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Title	Trust Us—We Are the (COVID-19 Misinformation) Experts: A Critical Scoping Review of Expert Meanings of “Misinformation” in the Covid Era
Type	Article
URL	https://clock.uclan.ac.uk/32469/
DOI	https://doi.org/10.3390/covid4090101
Date	2024
Citation	Chaufan, Claudia, Hemsing, Natalie, Heredia, Camila and McDonald, Jennifer (2024) Trust Us—We Are the (COVID-19 Misinformation) Experts: A Critical Scoping Review of Expert Meanings of “Misinformation” in the Covid Era. COVID, 4 (9). pp. 1413-1439.
Creators	Chaufan, Claudia, Hemsing, Natalie, Heredia, Camila and McDonald, Jennifer

It is advisable to refer to the publisher’s version if you intend to cite from the work.
<https://doi.org/10.3390/covid4090101>

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Review

Trust Us—We Are the (COVID-19 Misinformation) Experts: A Critical Scoping Review of Expert Meanings of “Misinformation” in the Covid Era

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Abstract: Since the WHO declared COVID-19 a pandemic, prominent social actors and institutions have warned about the threat of misinformation, calling for policy action to address it. However, neither the premises underlying expert claims nor the standards to separate truth from falsehood have been appraised. We conducted a scoping review of the medical and social scientific literature, informed by a critical policy analysis approach, examining what this literature means by misinformation. We searched academic databases and refereed publications, selecting a total of 68 articles for review. Two researchers independently charted the data. Our most salient finding was that verifiability relied largely on the claims of epistemic authorities, albeit only those vetted by the establishment, to the exclusion of independent evidentiary standards or heterodox perspectives. Further, “epistemic authority” did not depend necessarily on subject matter expertise, but largely on a new type of “expertise”: in misinformation itself. Finally, policy solutions to the alleged threat that misinformation poses to democracy and human rights called for suppressing unverified information and debate unmanaged by establishment approved experts, in the name of protecting democracy and rights, contrary to democratic practice and respect for human rights. Notably, we identified no pockets of resistance to these dominant meanings and uses. We assessed the implications of our findings for democratic public policy, and for fundamental rights and freedoms.

Keywords: COVID-19; misinformation; disinformation; malinformation; infodemic; fake news; conspiracy theories; scoping reviews; critical policy studies; critical discourse analysis



Citation: Chaufan, C.; Hemsing, N.; Heredia, C.; McDonald, J. Trust Us—We Are the (COVID-19 Misinformation) Experts: A Critical Scoping Review of Expert Meanings of “Misinformation” in the Covid Era. *COVID* **2024**, *4*, 1413–1439. <https://doi.org/10.3390/covid4090101>

Academic Editors: Chiara Lorini, Mirko Duradoni, Andrea Guazzini, Guglielmo Bonaccorsi and Letizia Materassi

Received: 18 June 2024

Revised: 19 August 2024

Accepted: 28 August 2024

Published: 10 September 2024



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“Infodemic is a public health challenge that necessitates innovative solutions and preventive and holistic approaches. . . Beyond public health authorities, practitioners, researchers, and editors, it is a challenge to address for society as a whole”.

The Lancet Public Health, 2024

“If all mankind minus one, were of one opinion, and only one person were of the contrary opinion, mankind would be no more justified in silencing that one person, than he, if he had the power, would be justified in silencing mankind”.

John Stuart Mill, On Liberty, 1859

1. Introduction

Since the World Health Organization (WHO) announced to the world, in March 2020, that a new disease, COVID-19, had reached the status of pandemic [1], dominant institutions, groups, and individuals (hereafter “the establishment”) have voiced their concern about the existential threat posed by false or misleading information about it. By way of example, one month after the announcement, the WHO released a document, *Managing the COVID-19 Infodemic: A Call to Action*, stating that “the 2020 pandemic of Coronavirus disease [had] been accompanied by a massive ‘infodemic’”, and defined this newly coined

term as “too much information including false or misleading information in digital and physical environments during a disease outbreak” [2] (p. 1). This document was, shortly afterwards, followed by a United Nations (UN) report, *UN Guidance Note on Addressing and Countering COVID-19 Related Hate Speech*, warning the public that “derogatory, misogynistic, racist, xenophobic, Islamophobic or antisemitic language” was “closely linked [to] COVID-19 ‘disinformation’ or ‘misinformation’” [3] (p. 2) and, a few days later, by a tweet from the UN Secretary General Antonio Guterres, alerting about “a tsunami of misinformation, scapegoating and scaremongering”, referring to seemingly false or misleading information about COVID-19 [4].

The following years would witness an explosion of similar declarations. These included a 2021 press release from the Office of the US Surgeon General announcing the report *Confronting Health Misinformation: The U.S. Surgeon General’s Advisory on Building a Healthy Information Environment*, warning that “misinformation about masks and social distancing, treatments, and vaccines” was eroding the public’s trust in COVID policies, importantly, vaccination [5]. They also included a US Food and Drug Administration (FDA) tweet, “You’re not a horse. You are not a cow. Seriously, y’all. Stop it”, warning anyone considering or already consuming the antiparasitic drug ivermectin to treat or prevent Covid that the drug could be “dangerous and even lethal” unless its use complied with FDA guidelines [6].

At the time of this writing, warnings against this alleged threat continue unabated, as gleaned by the World Economic Forum (WEF) *Global Risks Report 2024*, warning that “misinformation and disinformation are the biggest short-term risks”, first of ten, and ahead of armed conflict (fifth), lack of economic opportunity (sixth), and pollution (tenth) [7]. A few months later, the prestigious medical journal *The Lancet* would remind readers that “Infodemic is a public health challenge that necessitates innovative solutions and preventive and holistic approaches. . . Beyond public health authorities, practitioners, researchers, and editors, it is a challenge to address for society as a whole” [8] (p. e345). However, neither the premises underlying these assertions, nor the standards used to separate truth from falsehood, have been appraised. There has also been scant interrogation, even by the usual critics of the establishment, for instance, in academia, of the premises underlying expert claims. This is problematic, because these standards are critical to guaranteeing the success of the policies required to address the perceived double threat of a “polluted information environment [and a] novel pandemic” [9]. It is also problematic because experts, in medicine and elsewhere, have often informed policy action that, in hindsight, turned out to be detrimental to health and wellbeing [10].

To help fill this gap, we conducted a critical scoping review of the expert literature in the medical and social sciences. Our goal was to identify, summarize, and appraise what this literature means by the family of concepts coalescing on the notion of “misinformation” as it applies to COVID-19. After this introduction, Section 2 offers a background of the etymology and use of the concept of misinformation generally and notes salient moments and voices in the public debate around its application, including but not limited to Covid. Section 3 describes the methods, Section 4 presents the findings, Section 5 discusses these findings, and Section 6 concludes our analysis and suggests implications for democratic policy, the integrity of scientific and medical research, and ethical public health practice. The study is part of a larger project examining geopolitics, medicalisation, and social control in the Covid era (<https://osf.io/84kbr/> (accessed on 15 December 2023)).

2. Background

2.1. A Brief History of the Concept of Misinformation and Its Use

The concept of misinformation is not new, although its application to health is recent. According to the Online Etymology Dictionary (OED), the idea of false or misleading information, as misinformation is defined, dates back to the 16th century [11]. For its part, the Wellcome Trust, a UK foundation, has reported that throughout the 17th century, accounts of whether demonic possessions were misinformation or not abounded, and drove

efforts to lure the populace towards or against political rulers [12]. In the 18th century, the printing press is said to have helped opponents of George II, then King of Great Britain and Ireland, to spread misinformation that, according to the BBC, subverted the king's attempt to be perceived as a strong leader, although he still managed to control the rebellion against him [13]. During the 19th century, the printing press also appears to have spread misinformation by, for example, misleading the public about the location of reporters of international news, such as a local staff writer from a conservative German outlet reporting "from London", yet never having "actually crossed the English Channel", a technique dubbed "the fake foreign correspondent's letter" [14]. Throughout the 20th century, the Western political establishment appears to have used misinformation to "legitimize the revival of the Cold War", by selectively communicating worsening health rates in the USSR to mislead the public into believing in a "general breakdown in the [Soviet] health care system as well as the failure of the Soviet form of socialism" [15] (p. 481).

