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The American University in Cairo
School of Global Affairs and Public Policy
Department of Journalism and Mass Communication

“Tweeting During Emergencies”:
The Egyptian Ministry of Health Twitter Communication Strategy Under the Umbrella of the
Crisis and Emergency Risk Communication Model (CERC)
CASE STUDY: COVID-19 Pandemic

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Under the supervision of Dr. Rasha Allam



**THE AMERICAN
UNIVERSITY IN CAIRO**

Fall 2022

ABSTRACT

This research investigates using the Crisis and Emergency Risk Communication Model (CERC) for COVID-19 communication by analyzing the content of Twitter messages posted by the Government of Egypt through the Egyptian Ministry of Health (MOHP). It further examines how official communicators and institutions utilize social media to contact the public during emergencies like the COVID-19 pandemic, highlighting critical strategies of recommendations. Crisis and Emergency Risk Communication (CERC), a five-staged theory, recommends a set of messaging and pertained communication characteristics to implement at each stage of the identified following stages: (1) “Pre-crisis, (2) Initial event, (3) Maintenance, (4) Resolution, and (5) Evaluation”. The Egyptian Ministry of Health succeeded in applying most, if not all, of the recommended messaging and communication characteristics with varying frequency levels; however, it did not comply with the recommended order of stages while applying these characteristics. Throughout the study, the MOHP’s tweets achieved each CERC principle. Like the CERC characteristics, all CERC principles were also achieved at varying frequency levels. This study also showed different levels of engagement with different CERC characteristics.

KEYWORDS: COVID-19, Twitter, CERC, Crisis Communication and Emergency Risk Communication, Emergency, Pandemic, Egyptian, Ministry of Health and Population, Community, Social Media.

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Introduction

Global health crises, especially pandemics, have received primary focus and attention from international media and professional health communicators. [According to the World Health Organization \(WHO\)](#), COVID-19, a contagious and alarming acute respiratory disease, emerged in December 2019 as a strain that had never been identified before. It causes infected individuals to suffer from dry cough, fatigue, fever, and difficulty breathing. It was initially identified after a series of cases in Wuhan, China. There has been a substantial increase in the number of cases since then. Later in January 2020, WHO announced that the disease is considered a global public health emergency. Egypt did not escape the spread of the virus, and the first case was recorded in February 2020. It was not until mid-March when Egyptians, who were not worried before, started to be as concerned as the rest of the world since the media framed the situation in a more fear-based narrative and language, using the “deadly disease” as the most prevalent term when reporting on the event (Wahl-Jorgensen, 2020). The media and professional health communicators remarkably reinforce attitudes and conversations, especially during health emergencies (Kott & Limaye, 2016). How health is portrayed and framed in media constructs the general understanding, salience, causes, solutions, and perceptions of health crisis issues (Berry et al., 2007). While social media is rapidly being utilized for health crisis communication, little research has looked at how it might assist strategic communication at its various stages during health crises and emergencies. To avoid crises and emergencies that can result in illness, injury, or death, a Crisis and Emergency Risk Communication Model (CERC) is used to regain or sustain calm and to foster trust in the on-ground operational responses (Reynolds, 2006). The model highlights particular communication characteristics that should be used at different phases of a crisis or emergency by focusing on the audience’s communication needs across different stages. By following the model, health communication

strategies to be better planned and more comprehensive (Reynolds & Seeger, 2005; Veil et al., 2008). The CERC model has, however, not yet been thoroughly tested and adjusted to social media contexts during pandemics and outbreaks. Also, the degree to which government health agencies adhere to the CERC model on social media during disease outbreaks has not been thoroughly studied. This investigation is critical since pandemics and outbreaks may typically follow the CERC pattern more closely than other crises (Reynolds & Seeger, 2005). Consequently, results can have significant implications for the CERC model.

This research uses the Crisis and Emergency Risk Communication Model (CERC) for COVID-19 communication by analyzing the content of Twitter messages posted by the Egyptian Ministry of Health and Population (MOHP). It examines how official communicators and institutions use social media to contact the public during emergencies like the pandemic. Intending to highlight critical strategic recommendations, this researcher seeks to assess the Ministry's communication strategy to guide and inform the best practices and areas of development that the Ministry can build on for any future emergencies that can take place in Egypt. This study shows significant importance by assessing and understanding the messaging that the public mainly engaged with regarding retweets and likes. Therefore, this study will assist the Ministry in identifying the most effective and needed messaging for the Egyptian community.

Theoretical Framework

- Framing:

Health officials, professionals, and communicators mostly frame their messages as risk communication concerning the chance of encountering a significant public health threat. (Covello, 1992; Heath, 1994; Freimuth et al., 2000; Witte et al., 2000; Sandman, 2002). However, in organizational settings, including corporate contexts and disaster management, these perspectives are often framed as crisis communication (Barton, 2001; Coombs, 1995; Seeger et al., 1998, 2001).

Used as a storytelling mechanism, framing is adopted by individuals to make sense of their social realities (Goffman, 1974). They are mainly used to identify, perceive, label, and locate their interpretation (Goffman, 1974). For Gamson and Modigliani (1987), framing is defined through its ability to give meaning to a primary and central storyline, idea, or any connection among a series of events. Framing also offers a way for news audiences to cognitively interpret reality by picking up on cues - the overall content, words, phrases, or the hierarchy of ideas' importance (Tuchman, 1978). Besides, Neuman et al. (1992) defined news framing as a “conceptual tool” on which media consumers and makers depend on it to interpret and convey information. For Entman (1993), framing is considered the process of selecting certain “aspects of a perceived reality” and putting them in a way that makes them “more salient in a communicating text. The text should promote a particular problem definition, causal interpretation, moral evaluation, and treatment recommendation” (Entman, 1993), while also focusing and highlighting those points to assess and decide if they should be “noticeable, meaningful, or memorable to audiences” (Entman, 1993).

The impact of framing is how it affects audiences' responses to issues or events based on how it was put together or framed in a way that elicited a negative, positive, or ambivalent feeling (Iyengar, 1991; Scheufele, 1999). Scholars have noted that the effects of framing take place in two cases. First, two logical but not equivalently transparent statements for a particular issue lead decision-makers and policymakers to choose different options. Second, demonstrating a problem by which a focus is made on relevant considerations makes media consumers more likely to emphasize these considerations while also creating opinions and perceptions on the matter (Druckman, 2001). The effects of media can take place on numerous levels. Scholars have noted that they can affect how public affairs are outlined and define one's perception and knowledge (La Porte & Azpiroz, 2009).

- Crisis and Emergency Risk Communication Model (CERC)

Despite critics' concerns about the shortage of robust theoretical foundation and atheoretical tools in several health communication research, health professionals and communicators have used a range of concepts and frameworks to test, explain, organize, and plan campaigns (Kreps, 2001; Veil et al., 2008). In 1992, Backer, Rogers, and Sopory asserted that theoretical lenses, models, and frameworks for communication campaigns only give broad guidance for creating effective campaigns. As they noted, these models must be complemented by practitioner experience and confirmed by actual campaigns and their outcomes.

In 2002, the US Centers for Disease Control (CDC) created the Crisis and Emergency Risk Communication (CERC) model and framework for public health communicators and officials to provide guidance and advice on best practices during crises and emergencies (Reynolds & Seeger, 2005; Veil et al., 2008). The integrated conceptual, training and application approach was founded

right after the US anthrax attacks (also known as Amerithrax) took place in 2001, one week after the 9/11 events (Reynolds, 2004; Reynolds, Seeger, & Palenchar, 2012). Veil, Reynolds, Sellnow, and Seeger (2008) characterized CERC “...as a framework or paradigm developed through grounded theory and influenced by the health, risk, and crisis communication disciplines.” Lwin, Sheldenkar, and Schulz (2018) noted that CERC serves as a key tool that enables and supports officials and leadership with the proper recommendations and advice for strategic communication during the evolving and pinpointed phases of an emergency or crisis. As noted by CDC, CERC is set “to provide information that allows an individual, stakeholders or an entire community, to make the best possible decisions about their well-being, under nearly impossible time constraints, and to communicate those decisions, while accepting the imperfect nature of their choices” (CDC, 2007).

In the model’s early publications, Reynolds and Seeger (2005) consolidated two full-grown but different segments of communication research: crisis and risk communication. They further argued that both areas of communication serve as a new mixed form of messaging that healthcare professional communicators can not discard since the model provides a holistic approach to public health emergencies. The five-staged theory provides communication strategies to implement at each stage and points to proper response. The five stages are:

-
- (1) “Pre-crisis*
 - (2) Initial event*
 - (3) Maintenance*
 - (4) Resolution*
 - (5) Evaluation”*
-

In its first stage, “pre-crisis” entails deducing potential threats. At this phase, communication is concentrated on risk-focused messaging, such as advocating for communities to prepare themselves

in case the pinpointed threat gradually becomes a crisis. They are followed by the “initial event” stage, which marks the beginning of a crisis. During this stage, sharing messages that reduce uncertainties, publicize reassurance, and promote self-efficacy, is required. While the “maintenance” stage stands for the crisis when it spreads out. At this point, similar messages like those of the “initial event” are needed, besides others that should tackle and correct misperceptions or rumors. Besides, the “resolution” stage marks the end of the crisis. It is the time when communication addresses restoration and building while sharing the reasons and findings about the factors that contributed to and caused the crisis in the first place. Lastly is the “evaluation stage,” when practitioners reflect on the underlying factors and circumstances of the crisis, followed by discussing the observed and noticed lessons learned. In this last stage, an assessment of the communication strategies and activities undertaken pre, during, and after the crisis is required (Reynolds & Seeger, 2005).

While communicating with the recommended strategies in the five stages mentioned above, the CDC has proposed six guiding principles to conduct while applying the CERC framework:

-
- (1) “Be First**
 - (2) Be Right**
 - (3) Be Credible**
 - (4) Express Empathy**
 - (5) Promote Action**
 - (6) Show Respect”**
-

Three years after Reynolds & Seeger’s work, Veil et al. (2008) traced the roots of the CERC model for self-efficacy and sensemaking to share the six propositions, where the first three focus on the central and evolving role of communication in the holistic crisis and emergencies response. The other three emphasized the importance of “pre-crisis” communication, audience self-efficacy, and the nature of distinctive audiences:

1. Risk and crisis are ambiguous and unclear conditions that elicit distinct informational necessities and shortcomings;
2. For the public, agencies, and other stakeholders to make sense of unclear and ambiguous situations and make decisions about how to manage and lessen the threat to their health, ongoing two-way communication activities are required;
3. As a risk progresses through the phases of a crisis, communication strategies will change considerably, presenting additional hazards as the crisis progresses through post-crisis and recovery;
4. Once the crisis has occurred, the risk communication messages delivered before a crisis impact people's views, expectations, and actions. These responses then influence subsequent risk messaging.
5. Communication has a significant impact on particular risk and crisis management outcomes by fostering self-efficacy; and
6. Risks and crises influence various publics with distinct needs, interests, and resources, affecting their communication capacities, necessities, activities, and interests.

The CERC model provides an outline to 'communicate complex issues quickly, accurately, and credibly in extreme and uncertain situations' (Courtney, Cole, & Reynolds, 2003). Ballard-Reisch et al. (2007) argued that CERC is an advanced tool for health professional communications to help them manage public health risks: disastrous and crisis moments and emerging threats such as possible bioterrorism and disease outbreaks. In their book, Lundgren and McMackin (2018) classified the CERC framework stages and further expanded them on social media and digital applications as follows:

-
- (1) **Risk messages:** messages with information about symptoms;
 - (2) **Warnings:** messages with information on risk factors and threads associated with the outbreak;
 - (3) **Preparation:** messages with information on first responders and providing response recommendations;
 - (4) **Uncertainty reduction:** messages with information summarizing case reports and other information sources;
 - (5) **Efficacy:** messages with information highlighting specific personal prevention measures and common responsibility; and
 - (6) **Reassurance:** messages with information that calmed the public with mentions of government interventions and expressed thanks for the public's efforts."
-

Veil et al. (2008) also highlighted the need to attend to audiences' diversity in the CERC framework during risk and crisis communication. Other scholars have noted the importance of audience segmentation and the development of focused messages for each target audience (Schmid et al., 2008). Stigmatization is another pillar that has been addressed and recognized by the CERC framework as a pressing and common issue during pandemics. CDC (2014) encourages public health communicators to fight against and counter such a problem, preferably since the emergence of a pandemic. Health emergencies and crisis events, such as those caused by pandemics, need a strategic and predetermined communication blueprint to address the general public's need for knowledge to clarify uncertainties. Through the lens of CERC, Egyptian MOHP Twitter's communication strategy is investigated for the COVID-19 emergency and crisis. It examines how official and professional health communicators used social media during the pandemic to communicate with the public.

Literature Review

- **Public Health and National Security**

Public health focuses on societies and what they do collectively to ensure healthy conditions for people (Fidler, 2003). Historically, as national security, public health aimed to protect people from diseases emerging from the western world that worked as a modernist surveillance project (King, 2002). One article by Karnik (2001) argued that importing western-based responses on public health paves the way for particular ideologies to serve as influential policy-makers locally to the national public health. For example, Western ideologies for public health have been imported and disseminated in India through HIV/AIDs response (Karnik, 2001). Similarly, Lupton (2003) notes that the Western public discourse that aimed to protect the general masses, when proposed into the Asian context, acted as a justification to widely spread content based on a “top-down” approach, where the flow of information came from the centers of the authority to peripheral locations.

Peterson (2002) argued that epidemics and infectious disease outbreaks could risk national security for several reasons. Firstly, as noted, these outbreaks can create a violent scene due to political and economic instability. Secondly, the history of epidemics and infectious diseases, such as the plague, has modified the outcome of international conflicts, which could continue to happen. Additionally, they could also serve as war weapons and thus could directly influence and risk national security. For example, soldiers can focus and target the pillar of public health by disseminating a particular infectious disease to kill the strength of enemies. In other words, infectious diseases could influence the military’s readiness in a negative manner (Peterson, 2002).

