



Review article

The use of fear appeals for pandemic compliance: A systematic review of empirical measurement, fear appeal strategies and effectiveness

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ABSTRACT

Interventions to pandemic outbreaks are often associated with the use of fear-appeal to trigger behavioral change, especially in public health issues. However, no systematic review exists in the literature on the effectiveness of fear appeal strategies in the context of pandemic compliance. This paper aims at providing systematic literature review that answers the following thought-provoking research questions: (1) What is the standard measurement of fear in relation to pandemics in the existing literature? (2) What are the fear appeal strategies used in the empirical literature? (3) How effective are fear appeal strategies in changing behavior toward adopting pandemic preventive measures? A total of 22 studies were selected from 455 potential studies, following a comprehensive literature search and assessment in accordance with the PRISMA guidelines. The findings show that nearly all the available studies on fear measurement used the Likert scale (as the standard approach) with different points of degree and fear appeal strategies such as fear triggers in media channels, print advertisements, and verbal descriptions. Furthermore, most studies conclude that fear appeal is effective in making participants adopt pandemic preventive measures; hence, it is effective for positive behavioral change (the degree of effectiveness depends on gender, population group, etc.), especially when combined with self-efficacy and socio-cultural considerations. Very few studies, however, find an insignificant association, arguably due to the kind and intensity of the fear appeal messages and strategies used.

1. Introduction

The use of fear appeals in preventive and behavioral change communication has received a great deal of attention, especially in the field of public health, due to the heated controversy surrounding them. Fear appeals are persuasive messages aimed at arousing fear by highlighting the possible danger and harm that could result from failing to adhere to the recommendations put forth in the messages [1–3]. These include using graphical images, sensational language, and explicit pictures of affected individuals to arouse fear of negative consequences if recommended behavior is not adopted. Some schools of thought contend that fear appeals may have unintended negative outcomes that may defeat their purpose and propose alternative tactics such as educational entertainment, humor, opinion leaders, and celebrity appeals [1,4–8]. Other schools of thought hold contrary views that false appeals motivate desirable

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Table 1
inclusion and Exclusion Criteria.

Inclusion criteria	Exclusion criteria
Relevant to measurement of fear, fear appeals and pandemics	Not relevant to these
Published manuscripts	Unpublished manuscripts
Psychology study, health economics and Behavioral Economics,	Not in any of these fields
English language	Not in the English language
Scientific work	Not Scientific work
Available in full text	Not available in full text
Right instruments and outcomes	Wrong instruments and outcome

behavior and therefore are effective in times of emergency, such as pandemics [9–11]. The different viewpoints on the effectiveness of fear appeal can be attributed to several factors, such as cultural and population groups, the intensity of the message, and the combination of fear appeal with self-efficacy [2,11]. Other studies have also shown ample evidence that fear appeal communications are applied differently and with outcomes that vary depending on the contexts and the contents, such as whether they are related to the prevention of deadly diseases, vaccination, or promotion of lifestyle changes [2,12–14]. Fear appeal communication is particularly common in public health issues such as pandemic outbreaks (due to its far-reaching impacts across the globe), and its application has stirred up public debates [15–19].

Pandemic outbreaks remain a major threat to public health, recording one of the highest mortality rates globally [20] with significant impacts on life, especially in the case of COVID-19 [21–26]. Pandemics are global outbreaks of infectious diseases that can significantly cause widespread morbidity and mortality across geographic areas with adverse social, economic, and political effects [27,28]. Available evidence suggests that the past century has witnessed an increasing prevalence of pandemic outbreaks because of

