Review Article

Health Information Disorders Models: A Scoping Review

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Abstract

Background: The purpose of this scoping review is to identify the models of Health Information Disorders (HIDs), the components of these models, their study setting, and their designing approaches. **Materials and Methods:** In this study, PubMed, Web Of Science (WOS), Scopus, ProQuest, and Embase databases were searched to identify relevant articles. After screening the identified studies, 22 studies were selected. Data was extracted based on objectives and was combined and summarized by a narrative method. **Results:** The analysis of articles showed most of the included studies presented conceptual models or frameworks that provide a more structured and comprehensive view of a topic. The elements and components of the HID models were categorized into five main components, including information issues, communication issues, psychology issues, social issues and theories. Most studies employed, existing theories, evidence, or principles to design their approaches. The main setting of studies were COVID-19 and related topics such as vaccination. **Conclusions:** By synthesizing the HID models we tried to find the gap among types, components, designing approaches and setting of models. It seems we need some HID models based on contextual frameworks to understand deeply the way of being born, spread and death of HIDs in society. Also, future advancements in HID models should focus on other diseases rather than COVID-19 to provide a holistic approach in diverse healthcare landscapes.

Keywords: *Disinformation, health communication, misinformation, theoretical models*

Introduction

The evolution of the internet has revolutionized the way we access and consume information. The first generation of the web, Web1, was characterized by static websites, limited interactivity, and a passive role of the user as a mere consumer of information.[1] Web2, on the other hand, transformed the internet into a collaborative space for sharing and exchanging information.[1] With the advent of Web3, the web has become a decentralized and interconnected network, enabling new forms of value exchange and governance through blockchain technology.[1,2] The development of the internet and social media has changed the role of users from information passive consumers to active producers and disseminators of content.[3] This shift has caused information overload, where the managing of sheer volume of information available can be overwhelming and challenging.[4] The infobesity has further exacerbated this problem and has brought consequences such as information pollution and web surfing by people that make it difficult to discern reliable information from misinformation.

The dissemination of misinformation, especially in the realm of health and medicine, has become a growing concern, as it can have detrimental effects on public health[5] and could produce the different types of information disorders, such as fake news, conspiracy theories and propaganda. These information disorders can have severe consequences on public health, particularly during the pandemics.[6] Today, the media has long disseminated misleading stories for their shock value.[7] Researchers across the globe have raised concerns towards the information pollution from time to time, but the complexity and scale of information pollution in our digitally connected world presents an unprecedented challenge.[8] Distorting facts, manipulating information, sharing information without understanding the consequences, vilifying others' beliefs and faiths, and running behind propaganda and fake news with or without vested interest are some of the kinds of information disorder.[9] Some

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evidence states the pervasiveness of fake news in the pandemics. Moreover, the claim of a drug or vaccine being developed and advertised online could be false information to make money.[10] Studies on COVID-19 similarly found that misinformation was more frequently tweeted more than science-based evidence or public health recommendations.[11] However, the people still don't grow conscious of the need and importance of the ways fighting against information.[3] Wardle and Derakhshan[7] describe the differences between three types of information disorders: 1) Misinformation is when false information is shared, but no harm is meant; 2) disinformation is when false information is knowingly shared to cause harm; and 3) malinformation is when genuine information is shared to cause harm, often by.

Also, Baines and Elliot[12] present new scientific definitions of mis-, dis-, and malinformation based on the information system perspective (communication channel between senders and receivers) to face the unforeseen health crisis. Furthermore, the misinformation and disinformation triangle by Rubin[13] describes three interacting causal factors that contribute to the spread of information disorders and proposes three interventions to stop interaction between causes: automation, education, and regulation.

Given the dangers associated with misinformation and its impact on public health, there is a pressing need to better understand the phenomenon of information disorders, especially in the field of health and medicine. While there are several studies that have examined the causes and consequences of misinformation,[12,14] and some existing articles have provided some models for understanding and conceptualizing misinformation,[7,12,15-21] which can serve as a basis for further research; there are only few studies that have focused specifically on models of HIDs.[6,19] Therefore, the purpose of this scoping review is to identify the models of HID, the components of these models, their study setting, and their designing approaches. By conducting a comprehensive review of the literature, we aim to provide a systematic overview of the current state of knowledge regarding HID models. By identifying the components and designing approaches to existing models, this study will provide valuable insights into how to develop evidence-based interventions that can promote the dissemination of accurate and reliable health information. Ultimately, this will benefit a wide range of stakeholders, including the public, healthcare providers, health policymakers, and governments, by improving health outcomes and reducing the spread of different types of HID.