From a public health communication perspective, national security is best shaped by noting that a pandemic threat has emerged elsewhere (King, 2002; Larson et al., 2005). Similarly, other scholars have noted that countries use national security in their communication approaches to justify their responses to the emerging threat whose origin is located beyond the national border. (King, 2002; Lupton, 2003; Petersen & Lupton, 2000)

Public health is one pillar of national security that the imported global public health responses could influence. Hence, this study investigates using the Crisis and Emergency Risk Communication Model (CERC) for COVID-19 communication by analyzing the content of Twitter messages posted by the Egyptian MOHP. Furthermore, it examines how official communicators and institutions use social media to contact the public during emergencies like the pandemic to highlight critical strategies of recommendations.

- Role of Communication during Risks, Crises, and Emergencies

In a broad sense, communication is essential for building connections and gathering, exchanging, presenting, and holding the knowledge needed to make decisions. Such a process is critically important during crisis and emergency planning and response. Miscommunication might amplify the harm and consequences of high risks, crises, and emergencies (Veil et al., 2008). Communication can restore a sense of personal control, lowering risk perceptions (Bradbury et al., 1999). This mindset requires communicators, in this case, public health authorities and officials, to comprehend and take in the demands, needs, cultures, and backgrounds of the targeted audiences (Veil et al., 2008). On the other hand, many scholars demonstrated that distinct types of crises present different threats and communication challenges (Pauchant & Mitroff, 1992; Seeger et al., 2003). For example, when a hazardous chemical leak occurs, people are generally advised to close windows, turn off all outside

ventilation, and stay in place. In other instances, residents should take cover promptly when a tornado warning is issued. During floods, community members are frequently advised to consume bottled water or boil water to avoid waterborne infections (Sellnow et al., 2002).

However, when it comes to public health emergencies, which are primarily concerned with the breakouts of specific illnesses or the discovery of specific hazards posed by environmental or lifestyle factors, other warnings, advice, and recommendations are communicated. For example, Foodborne infections, such as *Escherichia coli* O157:H7, that contaminate meat and beef threaten the general public's health. In such circumstances, public health professionals will trace the disease's sources, take steps to stop it from spreading, issue warnings, and inform the public about symptoms, treatments, and methods to prevent exposure (Fischhoff & Downs, 2001; Ulmer & Sellnow, 2000). Another example from the United States showed how public health officials communicated information regarding the West Nile virus (WNV), a mosquito-borne disease. Not only did they disseminate data on the disease's nature, prevalence, and risk level, but they also issued instructions for avoiding mosquito bites. In addition, the media and general public education campaigns are typically used to disseminate the news about these events (Reynolds & Seeger, 2005). While for emerging diseases, for instance, such as SARS or avian flu (H5N1) and also known as "bird flu," despite having less malicious origins, the virus generates frightening and harmful scenarios due to its massive public health negative impact and high level of risks. Accordingly, communication in these situations necessitates greater collaboration among government entities, law enforcement bodies, and elected politicians at the governmental levels.

Nevertheless, threats can become more political than they should in some circumstances, adding more complexity to the existing situation and crisis (Reynolds & Seeger, 2005). Risk and crisis communication have been heavily used in emergency and disaster-based research. Although both terms are closely related, they have prominent features. Researchers explained that both terms are used in research to supplement each other or to address specific topics individually. Seeger (2006) noted that crisis communication is more event centered, while risk communication is focused on the projection and estimation of risks that could take place in the future. Therefore, the message content may also be distinguished, where crisis vs. risk communication sheds light on the current state vs. probabilities of negative implications or the known vs. unknown.

- Crisis and Risk Communication

Historically, Hermann (1963) defined crises as surprises, threats, and a timely shortened response. According to Seeger, Sellnow, and Ulmer (1998), a crisis is a distinct, unanticipated, and non-routine occurrence or series of events that create or perceive high levels of uncertainty and threat to an organization's high-priority goals. For Sturges (1994), crisis communication serves three purposes: instruct information, which tells people how to react in terms of personal safety; adjustive information, which assists people in dealing with uncertainty; and internalizing information, which refers to information that assists an organization in managing its reputation.

Crisis communication functions as a mediator, spokesperson, and knowledge propagator (Seeger et al., 1998). The ultimate purpose of crisis communication, which is time sensitive, is to prevent and limit a crisis's negative repercussions and help protect stakeholders and organizations from possible harm (Coombs, 1999). In 2002, it was noted that crisis communication is “... is verbal, visual, and

written interaction between the organization and its stakeholders (often through the media) before, during, and after a negative occurrence’’ (Fearn-Banks, 2002).

Similarly, Sellnow et al. (2002) clarified that sharing information during a crisis usually aims to reduce threat and mediate harm. In a crisis condition, an increased need for information may improve the levels of uncertainties undergone by people (Sellnow et al., 2002). These communication tactics are intended to limit and encapsulate harm, offer adequate specific information to stakeholders, and promote and improve recovery. They also handle the view of blame and responsibility, reestablish legitimacy, establish support and assistance, describe and justify actions, apologize, and call for learning, healing, and change (Seeger et al., 2003).

To broaden the definition of crisis from the organization level to the community level, Boin and other scholars (2005) defined a crisis as a set of situations in which common core values are threatened, leaving a sense of urgency and a need for swift actions for uncertainties, and clarity on possible repercussions as well as treatment. Accordingly, in a truthful, transparent, timely, accurate, and thorough manner, crisis communication aims to describe the specific occurrence, identify potential implications and outcomes, and provide specific harm-reduction information to affected groups (Reynolds & Seeger, 2005). The same authors argued that crisis communication is connected and associated with public relations as it proactively manages and frames public views of an event to minimize harm to stakeholders and organizations (Reynolds & Seeger, 2005).

Crisis communication research covers the communication management of government, community, and organizations under discrete disasters and issues (Linkov et al., 2010). Crisis

communication focuses on responding to an uncommon, unforeseen, and unexpected event that puts everyone in danger and necessitates a quick response time to prevent harm (Coombs, 2010).

In its course and early definition, risk communication was described by the National Research Council (1982) as the engagement of individuals, groups, and institutions in an interactive process of exchanging information and opinions. Other scholars, such as Covello (1992), defined risk communication as the type of information about the magnitude, nature, significance, and control of a risk shared among interested parties. Later in 1994, Heath noted that risk communication concerns risk aspects, tolerability, and risk repercussions.

Risk communication usually includes generating public health messages on risks and environmental hazards (Reynolds & Seeger, 2005). It's mainly related to risk and threat sensing as well as evaluation and assessment (Reynolds & Seeger, 2005). In their work, Witte and other scholars (2000) indicate that research on fear appeals as a persuasive tactic is rooted chiefly and anchored in risk communication. By providing a fear or threat and detailing behavior that may lessen the threat, these messages attempt to elicit behavioral change (Witte et al., 2000).

Seeger and Reynolds (2007) further asserted that risk communication revolves around the deliberate attempt to educate the public about dangers and encourage people to change their behavior to lessen risks. The notion that the public has a generalized right to know about hazards and risks underpins risk communication. The availability of knowledge allows the general people to make well-informed risk decisions. Risk communication supports decision-making and risk-sharing (Reynolds & Seeger, 2005).

Messages about risk can and should be analyzed in the context of the target audience's needs, background, values, experience, culture, health literacy, and diversity (Murray-Johnson et al., 2001). Risk messages should be straightforward, appeal to rationalism and sentiment, and solve problems (Freimuth et al., 2000). Many risk communication strategies in public health include these elements of public communications, typically broadcast in the mainstream media as broad convincing tactics. They aim to educate the public and influence behavior to maintain and improve public health and safety (Reynolds & Seeger, 2005).

Risk communication is also associated with conversations about the chances and outcomes of an event that may occur, which individuals utilize to make decisions (Reynolds & Seeger, 2012). Risk communication, in further detail, entails evaluating the surroundings for possible risks, debating such threats among experts, influencing diverse publics to make healthy judgments, issuing warning messages, and offering post-event suggestions (Reynolds & Seeger 2005). Risk communication can also be summarized as enhancing our ability to think about the unfathomable to prepare for prospective catastrophes (Mitroff, 2004).

The concept of risk communication has been more frequently addressed with public health events such as disease outbreaks due to the importance of intervention with proactive and adaptive strategies to limit the impact of the crisis (Linkov et al., 2010). Accordingly, the concept of risk communication then refers to informing media consumers about the risks of an issue but also trying to change their behaviors to limit this set of risks (Seeger & Reynolds, 2007).

In contrast, Glik (2007) defined the term as exchanging information about risks from either industrial and environmental causes or by policies and products from institutions, groups, and individuals. In the same notion, Domke, Shah, & Wackman (1998) have noted that understanding the health crisis is a multilateral psychological concept in which people's reactions are connected to different features of the risk information they consume by the media.

Some scholars argue that crisis communication is a more constrained version of risk communication (Lundgren, 1994). This risk and crisis communication, for example, have different underlying goals. Risk messages deal with the possibility of associated harm and the strategies for lowering its probability. Risk messaging is frequently based on current scientific and technical information and cultural or societal attitudes about the risk. Through persuasion, risk messages attempt to convert or operationalize technical understanding of risk into actions. On the other hand, crisis messages are usually concerned with both what is known and what is unknown about a particular incident. In many cases, crisis messaging is more concerned with informing than convincing (Reynolds and Seeger 2005).

Risk communication has grown in tandem with the rising public demand for more information and a better understanding of risk, particularly technical and scientific. In contrast, crisis communication has largely remained event-specific, despite pre-crisis planning encouraging emergency managers to think beyond the scope of a single incident (Reynolds and Seeger 2005).

On the other hand, risk and crisis communication share a lot of similarities and cross paths at different stages. Both types of communication entail the development of public messages aimed at

eliciting specific responses from the general audience. The messages are predominantly transmitted through both mass communication channels, while they contain public and group communication elements. Although they emerge in various ways, risk and crisis communication rely on credibility as an essential persuasive feature. Both share the goal of limiting, containing, mitigating, and reducing public harm (Reynolds and Seeger, 2005).

With the emergence of the Crisis and Emergency Risk Communication (CERC) paradigm, academic research on crisis and risk communication has advanced to a new level (Reynold et al., 2005). Nour et al. (2017) noted that in the early stages of the MERS-CoV outbreak in Qatar, the CERC model was only partially implemented and concluded that implementing CERC principles can assist public health officials in rebuilding and preserving their confidence.

Not to forget to highlight that Internet technologies have become a vital component of crisis and emergency risk communication (Yang et al., 2021). Reynolds (2010) found that using social media to implement CERC's six fundamental principles has boosted the public's trust in the government's recommendations during the 2009 H1N1 pandemic.

During the Zika outbreak in Singapore, Lwin et al. (2018) studied how the CERC model was employed through social media. The findings indicate that social media was effectively utilized throughout the crisis. They also discovered that the main CERC phases were employed and that "raising public collective responsibility" and "expressing appreciation to the audience for collaboration" were the most commonly used CERC phases.

A year later, Meadows et al. (2019) also used CERC to look at a sample of tweets from various phases of the 2015 California measles epidemic. They discovered that in the early phases of the crisis, the public was very interested in government statements aired through social media, but that attention waned as the crisis progressed. Furthermore, during the maintenance and resolution periods, the expression of reassurance grew dramatically.

Due to the importance of crisis and risk in many fields, crisis and risk communication research has increased. However, very little research has looked at the intellectual environment holistically. A comprehensive assessment of CERC-related papers published between 2002 and 2017 found that despite the solid body of literature citing and applying the CERC model in case studies, few efforts have empirically evaluated the CERC model (Miller et al., 2021). In the same notion, Lwin et al. (2018) asserted that current literature had not been properly and fully evaluated during disease outbreaks, especially on social media. They further clarified that little research has been done during disease outbreaks on how successfully government health officials adopted the CERC model on social media (Lwin et al., 2018).

It is crucial to investigate infectious disease epidemics that tend to follow the CERC pattern more than other types of crises (Reynolds & Seeger, 2005) and to study the effectiveness of those strategies, particularly on social media, as they are lacking (Lwin et al., 2018). Therefore, this research aims to investigate the use of the Crisis and Emergency Risk Communication Model (CERC) for COVID-19 communication by analyzing the social media content, Twitter messages in specific, posted by the Egyptian MOHP. We aim to demonstrate the strategic uses of Twitter for communicating the COVID-19 epidemic.

- Health Crisis and Risk Communication Over Social Media: Pandemics and Diseases outbreaks

The internet has become essential to crisis and emergency risk communication (Yang et al., 2021). The significance of internet technology in transmitting emergency risk information has been investigated in several research studies (Guidry et al., 2017; Liao et al., 2020; Vos & Buckner, 2016). In addition, the use of social media has snowballed in recent years. Safko and Brake (2009) defined social media as the activities, practices, and behaviors among groups congregating online to share content, information, and views via communicative media.

Many scholars looked at social media, especially those checking governments' communications on emergencies (Lwin et al., 2018; Ngai et al., 2020; Panagiotopoulos et al., 2016). Other scholars noted that individuals and healthcare institutions increasingly rely on these platforms to interact and exchange data (Moorhead et al., 2013). Numerous government and public health agencies (such as WHO, CDC, and various local health departments) have used social media to enhance public communication (Tang et al., 2018). Over 3.8 billion people utilize social media on various platforms globally (Kemp, 2020). Social media use in health education and promotion has proven to be helpful by enabling free access to information, delivering health campaigns, and providing social support (Korda & Itani, 2013).