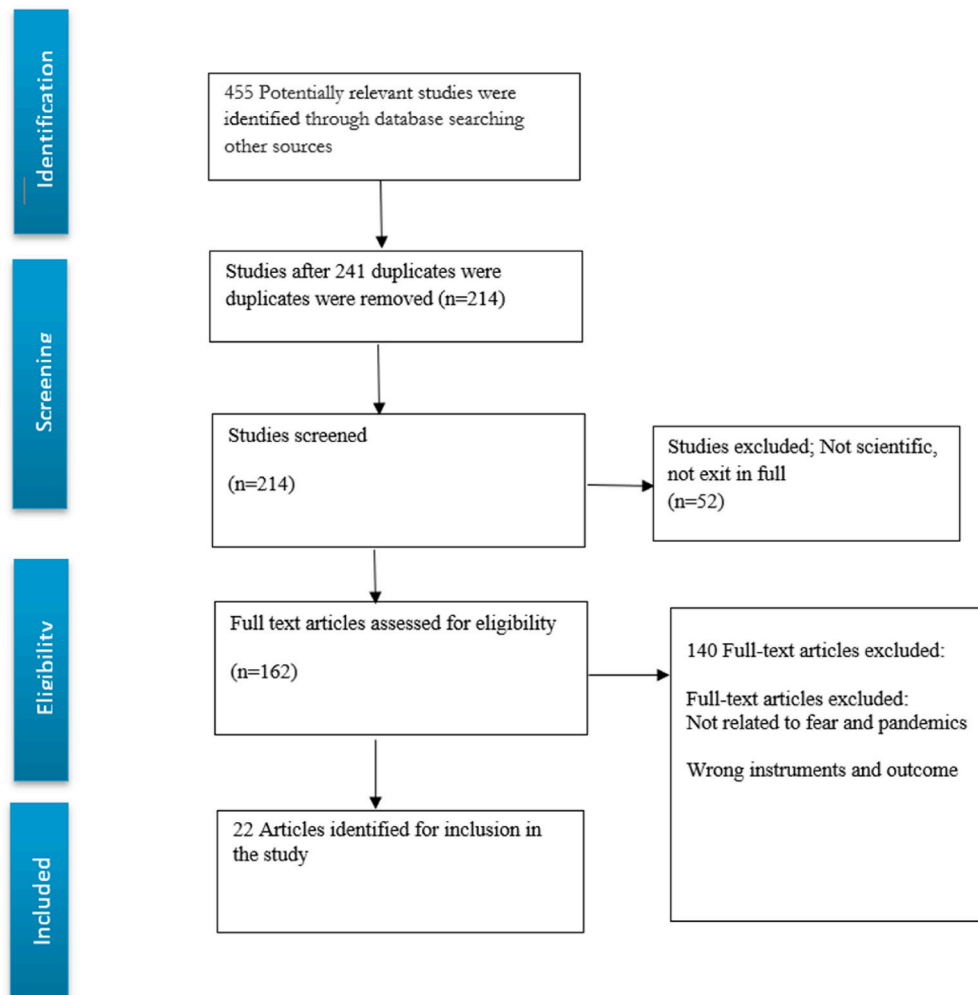


Fig. 1. PRISMA flow diagram of study search and selection.

Table 2

Summaries of studies on fear measurement, Fear appeal strategies and its effectiveness on pandemic preventive measures.

Authors	Study Characteristics			Study methodology			Findings		
	Location/ Country	Study aims	Pandemic outbreak/ disease	Sample	Nature of study	Type of study design	Measurements of fear	Fear appeal strategies used	Effectiveness of fear appeal strategies
Ahorsu et al. (2020) [52]	Iran	To develop the Fear of COVID-19 Scale	COVID-19	717 Iranian participants	Both qualitative and quantitative		The Fear of Coronavirus-19 Scale (FCV-19S), consisting of seven items on a 5-point scale,		The authors concluded that the Fear of COVID-19 Scale, which consists of seven items, has strong psychometric qualities. This assessment is both reliable and appropriate for measuring the level of fear towards COVID-19 among the general population. It has the potential to alleviate people's fears effectively.
Broche-Pérez Y et al. (2020) [45]	Cuba	To assess and evaluate the level of anxiety towards COVID-19 among different genders and determine if this disparity can be used to predict the likelihood of contracting COVID-19.	COVID-19	A sample size of 772 Cuban participants	Qualitative analysis	A cross-sectional web-based survey design	The Fear of Coronavirus-19 Scale (FCV-19S), which consists of seven items on a 5-point scale ranging from "strongly disagree to strongly agree,"		The level of fear of COVID-19 was higher among female individuals compared to male ones.
Ceylan, and Hayran (2021) [38]	Turkey and U.S.A	To investigate the efficacy of phrasing social distancing messages using prosocial versus self-interested appeals in promoting message compliance and encouraging helpful behaviour.	COVID-19	A sample of 119 students from a private university in Turkey and 202 participants from the United States was taken.	Quantitative	A cross-sectional web-based survey design	Fear of coronavirus scales such as "My heart races or palpitates when I think about getting coronavirus" (1-7 = "not at all" to "very much") and questions with a binary response	A coronavirus illustration, pictures, spread, and attack were included in the flyers to delineate the concept of the message.	Their research indicates that prosocial messages that highlight the advantages for the entire society are more impactful than self-centered messages that focus on individual gains.
Green and Witte (2006) [11]	Global	to understand the prevailing American expert view, African national views, and the most recent findings on the use of fear arousal in behavior change campaigns.	HIV	Country and regional-level expert view samples (e.g., America, African countries such as Uganda)	Qualitative reviews	Content analysis	A wide range of approaches, such as using a set of items with a "yes or no response," believing there was no cure for AIDS, believing AIDS causes great suffering, or believing AIDS was the most serious		Fear appeal works effectively, especially when combined with self-efficacy.

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Table 2 (continued)

Authors	Study Characteristics			Study methodology			Findings		
	Location/ Country	Study aims	Pandemic outbreak/ disease	Sample	Nature of study	Type of study design	Measurements of fear	Fear appeal strategies used	Effectiveness of fear appeal strategies
Harper et al. (2020) [31]	Cross- country (but 79 % from UK)	To explore multiple predictors of engaging in virus-mitigating behaviors within the context of COVID-19	COVID-19	International community sample (N = 324)	combination of qualitative and quantitative analysis	Cross-sectional data analysis	problem in the country. Seven items from the Fear of Coronavirus- 19 Scale (FCV-19S) on a 5-point scale ranging from "strongly disagree to strongly agree" were used.		Fear consistently predicts engaging in culturally and governmentally recommended public health behaviors (e.g., improved hand hygiene and social distancing).
Heffner, Vives, and FeldmanHall, (2021) [55]	USA	To examine the effectiveness of the fear and prosocial interventions in the case of COVID-19	COVID-19	U.S. A representative sample of 955	Quantitative analysis	Cross-sectional analysis	Using a rating (the dynamic affective representation mapping (dARM) measure) to measure the level of emotional response to the exposure	Fear message: "The coronavirus is coming for you. When it does, your healthcare system will be overwhelmed. Your fellow citizens will be turned away at the hospital doors. Exhausted healthcare workers will break down. Millions will die."	Their results show that even though threats and prosocial interventions change people's plans to be alone, they don't do so through the same emotional processes. Threat messages that use fear-mongering language tend to work better than prosocial messages because they don't depend as much on the strength of emotional reactions.
Kigatiira (2020) [32]	Kenya	To investigate the effectiveness of fear appeals on the adoption of COVID-19 preventive measures	COVID-19	Boda boda (motorcycle) rider in Nairobi County, Kenya N = 17	Qualitative analysis,	Case study research design through telephone interviews	Using fear-related questions with a "yes or no response" and augmented with subjective experience	A pictorial description of the adverse effects of the disease during the interview	The use of fear appeals proved to be successful in inducing compliance among Boda Boda riders in Nairobi County with regards to the implementation of COVID-19 preventive measures.
Klemm, Das, and Hartmann (2016) [37]	Cross country	To examine the validity of the hype or hysteria around the new virus in the media	H1N1 influenza pandemic (swine flu)	About 13 studies were included in the qualitative analysis.	Qualitative analysis	Systematic review		Threat in the media platform, headlines, and television content	The findings demonstrate that there was a significant amount of media attention, with news content emphasising threats and fear appeals rather than preventative measures. However, the overall tone of the coverage remained unclear due to inconsistent results.

