti-Vaccination: Trends and Future Prospects for Public Health	Dubé È, Ward JK, Verger P, MacDonald NE	Annual Review of Public Health	Canada	English	2021
Vaccine hesitancy and anti-vaccination in the time of COVID-19: A Google Trends analysis	Pullan S, Dey M.	Vaccine	UK	English	2021
Identifying Vaccine Hesitant Communities on Twitter and their Geolocations: A Network Approach	Ruiz JB, Featherstone JD, Barnett GA	Proceedings of the 54th Hawaii International Conference on System Sciences	2021	USA	English	2021
Ecological model of health behavior as a methodology for reducing anti-vaccination trends	Braverman A	Wien Klin Wochenschr	USA	English	2021
"Brazil is still na huge hospital": Hygienist and Anti-vaccine Movements in Brazil - from the incipient Republic to the contemporary	Wermuth MAD, Nielsson JG, Tertuliano GC	Revista Academica Da Faculdade De Direito Do Recife	Brazil	English	2021
The Model of "Informed Refusal" for Vaccination: How to Fight against Anti-Vaccinationist Misinformation without Disregarding the Principle of Self-Determination	D'Errico S, Turillazzi E, Zanon M, Viola RV, Frati P, Fineschi V	Vaccines	Italy	English	2021
Pro-Vaxxers Get Out: Anti-Vaccination Advocates Influence Undecided First-Time, Pregnant, and New Mothers on Facebook	Bradshaw AS, Shelton SS, Wollney E, Treise D, Auguste K	Health communication	USA	English	2021
Multi-perspectives systematic review on the applications of sentiment analysis for vaccine hesitancy	Alamoodi AH, Zaidan BB, Al-Masawa M, Taresh SM, Noman S, Ahmaro IYY, Garfan S, Chen J, Ahmed MA, Zaidan AA, Albahri OS, Aickelin U, Thamir NN, Fadhil JA, Salahaldin A	Computers in Biology and Medicine	Malaysia	English	2021

Information, misinformation, disinformation, and Anti-vaccine movements: materiality of enunciationsin information regimes	Vignoli RG, Rabello R, de Almeida CC	Revista eletrônica de Biblioteconomia e Ciência Da informação	Brazil	Portuguese	2022
Faster than warp speed: early attention to COVD-19 by anti-vaccine groups on Facebook	Kalichman SC, Eaton LA, Earnshaw VA, Brousseau N.	Journal of Public Health	UK and US	English	2022

It was evident that the journals that published these articles have different scopes, such as vaccines, microbiology, medical sciences, social and behavioral sciences, law, health policies, environment and health, as well as health information and communication. Among the 37 publications, the journals come from the American, European and Asian continents, most of them located in the United States, Brazil and Canada. Additionally, the original language of the publications is mostly English (34 articles), with only 2 articles in Portuguese and 1 article in Spanish.

It is interesting to note that the publications ranged from 2001 to 2022, with only 2 articles in the period between 2000 and 2010, 21 articles in the period 2011 and 2020 and 14 articles in the period between 2021 and 2023.

As for the similarity analysis from the abstracts of the publications selected as sources of evidence (Figure 2), it was verified that there is a formation of a central nucleus that comprises the term "vaccine," and the division into four "branches of interest" that stand out in the graph which are identified with the terms: "vaccination," "public health", "information" and "anti-vaccination," the latter being divided into two branches with the terms "anti-vaccination movement" and "social."In the similarity analysis of the conclusions of these articles selected for the study (Figure 3), again the term "vaccine" appears as a central term and there are four branches of interest with strong connectors with the terms: "vaccination", "public health," "social" and "information."

Figure 2

Figure 3

When we analyzed the relationship between the central theme of the 37 publications and the "Anti-Vaccine Movement" (Figure 4A), it was possible to observe that 28 (75.7%) had no direct relationship, 2 (5.4%) had a partial relationship with the theme and only 7 (18.9%) have a direct relationship.