Social media could also be a helpful tool for efficiently communicating outbreak-related updates and vital information to the public (Alhassan & AlDossary, 2021). According to existing studies, people frequently resort to social media for information during infectious disease outbreaks, which can impact their decision-making and subsequent actions (Tang et al., 2018). Melovic et al. (2020) advised policymakers and governments to consider new internet communication formats and social

media platforms when convincing communities about health-related campaigns during crises. In the same manner, Masip et al. (2020) proposed that communicators should include social media platforms in their crisis communication strategy on a professional level.

In fact, according to Shawky et al. (2019), health experts and a sample of the broader public thought social media was a valuable channel for spreading health-related messages amid emergencies. Others indicate that audiences saw health-related messaging on social media as trustworthy and serious. They also demonstrated that social media was more convincing than traditional media, despite its declining popularity among some of the target groups (Westberg et al., 2018). In addition, individuals utilize cell phones and social media more than traditional media to obtain health information amid health crises (Goshayeshi et al., 2019).

When an infectious disease breakout, much information is needed and demanded (Yang et al., 2021). International, national, and local health organizations have all addressed the use of various channels for public mass communication to increase audiences' access to information (Yang et al., 2021). Several research studies have looked into the usage of various social media platforms during outbreaks of infectious diseases. Chen et al. (2018), for example, assessed the CDC's reaction over time and public involvement on Twitter during different stages of the Zika outbreak. They noted that the CDC was more proactive in the early phases of the Zika outbreak and successfully gained public attention, particularly in the first quarter of 2016. However, when the number of Zika infections skyrocketed in the second and third quarters of 2016, the CDC's efforts on Twitter plummeted. During the same disease outbreak, three Singaporean health agencies: The National Environment Agency, the Health Promotion Board, and the Ministry of Health (MOHP), used Facebook

strategically to communicate about the Zika virus, according to Lwin et al. (2018) who also noted that Facebook was acknowledged to be strategically utilized for Zika-related communication. They also suggested that preparedness posts (e.g., content that mentions responders and offers tips to limit harm) may have been the most effective, as shown by higher public interaction and engagement levels. Guidry et al. (2017) studied Ebola-related posts from the CDC, the WHO, and Médecins Sans Frontières (i.e., Doctors Without Borders) on social media. They discovered that Instagram was a very useful tool for engaging with the public during times of crisis. It was also proposed that social media messaging is more successful when used by well-known health organizations and based on risk communication concepts.

- History of Pandemics

Originating from the Greeks, the word "Pandemic" consists of "pan," which means all, and "demos," which means the people. Typically, the term refers to a highly and widely spread contagious disease in a country/s, continent/s individually, or simultaneously (Honigsbaum, 2009). The term has yet to be adequately defined in the past two decades by either modern medical or authoritative texts (Morens et al., 2009). However, one globally accepted definition for a pandemic is an epidemic that is spreading across an enormous geographic area, crossing international borders, and typically impacting a significant number of people (Harris, 2000). Qiu et al. (2017) identified several features of a pandemic to better understand the concept. This includes diseases with the following:

- (1) "Wide geographic extension" describes how far a disease can spread across substantial geographic areas;
- (2) "Disease Movement" asserts that a disease has been transmitted unexpectedly but has been traced;
- (3) "Novelty" identifies a disease that is either entirely new or at least related to an existing variant;

- (4) "Severity" relates to deadly or severe illnesses;
- (5) "High Attack Rates and Explosiveness" refers to diseases that spread rapidly and with high transmission rates;
- (6) "Minimal Population Immunity"; and
- (7) "Infectiousness and Contagiousness."

Throughout history, several recorded outbreaks and epidemics have occurred, including AIDS, cholera, smallpox, dengue, plague, influenza, tuberculosis, West Nile disease, and (SARS) severe acute respiratory syndrome. In the 20th century alone, three pandemics of influenza struck globally: Spanish Flu, Asian Flu, and Hong Kong Flu in 1919, 1957, and 1969 respectively (Qiu et al., 2017). At least six significant outbreaks occurred over recent years, such as SARS H1N1 influenza, HPS, H5N1 influenza, MERS, and the Ebola virus disease epidemic (Gostin et al., 2016). Emerging infectious diseases and outbreaks can cause high fatality rates worldwide, to the extent that they can result in the mortality of a quarter to a third of the world (Verikios et al., 2015). According to the WHO, the Spanish Influenza pandemic resulted in the death of more than 20 million individuals globally. In 2009, H1N1 was the first pandemic to strike the 21st century, affecting and causing more than millions of deaths globally (Hajjar & McIntosh, 2010). Also, Ebola killed more than 11,000 people worldwide (Maurice, 2016). Threatening public health in 34 countries, Zika has spread vastly throughout 2016 (Troncoso, 2016). Moreover, there is a concern over the repetition of some past infectious diseases as they threaten aspects beyond regional and global public health (Verikios et al., 2015).

Besides the fatal complications resulting from pandemics, they also have a wide range of negative political, economic, and social aftermaths (Davies, 2013). In 2009, for example, H1N1 had a serious detrimental impact on the financial sector, healthcare systems, animal, health, agriculture,

education, and transportation fields. In sum, a pandemic outbreak poses a threat to all domains of the social and economic system (Drake et al., 2012). Similarly and with a focus on Africa, Ebola pandemics have affected the social and economic order in West Africa, leaving communities with disrupted essential services, such as transportation, education, and tourism, striking the economy of West Africa and vulnerable populations (Nabarro & Wannous, 2016).

- Global and Egyptian COVID-19 Situation

According to [WHO](#) (2022), between 1 January 2020 and 31 December 2021, the total death toll related directly or indirectly to the COVID-19 pandemic (referred to as "excess mortality") was roughly 14.9 million. The discrepancy between the number of fatalities that have occurred during the COVID-19 outbreak and the number that would be predicted in the absence of the pandemic (based on data from the previous year) is known as excess mortality. Excess mortality refers to deaths caused directly by COVID-19 or indirectly by the pandemic's influence on health systems and society. Deaths associated with COVID-19 indirectly are due to various health issues for which individuals could not receive treatment due to the pandemic's overburdening health services.

Such a considerable death toll is broken down by age and gender over the recorded data during the 24 months (2020 and 2021). It has been confirmed that more males died at a more significant rate than females (57 percent male, 43 percent female) and that older individuals died at a higher rate than younger ones. However, The full magnitude of excess mortality in many communities is often obscured due to insufficient investments in data. Therefore, these estimations were created utilizing the "best available data, a strong methodology, and a transparent approach" (WHO, 2022).

Egypt, the first African country to disclose a case of COVID-19, confirmed its first case on February 14, 2020 (Saied et al., 2021). [Egyptian Council of Ministers](#) (2022) reported that the total number of reported COVID-19 cases in Egypt since the virus emerged and appeared in the country is 495.4 thousand cases, with 24.3 thousand deaths (representing 4.9% of the total number of COVID-19 infections in Egypt). As a result, all flights between China and Egypt were banned on January 26, 2020, followed by a decision to suspend all flights starting from March 19, 2020. In addition, schools, universities, and other public spaces where people may congregate were all closed, and all mosques and churches were shut as of March 21, 2020 ([Egyptian Council of Ministers](#), 2022).

Furthermore, travels and tourism has been suspended to avoid virus transmission, especially when cases have been reported among Egyptians and visitors onboard a floating hotel cruise in Luxor and Aswan. In addition, a curfew was imposed until March 31, 2020. COVID-19 pandemic awareness campaigns were raised by disseminating "stay home, stay safe" messages and encouraging people on social media to adopt social distancing. Handwashing, cough etiquette, the use of personal protective equipment (e.g., facemasks), limiting hand-to-face contact, avoiding sharing rooms and towels, reducing air conditioner (AC) use, and avoiding crowds in public transportation were all promoted in different forms of media (Saied et al., 2021).

However, due to the negative economic impact resulting from curfew and lockdown, restrictions were eased and laid back to varying levels. Egypt is a developing nation, and movement restrictions will likely have an impact on its economy, notably on the tourism sector, which has been a pillar of

the Egyptian economy that suffered from the January 25 revolution until the advent of COVID-19. As a result, Egypt reopened its gates and borders to the world (Saied et al., 2021).

- COVID-19 Pandemic on Social Media through the lens of Academic Research

Although the COVID-19 pandemic caused widespread disruption, it improved the functionality of social networks, allowing citizens to engage with the government and healthcare officials (Almazan & Valle-Cruz, 2021). Several intellectuals have worked on research papers for various topics to aid with pandemic situations throughout the world. During the COVID-19 pandemic, Moreno et al. (2020) investigated the synchronized usage of government social media. They discovered that individuals who intensively used social media were more likely to have favorable views of the government's crisis communication efforts.

According to Limaye et al. (2020), social media allows the public to have timely access to a wide range of COVID-19 issues while also allowing for dynamic engagement beyond traditional media. Almazan & Valle-Cruz (2021) examined the impact of a Twitter message on the stock market during two pandemics (COVID-19 and H1N1), finding that the markets reacted between 0 to 10 days after the information was posted and spread. Cinelli et al. (2020) investigated Twitter data and discovered that it was fertile ground for rumor spread, resulting negatively in infodemic. Also, there was evidence that people spread false information regarding COVID-19 because they did not check the info's reliability (Pennycook et al., 2020a). Therefore, it has been noted that the global spread of false news has accelerated due to the COVID-19 epidemic (Allcott et al., 2020; Pennycook et al., 2020b).

Li, Chandra, & Kapucu (2020) are proponents of using SM in the fight against COVID-19. They documented their experience using social media technologies for government communication in Wuhan, suggesting that social media platforms reduced information overload and conflict across government levels. As they noted, "... SM outlet provided critical and timely information for government response in dealing with pandemic and serving the citizens' needs ..." (Li et al., 2020). Recent investigations of public health agencies' use of Facebook for COVID-19 in Singapore, the United States, and England, as well as corresponding public outreach to these activities, reported that the Singapore Ministry of Health was the most active in terms of posting frequency, while the CDC received the most comments (Raamkumar et al., 2020). Furthermore, they stated that in these three countries, public health officials kept posting frequently about preventative and safety measures and status updates (Raamkumar, Tan, & Wee, 2020).

With a focus on one of the latest outbreaks, Tengku, Budiman, and Purwaningsih (2021) found that the government could set engagement and understand the community's needs by using two-way communication on social media during the COVID-19 epidemic. In general, social media platforms can be used to improve health crisis strategic communication in several ways: online discussions can raise awareness, information can spread quickly and in real-time among the public, and they can be used to communicate recommendations and warnings to the public swiftly (Tengku et al., 2021).

- A Glimpse into the Global and Egyptian Digital World

As of Jan 2022, Digital Global Overview Report noted that the total number of internet users is 4.95 billion. This number represents 62.5% of the global population (7.19 billion). The same report highlighted that the total number of active social media users is 4.62 billion globally, constituting

58.4% of the total population worldwide. The CEO of the organization, Simon Kemp, said that “ ... Social Media users numbers continue to grow faster than they did pre-pandemic, with the global total still increasing at a rate of almost 13.5 new users every second...”.

While in Feb 2022, the same organization issued another country report with the same objectives for Egypt. According to Kepios’s Egypt’s Digital Overview Report, the total number of internet users is 75.66 million, representing 71.9% of the total global population (105.2 million). The same report highlighted that the total number of active social media users is 51.45 billion globally, which comprises 48.9% of the population worldwide.

According to Allam (2018), Egypt is classified as a transitional democracy whose media landscape has undergone several changes since the 25th of Jan revolution in 2011. Its digital media has evolved through a recognizable growth that led many media outlets to transform their transitional business models and adapt to digital services since the average time spent online per week has jumped from 18 hours in 2013 to 26 hours in 2017 (Allam, 2018).

- **Benefits and Uses of Twitter**

As a platform that transforms and reimagines the communication perspective in social life, Twitter has become an integral element of social and professional lives, with its number of users steadily increasing (Dogru & Dogru, 2015). As of Jan 2022, Digital Global Overview Report noted that the total number of Twitter active users is 211 million by the third quarter of 2021. According to Kepios’s Egypt’s Digital Overview Report, Egypt had 5.15 million Twitter users in early 2022.

People can use Twitter to examine various types of news, create a hashtag for a topic to unite, offer their thoughts, and communicate their ideas with their followers in real time. According to Cetintas and Buluthan (2019), Twitter facilitates the model of conversation that institutions develop with their stakeholders, as well as the communication that are planned online.

Created in 2006 as an online “short message service (SMS) replacement” (Wasserman, 2012), Twitter offers a worldwide social feature that allows users to access its free online services in the form of short messages with only 280 characters. Twitter’s real-time feature is also asserted by both Parry (2008) and Young (2008), who suggest that information is sent instantly between users. People may exchange information and thoughts instantly via Twitter on their mobile devices (Griswold, 2007). It is also a social network that allows users to view words, ideas, and phrases that are becoming increasingly popular, supporting them throughout specified hours, weeks, and days (Benhardus & Kalita, 2013).

Also, content on Twitter can be added in the form of hashtags and URLs. The usage of hashtags indicates that communication is related to a specific subject. Hashtags operate best when they are developed and agreed upon, which is essentially the case when an organization suggests a hashtag for adoption by persons interested in an event or for a topic (Lovejoy et al., 2012a). Including URLs in tweets can help boost “retweetability” (Suh, Hong, Pirolli, & Chi, 2010). Users can disseminate hyperlinks on Twitter using third-party websites. To comply with Twitter’s character limitations, many health organizations use URL-shortening services to distribute URLs (Lovejoy et al., 2012b). Another successful approach to providing information in an easy-to-understand style is to utilize photos and videos. Health recommendations and information on ministerial events accompanied by

pictures and videos may aid in the diffusion effort and thereby boost the public impression of the content's benefits (Bernhardt et al., 2011).