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Table 2 (continued)

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	Location/ Country	Study aims	Pandemic outbreak/ disease	Sample	Nature of study	Type of study design	Measurements of fear	Fear appeal strategies used	Effectiveness of fear appeal strategies
Krägeloh, Alwaily, and Henning (2020) [48]	Saudi Arabia	To investigate the role of fear of COVID-19 on recommended health behaviors	COVID-19	The study used 1029 Saudi participants.	Qualitative analysis	online survey	The COVID-19 scale was used.		The study identified that in Saudi Arabia, compliance with the COVID-19 recommendations is not derived from fear but rather from the facts and the provision of better information.
Melki, Tamim, Hadid et al. (2022) [60]	Lebano	The study examines the potential positive correlation between greater media exposure to COVID-19 news, interpersonal communication about the disease, and people's adherence to prevention measures. It also evaluates whether perceived knowledge and fear play a mediating role in this relationship.	COVID-19	The study used a sample size of 1536 adults.	Quantitative analysis	Survey	A Likert scale on a 4-point scale ranging from "strongly disagree," "somewhat disagree," "somewhat agree," and "strongly agree" was used for the following questions: "The thought of coronavirus makes me feel scared" and "I am afraid that someone in my family may get sick from coronavirus."	Threat in the media platform, headlines, and television content	They observed that higher media exposure to COVID-19 news favorably influences people's compliance with preventative measures and that perceived knowledge and fear mediate this association.
Mesch and Schwirian (2019) [39]	USA	To examine the relationships between basic demographic characteristics and Ebola vaccine intake behavior	Ebola	The study used a sample size of 1018 adults in the United States.	combination of qualitative and quantitative analysis	Survey	Likert scale on a 4-point scale ranging from "very scared," "somewhat scared," "not very scared, and "not scared at all"		Ebola vaccination intake behavior is positively associated with factors such as a generalized sense of fear and trust.
Ogundoyin (2016) [33]	Nigeria	To assess the impression and attitude of individuals towards a persuasive HIV/AIDS campaign message.	HIV	A sample size of 187 respondents was used.	Qualitative study	cross-sectional, descriptive study	A Likert scale was used to rate the fear mood of respondents, e.g., "I am scared, I am not scared, I am indifferent."	Fear appraisal of respondents through questions and responses on perceptions of the use of fear appeals in the HIV campaign	Fear appeal messages do not affect the behavior of participants but only arouse curiosity, which ignores fear messages and engages in high-risk behavior.
Pakpour, and Griffiths (2020) [61]	Global	To assess the extent of fear about COVID-19 among various groups based on certain socio-demographic variables (such as gender, age, education, ethnicity, religiosity, etc.) and/	COVID-19	Reviews of studies on some selected countries (e.g., Canada, Germany, the USA, etc.)	Reviews	Descriptive and qualitative	Fear of the COVID-19 Scale' (FCV-19S)		They found the FCV-19S to be valid and reliable among an Iranian adult sample and that it's unclear if scale scores link with COVID-19 prevention practices (e.g., handwashing, social

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Table 2 (continued)

Authors	Study Characteristics			Study methodology			Findings		
	Location/ Country	Study aims	Pandemic outbreak/ disease	Sample	Nature of study	Type of study design	Measurements of fear	Fear appeal strategies used	Effectiveness of fear appeal strategies
Slavin, Batrouney, and Murphy (2007) [42]	Australia	or different psychological components (such as personality type). To enhance understanding of the impact of fear appeals in the current HIV epidemic, with a specific emphasis on the adverse consequences of antiretroviral therapy (ART).	HIV	The sample consisted of 27 gay men.	Qualitative study	Experimental research	Using fear-related questions with a "yes or no response" and augmented with subjective experience	Use of poster images with fear triggers	distancing, respiratory hygiene, etc.). Fear and health-related behaviors are complicated. Fear appeal exacerbates the feeling of shame among the respondents, causing increases in HIV- positive men but little impact on HIV-negative men.
Stolow et al. (2020) [1]	General	To discuss the fear appeal during COVID- 19 and the negative outcome	COVID-19		Qualitative	Research Essay and Review		Literature reference to a poster featuring an image of mass burials of COVID-19 victims, televising hospitals overloaded with patients showing COVID-19 symptoms	Fear appeals could lead to unintended adverse outcomes, which can complicate the pandemic and its containment measures.
Tannenbaum et al. (2015) [2]	Global	To compile the largest available meta- analytic database of fear appeal research and estimate average effects	General, including pandemic (HIV)	meta-analysis of 127 studies	Qualitative and quantitative	Meta-analysis of studies that used experimental research designs	A 3-point Likert scale (highly depicted fear, moderately depicted fear, and a lowly depicted fear group)	Messages with death and non-death threats with vivid and non- vivid messages	Fear appeals shows greater efficacy when they portrayed heightened levels of fear and exerted greater influence when the recommended course of action was one-time, and death was not mentioned.
Terblanche-Smit and Terblanche (2010) [9]	South Africa	Effect of fear appeal on behavior pertaining to HIV/AIDS prevention	HIV	The study sampled 40 participants for qualitative analysis and 360 for quantitative analysis.	Qualitative and quantitative	Experimental design	A 5-point Likert scale was used to measure the level of fear.	Print advertisements and television shows with fear-trigger contents	They found evidence that fear appeals in HIV/ AIDS communication are successful in changing behaviour. Additionally, they found that HIV/ AIDS communication programmes play a crucial role in reducing the transmission of the disease among a certain group, specifically South African teens.