Fast-forwarding to the 21st century, the notion of misinformation and its functional equivalents continues to be used in the context of international and national politics. For instance, a 2015 doctoral thesis by a US Naval School graduate argued that "disinformatzia", a kindred expression, was deployed by the USSR to support "anti-Western and specifically anti-U.S. sentiment across the globe", a strategy of political warfare that, according to the author, continues in Russia to this day [16] (p. 61). Another kindred expression, "fake news", has been proposed by major social institutions, political pundits, and mainstream media outlets to explain the unthinkable—at least according to these proponents—twin outcomes of the 2016 US presidential elections [17] and the exit of the United Kingdom from the European Union [18]. In an interesting turn of events, politicians such as Nigel Farage in the UK or Donald Trump in the USA have accused the outlets accusing them of spreading fake news of actually spreading fake news themselves, an unexpected twist that, as per these outlets, has allowed "real 'fake news' to get more attention, as people didn't know who to trust [which gets] very confusing!" [13].

In 2017, the *Collins Online Unabridged English Dictionary* announced that "fake news" was the "word of the year", and a year later, *Dictionary.com* declared "misinformation" as the "word of the year", with the Associated Press reporting that "linguist-in-residence" Jane Solomon explained that this was to serve as a "call to action" [...] in the battle against fake news, flat earthers and anti-vaxxers" [19]. Finally, in 2022, "disinformation" and "infodemic", also kindred terms, would officially enter the medical lexicon, when the National Library of Medicine (NLM) listed both as Medical Subject Headings (MeSH), along with "fake news" as an alternative entry term [20,21]. Since then, researchers, the authors of this review included, have been able to conduct systematic, rigorous, unbiased, and reproducible selections with these terms, much like they can with cancer, diabetes, or depression.

2.2. A Review of the Pan-Institutional Debate around Covid Misinformation

In addition to the selected voices described in the introduction calling for a global response against Covid misinformation early in 2020, a few others are worth highlighting, given their influence and prestige. They include expert voices in academia—academic medicine, public health, and the social sciences and the humanities—who are often partners in national security endeavors. One such salient contribution was a 2021 report from the Center for Health Security at the Johns Hopkins Bloomberg School of Public Health, warning that "health-related misinformation and disinformation" were undermining the Covid policy response and eroding trust in public health institutions through "contradictory messages" about "false medical cures", with lead public health author Tara Kirk calling for the establishment of "a multiagency *national security response* effort that prioritizes management of public health misinformation to prevent disinformation campaigns and educate the public on their use" (emphasis added) [22].

Notably, a "national security response" was already under way before Covid entered the global scene. In October 2019 the US Department of Homeland Security (DHS) had

convened an expert team from the intelligence sector, academia, and the private sector that, in a 28-page report, concluded that disinformation—misinformation spread with the intention to mislead—had become a “whole-of-society issue” since the 2016 US presidential elections [23] (p. 2). In a follow up report, the DHS elaborated that disinformation had exploded with the “unprecedented challenge of the COVID-19 pandemic”, and warned Americans that, “like a virus”, disinformation “infected consumers with contempt for democratic norms” [23] (p. 2). As part of an overall strategy to address this threat, the Cyber Security and Infrastructure Security Agency (CISA), a little-known body within the DHS, subsequently released an educational infographic, “*Disinformation Stops With You*”, which defined “disinformation” as “false or misleading information that [. . .] leads people to share [information] without first looking into the facts for themselves, polluting healthy conversations about the issues and increasing societal divisions” [24].

CISA further distinguished three types of problematic information, based on differences in the intentionality of the producers. These types included *misinformation*, i.e., inaccurate information albeit “not created or shared to cause harm”, *disinformation*, i.e., false or inaccurate information “deliberately created to mislead, harm, or manipulate”, and *malinformation*, i.e., information “based on fact, but used out of context to mislead, harm, or manipulate” [24]. Their differences notwithstanding, the three types would become the focus of CISA’s Mis-, Dis-, and Malinformation (MDM) specialised team, entrusted with developing policies to protect the public from “foreign and domestic threat actors [who] use MDM to cause chaos, confusion, and division”, capable of undermining “[US] democratic institutions and national cohesiveness” in electoral, and more recently, health matters [24].

Social scientists have also actively framed public debates around misinformation, both about international politics and Covid, with many scholars self-identifying as “misinformation experts”. For example, an article authored by a multidisciplinary team of social scientists reported strong links between misinformation spreaders and “anti-intellectualism”, which they operationalised as “distrust of experts and intellectuals”, belief in Covid “conspiracies”, and Covid “vaccine hesitancy” [25]. Likewise, a systematic review authored by another multidisciplinary team examined the “potential antecedents and consequences of Covid “conspiracy beliefs” and linked “less belief in science” and lower “adherence to physical distancing measures” with a belief in the said conspiracies [26] (p. 6). In a similar spirit, misinformation expert Claire Wardle, co-founder of *First Draft* and director of the Vaccine Confidence Project, both misinformation research initiatives, has declared that misinformation spreaders do not necessarily spread misinformation through “outright lies” but rather by, for example, posting “first person videos detailing side effects [of vaccines] that are difficult to factcheck” and can deceive a well-meaning, albeit credulous, public [27] (p. 2).

Finally, information scientists, a new field merging the social sciences with management, technology, engineering, natural sciences, computer sciences, physics, mathematics, and the humanities [28], have also led important efforts against misinformation. For example, Lee et al. from the Massachusetts Institute of Technology (MIT) explored how visualisations of data have become “a battleground” manipulated by “coronavirus sceptics on US social media”, particularly “antimaskers”, to demonstrate—incorrectly, according to the authors—that, by 2021, “the crisis was either being exaggerated or over” [29] (p. 1). Interestingly, the authors concluded that greater “media literacy” would not stop the spread of misinformation because many misinformation spreaders appeared to be extremely data-literate yet deployed their literacy to draw on “orthodox scientific methods to make unorthodox arguments, beyond the pale of the scientific establishment”, and valued “unmediated access to information [. . .], personal research and direct reading” over “expert interpretations”, a stance that, the authors implied, leads to false beliefs (ibid) (pp. 2, 11). This account, by necessity incomplete, should offer readers a sense of the scope and magnitude of the establishment’s concerns with the question of misinformation and of the need for a critical inquiry, thus prompting our research.

3. Materials and Methods

3.1. Term Definitions, Approaches, and Analytic Tools

Before describing our chosen approaches, clarifying our use of terms is in order. We have adopted MDM, the acronym coined by the DHS agency CISA mentioned earlier, to capture the broadest range of terms used to refer to false or misleading information, regardless of the intentionality. We only clarify which specific term is being used when quoting our sources or if needed to support an argument. Therefore, hereafter, when using MDM, we refer to misinformation, disinformation, malinformation, infodemics, fake news, or “conspiracy theories”. We include the latter because when misinformation experts use this term, they always assume that, at the very least, the information so labeled is false or misleading (see, for instance, [30,31]). Given our goal of conducting a scoping review from a critical perspective, we drew from Carol Bacchi’s critical policy analysis approach, “What is the problem represented to be?” (WPR), which invites researchers to reconstruct how salient societal issues, in our case MDM, become framed as “problems” requiring intervention [32]. The approach to social research known as “studying up”, which studies power at its sources, informed our choice of refereed medical and social scientific literature as the point of entry to expert meanings and uses of MDM [33]. As well, because three of four of the authors are trained in medicine, we relied heavily on epidemiology, immunology, and pathophysiology to evaluate our observations.

As to our choice of a scoping review approach, as Arksey and O’Malley noted in their seminal paper, scoping reviews can include a variety of research designs and data types, seek to answer questions able to map the phenomena of interest, and need not assess the methodological quality, as this assessment may be incompatible with the exploratory goal of a review [34,35]. These characteristics were well suited to our goal of probing the underlying knowledge claims [36] and going beyond what all too often is a mere “listing or catalogues of previous research” [37] (p. 159). We still chose to preserve the rigour and reproducibility of systematic data selection methods, using a specified combination of search terms, databases, identifiable leading publications, and so forth, and following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) checklist [38]. Finally, we registered the review at Open Science Frame (<https://osf.io/r8fgk> (accessed on 15 December 2023)) and published the protocol [39]. Because we relied solely on publicly available documents, no IRB approval was required.

3.2. Goal of the Review and Review Questions

Our goal was to identify and appraise the evidence for the multiple meanings and framings of Covid MDM in the expert (i.e., refereed medical and social scientific) literature. Informed by Carol Bacchi’s WPR approach, our review question was the following. What is the “problem” of MDM represented to be in the actual or proposed policies to address MDM? Ancillary questions included the following. What do expert voices mean by MDM? What assumptions underpin these expert meanings? What is said to drive MDM? Who is said to spread MDM, and how are the motives of MDM spreaders described? Who are framed as the victims of MDM and how are the reasons for their victimisation described? What are the effects of dominant representations of MDM on the subjects of policies informed by these representations?