Evidence suggests that Twitter has become increasingly significant in disaster communication for the general public and organizations involved in disaster relief and response (David et al., 2016). Twitter is extensively utilized and regarded as a reliable source for credible and fast public health and emergency management information (Dalrymple et al., 2016; Lachlan et al., 2016; Spence et al., 2015). Organizations can engage stakeholders in two-way communication to establish trust by using Twitter. However, only some do so (Dalrymple et al., 2016). Lovejoy and Saxton (2012) examined nonprofits' use of Twitter in a seminal study, where the authors looked at a large body of tweets and categorized them. Most of them were informational rather than two-way focused, but Lovejoy and Saxton noted that "informational tweets serve as an essential base upon which more complex functions (e.g., dialogue and mobilization) can be built." Twitter use may grow throughout the course of a crisis, from delivering information to mobilizing relief activities and even offering an avenue for emotional release and support when two-way communication is enabled (Kinsky et al., 2021). As disastrous and crisis incidents gain worldwide attention more easily than before, Twitter amplifies voice, perhaps producing a wider audience, as well as mobilizing more efforts and higher attention from the support community at large (David et al., 2016). Using Twitter or other platforms for one-way communication might backfire since organizations frequently use it to boost their image, which can undermine efforts to look authentic (Kinsky et al., 2015).

Twitter is commonly utilized in research and incorporated into qualitative and quantitative scientific research methodologies for data analysis (Batu, Senturk, & Tos, 2020). Twitter, according

to Ayan et al. (2019), provides researchers with a wide range of fields relevant to social media by extracting and displaying a large amount of data. Furthermore, Twitter is a platform that directly benefits data science by providing researchers with content (Gaziolu and Seker, 2017). Therefore, attending to its content and messaging characteristics is essential. With this study's focus on CERC, viewing the framework's content and message characteristics can promote stakeholders' knowledge and resource acquisition, boost self-efficacy, and minimize uncertainties and emotional distress (Miller et al., 2021).

Methodology

This study uses a quantitative research method, content analysis, to investigate the use of the Crisis and Emergency Risk Communication Model (CERC) for COVID-19 communication by the Egyptian Ministry of Health and Population over two years. Guided by CERC, the research aims to analyze the Egyptian Ministry of Health and Population's social media content with a closer look at Twitter messages. In this study, tweets shared between the dates of February 2020 till February 2022 via the Egyptian Ministry of Health and Population (MOHP) official Twitter (<https://twitter.com/MOHPpegypt>) are examined in the context of the Crisis and Emergency Risk Communication (CERC) Model.

- **Content Analysis:**

Content analysis methodology uses quantitative and qualitative evaluation to assist in media content research (Wimmer & Dominick, 2011). As Kerlinger (1986) noted, it is described as a means of "... studying and analyzing communication in a systematic, objective, and quantitative manner to measure variables." Additionally, content analysis is a vital tool for examining the different variants and shifts in the coverage of a specific topic or group (Wimmer & Dominick, 2011). As a result, this methodology is a good fit for exploring the topic of this paper. To highlight key strategic recommendations, this paper seeks to assess the Ministry's communication strategy to guide and inform the best practices and areas of development that the Ministry can build on for any future emergencies that can take place in Egypt. Furthermore, this study holds significant importance by assessing and understanding the messaging the public mainly engaged with in terms of "retweets" and "likes." This understanding will assist the Ministry in identifying the most effective and needed messaging that would suit the Egyptian community.

- Research Questions:

The researcher is interested in revealing and examining the use of the CERC Model by official communicators and institutions on social media, focusing on Twitter during emergencies like the COVID-19 pandemic and highlighting key strategies of recommendations. The research questions are:

- ❖ **RQ1. To what extent did the Egyptian MOHP's Tweets on COVID-19 comply with the advised CERC communication characteristics during the crisis and emergency stages?**
- ❖ **RQ2. How frequent were the Egyptian MOHP's tweets on COVID-19 conforming to the advised CERC principles?**
- ❖ **RQ3. How engaged was the public with the Egyptian Ministry of Health's Tweets during the COVID-19 pandemic?**

- Identifying Variables:

The “empirical counterparts” of a concept or construct the researcher intends to study are variables (Wimmer & Domenick, 2011). This research paper analyzes using the Crisis and Emergency Risk Communication Model (CERC) for COVID-19 communication by the Egyptian Ministry of Health on social media, focusing on Twitter. To obtain systematic, measurable results, a researcher typically examines variables in relation to one another. Dependent variables are observed, while independent variables are systematically manipulated (Wimmer & Domenick, 2011). The “Egyptian MOHP Tweet” is the research study’s independent variable, changing each time the dependent variable is examined.

RQ1. To what extent did the Egyptian MOHP's Tweets on COVID-19 comply with the advised CERC communication characteristics during the crisis and emergency stages?

The dependent variable for the first research question is “**CERC communication characteristics.**” Guided by the CERC model, the researcher aims to explore this variable by looking into the availability and frequency of communication characteristics, mainly message types, posted by the Ministry in light of the COVID-19 crisis and emergency stages. With respect to Lundgren and McMackin’s book (2018) that further expanded on the identified stages of the CERC model to social media and technology-based applications, the authors identified the following as communication characteristics:

1. *Risk messages*
2. *Warnings*
3. *Preparations*
4. *Uncertainty reduction*
5. *Efficacy*
6. *Reassurance*

RQ2. How frequent were the Egyptian MOHP's tweets on COVID-19 conforming to the advised CERC principles?

The second research question of this study looks at the availability and frequency of CERC principles. While communicating with the advised characteristics during the different crisis and emergency stages, the CDC offers six principles to use while applying the CERC framework. The dependent variable of this research question is “**CERC principles,**” and the variables examined are:

1. *Be First*
2. *Be Right*
3. *Be Credible*
4. *Express Empathy*
5. *Promote Action*

6. *Show Respect*

*RQ3. How **engaged was the public** with the Egyptian Ministry of Health's Tweets during the COVID-19 pandemic?*

The third research question of this study focuses on studying the “**level of engagement**” with the Egyptian MOHP’s tweets. The dependent variable of this research question is broken into a set of variables defining the elements of the engagement level. This variable would then be examined by:

- The number of retweets per tweet.
 - The number of likes per tweet.
- Defining Population:

The Egyptian Ministry of Health's official Twitter account ([MOHPegypt](#)), initially founded in January 2020, holds approximately 913.3K followers and 11 following to date. [MOHPegypt](#) follows the Government of Egypt’s Cabinet accounts, which includes the Ministry of International Cooperation, former ministers, such as Dr. Hala Zayed, INGOs, such as The World Health Organization, and the Egyptian President, H.E. President Abdel Fatah El-Sisi. Since it was created, the account has posted around 10.8K tweets up to the research process date.

- Definition Population Parameters:

When WHO announced a mysterious Coronavirus spread in Wuhan by the 9th of Jan 2020, Egypt announced its first reported case on the 14th of February 2020. In this study, all tweets posted by the Egyptian Ministry of Health's official Twitter account from February 2020 till February 2022 were scrapped using Twitter Developer. A total of 5,362 tweets were extracted for this range of time. Out

of which, 3,013 tweets were not COVID-19 related. Only COVID-19-related tweets, which involved around 2,349, were taken into consideration.

- Unit of Analysis:

This research study analyzed the text of the Ministry of Health tweets related to COVID-19 over two years. This analysis entails studying the tweet's text, including the caption and the text on visuals (pictures, posters, infographics) attached to the tweet. The chosen dates for content analysis were selected to provide a comprehensive understanding of the event during its different stages.

Any tweets that do not refer directly/indirectly to COVID-19 were not selected and studied. Also, any tweets that include videos were discarded as the researcher aims only to study the text.

A coding sheet was developed mainly on a nominal level of measurement, with few on a ratio level, to measure the portrayal of both death events on local news coverage. In addition, an operational book carrying in-depth explanations of the questions and definitions for the choices was provided to the coders to secure the validity and reliability of the coding.

- Sampling:

A crucial and important step in the content analysis research approach is choosing a sample. When examining the content, the concept that each unit should have a chance of being selected by random sampling may not be optimal (Krippendorff, 2013). Purposive sampling, according to the most recent study by Drisko & Masch (2015), maybe a more accurate and precise method for gathering more representative results than simple random sampling and constructed weeks, which were previously proposed as being more frequently used for working on content analysis (Hester

& Dougall, 2007). The aim of our study is to find and choose data that corresponds to a particular topic with features of interest. Therefore, the purposive sample is a better method for content analysis because not every piece of content may turn out to be significant or pertinent to a study (Drisko & Masch, 2015). As a result, the sample excludes irrelevant data. Wimmer & Dominick (2011) define the purposive selection process as a selection that includes features with “specific characteristics or qualities and eliminates those who fail to meet these criteria.” Further, since electronic and digital media provide extensive content, limiting the sample under investigation most probably gives more accurate and representative results while decreasing the degree of sampling error. Hence, the researcher had purposively selected tweets that focused on COVID-19 directly or indirectly. All videos were discarded as they are not part of the study’s focus. All relevant tweets were considered for text analysis only. Infographics and images were also included in the same, but only the text written was analyzed. It's worth mentioning that images or infographics icons were not visually but textually analyzed. All 1825 tweets of text available on COVID-19 were considered for analysis.

Table 1 COVID-19 Scrapped Tweet Numbers Per Month

Month	Number of Tweets
Feb-20	0
Mar-20	71
Apr-20	49
May-20	84
Jun-20	88
Jul-20	91
Aug-20	64
Sept-20	67
Oct-20	64
Nov-20	65

Dec-20	83
Jan-21	90
Feb-21	63
Mar-21	89
Apr-21	89
May-21	91
Jun-21	76
Jul-21	64
Aug-21	87
Sept-21	77
Oct-21	67
Nov-21	71
Dec-21	75
Jan-22	86
Feb-22	74

- Coding Questionnaire and Operational Definitions:

The coding framework is built on CERC communication characteristics identified in Lundgren and McMackin's book (2018) and tailored to the Egyptian context. It is also based on the six principles CDC offered to use while applying the CERC framework as both align with the researcher's pursuit of revealing the use of the CERC Model by official communicators and institutions on social media, with a focus on Twitter, to during emergencies like that of the COVID-19 pandemic, to highlight key strategies of recommendations. The method of naming and categorizing phenomena by a detailed examination of the data is known as open coding, according to Williams and Moser (2019). The researcher pinpointed the emerging topics in the Egyptian context for each noted CERC characteristic

or principle. Accordingly, a codebook was developed to meticulously categorize the MOHP’s Twitter posts. The following tables (2 and 3) summarize the main characteristics and principles with the noted sub-themes while providing examples for further clarification:

Table 2 CERC Characteristics, Sub-themes, and Examples

CERC Characteristics	Contextualized Sub-themes	Example
Risk Messages “messages with information about symptoms”	Messages with information about COVID-19 symptoms, including the most common, less common, and most serious ones	إذا كنت مصاباً بالحمى والسعال وصعوبة التنفس التمس العناية الطبية مبكراً
Warnings “messages with information on risk factors and threat associated with the outbreak”	Alerts with information on risky ways of COVID-19 spread	احذر التواجد في الأماكن المزدحمة لأن التجمعات تزيد من انتشار العدوى بفيروس كورونا
	Information on risk factors (serious illness and/or death)	التدخين يزيد من احتمالات تعرضك لمضاعفات خطيرة عند الإصابة بـ فيروس كورونا
	Text on threats associated with the outbreak (mental health threats resulted from stigma or isolation and/or economic threats)	تعاطف مع كل مصابي فيروس كورونا مهما كان عرقهم أو جنسيتهم .. ادعم من حولك دائماً حتى تساعدهم على الشفاء
Preparations “messages with information on first responders and providing response recommendations”	Information on first medical responders, information on caretakers and vulnerable and high-risk groups support	ماذا تفعلين لتحمي طفلك الرضيع من الإصابة بـ فيروس كورونا أثناء فترة العزل المنزلي؟ يمكنك التواصل مع غرفة وزارة الصحة لمتابعة مصابي فيروس كورونا بالعزل المنزلي
Uncertainty Reduction “ messages with information summarizing case reports and other	Messages with information on COVID-19 cases update, testing, testing updates, vaccination, & vaccine uptake	الصحة: ارتفاع حالات الشفاء من مصابي فيروس كورونا إلى 210052 وخروجهم من المستشفيات
		الصحة: تسجيل 389 حالات إيجابية جديدة بفيروس كورونا .. و 30 حالة وفاة
		تعديل قيمة المصروفات الإدارية الخاصة بإجراء تحليل السفر PCR وكذلك تحليل Antigen Rapid

<i>information sources</i>		267 تحليل "pcr" لفيروس كورونا المستجد للفرق والمشاركين في البطولة خلال الـ ٢٤ ساعة الماضية لقاح فيروس كورونا هيساعد أطفالك يكونوا دائماً في أمان، لأنه هيقوي مناعتهم وهيققل من فرصة... إصابتهم بالعدوى سجّل بياناتهم دلوقتي على الموقع http://egcovac.MOHPp.gov.eg مدير مديرية الصحة بمحافظة القليوبية والفريق الطبي يحصلون على لقاح فيروس كورونا
	COVID-19 available information sources	وللمزيد من الاستفسار عن اللقاح يرجى الاتصال على الخط الساخن: 15335 حجز اللقاح يرجى زيارة الموقع الإلكتروني: egcovac.MOHPp.gov.eg
	Corrective information on COVID-19	ينتقل فيروس كورونا لطفلك أثناء الرضاعة الطبيعية (mythbusting) الطريقة الصحيحة لغسل اليدين وارتداء الكمامة، الفرق بين التطهير والتنظيف (clarifications)
Efficacy "messages with information highlighting specific personal prevention measures and common responsibility"	Information promoting specific personal prevention measures	اتبع طرق الوقاية من فيروس كورونا والتي تشمل ارتداء الكمامة، وغسل الأيدي باستمرار، وتجنب الأماكن المزدحمة، إلى جانب تلقي اللقاح وجرعته التنشيطية لتعزيز المناعة ضد المرض
Reassurance "messages with information that calmed the public with mentions of government interventions, and expressed thanks for the public's efforts"	Messages with information highlighting government interventions, shared responsibility, and gratitude to the public and Healthcare Workers' (HCWs) efforts.	ضمن خطة الدولة للتنوع والتوسع في توفير.. اللقاحات المضادة لفيروس كورونا وزير التعليم العالي والقائم بعمل وزير الصحة يعلن استقبال 667 ألف جرعة من لقاح «استرازينكا» بمطار القاهرة الدولي
		معاً نطمئن;