Material and Methods

The purpose of this scoping review was to explore the existing literature on HID models, the components of these models, their study setting, and their designing approaches in 2023. The review was conducted using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) framework.

We identified initial search terms on the basis of our experience and relevant publications. We used MeSH Browser, and CINAHL Thesaurus consensus to determine frequently occurring terms to include in the search strategy. Accordingly, we grouped search terms into three groups: 1) misinformation, misinformation, information disorder, fake news, disinformation, misleading information, false information, fake information, conspiracy theories, conspiracy belief, rumor, malinformation and misconception, 2) model, framework, paradigm, and pattern, 3) medical and health. According to the identified keywords, related studies were searched using the following strategy: model* OR framework* OR paradigm* OR pattern*) AND (misinformation OR mis-information OR "information disorder*" OR "fake news" OR disinformation OR dis-information OR "misleading information" OR "false information" OR "fake information" OR "Conspiracy Theor*" OR "Conspiracy belief*" OR rumor* OR rumour* OR malinformation OR malinformation OR misconception*) AND (medical OR health). We searched PubMed, Web of Science (WOS), Scopus, ProQuest, and Embase. Databases were searched in January 2023. We exported the retrieved references and, after de-duplication, performed the study selection process as described below. The inclusion criteria were: (1) all English language articles, (2) all original articles, (3) studies that provided models, framework, or patterns related to information disorders. Studies were excluded if they did not discuss or describe research objectives.

A total of 8483 records were retrieved by databases. We used EndNote for citation management. The results of each search were placed into separate folders, with subfolders for inclusion or exclusion. We then screened for duplicates. After the removal of duplicate records, records for 3420 unique items remained. After screening the original articles written in English language 2930 items remained. Then titles and abstracts were screened based on the objectives of the study and eligibility criteria, 424 sources remained. In the next step, the full text of articles was reviewed based on research objectives and 14 studies were selected to extract data. In the next step, by using the sources and references used in the obtained articles, the utmost effort was made to complete the search scope and 8 articles were added. Finally, 22 studies were included for analysis. One external checker did the resource selection independently, and disagreements were resolved by consensus.

For each included paper, we extracted available data on authors, year of publication, study country or setting, study design or method, study plan, study sample, type of models provided, components and elements of models, areas of health or disease, and the methods or stages of designing

those models. We narratively summarized extracted data in tabular form.

Ethical considerations

This study was approved by the Ethics Committee of Isfahan University of Medical Sciences (IUMS) with the ethics code IR.MUI.NUREMA.REC.1400.111 and the Academy of Medical Sciences of the Islamic Republic of Iran (AMSIRI) with ethics code IR.AMS.REC.1401.016. This review does not contain any studies with human participants, so informed consent was not required. The authors committed to avoiding duplicate publication and plagiarism. The results of the analysis were sincere. In this scoping review, the collected data were concerned only for scientific purposes, and reporting and publication were respected in intellectual property.

Results

The PRISMA flow diagram appears in Figure 1. The search in databases yielded 8,483 studies. After the removal of duplicates and non-English studies, we screened 424 titles and abstracts, resulting in the inclusion of 22 studies.