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Table 2 (continued)

Authors	Study Characteristics			Study methodology			Findings		
	Location/ Country	Study aims	Pandemic outbreak/ disease	Sample	Nature of study	Type of study design	Measurements of fear	Fear appeal strategies used	Effectiveness of fear appeal strategies
Terblanche-Smit and Terblanche (2011) [43]	South Africa	To investigate the effectiveness of fear appeal on behavioral change in various cultural and racial groups	HIV	Adolescents between the ages of 18 and 24 years N = 360	Qualitative study	Experimental research	This was measured on a scale defined as follows: low, medium, and high.	Advertisements, including low, medium, and high fear appeals for print and television	High fear appeal leads to behavioral change, but the degree varies across cultural and population groups.
Terblanche-Smit and Terblanche (2013) [44]	South Africa	To investigate the effectiveness of the fear advertisement on HIV sexual behavior	HIV	About 19 selected print and television advertisements and 40 respondents in focus groups (18–24 years old)	qualitative study	Experimental research	A Likert scale was used to rate fear or mood adjectives.	Social advertising campaign with fear-arousing messages	There is no evidence that fear appeal influences sexual behavior among young adults.
Van Lent et al. (2017) [40]	Netherlands	The objective is to analyze the correlation between the level of psychological distance individuals feel towards an epidemic and the amount of public attention and sentiment expressed on the social media platform Twitter.	Ebola	A sample size of 4500 tweets	Qualitative study	Survey	The tweets were categorised into three groups based on the presence of "fear": (1) fear for oneself, (2) fear for others, and (3) absence of fear. Additionally, the use of other fear-related keywords was also considered. The developers employed fear-inducing keywords and emotions, including terms such as fear, scare, threat, help, terrifying, brr, OMG (oh my god), WTF (what the fuck), danger, panic, and dare not		The increase in public awareness of Ebola coincided with significant global incidents linked to the pandemic, although not all of these incidents induced fear.

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Table 2 (continued)

Authors	Study Characteristics			Study methodology			Findings		
	Location/ Country	Study aims	Pandemic outbreak/ disease	Sample	Nature of study	Type of study design	Measurements of fear	Fear appeal strategies used	Effectiveness of fear appeal strategies
Winter et al. (2020) [41]	New Zealand	To perform the initial psychometric evaluation and validation of the English edition of the COVID-19 SCALE.	COVID-19	About 1397 participants in sample one and 1023 in sample two	Qualitative analysis	Cross-sectional/ survey	The Fear of Coronavirus-19 Scale (FCV-19S), consisting of seven items on a 5-point scale ranging from "strongly disagree to strongly agree,"		The English version of the COVID-19S is a reliable and valid scale that measures a single dimension and may be confidently used among English-speaking populations.
Zhang (2021) [62]	China and USA	To understand the cultural nuances of the fear appeal model variables	COVID-19	China (N = 425) and the U.S. (N = 352).	Quantitative	cross-sectional survey	Using five-point Likert scales		Findings reveal that all fear appeal characteristics, except for severity, are somewhat culturally embedded and related to at least two cultural orientations. After adjusting for individual and cultural differences, the Chinese group reported increased severity, susceptibility, and self-efficacy but lower compliance.

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the increasing level of global mobility across different geographical areas, urbanization, regional integration, and social integration, among other factors [29,30]. For instance, over the last decade, pandemic outbreaks such as swine flu (first reported in 2009), Ebola (first case confirmed in 2013), and COVID-19 (first reported in 2019) were recorded amidst the long-staying infectious HIV, which was reported in 1981, Spanish flu in 1918, and many more such outbreaks that are likely to occur in the future. These trends triggered global and country-level responses for containment against spread.

Among the global and country-level interventions as responsive mechanisms for social protection against deadly pandemic outbreaks is the use of fear appeal messages in ads, news, rumors, and so forth as tools to trigger behavioral change to ensure compliance during pandemics [10,31]. The use of fear-based information for pandemic compliance has generated a lot of controversy among researchers and policymakers largely due to the opposing views highlighted in the preceding paragraphs (that is different findings in different contexts).

Review of existing literature shows a body of studies on the use of fear appeal in general [10,32–34], however, to the best of our knowledge, there is now no systematic review conducted on the subject (in the context of pandemic outbreaks) that provides a full understanding of fear appeal use, measurement, and efficacy for research and policy purposes. Relevant questions addressed in this study are: (1) What is the standard measurement of fear in relation to pandemics in the existing literature? (2) What are the fear appeal strategies used in the empirical literature? (3) How effective are fear appeal strategies in changing behavior to adopt pandemic preventive measures? Hence, as the first step, a systematic review relevant on fear appeal in the context of a pandemic outbreak was conducted. This systematic review aims at identifying the measurement, strategies, and efficacy of fear appeal in adopting pandemic preventive measures based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) and according to the guidelines of the population, intervention, comparator, and outcome framework (PICO). This study is important to identify evidence-based insights and recommendations on the use of fear appeal for the management of crises and pandemics in the future. It will also significantly contribute to the literature on the effectiveness of fear appeal strategies in pandemic management.