3.3. Data Selection, Charting, and Analysis

To identify relevant *medical* literature, we drew from PubMed, an authoritative source of biomedical information hosted by the US National Library of Medicine, and from three medical journals, namely the *British Medical Journal (BMJ)*, *The Lancet*, and the *New England Journal of Medicine (NEJM)*, which are considered to be leading sources of biomedical information. The PubMed search was conducted on 3 May 2023, and the leading journals were searched on 17 May 2023. For PubMed, we selected articles in English retrieved with the MeSH terms “infodemic” OR “disinformation” AND “COVID-19”. The journals were

searched directly through their websites with their advanced search function, applying the following queries: ["misinformation" and "COVID-19"], ["infodemic" and "COVID-19"], and ["disinformation" and "COVID-19"], and limiting our selection to articles that included these terms in their titles or abstracts. Neither search had restrictions on the time, place, or type of publication.

To capture dominant meanings of MDM within the *social scientific* literature we drew from the journal *Social Science & Medicine* (SS&M), selected due to its prominent role in debates around social and ethical aspects of health, and the work of self-identified and socially recognised "misinformation experts". To identify relevant material from SS&M, on 20 June 2023, we retrieved articles directly from the journal's website with the search terms "COVID-19 AND [misinformation OR conspiracy OR disinformation OR infodemic NOT vaccine hesitancy]", limiting our selection to empirical studies. To identify relevant material from misinformation experts, in June 2023, we searched for publications authored by the directors or research directors of influential academic institutions (e.g., The Stanford Internet Observatory) explicitly involved, as per their mission statements, in MDM research [40]. We searched Google Scholar combining the names of directors or research directors in these centres or organisations with the keyword "COVID-19" and reviewing the first five pages of the search results for relevant articles. Two researchers independently screened all abstracts using Rayyan review software to track decisions. Disagreements were resolved by a third researcher (Figure A1 and Table A1 in the Appendix A).

Data from selected articles were charted by two researchers independently, using Dedoose analysis software, and subgroup comparisons were performed according to the data source (medical vs. social sciences), publication date (before/after the global vaccination campaign), and country location of the lead author. Charting categories were designed to address the main and ancillary research questions. The thematic analysis helped us to identify salient themes within each category [41]. In the next section, we present our narratively synthesised findings organised around these categories and illustrate the themes with selected quotations.

4. Results

Our combined searches of the medical sources identified a total of $n = 33$ articles for analysis. Our combined searches of the social sciences sources identified a total of $n = 35$ articles for analysis, for a grand total of $n = 68$ articles for all sources (Table A2). In the medical sources, the lead authors were affiliated with a university ($n = 21/33$, 63.64%), a medical journal (as either an editor, journalist, or correspondent) ($n = 6/33$, 18.18%), a health organisation ($n = 4/33$, 12.12%) (e.g., the World Health Organization, the American Medical Association), the United Nations ($n = 1/33$, 3.03%), or a technology developer for public health projects ($n = 1/33$, 3.03%). In contrast, among the social sciences sources, nearly all first authors were affiliated with a university ($n = 32/35$, 91.43%), while the remaining authors ($n = 3/35$, 8.57%) were affiliated with a public health organisation (e.g., WHO, CDC, Quebec Public Health). Among the medical sources, the country of the first author was predominantly the United States ($n = 11/33$, 33.33%), followed by the United Kingdom ($n = 5/33$, 15.15%), Canada ($n = 2/33$, 6.06%), Italy ($n = 2/33$, 6.06%), Colombia ($n = 2/33$, 6.06%), and Australia ($n = 2/33$, 6.06%). For the remaining medical sources, the countries of study associated with one ($n = 1/33$, 3.03%) first author included Spain, Sweden, the Netherlands, Switzerland, Ireland, Lebanon, Taiwan, India, and Nigeria. Among the social sciences sources, the first authors were most often located in the United States ($n = 21/35$, 60%), followed by the United Kingdom ($n = 4/35$, 11.43%), Canada ($n = 2/35$, 5.71%), Switzerland ($n = 2/35$, 5.71%), and Taiwan ($n = 2/35$, 5.71%). Finally, among the social sciences sources, the countries of study associated with just one first author ($n = 1/35$, 2.86%) included Portugal, Australia, Singapore, and Poland (Table A3).

Among the medical sources, over one-third of the first authors had expertise in medical sciences ($n = 12/33$, 36.36%), followed by public health/population health ($n = 6/33$, 18.18%), medical journalism ($n = 4/33$, 12.12%), health policy ($n = 3/33$, 9.09%), and psychol-

ogy (n = 2/33, 6.06%). Two articles were editorials (n = 2/33, 6.06%), with no first author affiliation. In addition, among the medical sources, there was one first author (n = 1/33, 3.03%) with expertise in each of computer science, communication, library/information sciences, and software development. Authors from the social sciences sources most often had expertise in psychology, (n = 8/35, 22.86%), followed by communications (n = 6/35, 17.14%), political science (n = 4/35, 11.43%), computer science/data science (n = 4/35, 11.43%), sociology (n = 3/35, 8.57%), and public health/population health (n = 3/35, 8.57%). Two first authors from the social sciences had expertise in health policy (n = 2/35, 5.71%) and in economics (n = 2/35, 5.71%). Finally, there was one first author (n = 1, 2.86%) with expertise in either law, anthropology, or international policy (Table A3).

4.1. Defining and Identifying MDM as a Policy Problem

The most salient theme across the body of data was that of establishment-approved experts as bearers of truth, meaning that knowledge claims should be accepted as true because “recognised epistemic authorities” asserted they were and that, conversely, knowledge claims were MDM if they challenged authority. While the term “epistemic authority” was not used in discussions around how to identify a knowledge claim as true or MDM, the authors implied that, in the words of one “misinformation/conspiracy theory” expert, “if the proper authorities say something is a (real) conspiracy, then it is true; if they say it is a conspiracy theory, then it is likely false” [31] (p. 236). In other words, MDM was whatever the experts, albeit only those approved by the establishment, asserted that MDM was. So, whether the source was medical [42,43] or social [44,45], upon offering dictionary definitions of MDM, the question then became who qualified as an “epistemic authority”.

Across the medical sources, “epistemic authority” meant peer-reviewed articles in high-ranking journals, medical scientists, or public health officials. Conversely, as one author put it, “treatments that contradict public health experts” were MDM [46] (p. 1), while others asserted that “information outside expert circles” was MDM [47] (p. 1). Social science sources added that MDM was to be determined by initiatives conducting MDM research, usually through private–public partnerships, to which social scientists were often affiliated. Additionally, within these sources, epistemic authority did not appear to require any subject matter expertise but rather expertise in an ostensibly new field of inquiry, “misinformation studies” [48]. So, for example, Lalani et al. noted the importance of identifying MDM by “fact checking” claims against social media monitoring initiatives such as the Virality Project [49]. Interestingly, this initiative, recommended as a provider of standards to separate MDM from true claims, does not conduct medical research to refute presumed medical MDM. Rather, it is a sort of “MDM think tank”, led by Di Resta, the only article author without a medical degree (unlike the other three), who was the research director of the (now defunct) Stanford Internet Observatory (SIO), “a cross-disciplinary program [...] for the study of abuse in current information technologies, with a focus on social media”, with the SIO itself being the founder of the Virality Project. Similarly, Brennen et al. explained that the “225 pieces of misinformation [they] analysed were sampled from...fact-checks gathered by *First Draft News*” which, similar to the Virality Project at Stanford University, is another “counter-disinformation research initiative” linked to elite academic institutions, including Brown University and, formerly, the Harvard Shorenstein Centre [50] (p. b2).

Additionally, several themes supported the belief that MDM was a major “policy problem”, such as the themes that MDM leads to confusion, scepticism, distrust in medical and public health authorities, and, importantly, to “science denialism” and functional equivalents that drove the choice of treatments of allegedly unproven efficacy and dubious safety, rejection of Covid vaccinations, and ultimately loss of life. So, for instance, medical sources described MDM as a barrier to ending the pandemic via the rejection of vaccination, thus costing lives [51,52]. Social sciences authors worried that MDM was “a vexing challenge that threatens public health” [49] (p. 1) by undermining compliance with public

health guidelines [44,53,54] and, by undermining trust in Covid vaccinations, exacerbated “vaccine hesitancy”, [55–57].