And when we analyzed the mentions of the 37 publications regarding the implications of the "Anti-vaccine Movement" in the vaccination coverage of the Brazilian population and/or in general (Figure 4B), it was possible to observe that only 5 (13.5%) mentioned implications in the vaccination coverage of the Brazilian population, 6 (16.2%) mentioned implications in the vaccination coverage of the general population and 26 (70.3%) did not mention implications in the vaccination coverage of the Brazilian population and/or in general.
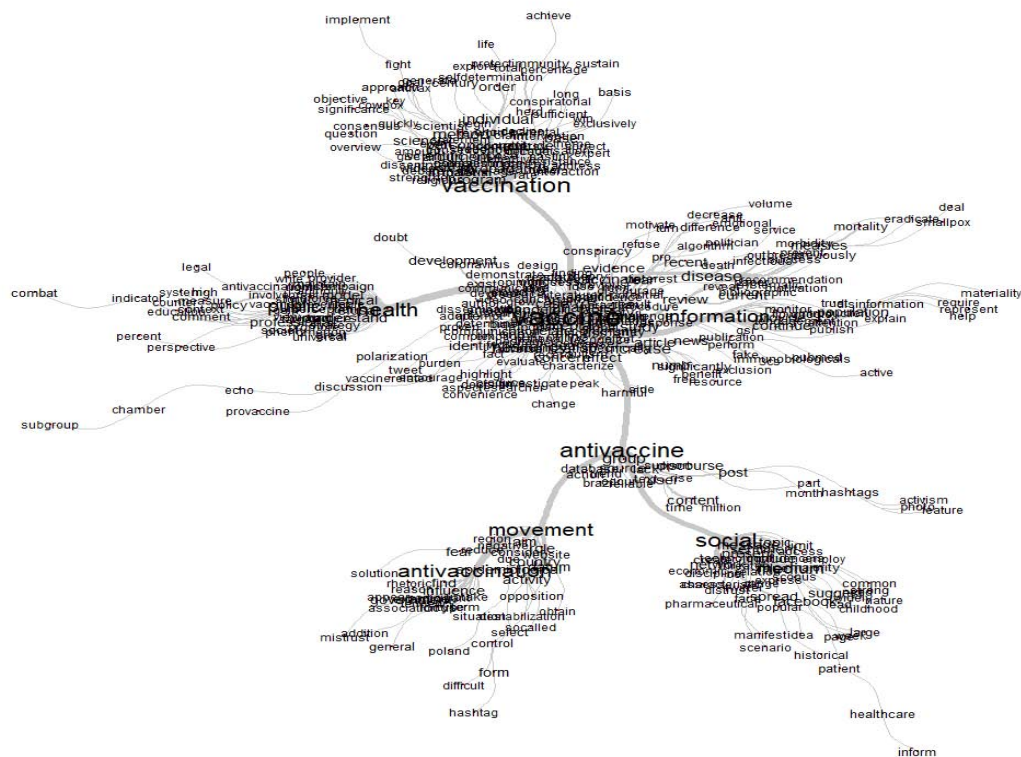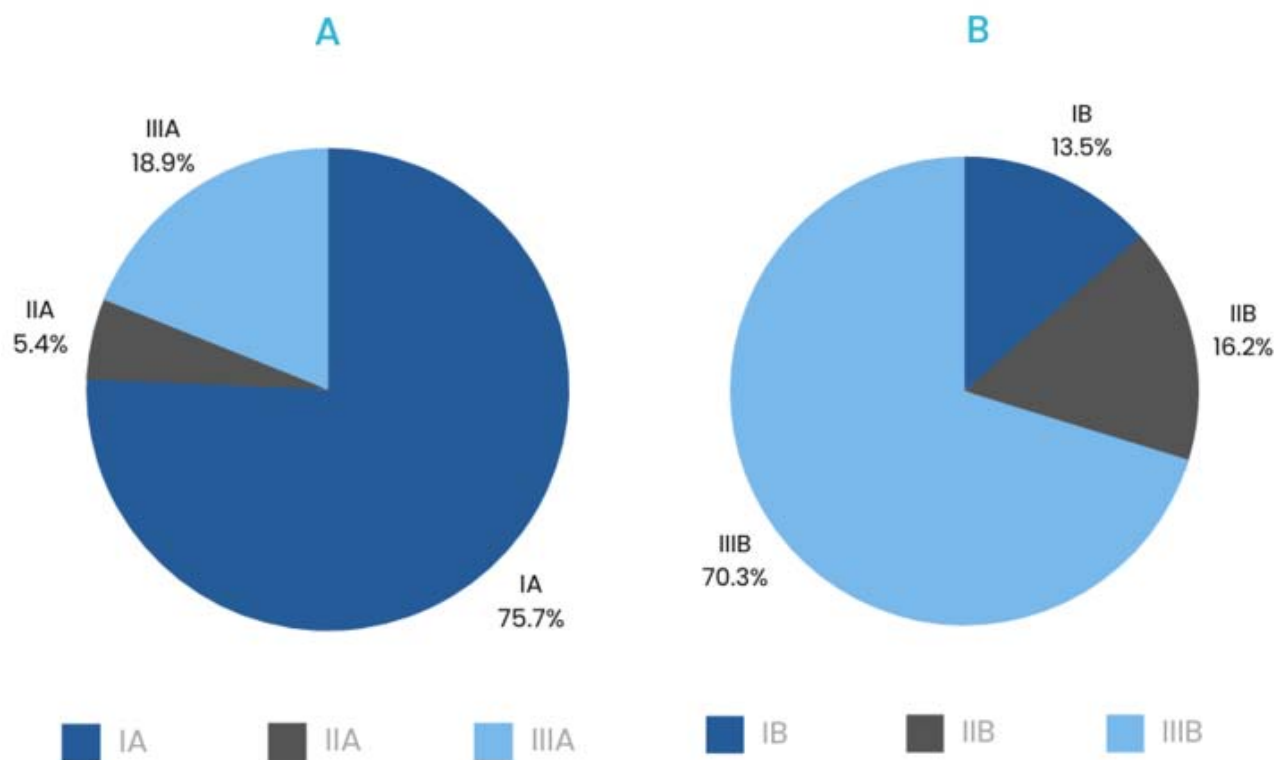
I-A: The publication is not directly related to the theme.
II-A: The publication is partially related to the theme.
III-A: The publication is directly related to the theme.
I-B: The publication mentions implications for vaccination coverage in the Brazilian population.
II-B: The publication mentions implications for vaccination coverage in the general population.
III-B: The publication does not mention implications for vaccination coverage in the Brazilian population and/or in general.