Following section 1 on the introduction and background, section reports the methods used for the study. Section 3 shows the results of the studies while sections 4 present the discussions of the results. Section 5 draws conclusions based on the findings.

2. Method

A systematic review was conducted on the empirical measurement of fear, fear appeal strategies, and their effectiveness on behavioral change for pandemic compliance. The review focuses on pandemic diseases such as HIV, Ebola, Swine flu, Spanish flu, and COVID-19. In order to improve the integrity and visibility of our results, this review adheres to the Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols (PRISMA-P) standards. In pursuit of this objective, a thorough review of the literature was undertaken, adhering to the population, intervention, comparator, and outcome framework [PICO] guidelines, from a list of electronic databases: MEDLINE (via LitHIV, LitEbola, LitSwineflu, and LitCOVID in PubMed), Cochrane Library, Google Scholar, African Index Medicus, and EBSCOhost. Primary concepts such as "fear" "fear appeal," "fear appeal messages," "measurement of fear," "fear appeal in pandemic" "fear appeal messages for COVID-19", "fear appeal messages for HIV" "fear appeal messages for Ebola" "fear appeal messages for Swine Flu," "fear appeal strategy", "effects of fear appeal," "effectiveness of fear appeal," and "efficacy of fear appeal" were part of search strategies. The subject and text word searches were performed separately in all the databases and then combined with the Boolean operators "OR" and "AND" (persuasion, appeal, argument, tactic, campaign, communication, or intervention). Additionally, to ensure a comprehensive search, reference lists of pertinent articles and associated documents from the databases of the Africa Centres for Disease Control and Prevention (Africa CDC) and the World Health Organisation (WHO) were combed for potentially relevant articles. Publications had to report on the measurement of fear, fear appeal strategies, their effectiveness on behavioral change, and preventive recommendations for pandemic outbreaks to be eligible for inclusion. Details of inclusive criteria, assessment of quality of studies, and synthesis are summarized below.

2.1. Study design eligible; inclusion and exclusion criteria

The inclusion and exclusion criteria for the study design are detailed in Table 1. Eligible studies for inclusion included surveys, cross-sectional investigations, experimental and quasi-experimental studies (in which the control group could offer data), observational studies, systematic reviews, and meta-analyses. Although fear appeal may be used in relation to non-pandemic conditions, they were excluded from this study in order to retain focus on the less-studied pandemic outbreaks. As such, the review is not limited to any particular year, so as to gather as much evidence as possible on the subject in relation to pandemic preventive measures. Thus, articles were excluded when they did not include results of fear appeals related to pandemics, were not available in full text, or were not reported in English, among other things. Research articles that met the inclusion criteria and were identified by team members were considered for inclusion in the studies. Disagreements were resolved through the process of discussion.

2.2. Quality of assessment

The screening procedure was evaluated in accordance with the PRISMA-P statement regarding the quality of the studies. The screening procedure protocol entailed examining the research objectives of each study to ascertain whether they provided answers to any of the research questions posed in that particular study. Additionally, the quality assessment centered on the evaluation of fear, the efficacy of fear appeal strategies, and the implementation of preventive measures to pandemics. By adhering to the predetermined inclusion and exclusion criteria, two evaluators assessed the appropriateness of the titles and abstracts in collaboration. The potential

for bias was evaluated by these assessors as they extracted data; any inconsistencies were resolved through deliberation. The remaining 241 papers underwent full-text filtering in accordance with the identical criteria. To ensure consistency, it was imperative to replicate the individual screening process; however, no inconsistencies were identified. A quality rating on a ten-point scale was determined using the Critical Appraisal Skills Programme [35]. Lastly, a reduction was made to the sample size of these studies due to the failure of some to adhere to this quality assessment procedure.

2.3. Synthesis

Various techniques were used to construct the synthesis of the evidence, following the suggestion of [36]. Initially, we synthesised the research findings narratively and categorised them thematically based on the purpose of the study. Subsequently, we created a table summarising the results and examined the relations with discussions.

3. Results

A sample of 22 studies were included in this study, and the scope of these studies is not limited to a specific geographical area. but across different regions and countries such as the USA, Australia, New Zealand, UK, Netherlands, Cuba, Iran, South Africa, Nigeria, Kenya, Uganda, Saudi Arabia, and Global Studies. The search and selection criteria encompassed peer-reviewed papers, which were identified with the aforementioned search keyword phrases. A total of 455 possible studies were found throughout the search. Out of these, 52 titles and abstracts were removed as they were not scientific, resulting in a reduced number of 214 after deleting any duplicate studies. After a comprehensive evaluation based on the inclusion and exclusion criteria, a total of 22 papers remained. The process is clearly depicted in Fig. 1 on the PRIMA flow diagram.

3.1. Study characteristics

3.1.1. Location

The empirical literature on fear appeal covers many geographical areas and countries, frequently linked to distinct socio-cultural contexts and attributes. Four studies focused on global context [11,34,37] some focused on specific countries from the developed world, such as the USA and Turkey [37–39], others focused on specific countries from the developed world, such as the USA and Turkey [38,39], the Netherlands [40], and New Zealand [41], Australia [42] and African countries such as South Africa [9,43,44], Nigeria [33], and Kenya [32].

3.1.2. Pandemic outbreak or disease

This review attempts to synthesize the literature on fear appeals related to pandemic outbreaks. It thus covers fear appeal on pandemics such as COVID-19 [1,31,32,41,45], HIV [11,33,42,44], Ebola [39] and the Spanish and Swine flu pandemic [37].