4.2. MDM: Drivers and Victims

While the proposed drivers of MDM were wide-ranging—including politicians, journalists, celebrities, scientists, and even the public—a salient theme across medical and social scientific sources was the role of social media as an enabler of rapid, unmediated, and insufficiently “fact checked” content. So, for example, medical sources argued that social media, via algorithms that strengthen shared narratives and foster polarisation, drove the creation of “echo chambers” where MDM was reproduced [58]. Other medical sources reinforced this sentiment, stating that “the emergence of media platforms that feature conspiratorial thinking and attract audiences prone to believe in conspiracies creates a media landscape suited to insulate them from counter-persuasion” [56] (p. 10). Similarly, social science sources noted that information can “quickly propagate to large and diverse audiences” [59] via social media operating as “amplification stations” that exposed users to Covid MDM [60]. Authors also argued that with “cumulative exposure to misinformation”, social media users were “likely to experience a reinforcement effect whereby familiarity leads to stronger belief” [53].

The theme of fear and uncertainty generated by the unrestricted sharing of information via social media was also suggested by medical sources as an important driver of MDM [61], resulting from the fact that during crises, the psychological needs of ordinary people “are unfulfilled, leading to frustration”, which, in turn, fuelled conspiratorial thinking [52]. Social science sources shared in the sentiment, adding that during such crises, conspiracy theories tend to become popular [53,62,63], especially as the “constant dissemination of sensationalist reports regarding [COVID-19]” through social media creates a “climate of fear. . . [that] has fostered the emergence of a wide range of COVID-19 conspiracy theories” [62] (pp. 1–2).

Another salient theme was the danger that “trusted figures”—political, religious, or scientific leaders—would themselves become MDM spreaders, a threat exacerbated when said actors used social media as their medium to confuse, mislead, and ultimately deceive [59,64]. Sources also proposed a range of motivations behind these actions, such as financial gain or sheer spite. So, for example, in one medical source, the authors stated that “spreading falsehoods can be lucrative [because] some people allegedly benefit from spreading conspiracy theories and selling coronavirus cures” [42] (p. 1), whereas disinformation experts claimed that MDM spreaders aimed to undermine “vaccination efforts [to] attack the reputation of [former Chief Medical Advisor on COVID-19 to the US President] Anthony Fauci” [65] (p. 1).

When the “bad actors” were politicians, multiple medical sources pointed to former President Donald Trump as “likely the largest driver of the COVID-19 infodemic” [52] (p. 2) by having “forced the [US Centers for Disease Control and Prevention] to water down its recommendations for testing, and [. . .] pressured officials to approve hydroxychloroquine for emergency use” [66] (p. 1), which was implied to be beyond the pale of scientific rationality. The sentiment was echoed by one social science source proposing that politicians often “adopt disinformation as an instrument for gaining support and reducing resistance” [64] (p. 1). Other times, it was physicians and scientists, albeit those on the “fringe”, who were framed as MDM spreaders. For example, experts from medical sources discussed a publication by a non-profit organisation, The Center for Countering Digital Hate, which reported to have identified 12 individuals, dubbed “The Disinformation Dozen”, who were responsible for 65% of antivaccine content related to Covid, with a few among them being physicians, albeit “rogue”, because, as per these sources, they embraced pseudoscience and opposed childhood vaccination [52].

The theme of vulnerable populations as more prone to believing, or easy prey of, MDM spreaders, was also pervasive across the data, with authors generally describing these populations as racialised, low-income, with low levels of health literacy, and generally

prone to distrusting the government and medical authorities because of past and often continuing experiences of discrimination. As such, experts from both medical and social scientific sources tended to attribute their distrust to a combination of personal and collective traits, both psychological and cultural. So, for example, medical sources identified Latinos as vulnerable to MDM because “they don’t trust scientific sources, doctors, and the government” [66] (p. 1). They also described a greater “mistrust of health workers and institutions” in countries such as India and Colombia because of a “wave of conspiracy theories” [67] (p. 2). For their part, social science sources explored the frames that people used to make sense of Covid and included “antivaxxer” and “Trumpian” as examples of identities within the “conspiracy” frame who were vulnerable to MDM [68].

Specifically concerning vaccination, social science sources proposed that “opposition to vaccines may transcend scientific evidence” because, according to these sources, in the last instance, this opposition was not based on empirical evidence but was rather “linked to [...] cultural, social or religious identity” [65] (p. 2). These sources also identified “people of color [as] targets for disinformation”, to be explained by “systemic discrimination leading to differences in scientific literacy” [44] (p. 4) as well as “economic, cultural, or historical factors”, such that these groups have “a different lived experience of health institutions, as well as [inequitable] access to information” [45] (p. 6). The joint effect of these factors was that, for instance, Blacks and Hispanics expressed greater “vaccination resistance” than other groups [57]. Regardless, the overall message was that what may have been a healthy, evidence-based distrust in other situations, became, with Covid, paradoxically, antievvidence, because it fuelled distrust of the highest form of evidence, i.e., the authorities’ assertions about Covid, and, importantly, vaccination, thus negatively impacting these populations’ personal, family, and community health, and exacerbating existing health inequities.

Yet another salient theme across the body of data was the framing of both the spreaders and victims of MDM as politically conservative individuals, meaning those who valued personal freedoms over the greater societal good and were therefore more likely to oppose public health recommendations, ostensibly designed to protect this good. So, for example, the paradigmatic political MDM spreader was taken to be former US president Donald Trump, while paradigmatic MDM victims were, as per medical sources, generally “right-wing” [52,63], or, as per social science sources, often “Trump supporters” [56,60,68], who were allegedly more biased than their liberal counterparts. Possible explanations offered for this phenomenon included, for example, that consumers of conservative media such as Fox News—who were, as per some sources, major MDM spreaders—were more likely to disseminate MDM due to these consumers’ continuing exposure to such media, which, in turn explained the “increasing overlap between the alt-right and vaccine opposition in the United States” [69] (p.3).

Finally, a salient theme was that of denial of science, with medical and social scientific sources using terms such as “antiscience”, “science denier”, “science denialism”, “antivaxx”, and “antivaccine” to describe both those who spread and those who believed in MDM. So, for example, medical sources referred to a “physician accused of promoting anti-science views” [70] or described “anti-science aggression” within and outside of medicine, and called for “combating anti-science” [71], referring to views that challenged the knowledge claims of “epistemic authorities”, as defined earlier. For their part, social science sources deployed expressions such as “anti-science sentiments” [68], “science denier,” [72], and “right-wing COVID deniers” who organised protests against lockdowns, social distancing, and mandatory masking, despite, according to the authors, the clear benefit of these measures [63]. Finally, the experts appeared especially concerned with “antivaxx” or “antivaccine” activists and movements, which were believed to produce and spread MDM. This was the case across multiple sources, both medical [42,43,47,61,71,73–79] and social scientific sources [55,68,72,80–83].

4.3. Policies to Address MDM

The themes of the loss of trust by the public in traditional institutions and of the pressing need for effective strategies that may help to recover that trust were central across sources. That said, while proposed solutions to the problem of MDM, in both the medical [73] and social sciences sources [60], included, for example, debunking MDM by exposing presumed falsehoods, or, again according to both medical [84,85] and social science [44,86] sources, increasing the health literacy of populations, success was seen as depending less on offering arguments or evidence to counter MDM than on managing public perceptions.

Success thus conceptualised by both medical [58,85] and social science [49,60] sources depended on a good grasp of group psychology and of the cultural and political dynamics of trust, which required initiatives and investments in the behavioural sciences and their partnering with government, educational institutions, and traditional and social media, in addition to a “sustained and coordinated effort by independent fact-checkers, independent news media, platform companies, and public authorities to help the public understand and navigate the pandemic” [50] (p. 8). Another trust-related theme was the need to recruit “trusted figures”—faith-based leaders, educators, influencers, and, importantly, health professionals—who were willing to express their support for Covid vaccination. So for example, a *Lancet* article reported that physicians “urgently need to develop systems to help guide patients through the tidal wave of COVID-19 information and misinformation [and provide] tips on how to spot credible and trustworthy sources” [78], whereas *Lancet* editor Dr. Richard Horton urged “trusted politicians from all political parties (and other public figures) to speak out in support of COVID-19 vaccine science”, “avoid the unwitting spread of misinformation”, and “never give any kind of platform to vaccine skeptics” (p. 1474).