		السفير الروسي لدى مصر يؤكد دعم بلاده للتعاون مع مصر خلال التصدي لجائحة فيروس كورونا وسعيه لإرسال كميات من اللقاح الروسي إلى مصر
		الدكتور خالد عبد الغفار يوجه بتكريم المتميزين من الفرق الطبية والعاملين بكافة قطاعات الوزارة تقديراً لمجهوداتهم

Table 3 CERC Principles, Sub-themes, and Examples

CERC Principle	Contextualized Sub-themes	Example
Be First <i>“For members of the public, the first source of information often becomes the preferred source”</i>	This principle is evaluated and achieved by the entity/authority that was the first to announce the status of the COVID-19 interventions to limit the spread of the virus when it comes to receiving, admitting, or providing COVID-19 testing, plasma, vaccine kits or batches	أعلنت الدكتورة هالة زايد وزيرة الصحة والسكان، صباح اليوم الثلاثاء، عن استقبال ٣٠٠ ألف جرعة من لقاح فيروس كورونا المستجد من إنتاج شركة (سينوفارم) الصينية
	This principle is evaluated and achieved by the entity/authority that was the first to announce the establishment of public health facilities for COVID-19 response	في إطار خطة الوزارة للتوسع في مراكز تلقي اللقاحات.. وزيرة الصحة: زيادة عدد مراكز تلقي لقاحات فيروس كورونا إلى 138 مركزاً على مستوى الجمهورية
	This principle is evaluated and achieved by the entity/authority that was the first to announce the development of public health facilities for COVID-19 response	إنجازات وزارة الصحة في تطوير ورفع كفاءة البنية التحتية لمستشفيات الحميات والصدر خلال جائحة فيروس كورونا (كوفيد-١٩) الدكتور خالد عبدالغفار: استمرار تدريب الأطقم الطبية على التعامل مع مختلف درجات الإصابة بفيروس كورونا وفقاً لأحدث بروتوكولات العلاج
	This principle is evaluated and achieved by the entity/authority that was the first to announce the follow-up on the public health facilities' routine work during the COVID-19 response	في إطار متابعة خطة الوزارة لمواجهة فيروس كورونا المستجد.. وزيرة الصحة تتفقد مستشفى حميات و صدر العباسية لمتابعة سير العمل.. وتوجه بتوفير كافة سبل الرعاية الطبية للمرضى

	This principle is evaluated and achieved by the entity/authority that was the first to announce other countries' support for Egypt's COVID-19 response	الصحة: استقبال ٣٠٠ ألف جرعة من لقاح فيروس كورونا هدية من الصين لمصر بمطار القاهرة الدولي
Be Right <i>“Information can include what is known, what is not known, and what is being done to fill in the gaps”</i>	The second principle is evaluated and achieved by announcing what the MOHP was doing to tackle COVID-19 in an attempt to prevent or at least reduce the rapid spread of COVID-19 ,including the closure of public events, schools/universities, limiting mass gatherings, as well as applying curfew and lockdown	إغلاق جميع المطاعم والكافيهات والملاهي والنوادي الليلية في إطار مواجهة فيروس كورونا
Be Credible <i>“Honesty and truthfulness should not be compromised during crises”</i>	The third principle is evaluated and achieved by posting the actions taken by MOHP to tackle COVID-19 with the support of medical professionals, experts, organizations, and other ministries	خلال المؤتمر الصحفي لمنظمة الصحة العالمية .. لإقليم أفريقيا وزارة الصحة تستعرض تجربة مصر في التصدي لفيروس كورونا المستجد خلال 2020 عام
Express Empathy <i>“Addressing what people are feeling, and the challenges they face, builds trust and rapport”</i>	The fourth principle is evaluated and achieved by sharing messages that express empathy, support, and acknowledgment of the Egyptian healthcare workers' efforts during the pandemic	ولازال أبطال الفريق الطبي دائماً يصنعون الأمل من الألم الدكتور خالد عبد الغفار يوجه بتكريم المتميزين من الفرق الطبية والعاملين بكافة قطاعات الوزارة تقديراً لمجهوداتهم
Promote Action <i>“Giving people meaningful things to do calms anxiety, helps restore order, and promotes some sense of control”</i>	The fifth principle of the CERC model is evaluated and achieved by promoting actions that target influence at the: Cognitive Level: Provide info on COVID-19 symptoms, warnings, and preparatory information as well as sources on COVID-19, virus updates & corrective information, disease cases, info on testing and vaccines uptake, effectiveness, safety, and types, certificates, reasons for COVID-19 spread, myth-busting, and warnings	Check risk messages, preparations, warnings, and uncertainty reduction examples

	Behavioral Level: information that promotes specific actions to limit the spread of the virus that includes but is not limited to leaving home, leaving distance, wearing masks, washing hands, promoting/encouraging to get vaccinated, etc.	Check all efficacy examples
Show Respect <i>“Respectful communication is particularly important when people feel vulnerable”</i>	The fifth principle of the CERC model is evaluated and achieved by sharing messages that support and respect citizens influenced by the virus	<p>قام فريق من أطباء مستشفى ناصر العام ببني سويف بإجراء أول ولادة قيصرية لمريضة مصابة بفيروس كورونا المستجد</p> <p>لصحة تستجيب لاستغاثة دار "البقيات الصالحات" للمسنين بعد ظهور إصابات بفيروس كورونا..</p> <p>وزيرة الصحة: إرسال فريق طبي لمتابعة الحالة الصحية للمتواجدين بالدار بإشراف الدكتور محمد شوقي وكيل الوزارة بالقاهرة...</p>
	The fifth principle of the CERC model is evaluated and achieved by sharing messages that highlight efforts by the government to ease the negative economic implications resulting from COVID-19	وزيرة الصحة: صرف علاج فيروس كورونا المستجد لـ 38 ألف حالة بالعزل المنزلي
	The fifth principle of the CERC model is evaluated and achieved by sharing messages that highlight efforts by the government to ease the negative health and mental implications resulting from COVID-19	<p>إرشادات للتغلب على الشعور بالقلق والتوتر تجاه أزمة فيروس كورونا</p> <p>للتواصل مع فريق الدعم النفسي بالأمانة العامة للصحة النفسية يرجى الاتصال على الأرقام</p> <p>٠٨٠٠٨٨٨٠٧٠٠</p> <p>٠٢٢٠٨١٦٨٣١</p>

- Intercoding Reliability

Table 4 Cohen's Kappa results for the overall intercoder reliability

		Value
Measure of Agreement	Kappa	0.905
N of Valid Cases		2935
a. Not assuming the null hypothesis.		
b. Using the asymptotic standard error assuming the null hypothesis.		

Table 5 Cohen's Kappa Interpretation

Value of Kappa	Level of Agreement	% of Data that are Reliable
0-.20	None	0-4%
.21-.39	Minimal	4-15%
.40-.59	Weak	15-35%
.60-.79	Moderate	35-63%
.80-.90	Strong	64-81%
Above.90	Almost Perfect	82-100%

Table BB.

To determine and calculate the intercoder reliability, the researcher selected 10% of the sample, accounting for 183 articles, to be re-coded by one other researcher who had not worked on this study and 10% sample before. The intercoder reliability was measured using Cohen's Kappa on SPSS (Table 4). The overall reliability was found to be 0.905, which is almost perfect according to Kappa's interpretation (McHugh, 2012) presented in Table 5.

Results:

- RQ1. To what extent do the Egyptian MOHP’s Tweets on COVID-19 comply with the advised **CERC communication characteristics** during crisis and emergency stages?

Figure 1. The frequency of CERC communication characteristics found in COVID-19 tweets posted by the Egyptian MOHP

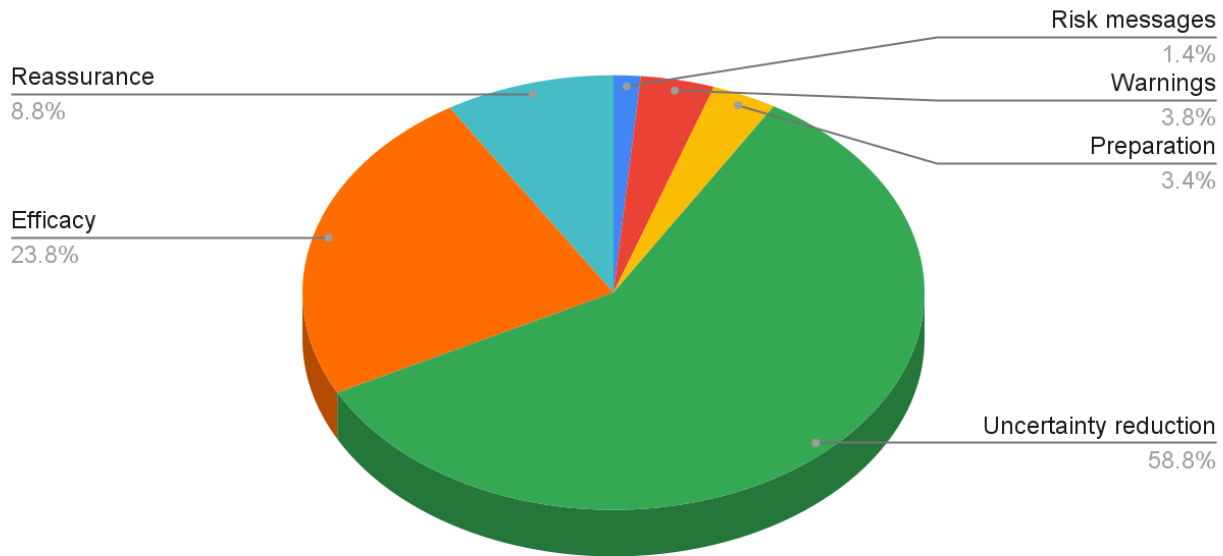


Figure 1 - The frequency of CERC communication characteristics found in COVID-19 tweets posted by the Egyptian MOHP

Note: Every tweet can be classified more than once within the major CERC Characteristics

To understand the frequency of CERC communication characteristics found in COVID-19 tweets posted by the Egyptian MOHP, the researcher first looked at the rate at which each CERC characteristic took place within every tweet. As shown in Figure 1, the researcher found that the majority of tweeted messages, 58.2% of the 1825 analyzed tweets, aimed to “reduce uncertainty” either at the cognitive or behavioral level. Followed by “efficacy,” around 24.1% of the tweets promoted personal protective and preventive measures. Also, approximately 8.9% of tweets expressed the characteristic of “reassurance,” in which government interventions & efforts, shared

responsibility, and appreciative messages were highlighted. Additionally, a fair number, around 3.9%, of the tweets expressed a “warning characteristic, in which potential means of spread outside households, risk facts, and threats associated with COVID-19 were pointed out. Besides, a small portion of the tweets, representing 3.4%, accounted for the “preparation” characteristic by which information for the type of support provided or received as first medical responders support caretakers, vulnerable and high-risk groups is highlighted. Lastly, a negligible quantity of 1.4% was reported for the “risk messages” characteristics that entail information about COVID-19 symptoms.

Figure 1.A. The types and frequencies of Risk Messages (CERC communication characteristic) found in COVID-19 tweets posted by the Egyptian MOHP

Risk Messages: Messages with information about COVID-19 symptoms, including the most common, less common, and most serious ones

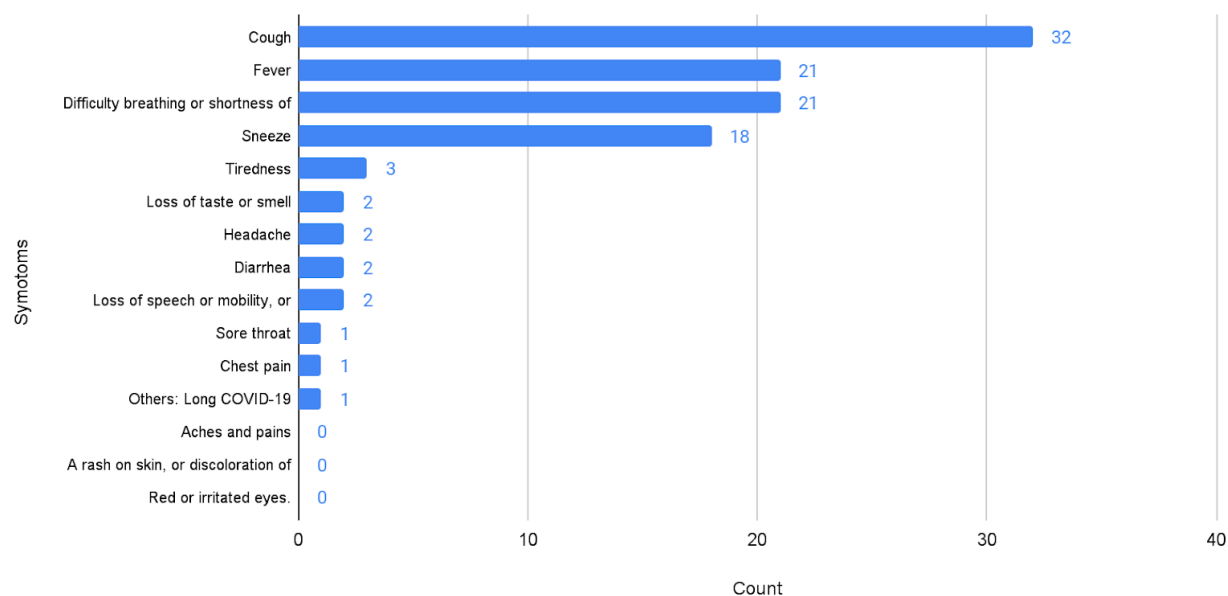


Figure 2 /1.A. The types and frequencies of Risk Messages (CERC communication characteristic) found in COVID-19 tweets posted by the Egyptian MOHP

For the 1.4% of risk messages, most of the disseminated content focused more on highlighting the cough (count= 32), fever (count= 21), sneezing (count= 18), and difficulty in breathing (count = 21) more than other symptoms such as tiredness (count= 3), loss of taste and smell (count= 2), the sore throat (count= 1), headache (count= 2), aches and pains (count= 0), diarrhea (count= 2), rash

(count= 0), red eyes (count= 0), loss of speech or mobility (count= 2), and chest pain (count= 1), as shown in Figure 1. A. Other symptoms, such as long COVID-19 symptoms (count= 1), were included.