3.1.3. Aims of the studies

The existing studies focuses on a range of study objectives on fear appeal during pandemic. This includes studies that sought to investigate the measurement and effectiveness of fear appeal on the adoption of COVID-19 preventive measures and cultural and population group differences that might be predictors of the efficacy of fear appeal [31,32]. Other studies focused on the negative and positive outcomes of fear appeal messages related to different pandemic diseases [34,42], racial differences that might be predictors of the efficacy of fear appeal [31,32]. Other studies focused on the negative and positive outcomes of fear appeal messages related to different pandemic diseases [1,42]. Similarly, studies on HIV aimed at examining the effectiveness of fear appeal on the sexual behavior of HIV positive and negative people and on gays and updating knowledge about the effects of fear appeal in the context of HIV, focusing on the side effects of antiretroviral therapy (ART) [33,44]. Other studies take a similar direction on the purpose of the studies but focus on Ebola [40] and the swine flu pandemic [37].

3.2. Study methodology

3.2.1. Sample

Studies in the extant literature use different sample size for a variety of reasons, including but not limited to: study area, design, purpose, target participants, and types of pandemics. Therefore, there is a lack of consensus on the optimal sample size in the existing literature. For instance, some case studies used a sample size of 17 participants on COVID-19 studies in Kenya [32]; sample sizes of 360 and 19 were used for experimental studies on HIV in South Africa [43,44]. Other studies used a survey design with a sample size of 4500 on Ebola in the Netherlands [40].

3.2.2. Nature of study

The available literature on the measurement of fear, fear appeal strategies, and efficacy are largely qualitative studies. A few exceptions, that is, two studies, combined both qualitative and quantitative analyses [9,39], while others, such as [34] are reviews.

3.2.3. Study design

Multiple research designs were used in the literature on the subject. These include case studies [32], experimental design [42,44],

cross-sectional data [31,33], systematic reviews [37], and surveys [40].

3.3. Findings

Table 2 presents a concise overview of validated research on fear in pandemics that are included in this review. Here, we present findings on each aspect of interest, namely, fear measurement, fear appeal strategies, and their effectiveness on pandemic preventive measures.

3.3.1. Measurement of fear

Measurements of unobservable variables such as fear can be controversial, as the definition of fear is multifaceted, ranging from a pure emotional and cognitive perspective to a combination of other factors. Studies such as [9,45–51] have analyzed and measured fear in their respective studies and used Likert scales with different points of degree. Six studies such as [31,41,45] used the Fear of Coronavirus-19 Scale (FCV-19S) developed by Ref. [52] consisting of seven items (such as "It makes me uncomfortable to think about coronavirus-19") to measure one's fear of COVID-19 (where greater scores indicate greater fear). On a 5-point scale, participants were requested to indicate their level of agreement with each statement from "strongly disagree" to "strongly agree." Other studies used a Likert scale on a 4-point scale ranging from "very scared," "somewhat scared," "not very scared," "not scared at all," and "not scared at all" [33,39], whereas few used questionnaires with questions on fear and binary responses. Some experimental design studies on the fear of HIV used trigger ads as a measure of fear, that is, as an aftermath mood after the individual watches the advertisement [43]. Furthermore, quantitative studies by Ref. [48] used the COVID-19 fear scale (from 1 to 5), which consists of 7 items with a set of questions such as "I am afraid of COVID-19 or it makes me uncomfortable to think about COVID-19". Ref. [32], on the other hand, used a single item variable in a question to the participants to indicate if they were afraid or not through telephonic interviews.

3.3.2. Fear appeal strategies

The extant literature shows slightly distinct but similar fear appeal strategies often used to arouse or trigger fear to promote recommended preventive measures and behaviors in response to pandemic outbreaks. The commonly used ones include threats in the video, headlines, television content [37], and hypothetical pictorial descriptions of the adverse effects of the disease [32]. Others include social advertising campaigns with fear-arousing messages [44] and using poster images with fear triggers [42]. For instance, there was a COVID-19 virus advertisement that showed how the virus is contracted—when people shake hands, multiples of the virus start to spread to the whole body.

3.3.3. Effectiveness of fear appeal strategies

The use of fear appeals is to ensure that individuals are able to respond to pandemic recommendations; thus, it makes people think deliberately since decision-making is either automatic (very common) or deliberate (reflect and think of others—social thinking). Firstly [32], used a case study design to investigate the effectiveness of fear appeals on 17 Boda Boda riders (participants) in Kenya and found that fear appeals were effective in changing the attitude and behavior of Boda Boda riders in Nairobi, leading to high adoption of the COVID-19 preventive measures. Ref. [43] also analyze the impact of HIV-fear appeals on different population group in South Africa (with a sample size of 360). The authors found that fear appeals for pandemic compliance had different impacts on people of different population group [53] and that racial consideration is important when using the fear approach.

Furthermore [54] documented that there is a positive impact on curbing infections in HIV and influenza using fear appeals. Similarly [55], also state that prosaic messages are more efficient for driving behavioral change and that the magnitude of the prosocial messages evokes some level of emotional response, which leads to greater compliance as compared to fear and threatening messages. Their finding, however, is inconsistent with findings by Refs. [1,48,55–58]. Separate studies by Refs. [1,55,59] on the behavior of agents in the USA, concluded that fear appeals are not effective for ensuring compliance. According to Ref. [1]), COVID-19 fear appeal messages must not be used but rather look for alternative ways of ensuring the population is conscious of the existence and severity of the disease.

Ref. [48] argued that fear is not an appropriate tool to achieve behavioral change in times of pandemic. They reported that publishing facts and providing better information help to ensure more consciousness and compliance to recommendation. Similarly [58], reported their finding on the effectiveness of fear on immigrants, that fear appeal leads to illegal immigration due to fear of being tested in Thailand.

