

Longitudinal analysis of behavioral factors and techniques used to identify vaccine hesitancy among Twitter users: Scoping review

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Item type

Journal Contribution

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ELECTRONIC SUPPLEMENTARY MATERIAL

Longitudinal analysis of psychological characteristics associated with vaccine hesitancy and resistance using Twitter data—A Scoping Review

Supplementary Table 1: PRISMA-ScR Checklist

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	Reported in Section
TITLE			
Title	1	Identify the report as a scoping review.	Title page
ABSTRACT			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, methods, results, and conclusions that relate to the review questions and objectives.	Abstract
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	Introduction
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 questions and/or objectives.	Introduction
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.	Methods
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.	Methods
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.	Methods and search results Excel file

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	Reported in Section
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	Methods and Excel file
Selection of sources of evidence	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	Methods and search results Excel file
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 done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	Methods and data_extraction_sheet Excel file
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	Methods and data_extraction_sheet Excel file
Critical appraisal of individual sources of evidence	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe the methods used and how this information was used in any data synthesis (if appropriate).	N/A
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	Methods
RESULTS			
Selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	Results
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	Results
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	N/A
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 questions and objectives.	Results and S5 Table
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	Results
DISCUSSION			
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and	Discussion

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	Reported in Section
		types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	
Limitations	20	Discuss the limitations of the scoping review process.	Discussion
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.	Conclusion
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.	N/A

Supplementary Table 2: Search Strategy

1. Search sources:

- Electronic databases: PubMed, Scopus, IEEE Xplore, ACM, Google Scholar, PsycINFO, Ovid, CINAHL, Springer Link, and Cochrane Library. (Medline covered in PubMed)
- Reference list checking for additional relevant papers.

Years: 2006 to 2022

Search dates: 20 November 2022 to 07 January 2023

Initial raw search results: 298 studies

Database	Search strategy	Hits
PubMed	(('longitudinal'[Title/Abstract] OR 'retrospective'[Title/Abstract] OR 'prospective' [Title/Abstract]) AND (twitter[Title/Abstract] OR tweet*[Title/Abstract]) AND (vaccin*[Title/Abstract] OR immuniz*[Title/Abstract] OR immunis*[Title/Abstract]))	28
IEEE Xplore	(('longitudinal' OR 'retrospective' OR 'prospective') AND (twitter OR tweet*) AND (vaccin* OR immuniz* OR "All Metadata":immunis*))	1
Scopus	TITLE-ABS-KEY (('longitudinal' OR 'retrospective' OR 'prospective') AND (twitter OR tweet*) AND (vaccin* OR immuniz* OR immunis*))	49
ACM	[All: longitudinal or retrospective or perspective] AND [All: twitter or tweet*] AND [All: vaccin or immuniz* or immunis*]	63
Google Scholar	(('longitudinal' OR 'retrospective' OR 'prospective') AND (twitter OR tweet*) AND (vaccin OR immuniz* OR immunis*))	100
PsycInfo	(('longitudinal' OR 'retrospective' OR 'prospective') AND (twitter OR tweet*) AND (vaccin OR immuniz* OR immunis*))	89
Ovid	((longitudinal OR retrospective OR prospective) AND (twitter OR tweet*) AND (vaccin OR immuniz* OR immunis*))	153
CINAHL	("longitudinal" OR "retrospective" OR "prospective") in Title Abstract Keyword AND ("twitter" OR "tweet*") in Title Abstract Keyword AND ("vaccin" OR "immuniz*" OR "immunis*") in Title Abstract Keyword - (Word variations have been searched)	7
SpringerLink	((("longitudinal" OR "retrospective" OR "prospective") AND ("twitter" OR "tweet*")) AND ("vaccin" OR "immuniz*" OR "immunis*"))	115
Cochrane Library	((longitudinal OR retrospective OR prospective) AND (twitter OR tweet*) AND (vaccin OR immuniz* OR immunis*))	100

Supplementary: Study Eligibility Criteria

The inclusion and exclusion process is briefly explained in the methodology section in the original draft. Other key terms used are explained below.

1. Comparator: no restrictions applied
2. Outcome: Diagnosis/Detection, Prognosis or survival prediction, Segmentation, Classification, Grading.
3. Language of study
Inclusion: English
Exclusion: any other language
4. Study design: No restrictions applied
5. Year of study: 2006-2022
6. Type of publications:
Inclusion: Peer-reviewed articles, thesis, dissertations, conference proceedings, book chapters.
Exclusion: Reviews, conference abstracts, proposals, short letters, editorials, commentaries and non-peer reviewed pre-prints.

Study selection process

- Screening titles and abstracts, and then reading full texts.
- Include studies via backward and forward referencing.
- This process is conducted by two reviewers (SK & R.B)

Data extraction process

- Data regarding the study, population, intervention, comparator, the outcome will be extracted using Excel
- This process is conducted by two reviewers (ZS & SK)

Data synthesis

- Narrative synthesis

Data Extraction Fields

Data extraction fields will be provided in the Excel sheet.

Supplementary Table 3: Data extraction form

Concept	Definition
Study Characteristics	
ID	Unique ID assigned to each study
Author	The first author of the study.
Year	The year in which the study was published
Country of publication	Affiliation of the first author of the study.
Publication type	Journal or conference or book chapter
Conference name	Name of the conference where the study was published
Journal name	Name of the journal where the study was published
Techniques Used for Longitudinal Behavior Analysis	
Community Analysis	What are the magnified community factors addressed to identify type of cohorts a Twitter user follows?
Sentiment analysis	What were different individual factors discussed in the communities to track users' sentiment about vaccines?
Techniques or software used	What were different software and algorithms used for the development of users' behavior analysis longitudinally?
Topic modeling methodologies	What are different software and machine learning (deep and shallow architectures) used for topic modeling using Twitter data?
Emotions and stance calculation	What are different statistical and machine learning based techniques used (Silhouette width, Cosine similarity, t-test, etc.) for emotions and user stance calculation towards vaccine?
Dataset Characteristics	
Type of data sources	Public or private
Data timeframe	For how long the data is collected from Twitter or other social media tools
Data source (full URL)	Mention full URL of the dataset
Dataset size (Number of subjects or individuals)	For how many individuals the data is recorded?
Dataset size (number of sample)	What is the total number of samples in the dataset used for longitudinal behavior analysis?
Tools	What is the APIs and frameworks used for Data collection from social media platforms?
Evaluation	
Evaluation metrics	Metrics of evaluation (for example, Accuracy, Precision, Recall, Dice score, F1 score, Sensitivity, Specificity, etc.)
Study aim	The primary aim of this research work is to explain, <u>how we can longitudinally analyze Twitter users' behavior towards vaccine.</u>