In turn, social science sources stated that “efforts to engage the overall medical community to advocate for the efficacy and safety of vaccines will be an important strategy going forward”, also reporting the need for influencers, trusted speakers, community members, and good storytellers to be involved in mitigating MDM [45,57,87]. The authors also discussed the importance of presenting a consensus or a unified message, arguing that “people on average do not have the competencies to understand scientific thinking” and that disagreements among scientists “creates confusion” [45] (p. 7). Finally, a salient theme was the urgency of media platforms doing a better job of combating MDM. Recommended approaches varied along a “soft” to “hard” continuum. As per medical sources, soft measures might include the promotion of media literacy via “creative, regulated online media campaigns” [88] (p. 1). Hard measures ranged from adding warning signs to content of suspicious origins, to downranking sources of MDM to make them harder to find, and to deplatforming and demonetising MDM spreaders [82].

Regardless, several authors proposed that while social media were part of the problem of MDM, they could also be part of the solution. Thus, many medical (e.g., [75]) and social science sources (e.g., [53,57,80]) called upon social media and tech companies to be “more aggressive” and to limit, monitor, or remove “problematic COVID-19 vaccine information” from their platforms [57] (p. 11). For this to happen, sources noted, social media would have to not only expand the ostensibly classic role of democratising the flow of information but also to assume greater responsibility via content moderation and enforcement of disciplinary measures [75]. As such, social media companies were identified as having a key role to play, for example by applying fact checking labels and reconsidering “their algorithms to mitigate the spread of COVID-19 misinformation” [60] (p. 6).

Often, however, sources posited that measures engaging social media were insufficient, and argued that the legal system, in collaboration with organised medicine, had important roles to play in the global crusade against MDM, thus the pervasive theme across the literature of an urgent need to delegitimize, even criminalize, social media companies, politicians, and physicians involved in producing, spreading, or even not being committed enough to forcefully suppressing MDM. As such, medical sources suggested “legal actions”, for example, holding to account “prominent figures who have implied the pandemic is

a hoax” [46] (e.114), or offered as examples to emulate a California bill that would allow regulators to revoke the medical license of doctors found to disseminate MDM about “Covid vaccines and treatments” [52]. Similarly, *Lancet* editor Richard Horton called for lawmakers to “do more to regulate sources of misinformation, just as they have done for other threats to health, such as tobacco” [75] (p. 1474), and social media platforms such as Facebook and Twitter to “do more to police their networks and eliminate false information about a potential COVID-19 vaccine” [75]. Except for two misinformation experts, who warned that “governments have used the [...] alleged flood of [...] ‘fake news’” to pass laws that “curtail fundamental human rights, such as freedom of speech or press freedom” [89] (p. 3), most sources supported increased, coordinated, pan-institutional, and “bold” interventions against MDM, often including the suppression of those rights.

5. Discussion

Across the body of data, the theme that MDM involved claims that challenge the assertions of “recognised epistemic authorities”—recognised, that is, by the establishment—was salient, regardless of the source, institutional affiliation, timing in the crisis, or country location of the lead author. These authorities were also presented as agreeing on a “consensus” on Covid-relevant matters, with challenges to this consensus framed as existential threats to civilised society. We were unable to identify any evidentiary criteria—databases, government records, or documents retrieved through Freedom of Information Act (FOIA) requests—external to the assertions of the authorities and proposed as independent standards of verification that would help to separate truth from MDM. It followed from this assumption that individuals were “misinformed” not because of the substance of their beliefs—which the sources did not refute with independent evidence—but because these beliefs were at odds with those of a community of experts officially sanctioned to determine what counts as MDM [90]. Alternatives to this “consensus” (more on this point shortly) were framed not only as scientifically unfounded and morally wrong, but simply unimaginable.

Another notable finding supporting the experts’ authority was that in contrast to other fields, such as quantum physics, in which competing views abound and epistemic authority requires highly specialised training, epistemic authority in the field of Covid MDM did not appear to require that the said authorities demonstrate expertise on a relevant subject matter, such as immunology or even general medical sciences, to opine about how, for example, the immune system works. Indeed, it was unclear from the data what was the process whereby authority was bequeathed upon MDM experts, even if, undoubtedly, it was giving rise to specialised journals [91], generous research funding [92], and prestigious academic positions [93]. Instead, the overarching message was that the public should “trust the [COVID-19 misinformation] experts”, who would, in turn, sanction fact-checking initiatives that would determine which claims should be “pre-bunked”/“debunked” and which social actors were “science deniers”. This was the case even though, oftentimes, the “deniers” had highly specialised degrees and training in relevant scientific disciplines, the only relevant difference with the said experts being that their views were at odds not necessarily with science but with the scientific establishment.

The across-the-board pressure to conform to an alleged scientific consensus translated into calls to set boundaries, virtual and physical, to permissible cognitions, attitudes, behaviours, and discourse for the sake of protecting democracy and human rights. These rights were construed almost entirely as the rights of the collective to implement policies deemed by the establishment’s institutions and actors to promote the good of this collective. This was the case, regardless of whether the rights of the collective may trample those of minorities, the protection of whose rights has historically been considered critical to a functioning democracy [94]. While social media were framed as a problem and a space to be “managed”, they were also proposed as a solution, provided that the platforms “did more”, meaning that they engaged in *greater* suppression of heterodox information. Notably, several authors already participated in multiple, well-funded public–private partnerships

among academia, social media/tech companies, medical corporations, and government, partnerships, whose explicit goal was to monitor Covid messaging, suppress unorthodox information, and promote the alleged Covid consensus.

Take, for instance, the Virality Project mentioned earlier, a US-government supported “partnership” among Stanford University, New York University, and University of Washington researchers; tech companies; federal agencies; state-funded or independent non-profit organisations; and six social media platforms, described as “a global study aimed at understanding the disinformation dynamics specific to the COVID-19 crisis” that boasted a program on “democracy and the Internet” [95]. However, as critics have pointed out, the project has reduced democracy, by accelerating “the evolution of *digital censorship*, moving it from judging truth/untruth to a new, scarier model, openly *focused on political narrative at the expense of fact*” (Twitter Files Tweet, dates March 18, 2023) (emphasis added).

While a full examination of all the scientific evidence relevant to settling the question of what counts as Covid MDM is beyond the scope of this review, a few challenges to the presumed consensus are worth noting. These include the admission that Covid mortality among young adults in the pre-vaccine era was exceedingly low (under 0.02% or about 140 times lower than for adults 70 years and older [96,97]), hardly warranting the unprecedented policy response; that individuals with comorbidities or from disadvantaged social and economic backgrounds are, as has generally been the case with most health conditions, at a significantly higher risk of poor Covid outcomes [98–100]; and that Covid vaccines had, since the outset, failed to prevent infection or transmission [101], which removed any scientific rationale for mandated vaccination, ethics aside. This fact is unsurprising, since the major vaccine trials themselves did not include transmission (or hospitalisations or deaths) as clinical endpoints [102], an observation that was accessible to anyone willing to read the trials’ registration [103].

The alleged consensus has also been challenged by evidence that natural immunity is durable, comprehensive, and strong as compared with the faster-waning vaccine immunity [104–107]; that multiple safe and effective alternatives have been available all along when treatment was needed [108–111]; and that adverse events post-vaccination include serious illness and death [112–117]—not to mention major evidence for the negative social, emotional, and health impacts of the panoply of official Covid policies, such as enforced lockdowns, mass quarantining of healthy people, and mass masking, especially of children and youth [118–120], or the lack of scientific evidence for the much touted “6-foot-social distance” rule [121]. This brief and, of necessity, incomplete account should call into question claims that there is, or ever was, anything other than an “illusion of consensus” [122] (p. 1195), even though this consensus has been held as the sole standard against which knowledge claims should be assessed. Challenges to the consensus were, however, all but absent from the literature we reviewed.

Our study has limitations, including those of our data selection strategy and choices. For instance, our selection was limited to English, and other languages might have revealed views that our study failed to capture. However, a non-systematic examination of expert and official publications in Spanish conducted by the first author, a native Spanish speaker, revealed a similar preoccupation with the “problem” of COVID-19 MDM in the expert literature and among public health authorities in the Spanish-speaking world, and similar attempts to “manage” or “suppress” it. Our study was also interpretive, subject to personal and professional biases. However, this limitation is shared by all qualitative research, yet does not prevent this type of research from providing valuable insights to improve health practice and policy. Nevertheless, we have attempted to offset this and other limitations by providing a detailed and transparent account of our process, illustrated by quotations, supporting citations, and a detailed description of the articles selected for review, including the country and discipline of lead authors. This level of detail compellingly illustrates the extent to which the establishment’s framings of MDM dominate. Further, we did not attempt to engage the authors of the selected studies, which may have better explained the reasons behind their assumptions about MDM. To our knowledge, however, this

limitation is shared by most other scoping reviews, whose authors do not reach out to the authors of the works they themselves review to better understand them. Finally, other limitations include those related to our personal and disciplinary biases. However, we note that our collective disciplinary background includes the medical sciences, health policy, the social sciences, and the humanities, which is broad by usual standards. These limitations notwithstanding, we believe that our selection successfully captured leading and prestigious expert voices of the establishment, and that our analysis accurately represents the views we sought to document and appraise.