Figure 4: Graph with the number of publications and their relationship with the theme, in addition to mentions or not of implications for vaccination coverage in the Brazilian population and/or in general.

IV. DISCUSSION

The present scoping review sought to analyze the production on the anti-vaccination movement and its implications for vaccination coverage of the Brazilian population in the indexed scientific literature.

The 37 articles selected as sources of evidence made it possible to identify that, in the last two decades, there has been a significant increase in publications that address the theme of the "Anti-Vaccine Movement," going from 2 publications identified in the period from 2000 to 2010, increasing to 21 publications between 2011 and 2020 (ten times more), and between 2021 and 2023, already a number of 14 publications, which points to an increasing trend on the subject in the coming years.

From the similarity analysis carried out in the present study, it was possible to identify that the theme "vaccine" is a central theme in the publications, which is corroborated by the presence of the term in the center of the graphs of the abstracts and conclusions of the selected articles. The theme of the "anti-vaccination movement," despite the articles having become increasingly present and gaining greater attention,[31] is shown peripherally in our similarity graphs.This peripheral location of the "anti-vaccination movement" theme, as well as the absence of a direct relationship with the theme in most of the publications in our scoping review (28, 75.7%), indicates how this subject has been presented in the indexed scientific literature.

The publications selected as sources of evidence allowed us to perceive that there is a prevalence of use of the concepts of vaccine hesitation, vaccine refusal, with little mention of the term "Anti-Vaccine Movement" and the implications for vaccination coverage of the Brazilian population and/or in general.