4. Discussion

The systematic review process undertakes a synthesis of fear facets during pandemics. Firstly, the study looked at the measures of fear and found that most of the existing studies used Likert scales for measuring fear. A few studies [41,45] used the Fear of COVID-19 Scale (whose development was pioneered by Ref. [52], consisting of seven items. However, Harper et al. (2020) argued that these items are similar to those used in measuring anxiety, a preparatory reaction to ambiguous or distant stimuli. They further argued that beyond the conceptual similarity in the wording of items, some empirical studies provide evidence of a strong relationship between the FCV-19S and Diagnostic and Statistical Manual of Mental Disorders (DSM)-based measures of anxiety. This argument was documented earlier by McNaughton and Corr (2008), who highlighted that fear and anxiety are behaviorally and neuroendocrinologically distinct responses and that anxiety has a functional preparative role to counter future negative stimuli for safety and security. Studies on other pandemics such as HIV [33], Ebola [39], the H1N1 influenza pandemic, or swine flu [37] use the Likert scale with different points of

degree. This finding shows that fear measurement in relation to pandemics is generally based on the Likert scale.

Additionally [45], also applied the Fear of COVID-19 Scale to measure fear in their cross-sectional web-based survey design with 772 Cuban participants and concluded that fear of COVID-19 was more severe in the female participants than in their male counterparts. They attributed gender impacts to several factors (such as risk perception, RP) that may have immediate implications and others that may have long-term implications. Similarly [60], found a significant correlation between media exposure and perceived understanding of COVID-19 for women, persons under 30 years old, those with no university degree, and those with no media literacy training. People over the age of 30, those with a college degree, and those without any training in media literacy all showed increased anxiety about COVID-19 after being exposed to the media. This reinforces a recent study by Dryhurst et al. (2020), who empirically found (from a sample of 6991 participants) that the only sociodemographic factor that significantly predicted risk perception was gender. A moderate fear of COVID-19 could increase the perception of risk from the disease by 21 %, promoting preventive behaviors [31,61]. This result points to the need to design interventions that reduce the negative impact of the current outbreak on women's mental health. This shows that social, risk, and time preferences do differ across individuals, that individuals are not risk neutral, and that risk preferences are not homogenous within communities as traditional theory posits.

Concerning risk [63], documented in his Parallel Process Model (EPPM) that risk perceptions comprise perceived severity and perceived vulnerability, while perceived efficacy consists of self-efficacy and response efficacy. When perceived efficacy exceeds perceived threat, individuals participate in risk control by adopting self-protective activities to prevent the threat. In contrast, when perceived danger exceeds perceived effectiveness, individuals enter fear control, when they use defensive strategies such as denial and avoidance to deal with the threat. In other words, good risk communication messages must balance effectiveness and threat signals [64]. Due to excessive fear, individuals will be unable to act. If there is insufficient fear, individuals will not be inspired to act [65]). Ref. [66] emphasised the importance of considering psychological factors, such as empathy, self-efficacy, and imagination, when implementing psychoeducational interventions to empower the population in adopting preventive and containment measures. The authors highlighted the necessity of implementing targeted programmes to improve personality traits that significantly influence the adoption of healthy and preventative behaviours. This is crucial for containing the spread of the virus and mitigating potential catastrophic outcomes. This finding was reinforced by Refs. [22,67,68], who concluded from their separate studies that willingness to be vaccinated against a novel virus was predicted by the individual's perception of a greater risk associated with that virus. This implies that fear appeal strategies need to be designed with full consideration of and program to produce the desired risk perception of the subjects to maximize their effectiveness.

The proponents of non-fear appeal messages argued that using fear messages has the tendency to yield unintended negative outcomes, which may erode efforts at stopping the pandemic [1,55]. The authors proposed alternative means of communication (for instance, educational entertainment, humor, and opinion leaders) and recommended that public health professionals reconsider the use of fear appeals in COVID-19 health communication and instead make use of evidence-based health communication to tailor messages to individual communities, clarify requests, provide clear instructions for taking preventative measures, and take into account external factors that may impede or facilitate behavior change. They also stressed that prosocial communications rely on intense, positive emotional involvement, whereas fear-mongering ones need less. Given the lack of a connection between emotion and the tendency to isolate oneself in reaction to fear-inducing language, other factors such as a predisposition towards negativity or the selective focus on negative information may contribute to the success of fear-based messaging. Using visual and emotionally evocative language in prosocial messages may enhance its effectiveness, as negative emotional reactions did not have a significant impact on self-isolation. Self-isolation and economic hardship may cause sadness and anxiety [69], therefore, public health professionals should avoid fearmongering when designing public service announcements. Positive messaging may help prevent mood problems. Messages that encourage behavioral change while appealing to happy emotions are more needed today than ever. This confirms the Protection Motivation Theory [70,71] that, in response to health hazards, individuals participate in threat evaluation and coping evaluation processes. Threat appraisals include the evaluation of risks and the feeling of unease, while coping appraisal involves the assessment of one's ability to handle the situation, the effectiveness of one's response, and the potential drawbacks of taking action. When someone has a thorough evaluation of the potential danger they face and a positive judgement of their ability to handle it, they are more likely to have the drive to take actions to protect themselves. Nevertheless, when there is a convergence of a heightened perception of risk and a diminished evaluation of one's ability to handle the situation, it might ultimately lead to a lack of motivation to take preventative measures [62].