Study characteristics

The included studies were shown in Table 1. To sum up briefly, it can be said: eight studies were published in 2020, seven in 2021, five published in 2022, and two in 2019. Four studies concern various regions and countries and countries that cover all the WHO regions,[21-24] Seven studies were conducted in the United States,[14,25-30] three in China[30-32] two in Nigeria,[16,33] one in Pakistan,[34] England,[12] Iran,[15] Canada,[13] and Ukraine,[35] additionally two studies were conducted on internet users without mentioning specific area.[36,37]

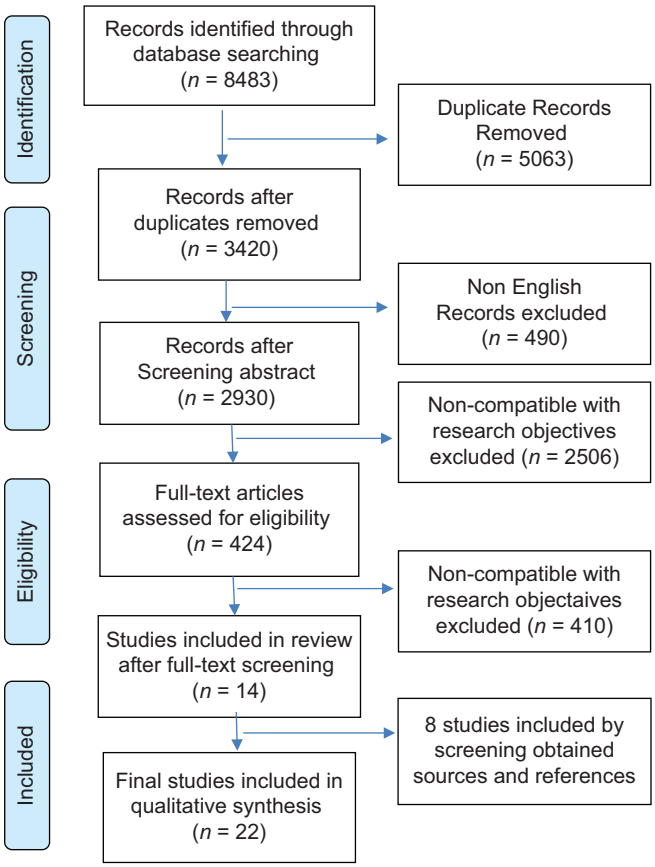

Figure 1: PRISMA flow diagram

Among the included studies, ten studies were qualitative, conducting data and content analysis often with in-depth interviews, ten studies were quantitative using surveys, and two studies were mixed methods. Regarding the participants and subjects, eleven studies conducted on social media such as tweets, posts, and messages (15, 16, 22, 24-26, 29, 31-33, 37), four on experts (managers, stakeholders, and healthcare professionals) (14, 21, 27, 35), two on existing literatures and experiences (12, 13), two on psychiatrists and psychologists (23, 28), two on public experiences (30, 36), and one on journalists (34).

Types of HID models

Table 2 shows the types of models of HID. The majority of the studies (12 studies) presented conceptual models, seven studies presented theoretical models or frameworks. Moreover, crossword ideas model, contextual framework, and moderated-mediation model are presented in the rest of the studies.

Components of HID models

Table 3 shows the components of HID models. The elements and components of the HID models are categorized into five main components, including information issues (5 subcomponents), communication issues (3 subcomponents), psychology issues (3 subcomponents), social issues (5 subcomponents), and theories (2 subcomponents).

Designing approaches of HID models

Table 4 shows the approaches of designing for HID models. We investigated the approaches of designing HID models in the included studies, but it rapidly became clear that most of the approaches were designed based on the proven models or theories introduced in the studies. In other words, most studies employed existing theories, evidence, or principles to design their approaches.

Settings of HID models

Table 5 shows the settings/diseases on which the HID models are developed based on. The majority of studies were conducted on COVID-19 and issues related to this disease such as vaccination.

Discussion

In this study, we analyzed 22 articles with models of information disorders. Most models were conceptual models or theoretical models, and there was a gap between contextual models. Notably, the preponderance

Table 1: Studies characteristics (Sorted by Year)