Figure 1.B. The types and frequencies of Warnings (CERC communication characteristic) found in COVID-19 tweets posted by the Egyptian MOHP

Warnings: alerts with information on risky ways of COVID-19 spread

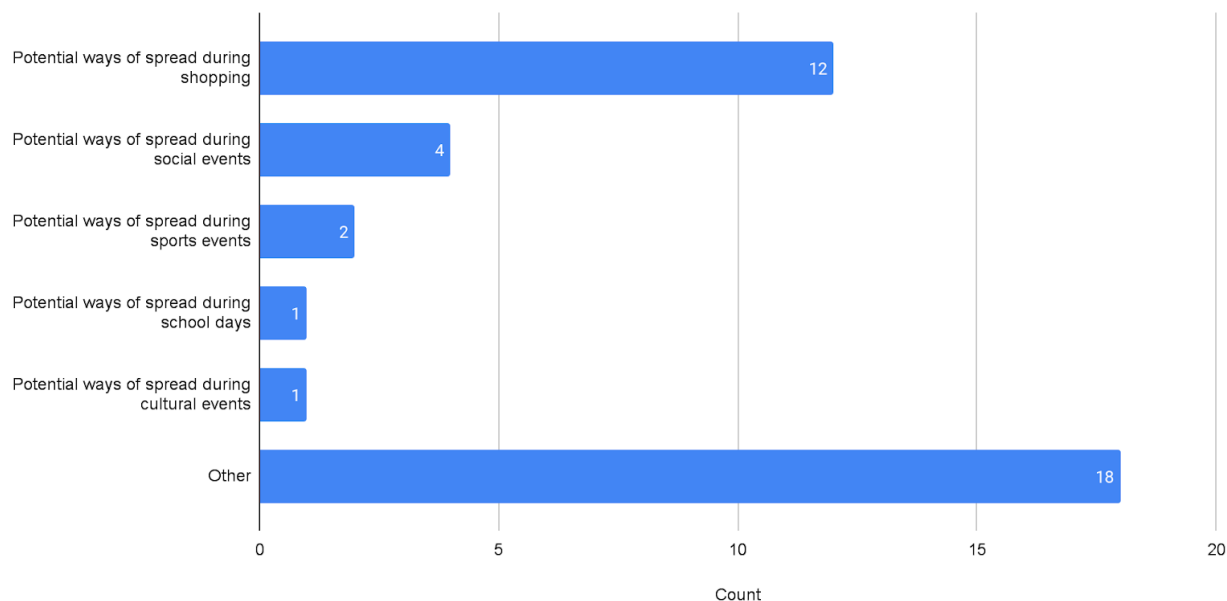


Figure 3/ 1.B. The types and frequencies of Warnings (CERC communication characteristic) found in COVID-19 tweets posted by the Egyptian MOHP

As shown in Figure 1. B, several tweets depicted numerous warning messages with information on potential means of spread during religious events (count= 17), followed by shopping (count= 12), and social events (count= 4). On the other hand, only some tweets showed information with possible and potential means of spreading in schools and universities (count= 1), during cultural events (count= 1), and sports events (count= 2). Lastly, other occasions that can potentially risk the spread of the virus were included, such as workplace (count= 5), crowded areas (count= 5), staying in hotels (count= 5), public transportation (count= 2), wrong norms and behaviors (count= 2), smoking a hookah (count= 1), using ATMS (count= 1).

Figure 1.C. The types and frequencies of Warnings (CERC communication characteristic) found in COVID-19 tweets posted by the Egyptian MOHP

Warnings: information on risk factors (serious illness and/or death)

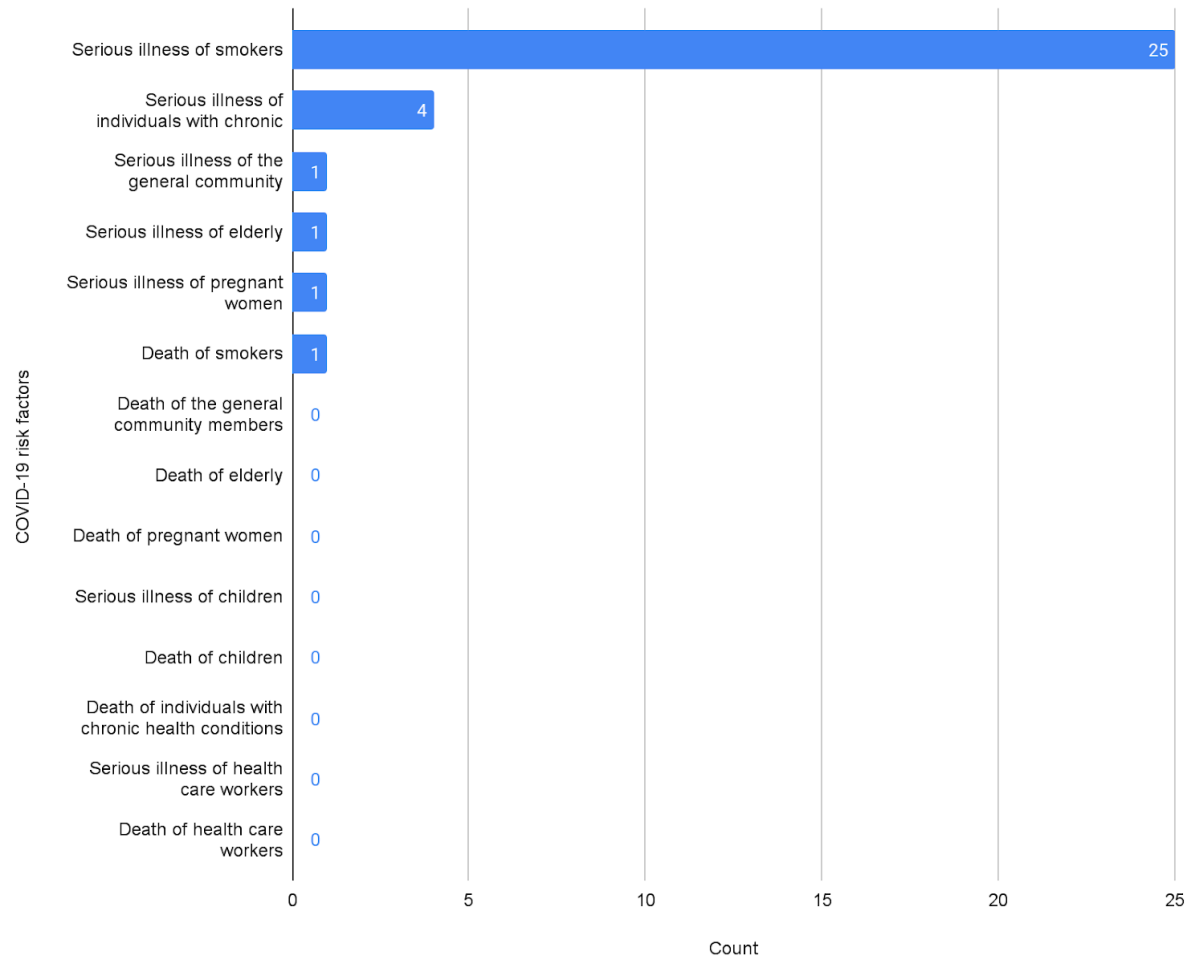


Figure 4/ 1.C. The types and frequencies of Warnings (CERC communication characteristic) found in COVID-19 tweets posted by the Egyptian MOHP

Warnings were also presented highlighting COVID-19 risks, which is the severe illness or death of general or targeted groups because of the virus. As demonstrated in Figure 1. C, tweeting on the anticipated serious illness of smokers who encounter the virus was mainly pointed out 25 times. The potential serious illness of individuals with chronic health conditions (count= 4), serious illness of pregnant women (count= 1), elderly (count= 1), and the general community (count= 1) were also

pinpointed. Except for smokers (count= 1), there were zero warnings on the risk of death for those infected with the virus.

Figure 1.D. The types and frequencies of Warnings (CERC communication characteristic) found in COVID-19 tweets posted by the Egyptian MOHP

Warnings: text on threats associated with the outbreak (mental health threats resulted from stigma or isolation and/or economic threats)

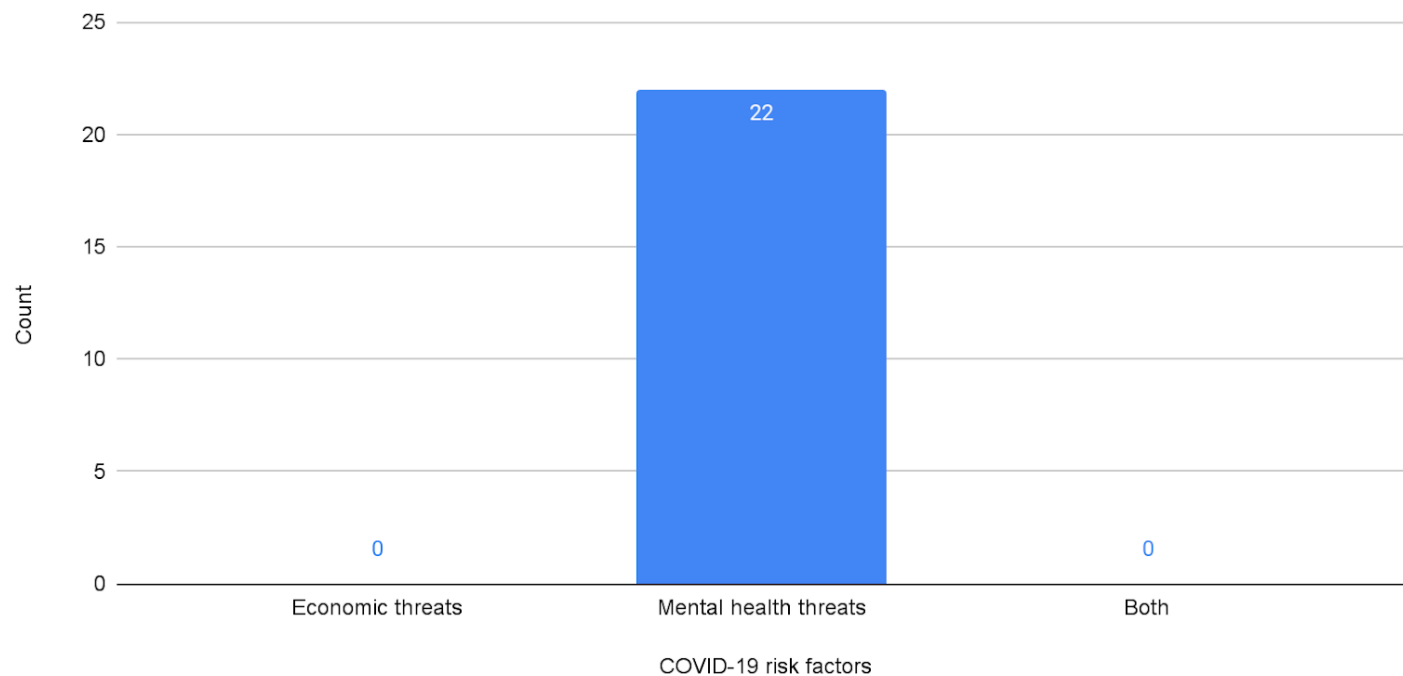


Figure 5/ 1.D. The types and frequencies of Warnings (CERC communication characteristic) found in COVID-19 tweets posted by the Egyptian MOHP

It is worth noting that other warnings were expressed regarding the potential threats that could unfold due to the spread of COVID-19, including economic or mental health threats. However, out of the 3.9% warnings, only mental health threats were emphasized 22 times, as illustrated in Figure 1.D.