The question, however, remains, what explains the remarkable homogeneity of the dominant, expert message on the matter of MDM? We tentatively suggest that several material and ideological factors may have played a role. There exist substantial monetary and symbolic incentives, from private and public social actors and institutions, to support research that promotes the establishment's Covid narrative by, for instance, exploring factors contributing to "vaccine hesitancy" [123], promoting "vaccine confidence" [124], or examining the drivers of COVID-19 MDM [125]. Another is the virtual corporate co-optation of organised medicine, including clinical trials [126], medical journals [127], and practicing doctors themselves [128], conceptualised 50 years ago as a "medical industrial complex" [129] with notorious expertise in "selling sickness" [130]. Perhaps it is the generous funding of academia by social actors with vested interests in certain types of policies over others. Consider, for instance, the Bill & Melinda Gates Foundation award of \$11.6bn to fund 471 universities and higher education institutions in 66 countries over the past 10 years [131], and the public acknowledgement by Bill Gates that his "best investment [in vaccines] turned \$10 billion into \$200 billion worth of economic benefit" [132]. As well, the rise of the "corporate university" [133] may have persuaded experts, especially those with academic affiliations, that it is best to not engage in due epistemic diligence (i.e., competent and rigorous testing of knowledge claims and disputes) [134], perhaps understandably, *since their prestige and livelihoods depend on ignoring this diligence*.

We also suggest that the unwavering allegiance to an imagined consensus on the matter of COVID-19 science and policy may be another instance of "illiberal liberalism", a re-enactment of an old, elite fear of public opinion by a liberal, privileged class, overrepresented in academic circles [135] and premised on the self-serving assumption that ordinary people, unlike the "experts", lack the capacities of rational thought, free reasoning, and ethical behaviour, and must therefore be "nudged" towards the "correct" cognitions and actions (see, for instance, [136]). Perhaps our findings are an instance of the historically pervasive silencing of dissent in scholarly communication and circles [137], notably in vaccination research [138–140]. Or perhaps they provide evidence for an intriguing observation in research on meta-knowledge—knowledge about knowledge itself—namely, that experts are competent in recognising what they know, but are no different from non-experts in recognising what they do not know [141]. This trait may be exacerbated among experts in the new field of "misinformation expertise", who think of themselves as experts in identifying truth or falsity in *any* area of inquiry—an extremely ambitious undertaking, to be sure.

6. Conclusions

What, if any, are the implications of our findings for a democratic society that respects human rights, issues that allegedly concern misinformation experts? A few sociological mechanisms suggest that these are negative overall. Across the body of data, the expert discourse was reminiscent of that of "moral entrepreneurs", delivered in a tone of urgency as a rallying call to protect humanity from an "Other", in our case, a type of speech framed as an unprecedented threat to the social cohesion and control needed to maintain order in a modern, diverse, and evolving society [142]. And it is well documented that historically, "othering" has resulted in the stigmatisation of dissenters and, in the case of Covid policy, in the suppression of "inconvenient" data (epidemiological, clinical, and immunological) and of moral debate in support of a "state of exception", in which the

suspension of individual rights and freedoms is presented as the only (always temporary) road to collective salvation [143].

We conclude that, at a minimum, continuing efforts to identify, manage, or suppress MDM blunt much-needed democratic and open debate about matters of major social relevance in public health matters and beyond. They also impair open and socially useful scientific inquiry, and have chilling effects on normative academic principles, such as the pursuit of knowledge, the protection of freedom of expression, and the promotion of critical thinking among younger generations [144,145]. No less importantly, these efforts represent a grave threat to fundamental bioethical principles such as informed consent [146–148], violate the dignity of human beings by treating them as a contingent means towards ostensibly higher societal goals, and neglect the long history of policy interventions implemented “for our own good” [10] (p. 87) that, all too often, turned out to be morally repugnant. As long as the establishment vetted experts—or, rather, a cult of expertise [149]—dominate public discourse and policy practice, the loss of public trust that appears to preoccupy authorities as they attempt to regain this trust will be inevitable.

Author Contributions: C.C. conceptualised the project, designed the study, oversaw, and participated in every step of the research, and drafted the first version of the manuscript and subsequent ones as needed. N.H. assisted with the study’s design and led the initial article screening and selection process. N.H., C.H. and J.M. participated in data selection, charting, analysis, synthesis, and manuscript drafting. All authors have read and agreed to the published version of the manuscript.

Funding: This work was funded by a 2021 Social Sciences and Humanities Research Foundation (SSHRC) Grant (#435-2022-0959). The funders played no role in the study design, data collection and analysis, manuscript preparation, or decision to publish.

Data Availability Statement: The datasets presented in this article are publicly available refereed journal articles. They have been listed in Table A2.

Acknowledgments: C.C. thanks the many professional and lay organisations, students, trainees, friends, and loved ones that have afforded spaces of reflection and debate over the past years, especially Julian Field for his invaluable editorial feedback and support. N.H. thanks her family and friends for their ongoing encouragement and support, and C.C. for her mentorship. C.H. thanks her husband for his support and C.C. for the research opportunity. J.M. thanks her family and friends, and C.C. for her mentorship.

Conflicts of Interest: The authors have no conflicts of interest to declare.

Appendix A

Table A1. Data sources and search strategies.

Category	Sources	Search Terms	URLs
Medical sciences	PubMed <i>New England Journal of Medicine (NEJM)</i> , <i>British Medical Journal (BMJ)</i> , and <i>The Lancet</i>	MeSH major topic terms [“misinformation” OR “disinformation” OR “infodemic”], combined with [“COVID-19”]; [“misinformation” OR “disinformation” OR “infodemic”] in the abstract, title or keywords, combined with [“COVID-19”]	https://pubmed.ncbi.nlm.nih.gov/advanced/ https://www.nejm.org/ https://www.bmj.com/ https://www.thelancet.com/
Social sciences	<i>Social Science & Medicine</i>	“COVID AND [misinformation OR conspiracy OR disinformation OR infodemic NOT vaccine hesitancy]”	https://www.sciencedirect.com/journal/social-science-and-medicine
NGO MDM scholars	Search for articles authored by directors and/or research directors of key organisations identified through Schmidt et al. (2023) <i>Report on the Censorship–Industrial Complex: The Top 50 Organizations to Know</i>	Searching Google Scholar by combining the names of the directors/research directors with the keyword “COVID” and reviewing the first five pages of the search results for relevant peer-reviewed articles by scholars	https://judiciary.house.gov/sites/evo-subsites/republicans-judiciary.house.gov/files/evo-media-document/shellenberger-testimony.pdf