Row	Author	Year	Country	Study Type	Study Aim	Sample or Participants
1	Rubin	2019	Canada	Qualitative	Provide an interdisciplinary perspective on the current state of disinformation and misinformation in digital news	Literature from various fields, including library and information science, epidemiology, and communication studies
2	van der Meer & Jin	2020	USA	Quantitative	Examine the effect of corrective information on participants' beliefs, affective response, and behavioral intentions during a public health crisis	700 participants who were exposed to initial misinformation and then to corrective information type
3	Apuke & Omar	2020	Nigeria	Quantitative	Identifying the factors that affect online fake news sharing related to COVID-19	650 social media users
4	Baines & Elliott	2020	England	Qualitative	Provide a novel taxonomy and related model for defining mis-, dis-, and malinformation in the context of the COVID-19 infodemic	Synthesizes insights from information science, philosophy, media studies, and politics
5	Jamil & Appiah-Adjei	2020	Pakistan	Qualitative	Understanding the challenges faced by Pakistani journalists in providing accurate information about the COVID-19 pandemic	25 Pakistani journalists
6	Kim *et al*	2020	US, South Korea, and Singapore.	Quantitative	Effects of misinformation and information insufficiency on information seeking, avoidance, and processing in the context of the COVID-19 pandemic	2,942 respondents from the United States, Singapore, and South Korea who searched information about COVID-19
7	Ljunghol & Olah	2020	USA	Quantitative	Misinformation and reliable sources of information during the COVID-19 pandemic	3,600 responses of internet users
8	Ransing *et al*	2020	16 countries that cover all the WHO regions	Quantitative	Developing a conceptual framework that could guide the development, implementation, and evaluation of mental health interventions during the ongoing COVID-19 pandemic	Psychiatrists from six WHO regions who were invited to share information related to their country and the COVID-19 situation in each of their nations
9	Tangcharoensathien *et al*.	2020	111 countries	Qualitative	Managing the infodemic related to COVID-19 with aims to crowdsource ideas to form a novel COVID-19 infodemic response framework	Total of 594 ideas of plenary sessions organized by the WHO Information Network for Epidemics (EPI-WIN) focused on managing the infodemic related to COVID-19
10	Vraga & Bode	2020	USA	Qualitative	Challenge of defining "misinformation" in a consistent and coherent way	The ideas of US experts and evidences of the concept and definitions of misinformation
11	apuke& Omar	2021	Nigeria	Quantitative	The factors that predict fake news sharing, with a focus on the COVID-19 pandemic, using a survey research design	385 participants from Nigerian population
12	Bastani *et al*.	2021	Iran	Qualitative	Present a conceptual framework about the misinformation surrounding COVID-19 outbreak in Iran	5 WhatsApp and Telegram groups containing Iranian medical faculty members
13	Bautista *et al*.	2021	USA	Qualitative	Developing a conceptual model that demonstrates how healthcare professionals correct health misinformation on social media	30 US medical doctors (15 MDs) and registered nurses (15 RNs)
14	Bushuyev	2021	Ukraine	Mixed Method	Formulate a model of emotional behaviors of stakeholders of complex projects and programs in a crisis and in COVID-19 circumstances	Emotional state of stakeholders assessed in the Infodemic vs. Panicdemic vs. Pandemic model of COVID-19

Contd...

Table 1: Contd...

Row	Author	Year	Country	Study Type	Study Aim	Sample or Participants
15	Monkman *et al*.	2021	-Internet Users	Qualitative	Understanding the context of citizens' experiences with information during the COVID-19 pandemic	Citizens' experiences with information during the COVID-19 pandemic who use information provided by health authorities
16	Scannell *et al*.	2021	-Tweeter Users	Qualitative	Understanding the persuasion techniques used in Twitter posts about COVID-19 vaccines	1,000 Tweets related to COVID-19 vaccines
17	Van Bavel *et al*.	2021	USA	Qualitative	Providing an overview of the psychology involved in the belief and spread of misinformation	Assessing social network behaviors like YouTube and internet users regarding the area of political psychology, political polarization, and political disinformation
18	Borah *et al*.	2022	-USA	Quantitative	The role of incidental exposure to news on social media in shaping individuals' beliefs and misperceptions related to COVID-19	1,000 adults in the United States
19	Daradkeh	2022	Cover various locations, including Brazil, the USA, Iran, China, and Hong Kong	Quantitative	Analyzing topics and sentiments associated with COVID-19 vaccine misinformation in social media	40,359 tweets related to COVID-19 vaccination on social media
20	Liu *et al*.	2022	China	Quantitative	Underlying mechanisms of the relationship between official social media accounts and the infodemic, experienced during the first wave of COVID-19 in China	1398 citizens over the age of 18 years old in Mainland China
21	Yan *et al*.	2022	China	Quantitative	Discovering trustworthy sources of social media data to improve the prediction performance of severe and critical COVID-19 patients	1,076,174 items of social media data related to COVID-19
22	Zhao *et al*.	2022	China	Mixed Method	Proposing an elaboration likelihood model–based theoretical model to understand the persuasion process of COVID-19-related misinformation on social media	11,450 misinformation posts related to COVID-19 on the social media platform Weibo