Figure 1.E. The types and frequencies of Preparation (CERC communication characteristic) found in COVID-19 tweets posted by the Egyptian MOHP

Preparation: information on first medical responders, information on caretakers and vulnerable and high-risk groups support

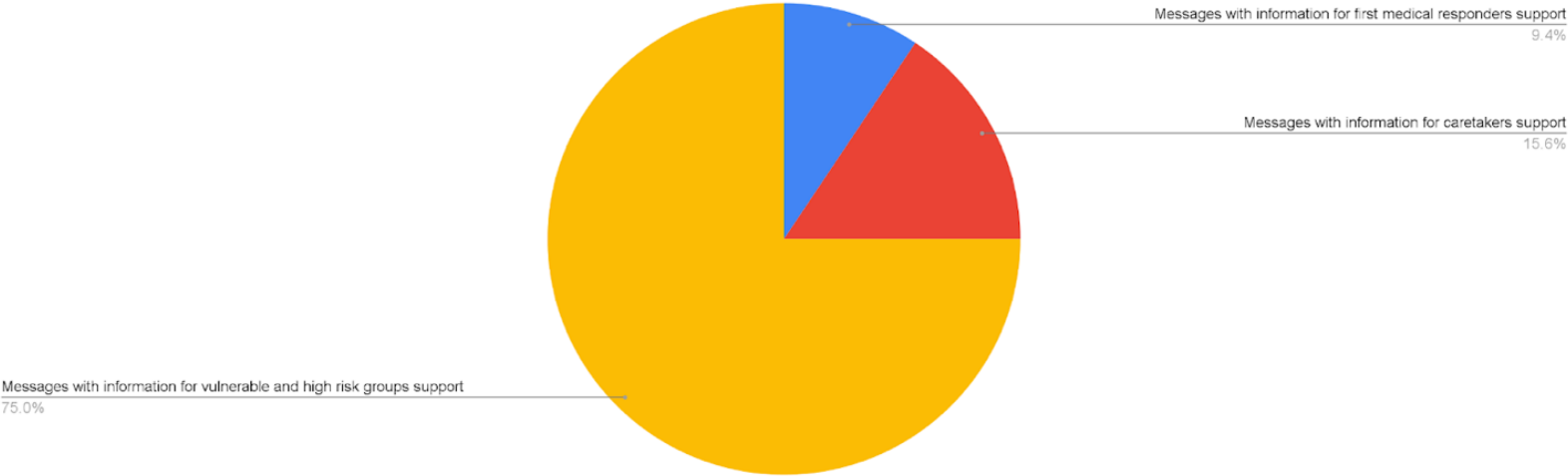


Figure 6/1.E. The types and frequencies of Preparation (CERC communication characteristic) found in COVID-19 tweets posted by the Egyptian MOHP

With respect to the Preparation characteristic, around 75% of the messages targeted the vulnerable and high-risk groups, 15.6% held information for caretakers, and only 9.4% packaged information for first medical responders, as represented in Figure 1.E.

Figure 1.F. The types and frequencies of Uncertainty Reduction (CERC communication characteristic) found in COVID-19 tweets posted by the Egyptian MOHP.

Uncertainty Reduction: messages with information on COVID-19 cases update, testing, testing updates, vaccination, & vaccine uptake

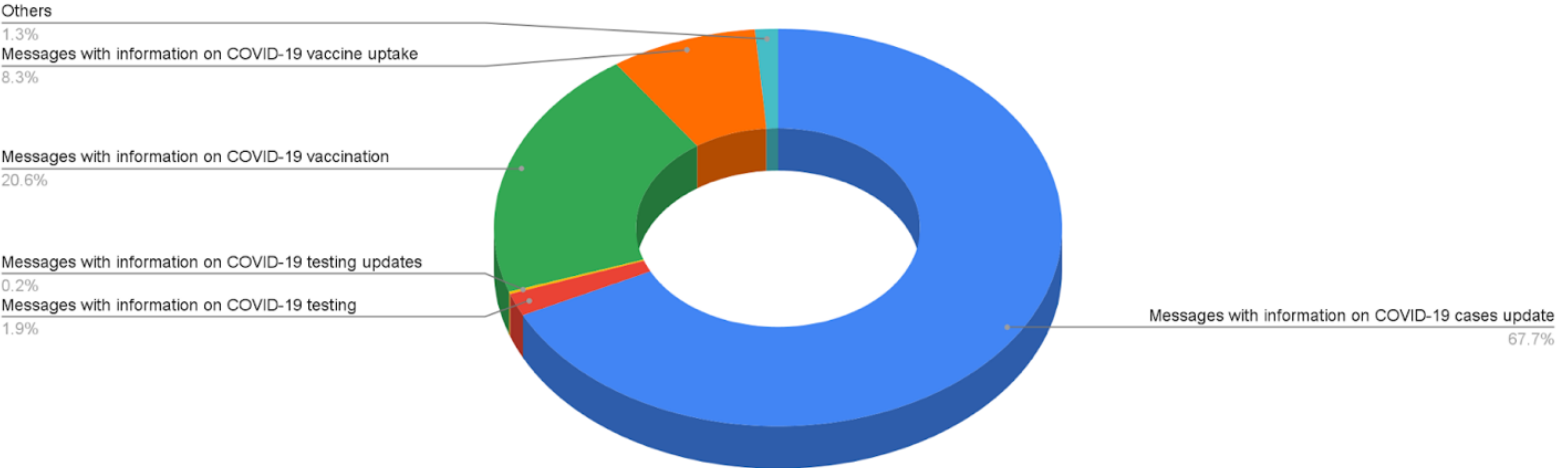


Figure 7/ 1.F. The types and frequencies of Uncertainty Reduction (CERC communication characteristic) found in COVID-19 tweets posted by the Egyptian MOHP

In relevance to the Uncertainty Reduction characteristic, most tweets encapsulated information on COVID-19 cases, precisely 67.7%, as noted in Figure 1. F. In comparison, around 20.6% was calculated for the number of times information on COVID-19 was tweeted. About 8.3% of the disseminated content held information on COVID-19 vaccine uptake. As for the 1.9% was identified for the number of times in which information on COVID-19 testing was raised. On the other hand, 0.2% of this characteristic carries information on updates for those who got tested and showed results. Further information on COVID-19 was mentioned (1.3%), such as information on COVID-19 variants, certificates, treatments, vaccine side effects, and plasma. Besides, several other tweets touched upon information on the needed steps to take if a case is confirmed positive, explanatory content on how to know that someone is recovered from COVID-19, and lastly, information on the expected duration to show symptoms after being in contact with a COVID-19 positive case.

Figure 1. G. The types and frequencies of Uncertainty Reduction (CERC communication characteristic) found in COVID-19 tweets posted by the Egyptian MOHP

Uncertainty Reduction: COVID-19 available information sources



Figure 8/ 1.G. The types and frequencies of Uncertainty Reduction (CERC communication characteristic) found in COVID-19 tweets posted by the Egyptian MOHP

Regarding the noted available information sources for COVID-19 in Figure 1. G, hotlines were mentioned 1492 times, websites were attached 186 times, press releases were referenced 92

times, applications were promoted 22 times, and the chatbot was publicized ten times, as noted in Figure 1. G. Other information mechanisms were highlighted twice, such as encouraging followers to comment with their queries on COVID-19 tweets, and MOHP will get back to them.

Figure 1.H. The types and frequencies of Uncertainty Reduction (CERC communication characteristic) found in COVID-19 tweets posted by the Egyptian MOHP

Uncertainty Reduction: corrective information on COVID-19

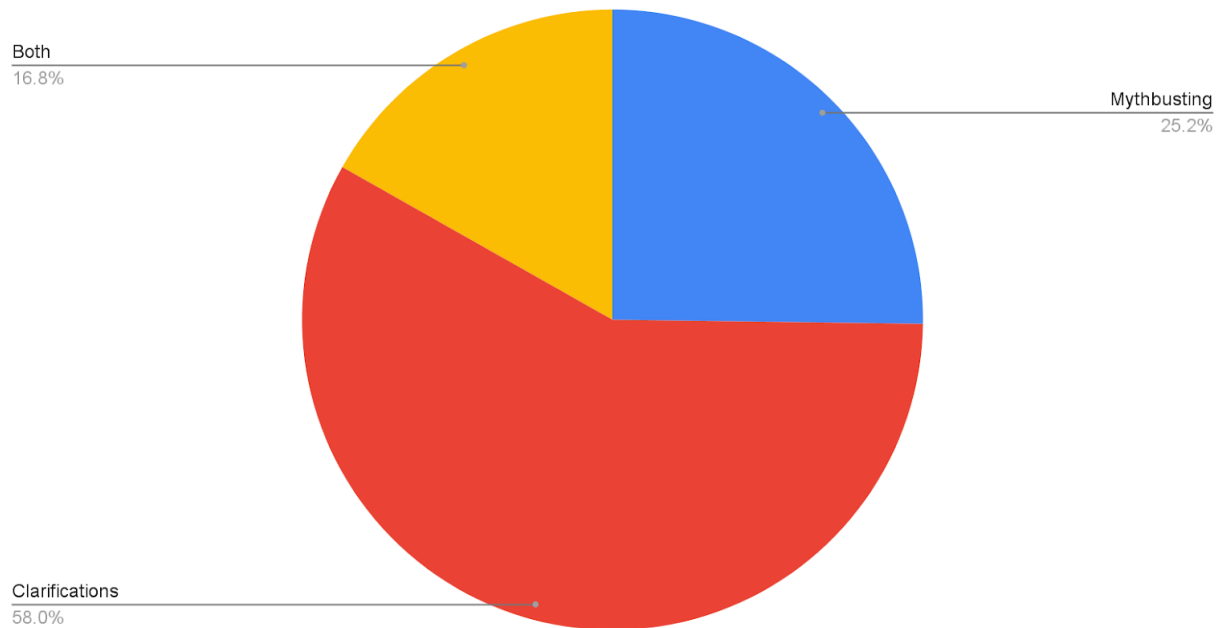


Figure 9/ 1.H. The types and frequencies of Uncertainty Reduction (CERC communication characteristic) found in COVID-19 tweets posted by the Egyptian MOHP

About the uncertainty reduction characteristic, 58% of the posted content aimed to share clarifications on COVID-19, 25.2% worked on myth-busting, and 16.8% did them together, as noted in Figure 1. H.

Figure 1.I. The types and frequencies of Efficacy (CERC communication characteristic) found in COVID-19 tweets posted by the Egyptian MOHP

Efficacy: information promoting specific personal prevention measures

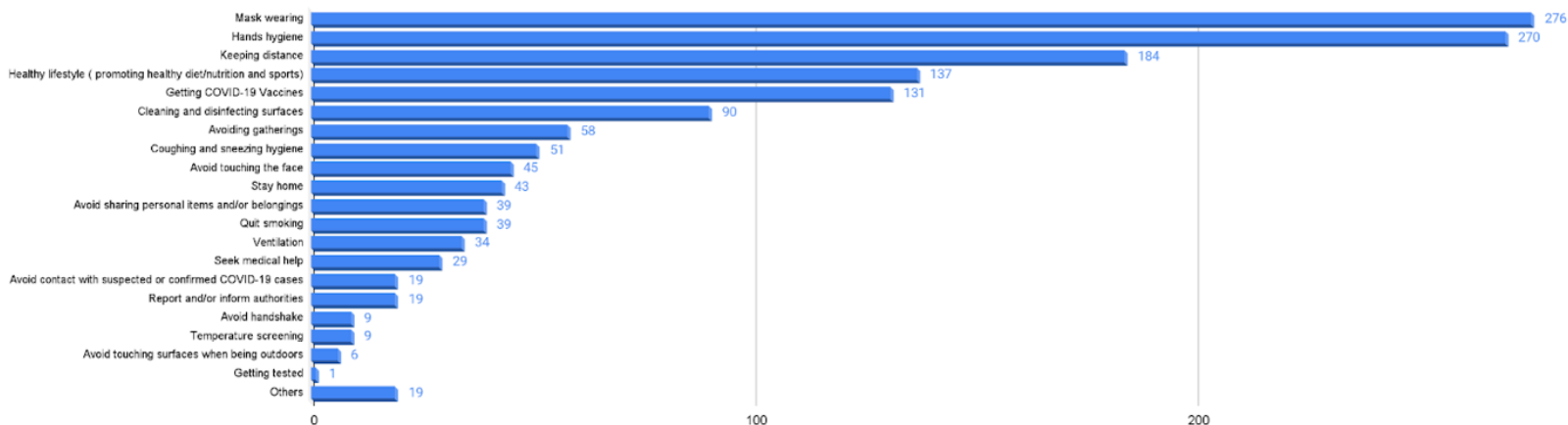


Figure 10/ 1.I. The types and frequencies of Efficacy (CERC communication characteristic) found in COVID-19 tweets posted by the Egyptian MOHP

As for the 24.1% of the efficacy characteristic, which is information on personal and protective measures, mask-wearing was mentioned 276 times, while promoting hand washing and hygiene was noted 270 times, as reported in Figure 1. I. Keeping distance was recommended 184 times. Advocacy for a healthy lifestyle was raised 137 times. To maintain safety against COVID-19, getting vaccinated was expressed 131 times. Encouraging followers to clean and disinfect surfaces was mentioned 90 times, while advising them to avoid gatherings and crowds was stated 58 times. Motivating viewers to adhere to coughing and sneezing hygiene, a practice of sneezing and coughing into the elbows or in a tissue that needs to be thrown immediately, was mentioned 51 times. On other occasions, the Ministry advised followers to avoid face-touching, including the eyes and nose, 45 times while encouraging them to stay home around 45 times. Quitting the habit of smoking and avoiding the use of others' personal belongings were promoted 39 times. Ensuring proper ventilation by staying outdoors or opening windows was raised 34 times. Besides, seeking medical help was promoted 29 times. Reporting and informing authorities and avoiding contact with suspected or

confirmed COVID-19 cases were only pinpointed 19 times. Viewers were advised to screen and monitor their temperatures and avoid handshakes around 19 times.

Additionally, it was recommended to avoid touching surfaces around six times outdoors. Only once were followers encouraged to get PCR tested if they showed symptoms. Last but not least, the Ministry advocated for other focused and targeted preventative measures, such as using personal belongings, including prayer rugs. Other measures included:

- Avoiding the overuse of antibiotics.
- Making sure to take off the shoes at the house's entrance to prevent contact with any germs attached to them.
- Avoiding close contact with animals without wearing any protective measures.
- Cooking food thoroughly.
- Wearing gloves and safety goggles.
- Washing food thoroughly.
- Using online banking services.
- Connecting with others online.
- Changing and cleaning cloth.
- Avoiding the use of phones while shopping.
- Informing others in case of infection.

Figure 1.J. The types and frequencies of Reassurance (CERC communication characteristic) found in COVID-19 tweets posted by the Egyptian MOHP
 Reassurance: messages with information highlighting government interventions, shared responsibility, and gratitude to the public and Healthcare Workers' (HCWs) efforts.