The term "anti-vaccination movement" seems to be gaining more visibility in scientific research with the advent of social networks and, mainly, *"fake news,"* which since 2016 have contributed greatly to the reduction of vaccination coverage in the population. *Fake news* is considered false information disseminated irresponsibly and at high speed, mainly in digital media. For the elaboration of such news, there is a complete

absence of scientific information with respectable levels of evidence, being based on denialism that becomes more evident every moment.[47]

Such denial of science constitutes a major risk to Public Health, as demonstrated in the pandemic caused by Sars-CoV-2, in which empirical methods of prevention and treatment were passed on inconsequentially from individual to individual, evidencing the lack of respectand credibility to specialists and authorities in the area. *Fake news* circulates on the main social networks such as Facebook, Instagram, Twitter and Youtube, addressing a dangerous anti-vaccination discourse guided, by many, as the restriction of individual freedom being one of the consequences of vaccination.[48]

Digital media, as well as mass media, are important tools for disseminating news and information. Shapers of beliefs and popular opinions, they should be used as means by health and government authorities, aiming at carrying out health education with awareness plans accessible to the population.It is necessary to note that in the midst of the "information society" there is so much disinformation shared and taken as truth.[49]

V. Limitations

Systematic scoping reviews have some limitations, such as the possibility of bias in the selection of studies, since not all studies can be included. In addition, the quality and availability of studies can affect the results. It is also important to consider that scoping reviews may not provide a complete summary of the results, since they do not carry out statistical analysis of the data. Additionally, a limitation of great relevance related to our work is the fact that for the study of this theme we are more in the field of ideas and associated with social networks.

VI. Conclusion

The number of scientific publications on the anti-vaccination movement and its implications for vaccination coverage of the Brazilian population, from March 2001 to March 2022, is scarce and figures peripherally compared to the publications selected as sources of evidence in the present scoping review.

It is of great importance that new studies be carried out directly addressing this issue, clearly explaining the implications for the vaccination coverage of this population.

References Références Referencias

1. Beltrão RPL, Mouta AAN, Silva NS, Oliveira JEN, Beltrão IT, Beltrão CMF et al. Perigo do movimento antivacina: análise epidemio-literária do movimento antivacinação no Brasil. REAS [Internet]. 30abr.2020 [cited 2023 jan 17]; 12(6): e3088. Disponível em: https://acervomais.com.br/index.php/saude/article/view/3088 doi: https://doi.org/10.25248/reas.e3088.2020

2. Beltrão RPL, Mouta AAN, Silva NS, Oliveira JEN, Beltrão IT, Beltrão CMF et al. Perigo do movimento antivacina: análise epidemio-literária do movimento antivacinação no Brasil. REAS [Internet]. 30abr.2020; 12(6): e3088. Available from: https://acervomais.com.br/index.php/saude/article/view/3088 doi: https://doi.org/10.25248/reas.e3088.2020

3. Dubé E, Vivion M, MacDonald, NE."Vaccine hesitancy, vaccine refusal and the anti-vaccine movement: influence, impact and implications." Expert review of vaccines vol. 14,1 (2015): 99-117. doi:10.1586/14760584.2015.964212

4. Aromataris EMZ (ed.). JBI Manual for Evidence Synthesis. JBI, 2020 [cited 2023 jan 17]. Available from: https://synthesismanual.jbi.global. https://doi.org/10.46658/JBIMES-20-01.

5. Peters MDJ, GodfreyCM, KhalilH, McInerneyP, ParkerD, Soares CB. Guidance for conducting systematic scoping reviews. International journal of evidence-based healthcare, v. 13, n. 3, p. 141-146, 2015. Available from: https://journals.lww.com/ijebh/fulltext/2015/09000/guidance_for_conducting_systematic_scoping_reviews.5.aspx doi: 10.1097/XEB.0000000000000050

6. Ouzzani M, Hammady H, Fedorowicz Z, Elmagarmid A. Rayyan-a web andmobile app for systematic reviews. Syst Rev. 2016; 5(1): 210. doi: https://doi.org/10.1186/s13643-016-0384-4

7. Salviati ME. Manual do Aplicativo Iramuteq - versão 0.7 Alpha 2 e R Versão 3.2.3 [internet]. 2017 [cited 2023 jan 17]. Available from: http://iramuteq.org/documentation/fichiers/manual-do-aplicativo-iramuteq-par-maria-elisabeth-salviati

8. Ben-gal I. Bayesian Networks. In: RUGGERI, F.; FALTIN, F.; KENETT, R. Encyclopedia of statistics in quality & reliability, New Jersey: Wiley & Sons; 2007.