Table 2: The types of models of HID*

Model	No. (References based on Table 1)
Conceptual Model or Framework	12 (1-4, 6-8, 12-14, 19, 21)
Theoretical Model or Framework	7 (5, 11, 15-17, 20, 22)
Crowdsource Ideas Framework	1 (9)
Contextual Framework	1 (10)
Moderated-mediation model	1 (18)

*Health Information Disorder

of conceptual models or frameworks in the reviewed studies suggests a prevailing interest in developing comprehensive and structured perspectives on HIDs aligns with other studies[22] mentioning the broader trend in health communication research, emphasizing the need for nuanced frameworks to understand the complexities of information dissemination. However, the presence of unique HID models like the Crowdsource Ideas Framework and moderated-mediation model highlights the field's ongoing evolution and the continual refinement of methodologies to capture the intricacies of HIDs.

Our study presents a comprehensive breakdown of the components within (HID) models, revealing the intricate factors that contribute to the understanding and dissemination of health-related information. The categorization of these components into five main domains: information issues, communication issues, psychology issues, social issues, and theories provides a structured lens through which researchers can explore the complex interplay of factors influencing health information. Comparing these findings with existing literature, a convergence is observed in the emphasis on information issues and communication issues across various studies.[38,39] The different identification of HID types and HID characteristics aligns with the study[12] suggesting misinformation as an umbrella term which is confusing and should be dropped from use. The issues

Table 3: The components of HID* models

Main Components	Components	Subcomponents	References based on Table 1
Information Issues	Information Disorders Type	Misinformation	1, 12, 22
		Disinformation	1
		(Un) intentionally False Information	1
		Fake News	1
		Objective Incorrect Information	6
		Made-up News	7
		Infodemic	20
	Information Characteristics	Information-overloaded	1
		Information Insufficiency	6
		Information Type	2
		Information Accessibility	7
		Type of the Corrective Information	2
		Producers of Information	4
		Consumers of Information	4
		Reliable Information	14
		Timely Information	14
		Complete Information	14
		Information Quality	20
		Medical Information	22
	Health Information Seeking Behavior (HISB)	Information Needs	3, 6
		Health Information Seeking	3, 6, 11, 15
		Information Avoidance	6, 7, 14
		Over Searching the Information	7
		Exposure to General Information	6
		Exposure to Misinformation	6, 14, 17
		Exposure to Incidental News	18
		over-exposure to Information	7
		Sufficiency Threshold	6
		Perceived Current Knowledge	6
		Health Literacy	20
	Information Evaluation	Authentication (Creator Authority)	2,13, 22
		Verifying the Truth	4, 14
		Verifying the Content	2, 5
		Verifying the Source	5, 7
		Fact-checking Process	5, 7, 17
		Scientific Evidence	6, 9, 10
		Source of the Corrective Information	2
		Information Quality Evaluation	20
		Participants' Perceptions (authoritative; timeliness; comprehensive; accessibility; usefulness)	20
		Expert Opinion	6, 10, 13
		Corrections of Health Misinformation	13
		Identifying Health Misinformation	13, 16, 19
		Strategies for Enhancing the Persuasiveness of Corrections	13
		Methods for Disseminating Corrections	13
	Dissemination of Information	Fake News Sharing	3, 11
		Information Sharing	7, 11, 17
		The Intention of Information Sharing (Including entertainment, altruism, socialization, pass time, …)	1, 2, 3, 4, 11, 12, 17, 19
		Action against Misinformation or Disinformation	7, 12
		Process of Misinformation Dissemination	12, 19
		Spread of too much Information	15
		Spread of Misinformation	17

Contd...