The finding by Ref. [32] that fear appeal helps achieve high adoption rate for COVID-19 preventive measures is consistent with Ref [2], who added (using experimental design) that the effectiveness of fear appeals increased when the message depicted high susceptibility and severity. Further [32], reported that the role of the government (viewed as a credible source of information) through communicating threat messages and punitive measures for anyone found flouting the COVID-19 regulations was effective in triggering positive behavioral change among the Boda Boda operators. This finding is also consistent with that of [71], who documented that effective fear appeals have a message that is credible and induces positive behavior against negative health consequences.

Additionally [9], used mood and worry as measures of fear in an experimental setting where agents were exposed to fear triggers such as HIV advertisements. Concerning the effectiveness of fear appeal information for pandemic compliance, the study found conflicting findings in the literature among authors such as [32], who reported that it is relevant and significant for behavioral change, while others such as [72] documented that fear is insignificant and suggested a need for alternative methods. This is arguably due to the kind and intensity of the emotional appeal and strategies used. The study also noted in the literature that the source of information is important during pandemic outbreaks since news platforms are less likely to be rated as relevant sources of information than reports and information from government institutions directly. Furthermore [9], (using three experimental groups who were exposed to print advertisements and television advertisements as an intervention) found that the use of fear appeal as a triggering tool for behavioral

change must have racial consideration since its effects vary across racial devices in South Africa. This was confirmed by Ref. [73], who found that race is a significant predictor of fear behavior. Pre-comments and behaviors of individuals in response to lockdown (for example, not wanting to stop going to work) and post-comments and behaviors (for example, not wanting to start going back to work or schoolchildren to go back to school) can be attributable to fear of the unknown.

Ref. [39] used a survey design to investigate 1018 United States adults with instruments that have a Likert scale on a 4-point scale (ranging from "very scared," "somewhat scared," "not very scared," and "not scared at all") to investigate the relationships between basic demographic characteristics, including fear, and Ebola vaccine intake behavior. They found that fear and trust positively predicted Ebola vaccination intake. Drawing on Social Representations Theory (SRT), [74] argued that it is important to investigate how fear appeal is used, particularly how people incorporate the image of disease in general and Ebola in particular into their understanding of daily life events, as this understanding influences their general fear response to contagious outbreaks, the trust they hold in responding institutions, and the behavioral coping mechanisms they employ. Based on Social Representations Theory (SRT), [74] underscored the significance of studying the use of fear appeal, specifically how individuals integrate the concept of disease in general and Ebola specifically into their perception of everyday events. This perception affects their overall fear response to contagious outbreaks, their trust in institutions responsible for responding to such outbreaks, and the behavioural strategies they adopt to cope with them.

Ref. [37] did a systematic review of 13 studies on the effect of threatening media content on H1N1 influenza (swine flu) pandemic preventive measures and found conflicting findings on the subject. Their research indicates that the media received a significant amount of attention, and that the news content focused on emphasising the threat or using fear tactics rather than promoting preventative actions. However, the overall tone of the coverage remained unclear due to inconsistencies and inconsistent results. The researchers determined that the media may have unintentionally contributed to increased perceptions of risk by extensively covering and disproportionately emphasising the threat of swine flu.

Despite a plethora of studies on the effectiveness of fear appeal in changing behaviour to adopt pandemic preventive measures, gaps still exist for future research. First, there is a limited study in the context of Africa (except for Kenya, Nigeria, and South Africa), as fear triggers, beliefs, and behavioural change issues are significantly embedded in the socio-cultural system, which, to a large extent, is different from western culture; hence, more future study is needed in the context of Africa. Furthermore, considering the relatively large volume of studies and evidence from experimental research studies that support the effectiveness of fear appeal strategies in promoting desired behavioural change, studies on non-fear messages have not been experimentally tested. It would therefore be beneficial to conduct a similar study in the future to examine the impact of non-fear messages (such as educational entertainment, humor, opinion leaders, and celebrity endorsements) in the same context for comparative analysis.

5. Conclusion

In sum, the findings reveal that nearly all the available studies on fear measurement used the Likert scale (as the standard approach) with different points of degree and fear appeal strategies such as fear triggers in media channels, print advertisements, and verbal descriptions. Furthermore, most studies conclude that fear appeal is effective in making participants adopt pandemic preventive measures; hence, it is effective for positive behavioral change (the degree of effectiveness depends on gender and race), especially when combined with self-efficacy and socio-cultural considerations. Very few studies, however, find insignificant associations, arguably due to the kind and intensity of the fear appeal messages and strategies used. Given the fact that nearly all the studies that used experimental research design confirmed effectiveness of fear appeal strategies for achieving desired behavioural change, similar study could also be replicated to test for non-fear messages (that is, alternative measures such as educational entertainment, humor, and opinion leaders, celebrity) in the same context for comparative analysis.

6. Limitations of the study

This study is not without limitations. First, although we conducted a comprehensive literature search, we did not hand-search journals or other gray literature sources. However, since we limited our search to pandemics, we did not anticipate that any relevant material would escape our computerized searches. Lastly, some of the studies used in this review were survey-based, online, and cross-sectional, which may have drawbacks; there may be differences in access to online surveys owing to language barriers, thus the results may not be entirely generalizable to the whole population. However, the study follows all the standard protocols to ensure the replicability of the results and conclusions.

Data availability statement

Data is not available.

CRedit authorship contribution statement

Syden Mishi: Writing – review & editing, Writing – original draft, Validation, Methodology, Investigation, Formal analysis, Conceptualization. **Farai Borden Mushonga:** Writing – review & editing, Writing – original draft, Visualization, Validation, Methodology, Investigation, Formal analysis, Conceptualization. **Godfred Anakpo:** Writing – review & editing, Writing – original draft, Visualization, Validation, Methodology, Investigation, Formal analysis, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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