9. Knuppel S, Stang A. DAG program: identifying minimal sufficient adjustment sets. Epidemiology, v. 21, n.1, p.159, jan. 2010 [cited 2023 jan 17]. Available from: https://journals.lww.com/epidem/Fulltext/2010/01000/DAG_Program___Identifying_Minimal_Sufficient.29.aspx doi: 10.1097/EDE.0b013e3181c307ce

10. Lebart L, Salem A. Statistique textuelle. Paris: Dunod, 1994 [cited 2023 jan 17]. Available from: http://lexicometrica.univ-paris3.fr/livre/st94/st94-tdm.html

11. Poland GA, Jacobson M. Understanding those who do not understand: a brief review of the anti-vaccine movement. Vaccine, v. 19, n. 17-19, p. 2440–2445, mar. 2001.doi: 10.1016/s0264-410x(00)00469-2

12. Wolfe RM. Anti-vaccinationists past and present. BMJ, v. 325, n. 7361, p. 430–432, 24 ago. 2002.doi: 10.1136/bmj.325.7361.430

13. Kata A. Anti-vaccine activists, Web 2.0, and the postmodern paradigm – An overview of tactics and tropes used online by the anti-vaccination movement. Vaccine, v. 30, n. 25, p. 3778–3789, maio 2012.doi: 10.1016/j.vaccine.2011.11.112

14. Barbacariu CL. Parents' Refusal to Vaccinate their Children: An Increasing Social Phenomenon Which Threatens Public Health. Procedia - Social and Behavioral Sciences, v. 149, p. 84–91, set. 2014.doi: 10.1016/j.sbspro.2014.08.165

15. Kumar D. et al. Vaccine hesitancy: understanding better to address better. Israel Journal of Health Policy Research, v. 5, n. 1, 1 fev. 2016.doi: 10.1186/s13584-016-0062-y

16. Smith N, Graham T. Mapping the anti-vaccination movement on Facebook. Information, Communication & Society, v. 22, n. 9, p. 1–18, 27 dez. 2017.doi: 10.1080/1369118X.2017.1418406

17. Basch CH, Zybert P, Reeves R, Basch CE. What do popular YouTubeTM videos say about vaccines? Child: Care, Health and Development, v. 43, n. 4, p. 499–503, 19 jan. 2017.doi: 10.1111/cch.12442

18. Hornsey MJ, Harris EA, Fielding KS. The psychological roots of anti-vaccination attitudes: A 24-nation investigation. Health Psychology, v. 37, n. 4, p. 307–315, abr. 2018.doi: 10.1037/hea0000586

19. Hussain A, Ali S, Ahmed M, Hussain S The anti-vaccination movement: A regression in modern medicine. Cureus, v. 10, n. 7, 3 jul. 2018.doi: 10.7759/cureus.2919

20. Schmidt AL, Zollo F, Scala A, Betsch C, Quattrociocchi W. Polarization of the vaccination debate on Facebook. Vaccine, v. 36, n. 25, p. 3606–3612, jun. 2018.doi: 10.1016/j.vaccine.2018.05.040

21. Sato APS. What is the importance of vaccine hesitancy in the drop of vaccination coverage in Brazil? Revista de Saúde Pública, v. 52, p. 96–96, 22 nov. 2018. https://doi.org/10.11606/S1518-8787.2018052001199

22. Calderón RNP, Jerez Pacheco YZ, Ruvalcaba Ledezma JC, Chavarría MA, Jiménez Sánchez RC and Reynoso Vázquez J. The Influence of Antivaccination Movements on the Re-emergence of Measles, J Pure Appl Microbiol., 2019; Vol. 13(1): 127-132 doi: 10.22207/JPAM.13.1.13

23. Guttinger S. "The anti-vaccination debate and the microbiome: How paradigm shifts in the life sciences create new challenges for the vaccination debate." EMBO reports vol. 20,3 (2019): e47709. doi:10.15252/embr.201947709

24. Gunaratne K, Coomes EA, Haghbayan H. Temporal trends in anti-vaccine discourse on Twitter. Vaccine, v. 37, n. 35, p. 4867–4871, ago. 2019. doi: 10.1016/j.vaccine.2019.06.086