Table 3: Contd...

Main Components	Components	Subcomponents	References based on Table 1
		Negative Consequences of Misinformation Dissemination (Including Psychosocial, Health Status, Health System Economic, Ethical, …)	12
		information hazards (information underload, information overload, erroneous information, information scatter, and information conflict)	15
Communication Issues	General	Communications Channel	4
		Communications Platform	4
		Noise Source	4
		Information Management Flow	12
		Offline Network Size	18
	Media	Social Media	1, 7, 11, 12, 13, 20
		News Media	1, 2
		Toxic/complicit Platforms	1
		Online Media	1, 7
		Science journalism	5, 7
		News	1
		Representations	4
		Media effects	17
	Users	media literacy	18
		Frequently Used Social Media	11
		Time of Use Social Media	11
		Senders	4
		Receivers	4
		Gullible news readers	1
		Social media users	1
		Misinformation perceptions	18
		User subject cognition (information expression level, information content, and information utility level)	20
		Insensitivity to information	14
		Information processing	6
		Informational subjective norms	6
		Fake news knowledge as a moderator	3
		Experiences	15, 19
		IQ	20
	Content	User-generated content	1, 15, 22
		Messages	4
		Controversy in social media public and official sources	19
		Content feature	22
		Disturbing content	7
Psychology Issues	Individuals' Features	Individuals' Beliefs	2, 17
		Individual's Behaviors	6, 19
		Individual's Psychology Problems (fear, distress, anxiety, depression, sleep disorders and …)	8
		Individual Attitudes	5
		Situational Awareness	15
		Emotional State	2, 15, 17, 22
		Individual's Perception	6
		Perceived Severity	2, 19, 21
		Perceived Risk	6
		Perceived Susceptibility	19
		Perceived Benefits	19
		Perceived Barriers	19
		Cues to Action	19

Contd...

Table 3: Contd...

Main Components	Components	Subcomponents	References based on Table 1
		Preventive Actions	2
		Motivations	11, 17
		Feeling of satisfaction	14
		Self-efficacy	19
	Response Type	Thinking Styles	17
		Cognitive Response	2, 15, 17
		Cognitive Biases	17
		Affective Response	2, 6
		Creative Response	14
		Behavioral Response	2
		Emotional Response (optimistic, encouraged, and hopeful, fear, anxiety, confusion, hope, …)	2,6, 8, 14, 17
		Public Responses	19
Social Issues	Social Communication	Social Interaction	3
		Parasocial Interaction	3
		Interpersonal Interaction	15
		Social Networks	17
		Social Support (like information support, emotional support, and peer support)	20
		Social Influences level	3, 5
		Social Tie Strength	3
		Inadequate Communication	8
		International Communication	22
		Family and Friends	19
	Environmental and Cultural Status	Environmental and Institutional challenges (including political, social, cultural, legal, religious and other)	5, 19
		Cultural and Situational Differences	6
		Context	13, 19
		Social Identity	17
	Political Status	Political Context	17, 19
		Political Ideology	17
		Political Efficacy	18
		Partisan Bias	17
	Health Status	Number of Patients	21
		Spread of Epidemic	22
		Livelihood of People	22
	Demographic Features	Social Peer	2
		Education	3, 5, 6, 7, 11
		Gender	3, 5, 6, 7, 11, 13, 18
		Age	3, 5, 6, 7, 13, 18
		Residing City	6
		Geographic Region	6, 7
		Race/Ethnicity	7, 11
		Working Status	11, 13
Theories	Social-based	Uses and gratification theory (UGT)	3, 11
		Social networking sites (SNS) dependency theory	3
		Social impact theory	3
		Citizens' Mental Models	15
	Information-based	Information chaos framework	15
		Health Information Persuasion Exploration (HIPE) Framework	16
		Health Belief Model (HBM)	19

*HID: Health Information Disorders

related to psychology aimed to explain individual beliefs and responses to HID,[21,23,25,28,29] whereas information science issues presented in the models of included studies focus on the HID types[12-13] such as misinformation,