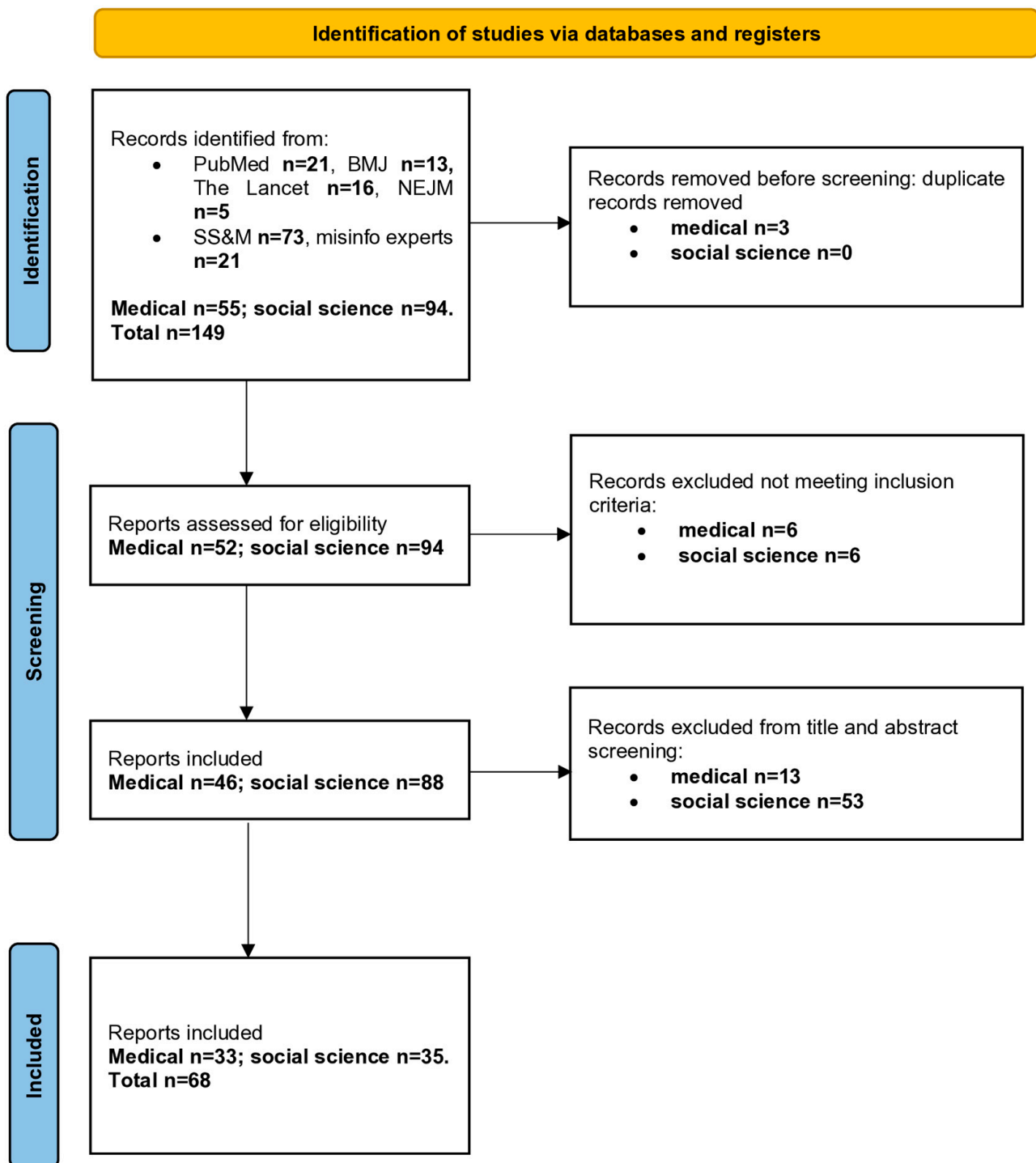


Figure A1. PRISMA flow chart. From: <https://www.prisma-statement.org/prisma-2020-flow-diagram> (accessed on 12 June 2021).

Table A2. List of articles and detailed descriptions.

Title	First Author's Last name	First Author's Affiliation	First Author's Area of Expertise	Date (Year)	Dataset	Country
Types, sources, and claims of COVID-19 misinformation	Brennen	University of Oxford	Communication	2020	Disinformation experts	UK
The causes and consequences of COVID-19 misperceptions: understanding the role of news and social media	Bridgman	McGill University	Political science	2020	Disinformation experts	Canada
How do you solve a problem like misinformation?	Calo	University of Washington	Law	2021	Disinformation experts	USA
Mis- and disinformation studies are too big to fail: six suggestions for the field's future	Camargo	University of Exeter	Computer science/data science	2022	Disinformation experts	UK
Dancing in the dark: disinformation researchers need more robust data and partnerships	DiResta	Stanford University	Computer science/data science	2021	Disinformation experts	USA
Social-media companies must flatten the curve of misinformation	Donovan	Harvard University	Sociology	2020	Disinformation experts	USA
Concrete recommendations for cutting through misinformation during the COVID-19 pandemic	Donovan	Harvard University	Sociology	2020	Disinformation experts	USA
The different forms of COVID-19 misinformation and their consequences	Enders	University of Louisville	Political science	2020	Disinformation experts	USA
The political economy of digital profiteering: communication resource mobilization by anti-vaccination actors	Herasimenka	University of Oxford	Political communication	2023	Disinformation experts	UK
The relation between media consumption and misinformation at the outset of the SARS-CoV-2 pandemic in the US	Jamieson	University of Pennsylvania	Communication	2020	Disinformation experts	USA
Not just conspiracy theories: vaccine opponents and proponents add to the COVID-19 'infodemic' on Twitter	Jamison	University of Maryland	Public health/population health	2020	Disinformation experts	USA
COVID-related misinformation on YouTube	Knuutila	University of Oxford	Anthropology	2020	Disinformation experts	UK
Addressing viral medical rumors and false or misleading information	Lalani	Harvard University	Health policy	2023	Disinformation experts	USA
Pandemics & propaganda: how Chinese state media creates and propagates CCP coronavirus narratives	Molter	Stanford University	International policy	2020	Disinformation experts	USA
Conspiratorial thinking as a precursor to opposition to COVID-19 vaccination in the US: a multi-year study from 2018 to 2021	Romer	University of Pennsylvania	Psychology	2022	Disinformation experts	USA
The role of conspiracy mindset in reducing support for child vaccination for COVID-19 in the United States	Romer	University of Pennsylvania	Psychology	2023	Disinformation experts	USA
Patterns of media use, strength of belief in COVID-19 conspiracy theories, and the prevention of COVID-19 from March to July 2020 in the United States: survey study	Romer	University of Pennsylvania	Psychology	2021	Disinformation experts	USA
Misinformation about vaccine safety and uptake of COVID-19 vaccines among adults and 5–11 year-olds in the United States	Romer	University of Pennsylvania	Psychology	2022	Disinformation experts	USA

Table A2. Cont.

Title	First Author's Last name	First Author's Affiliation	First Author's Area of Expertise	Date (Year)	Dataset	Country
WHO competency framework for health authorities and institutions to manage infodemics: its development and features	Rubinelli	World Health Organization	Health communication	2022	Disinformation experts	Switzerland
Misinformation, crisis, and public health—reviewing the literature	Starbird	University of Washington	Computer science/Data science	2020	Disinformation experts	USA
Measuring the burden of infodemics: summary of the methods and results of the fifth WHO infodemic management conference	Wilhelm	US Center for Disease Control and Prevention	Health communication	2023	Disinformation experts	USA
Political views, health literacy, and COVID-19 beliefs and behaviors: a moderated mediation model	Cameron	University of California	Psychology	2023	<i>Social Science & Medicine</i>	USA
What drives beliefs in COVID-19 conspiracy theories? The role of psychotic-like experiences and confinement-related factors	Ferreira	Polytechnic Institute of Porto	Health data science	2022	<i>Social Science & Medicine</i>	Portugal
Stigma and misconceptions in the time of the COVID-19 pandemic: a field experiment in India	Islam	Monash University	Economics	2021	<i>Social Science & Medicine</i>	Australia
Young people's media use and adherence to preventive measures in the 'infodemic': is it masked by political ideology?	Juvalta	Zurich University of Applied Science	Public health/population health	2023	<i>Social Science & Medicine</i>	Switzerland
A spectrum of (dis)belief: coronavirus frames in a rural midwestern town in the United States	Koon	Johns Hopkins University	Health policy	2021	<i>Social Science & Medicine</i>	USA
Stigma and blame related to COVID-19 pandemic: a case-study of editorial cartoons in Canada	Labbé	Institut National de Santé Publique du Québec	Public health/population health	2022	<i>Social Science & Medicine</i>	Canada
From pandemic to plandemic: examining the amplification and attenuation of COVID-19 misinformation on social media	Lee	Nanyang Technological University	Health communication	2023	<i>Social Science & Medicine</i>	Singapore
Government-sponsored disinformation and the severity of respiratory infection epidemics including COVID-19: a global analysis, 2001–2020	Lin	Academia Sinica	Sociology	2022	<i>Social Science & Medicine</i>	Taiwan
Dynamic relationships between different types of conspiracy theories about COVID-19 and protective behaviour: a four-wave panel study in Poland	Oleksy	University of Warsaw	Psychology	2021	<i>Social Science & Medicine</i>	Poland
Factors associated with contact tracing compliance among communities of color in the first year of the COVID-19 pandemic	Randall	University at Albany	Psychology	2023	<i>Social Science & Medicine</i>	USA
Conspirational thinking, selective exposure to conservative media, and response to COVID-19 in the US	Romer	University of Pennsylvania	Psychology	2021	<i>Social Science & Medicine</i>	USA
Heterogeneity in preventive behaviors during COVID-19: health risk, economic insecurity, and slanted information	Shin	University of Utah	Economics	2021	<i>Social Science & Medicine</i>	USA

Table A2. Cont.