25. Cuesta-Cambra U, Martínez-Martínez L, Niño-González JI. An analysis of pro-vaccine and anti-vaccine information on social networks and the internet: Visual and emotional patterns. El Profesional de la Información, v. 28, n. 2, 25 mar. 2019.doi: https://doi.org/10.3145/epi.2019.mar.17

26. Ortiz-Sánchez E, Velando-Soriano A, Pradas-Hernández L, Vargas-Román K, Gómez-Urquiza JL, Cañadas-De la Fuente GA et al. Analysis of the Anti-Vaccine Movement in Social Networks: A Systematic Review. International Journal of Environmental Research and Public Health, v. 17, n. 15, p. 5394, 27 jul. 2020. doi: 10.3390/ijerph17155394

27. Kim Y, Song D, Lee YJ. #Antivaccination on Instagram: A Computational Analysis of Hashtag Activism through Photos and Public Responses. International Journal of Environmental Research and Public Health, v. 17, n. 20, p. 7550, 17 out. 2020.doi: 10.3390/ijerph17207550

28. Borges GS, Cervi TD, Piaia TC. Parental autonomy in health and anti-vaccine movement conformation in the post-truth scenario. Revista Juridica, v. 2, n. 59, p. 453–477, 12 abr. 2020. doi: http://dx.doi.org/10.26668/revistajur.2316-753X.v2i59.4100

29. Elkin LE, Pullon SRH, Stubbe MH. "Should I vaccinate my child?" comparing the displayed stances of vaccine information retrieved from Google, Facebook and YouTube. Vaccine - Volume 38, Issue 13, pp. 2771-2778. https://doi.org/10.1016/j.vaccine.2020.02.041

30. Stolle LB,Nalamasu R,Pergolizzi Jr JV,Varrassi G,Magnusson P,LeQuang J et al. Fact vs Fallacy: The Anti-Vaccine Discussion Reloaded. Advances in Therapy, v. 37, p. 1–10, 23 set. 2020. doi: 10.1007/s12325-020-01502-y

31. Kołłątaj WP, Kołłątaj B, Panasiuk L, Sobieszczański J, Karwat ID. Anti-vaccine movements – a form of social activity for health care, ignorance or diversion aimed at destabilizing the health situation? Part 1. Epidemiological safety. Vaccinations – pros and cons. Annals of Agricultural and Environmental Medicine, 31 ago. 2020.doi: 10.26444/aaem/126013

32. Kołłątaj BM, Kołłątaj WP, Karwat ID, Sobieszczański J, Panasiuk L. Anti-vaccine movements – health care, ignorance or a diversion aimed at destabilizing the health situation? Part 2. Contemporary conditions for the functioning and development of anti-vaccination movements. Annals of Agricultural

13

and Environmental Medicine, 26 ago. 2020.doi: 10.26444/aaem/126014

33. Wawrzuta D, Jaworski M,Gotlib J, Panczyk M. 1Characteristics of Antivaccine Messages on Social Media: Systematic Review. Journal of Medical Internet Research, v. 23, n. 6, p. e24564, 4 jun. 2021.doi: 10.2196/24564

34. Bivar GCC, Aguiar MESC, Santos RVC, Cardoso PRG.Covid-19, the anti-vaccine movement and immunization challenges in Brazil: a review.Scientia Medica Porto Alegre, v. 31, p. 1-8, jan.-dez. 2021. doi: https://doi.org/10.15448/1980-6108.2021. 1.39425

35. Mitra T, Counts S, Pennebaker J. Understanding Anti-Vaccination Attitudes in Social Media. ICWSM [Internet]. 2021Aug.4 [cited 2023Jul.24]; 10(1): 269-78. Available from: https://ojs.aaai.org/index.php/ ICWSM/article/view/14729
doi: https://doi.org/10.1609/icwsm.v10i1.14729

36. Frugoli AG, Prado RS, Silva TMR, Matozinhos FP, Trapé CA, Lachtim SAF. Vaccine fake news: an analysis under the World Health Organization's 3Cs model.Rev Esc Enferm USP. 2021; 55: e03736. https://doi.org/10.1590/S1980-220X2020028303736