Table 4: The approaches of designing for HID* models

Model Type	Approach of Designing	References based on Table 1
Conceptual Model	Based on: Interdisciplinary model of epidemiology and the conceptual model of George McNew's disease triangle	1
	Based on: Three health crisis communication outcomes regarding individuals' beliefs, affective response, and behavioral intentions through experimental design (2 groups for corrective information type: simple rebuttal vs. factual elaboration) and (3 groups for corrective information source: government health agency vs. news media vs. social peer)	2
	Based on: Three theories: uses and gratification theory (UGT), social networking sites (SNS) dependency theory, and social impact theory through using structural equation modeling and Partial Least Squares (SEM/PLS)	3
	Based on: The scientific guide to concept formation in empirical sciences by Hempel (1952) for presenting a taxonomy of information types based upon the vocabulary of everyday language of empirical data from the COVID-19 infodemic with considering the role-play of communications platforms in the dissemination of information disorders based on Shannon and Weaver theory (1949)	4
	Based on: The Situational Theory of Problem Solving, the Planned Risk Information Seeking Model (PRISM), the Risk Information Seeking and Processing Model, and the Augmented Risk Information Seeking Model through hierarchical ordinary least squares regression with PROCESS macromodel 15	6
	Based on: Theoretical and empirical research using structural equation modeling and weight giving to items of interviews	7
	Based on: Three phases: preliminary assessment, development of an a priori conceptual framework, and mental health preparedness and action framework (MHPAF) and through modified Delphi method for finalization	8
	Based on: Online survey on social virtual networks (medical faculty members) through discourse analysis	12
	Based on: Two main stages authentication and correction model through interviews	13
	Based on: Analytical models of infection (SEIR model), infodemic model, Conceptual model reaction of the public immune system	14
	Based on: Latent Dirichlet allocation (LDA) a machine learning models to detect misinformation topic and a lexicon-based approach to analyze the sentiment orientation of misinformation, also health belief model (HBM) to interpret misinformation	19
	Based on: Hidden Markov model (HMM), actual patient consensus data, social media-perceived patient data, and social media-perceived public sentiment data. It consists of four steps: data preprocessing and acquisition of seed words, extraction and expansion of the feature dictionary of COVID-19 severe and critical patients, calculation of the number of perceived severe and critical patients and the output NPSCPt, calculation of sentiment polarity similarity and the output TSPIt and TSPISCt.	21
Theoretical Model	Based on: The various factors that affect news content through Hierarchy of Influences Model (Shoemaker & Reese, 2014)	5
	Based on: Uses and gratification perspective (Katz *et al*., 1974) through online survey using Structural Equation Model (SEM/PLS)	11
	Based on: Beasley's framework to and colleagues to characterize information hazards that primary care that in this study is adapted to describe citizens' experiences managing information	15
	Based on: The persuasion techniques used in Twitter posts (the Elaboration Likelihood Model (ELM), Social Judgment Theory, and the Extended Parallel Process Model (EPPM)) through Content Analysis	16
	Based on: Previous research and theoretical approaches about psychological factors of spreading of misinformation	17
	Based on: Previous studies through Partial Least Squares Structural Equation Modeling (PLS-SEM) and using Smart-PLS 3.3.7 software	20
	Based on: A data set of COVID-19 pandemic-related misinformation on three authoritative online platforms and a web crawler through content analysis	22
Crowdsource Ideas Framework	Based on: Brainstorming session with policymakers, public health professionals, researchers, students, and other concerned stakeholders through thematic analysis	9

Contd...

Table 4: Contd...

Model Type	Approach of Designing	References based on Table 1
Contextualizing Framework	Based on: Expertise consensus and evidence opinions about misinformation	10
Moderated-mediation model	Based on: A hypothesized moderated-mediation model using PROCESS macromodel 4 to examine the simple mediation model and model 7 to test the main relationships and the moderation effect of SPML on the main and the mediated relationships and also through confirmatory factor analysis	18

*HID: Health Information Disorder

Table 5: The health settings and disease on which the model is developed based on

Settings/Disease	No. (References based on Table 1)
COVID-19	14 (3-7, 9, 11-12, 14-15, 18, 20-22)
COVID-19 Vaccine	2 (16, 19)
Digital and Online News	1 (1)
Public Health Crises	1 (2)
Mental Health	1 (8)
Available Evidence and Expert Consensus	1 (10)
Corrected Health Misinformation by Healthcare Professionals	1 (13)
Shared Misinformation in Social Networks	1 (17)

disinformation, malinformation, HID characteristics[24,26,37] such as information overload, information sources, and HID ways of disseminations[27,32,33] such as traditional media including phones, television, oral communication, and print publications or novel social media including text messages, posts, tweets, microblogs, and online news outlets.