Title	First Author's Last name	First Author's Affiliation	First Author's Area of Expertise	Date (Year)	Dataset	Country
Political ideology predicts preventative behaviors and infections amid COVID-19 in democracies	Tung	National Taiwan University	Political science	2022	<i>Social Science & Medicine</i>	Taiwan
When the influencer says jump! How influencer signaling affects engagement with COVID-19 misinformation	Wasike	University of Texas Rio Grande Valley	Communication	2022	<i>Social Science & Medicine</i>	USA
COVID-19, misinformation, and antimicrobial resistance	Arshad	Northwestern University	Medical sciences	2020	Medical journals	USA
Too much information, too little evidence: is waste in research fuelling the COVID-19 infodemic?	Casigliani	University of Pisa	Medical sciences	2020	Medical journals	Italy
Supporting healthcare workers to address misinformation on social media	Arora	University of Chicago	Medical sciences	2022	Medical journals	USA
COVID-19: the deadly threat of misinformation	Galvão	United Nations	Health Policy	2020	Medical journals	USA
Offline: managing the COVID-19 vaccine infodemic	Horton	<i>The Lancet</i>	Medical sciences	2020	Medical journals	UK
Correcting COVID-19 vaccine misinformation. <i>Lancet</i> commission on COVID-19 vaccines and therapeutics task force members	Hotez	Baylor College of Medicine	Medical sciences	2022	Medical journals	USA
Global public health security and justice for vaccines and therapeutics in the COVID-19 pandemic	Hotez	Baylor College of Medicine	Medical sciences	2021	Medical journals	USA
The Vaccine-hesitant moment	Larson	University of Washington	Public health/population health	2022	Medical journals	USA
Should spreading anti-vaccine misinformation be criminalised?	Mills	University of Oxford	Public health/population health	2021	Medical journals	UK
Public trust, misinformation and COVID-19 vaccination willingness in Latin America and the Caribbean: today's key challenges	Rodriguez-Morales	Fundación Universitaria Autónoma de las Américas	Medical sciences	2021	Medical journals	Colombia
The COVID-19 infodemic—applying the epidemiologic model to counter misinformation	Scales	Weill Cornell Medical College	Medical sciences	2021	Medical journals	USA
COVID-19: US government committee hears how social media spreads misinformation	Tanne	<i>BMJ</i> (New York correspondent)	Medical journalism	2021	Medical journals	USA
COVID-19 misinformation sparks threats and violence against doctors in Latin America	Taylor	<i>BMJ</i> (Bogotá correspondent)	Medical journalism	2020	Medical journals	Colombia
The COVID-19 lab leak hypothesis: did the media fall victim to a misinformation campaign?	Thacker	Investigative journalist, Madrid	Medical journalism	2021	Medical journals	Spain
The COVID-19 infodemic	<i>The Lancet Infectious Diseases</i>	London, UK	N/A, no author listed (editorial)	2020	Medical journals	UK
Going viral: misinformation in the time of COVID-19	<i>The Lancet Rheumatology</i>	London, UK	N/A, no author listed (editorial)	2021	Medical journals	UK
What social media told us in the time of COVID-19: a scoping review	Tsao	University of Waterloo	Public health/population health	2021	Medical journals	Canada
Inoculating against COVID-19 vaccine misinformation	Van der Linden	University of Cambridge	Psychology	2021	Medical journals	UK

Table A2. Cont.

Title	First Author's Last name	First Author's Affiliation	First Author's Area of Expertise	Date (Year)	Dataset	Country
Understanding and neutralising COVID-19 misinformation and disinformation	Wang	Bocconi University	Health policy	2022	Medical journals	Italy
Creating misinformation: how a headline in <i>The BMJ</i> about COVID-19 spread virally	Winters	Karolinska Institutet	Public health/population health	2020	Medical journals	Sweden
A media intervention applying debunking versus non-debunking content to combat vaccine misinformation in elderly in the Netherlands: a digital randomised trial	Yousuf	VU University Medical Center	Medical sciences	2021	Medical journals	Netherlands
Physicians' role in the COVID-19 infodemic: a reflection	Blankenship	University of Alabama at Birmingham	Medical sciences	2021	Medical PubMed	USA
Infodemics: a new challenge for public health	Briand	World Health Organization	Public health/population health	2021	Medical PubMed	Switzerland
An honorable and ongoing fight. Protecting organ transplant recipients against COVID-19 in the age of disinformation	Conway	American Association of Kidney Patients	Health policy	2022	Medical PubMed	USA
Conspiracy beliefs and vaccination intent for COVID-19 in an infodemic	Ghaddar	Observatory of Public Policies and Health	Public health/population health	2021	Medical PubMed	Lebanon
Debriefing works: successful retraction of misinformation following a fake news study	Greene	University College Dublin	Psychology	2023	Medical PubMed	Ireland
How vaccination rumours spread online: tracing the dissemination of information regarding adverse events of COVID-19 vaccines	Harper	University of Western Australia	Communication	2022	Medical PubMed	Australia
Strengthening scientific credibility against misinformation and disinformation: where do we stand now?	Jeng	National Taiwan University	Library and information sciences	2022	Medical PubMed	Taiwan
What contributes to COVID-19 online disinformation among Black Canadians: a qualitative study	Kemei	University of Alberta	Medical sciences	2023	Medical PubMed	Canada
COVID-19 misinformation and infodemic in rural Africa	Okereke	University of Ilorin	Medical sciences	2021	Medical PubMed	Nigeria
When physicians spread unscientific information about COVID-19	Rubin	American Medical Association	Medical journalism	2023	Medical PubMed	USA
Misinformation, believability, and vaccine acceptance over 40 countries: takeaways from the initial phase of the COVID-19 infodemic	Singh	Institute of Basic Science	Computer science/data science	2022	Medical PubMed	India
Pandemics, infodemics and health promotion	White	Reach Health Promotion Innovations	Software development	2022	Medical PubMed	Australia

Table A3. Articles' distribution by country, affiliation, and area of expertise.

Country	Medicine	Social Sciences	Total
USA	11	21	32
UK	5	4	9
Canada	2	2	4
Australia	2	1	3
Switzerland	1	2	3
Taiwan	1	2	3
Italy	2	0	2
Colombia	2	0	2
Spain	1	0	1
Sweden	1	0	1
Netherlands	1	0	1
Ireland	1	0	1
Lebanon	1	0	1
India	1	0	1
Nigeria	1	0	1
Portugal	0	1	1
Singapore	0	1	1
Poland	0	1	1
Affiliation	Medicine	Social sciences	Total
University	21	32	53
Health org.	4	3	7
Medical journal	6	0	6
United Nations	1	0	1
Tech developer	1	0	1
Area of expertise	Medicine	Social sciences	Total
Medical sciences	12	0	12
Public health/population health	6	3	9
Medical journalism	4	0	4
Health policy	3	2	5
Psychology	2	8	10
Computer Science/data science	1	4	5
N/A (editorials; did not name author(s))	2	0	2
Communications/health communication	1	6	7
Library and information sciences	1	0	1
Software development	1	0	1
Political science/political communication	0	4	4
Law	0	1	1
Sociology	0	3	3
Anthropology	0	1	1
International policy	0	1	1
Economics	0	2	2

Table A4. Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) checklist.

Section	Item	PRISMA-ScR Checklist Item	Reported on Page #
Title			
Title	1	Identify the report as a scoping review.	1
Abstract			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives	1
Introduction			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review's questions/objectives lend themselves to a scoping review approach	2–3
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review's questions and/or objectives	6
Methods			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a web address); and, if available, provide registration information, including the registration number	6
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status) and provide a rationale	6
Information sources	7	Describe all information sources in the search (e.g., databases, with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed	6–7
Search	8	Present the full electronic search strategy for at least one database, including any limits used, such that it could be repeated	18
Selection of sources of evidence	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review	7
Data charting process	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was carried out independently or in duplicate) and any processes for obtaining and confirming data from investigators	7
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made	5–6
Critical appraisal of individual sources of evidence	12	If carried out, provide a rationale for conducting a critical appraisal of the included sources of evidence; describe the methods used and how this information was used in any data synthesis (if appropriate)	5–6
Synthesis of the results	13	Describe the methods of handling and summarising the data that were charted	7
Results			
Selection of sources of evidence	14	Give numbers of the sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram	7
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted, and provide the citations	7
Critical appraisal within sources of evidence	16	If carried out, present data on the critical appraisal of the included sources of evidence (see Item 12)	
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review's questions and objectives	19–32
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review's questions and objectives	8–12
Discussion			
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review's questions and objectives, and consider the relevance to key groups	12–13
Limitations	20	Discuss the limitations of the scoping review process	14
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps	15
Funding			
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review	16

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