37. Dubé È, Ward JK, Verger P, MacDonald NE. Vaccine Hesitancy, Acceptance, and Anti-Vaccination: Trends and Future Prospects for Public Health. Annual Review of Public Health, v. 42, n. 1, p. 175–191, 1 abr. 2021. https://doi.org/10.1146/ annurev-publhealth-090419-102240

38. Pullan S, Dey M. Vaccine Hesitancy and Anti-Vaccination in the Time of COVID-19: a Google Trends Analysis. Vaccine, v. 39, n. 14, mar. 2021. doi: 10.1016/j.vaccine.2021.03.019

39. Ruiz J, Featherstone JD, Barnett GA. Identifying Vaccine Hesitant Communities on Twitter and their Geolocations: A Network Approach. [s.l: s.n.].

40. Braverman, Ariel. "Ecological model of health behavior as a methodology for reducing anti-vaccination trends." Wiener klinische Wochenschrift vol. 133, 13-14 (2021): 721-723. doi: 10.1007/ s00508-021-01817-y

41. Wermuth MAD, Nielsson JG, Tertuliano GC. "Brazil is still an huge hospital": Hygienist and Anti-vaccine Movements in Brazil - from the incipient Republic to the contemporary. Revista Academica Da Faculdade De Direito Do Recife, p. 350–370, 2021.

42. D'errico S, Turillazzi E, Zanon M, Viola RV, Frati P, Fineschi V. The Model of "Informed Refusal" for Vaccination: How to Fight against Anti-Vaccinationist Misinformation without Disregarding the Principle of Self-Determination. Vaccines, v. 9, n. 2, p. 110, 1 fev. 2021. https://doi.org/10.3390/ vaccines9020110

43. BradshawAS, Shelton SS, Wollney E, Treise D, Auguste K. "Pro-Vaxxers Get Out: Anti-Vaccination Advocates Influence Undecided First-Time, Pregnant, and New Mothers on Facebook." Health communication vol. 36, 6 (2021): 693-702. doi:10.1080/10410236.2020.1712037

44. Alamoodi AH, Zaidan BB, Al-Masawa M,Taresh SM, Noman S, Ahmaro IYY et al. Multi-perspectives systematic review on the applications of sentiment analysis for vaccine hesitancy. Computers in Biology and Medicine, v. 139, p. 104957, 1 dez. 2021.doi: 10.1016/j.compbiomed.2021.104957

45. Vignoli RG, Rabello R.; de Almeida CC. Informação, Misinformação, Desinformação e movimentos antivacina: materialidade de enunciados em regimes de informação. Encontros Bibli: revista eletrônica de biblioteconomia e ciência da informação, v. 26, p. 01-31, 4 jan. 2021.doi: https://doi.org/10.5007/1518-2924.2021.e75576

46. Kalichman S, Eaton LA, Earnshaw VA, Brousseau N. "Faster than warp speed: early attention to COVD-19 by anti-vaccine groups on Facebook." Journal of public health (Oxford, England) vol. 44,1 (2022): e96-e105. doi:10.1093/pubmed/fdab093

47. Saraiva LJC,De Faria JF. ACiência e a Mídia: A propagação de Fake News e sua relação com o movimento anti-vacina no Brasil. Intercom – Sociedade Brasileira de Estudos Interdisciplinares da Comunicação. 42º Congresso Brasileiro de Ciências da Comunicação – Belém – PA, 2019. Disponível em: https://www.portalintercom. org.br/anais/nacional2019/resumos/R14-1653-1.pdf

48. Camargo Jr KR. Lá vamos nós outra vez: a reemergência do ativismo antivacina na Internet. Cad. Saúde Pública; 36 Sup 2:e00037620, 2020. doi: 10.1590/0102-311X00037620

49. Ferreira MV, Quadros A, Dellanhese APF,Fernandes MTC. Movimento antivacinação no Facebook®:uma análise crítica da disseminação de notícias falsas. Braz. J. of Develop., Curitiba, v. 6, n. 9, p.66669-66685, 2020.doi:10.34117/bjdv6n9-197