We outlined the diverse approaches employed in designing models for HIDs, shedding light on the methodologies and theoretical foundations that researchers have leveraged and reflecting the multidimensionality of the field. Some conceptual models were designed based on interdisciplinary models of epidemiology and conceptual frameworks, like George McNew's disease triangle,[13] emphasizing the importance of grounding the models in established scientific principles. Similarly, theoretical models are often crafted based on well-known theories such as uses and gratification theory, social Networking Sites (SNS) dependency theory, and social impact theory,[16] employing statistical methods like structural equation modeling for empirical validation. It's noteworthy that a few studies in our review also incorporate innovative elements into their design approaches. For instance, the Crowdsource Ideas Framework[21] was developed through a brainstorming session with a diverse group of stakeholders, showcasing a participatory approach. Additionally, the use of machine learning models,[19] such as hidden Markov models,[21] in certain studies reflects the integration of cutting-edge technologies to analyze and interpret HIDs.

We found HID models are predominantly developed based on the COVID-19 pandemic. Unsurprisingly, the majority of studies have focused on the global health crisis presented by the COVID-19 pandemic, encompassing issues related to the disease and its management, including vaccination. This result is similar to the finding of a scoping review by Zeraatkar and Ahmadi[39] which stated that the topic that was covered most in the studies was influenza. Drawing parallels with previous researches, we find interesting concepts in components of models such as over-exposure to information[26] and crisis emotion[25] which is similar to the scoping review studies[40,41] about health information overload as a primary driver of HID spread in patients, which emphasizes on problems made by spreading too much information in the process of information flow. Additionally, as eleven studies presented models based on data-driven from social media, our review concurs with the results highlighted by Borges *et al*.[42] in comparing and summarizing the literature regarding infodemics and health misinformation about the critical role of social media in disseminating rapid and far-reaching information. Contrasting perspectives arise when comparing our broad domain focuses on HIDs' models in general to the narrower scoping review about parents' use of social media as a health information source for their children by Frey *et al*.[43]

The overarching goal of conducting this scoping review was to attain a comprehensive understanding of the landscape of models addressing HIDs. The need for such an exploration arose from the increasing importance of effective response to information disorders, particularly in the context of the ongoing COVID-19 pandemic. The main results of our study revealed a predominant reliance on conceptual models or frameworks, categorizing their components into information issues, communication issues, psychology issues, social issues, and theories. The existing HID models fail to recognize how cultural factors impact the way people understand, interpret and perceive health-related information. Cultural diversity greatly influences individuals' reactions to information, making them more or less susceptible to misinformation and affecting their coping strategies.[44] Furthermore, the models presented in the included studies do not adequately consider the changes in digital, which are also highlighted by other studies.[45]

Given the predominant focus on COVID-19 in the examined studies, future research should expand its scope to investigate HIDs in the context of other diseases and diverse healthcare settings. Since the majority of proposed models

exhibited conceptual or theoretical frameworks and were often based on existing theoretical studies, it is imperative to delve deeper into these theoretical frameworks. Researchers should conduct grounded theoretical studies in diverse contexts to identify new dimensions of HIDs.

Conclusion

One of the limitations was limiting our searches to a finite set of bibliographic databases; we acknowledge that we may have excluded important references. Another limitation of the study is the exclusion of gray literature sources, which may have resulted in the omission of valuable information. Additionally, the focus on studies presenting models and COVID-19 could have overlooked insights from studies approaching the topic differently. Moreover, the restriction to English-language sources might introduce a language bias, potentially excluding relevant information available in other languages.

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Conflicts of interest

Nothing to declare.

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