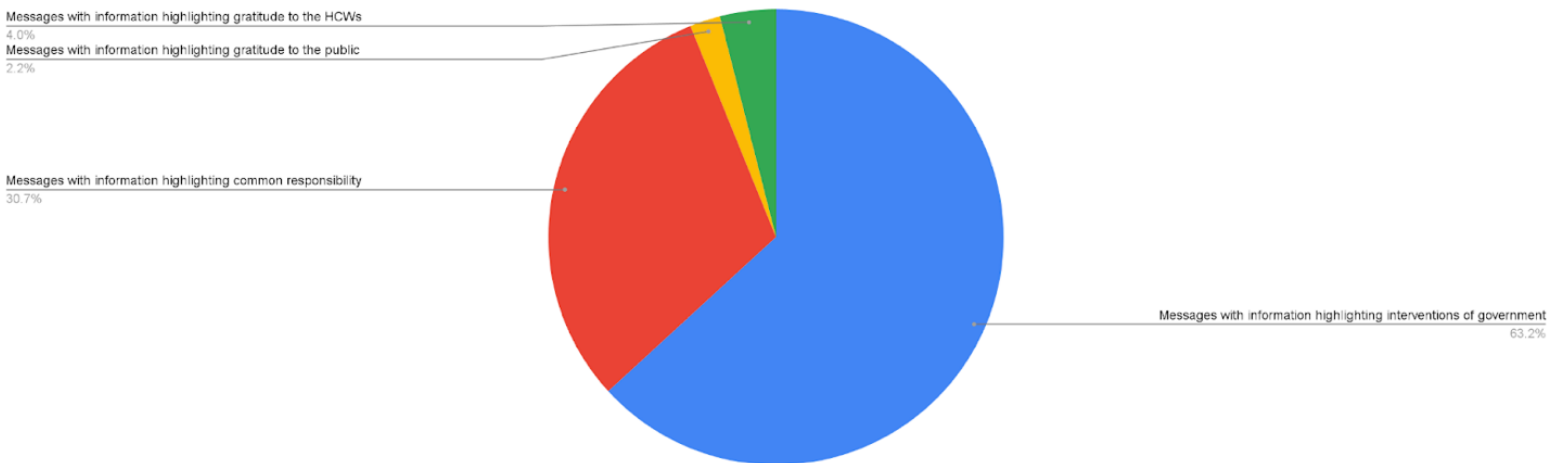


Figure 11/ 1.J. The types and frequencies of Reassurance (CERC communication characteristic) found in COVID-19 tweets posted by the Egyptian MOHP

For the reassurance characteristic, the majority of the messaging, with 63.2% of the total, focused on highlighting all government interventions to combat the virus, as illustrated in Figure 1. J. Around 30.7% aimed at promoting the government’s joint responsibility with other bodies and entities to limit the spread of the virus. Other vital messages were promoted to show gratitude and respect to the Egyptian healthcare workers and community, accounting for 4% and 2.2%, respectively.

- RQ2. To what extent did the Egyptian MOHP's tweets on COVID-19 conform to the advised **CERC principles**?

Figure 2. The frequency of CERC communication principles found in COVID-19 tweets posted by the Egyptian MOHP

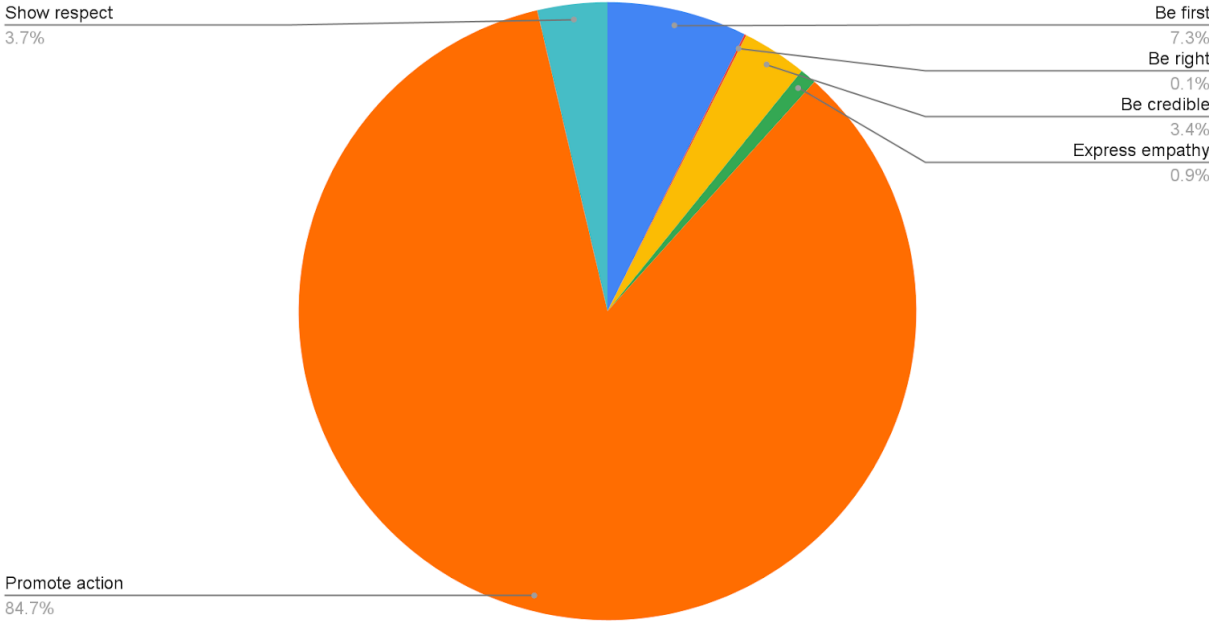


Figure 12/ 2. The frequency of CERC communication principles found in COVID-19 tweets posted by the Egyptian MOHP

Note: Every tweet can be classified more than once within the major CERC Principles

All CERC principles were achieved by the Egyptian MOHP’s Twitter communication strategy on COVID-19 at varying levels, as shown in Figure 2. With 84.7 % (count= 1666) alone of the total counted messaging, most tweets aimed to promote action at either cognitive and behavioral levels or both. The Ministry was also able to conform with the ‘Be First’ principle with 7.3% (count= 144) of the total analyzed content. For the ‘Show Respect’ principle, the Ministry could apply it with 3.7% (count= 72). At the same time, ‘Be credible’ was attained with 3.4% (count= 67) by posting the actions taken by MOHP to tackle COVID-19 with the support of medical professionals, experts, organizations, and other ministries. The ‘Express Empathy’ principle was achieved with only 0.9% (count= 17) of the total tweeted content by featuring the actions and efforts MOHP took to tackle COVID-19 with the support of medical professionals, experts, organizations, and other ministries. And lastly, ‘Be right’ was the least obtained principle, with only 0.1% (count= 1) availability in the posted tweets.

Figure 2.A. The types and frequencies of Be First (CERC principle) found in COVID-19 tweets posted by the Egyptian MOHP

Be First: for members of the public, the first source of information often becomes the preferred source

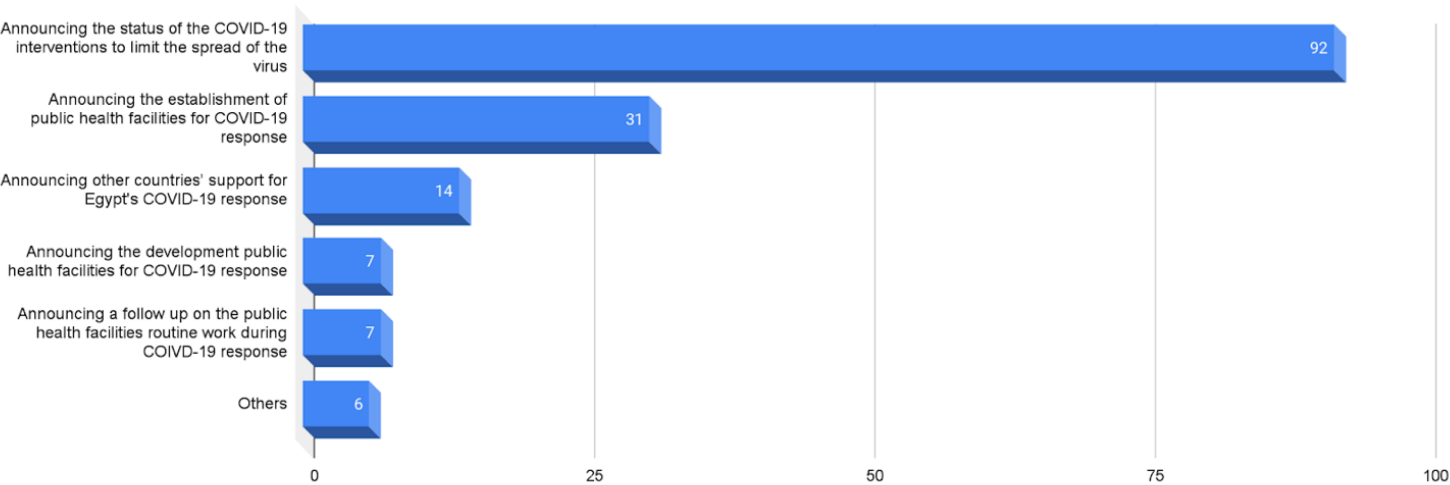


Figure 13/ 2.A. The types and frequencies of Be First (CERC principle) found in COVID-19 tweets posted by the Egyptian MOHP

Within the sphere of 'Be First,' the principle was achieved by having the Egyptian MOHP announce 92 times the status of the COVID-19 interventions done by the entity in terms of receiving, admitting, or providing COVID-19 testing, plasma, vaccine kits or batches, as shown in Figure 2. A. It was also obtained by announcing the establishment of public health facilities 31 times to respond to the immense waves of COVID-19. Also, working on developing healthcare facilities, including healthcare workers, to respond to the virus consequences was mentioned seven times. The principle was also obtained by sharing, around seven times, the Ministry's efforts to follow up on the routine work of the health sector during the COVID-19 emergency. Besides, this principle was met when the Ministry tweeted, around 14 times, the ongoing materialistic and non-materialistic support Egypt received from other countries to combat COVID-19. Lastly, the Ministry also presented different messaging themes that achieved this principle, such as announcing the status of the COVID-19 vaccination certificates, announcing Egypt's learned lessons and successes during the COVID-19 response, and announcing Egypt's support to other countries to combat the COVID-19 pandemic.

The Ministry neither announced nor tweeted about any closure of public events, schools, or universities, about limiting mass gatherings or applying curfews to prevent and reduce the virus's rapid spread. This principle was only achieved by other thematic content, which announced the Ministry's health security plan for social, religious, cultural, and sports events as it works on preventing and curbing the spread of COVID-19.

Figure 2.C. The types and frequencies of Promote Action (CERC principle) found in COVID-19 tweets posted by the Egyptian MOHP

Promote Action: Giving people meaningful things to do calms anxiety, helps restore order, and promotes some sense of control

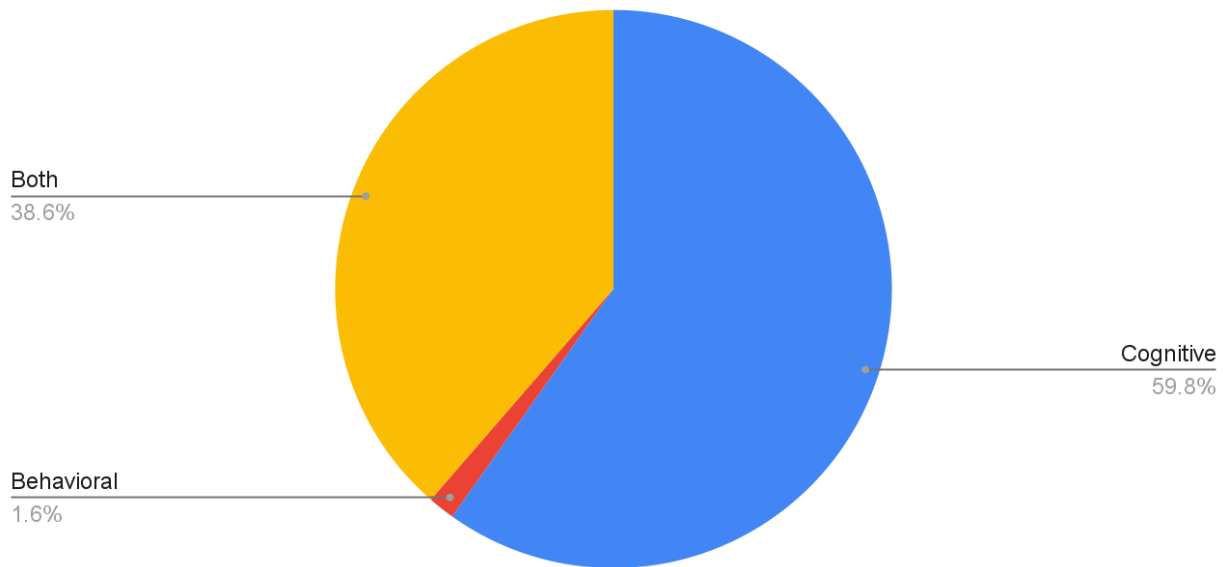


Figure 14/ 2.A. The types and frequencies of Promote Action (CERC principle) found in COVID-19 tweets posted by the Egyptian MOHP

As presented in Figure 2. C, most of the tweets aimed to promote action at the cognitive level only, which accounts for 59.8% (count=1001) of the total number of times a tweet was labeled under this principle. Only 1.6% (count=26) of the same batch principle sought to promote action only at the behavioral level. However, 38.6% (count= 646) of the total number aimed at promoting action at both cognitive and behavioral levels.

Figure 2.D. The types and frequencies of Promote Action (CERC principle) found in COVID-19 tweets posted by the Egyptian MOHP

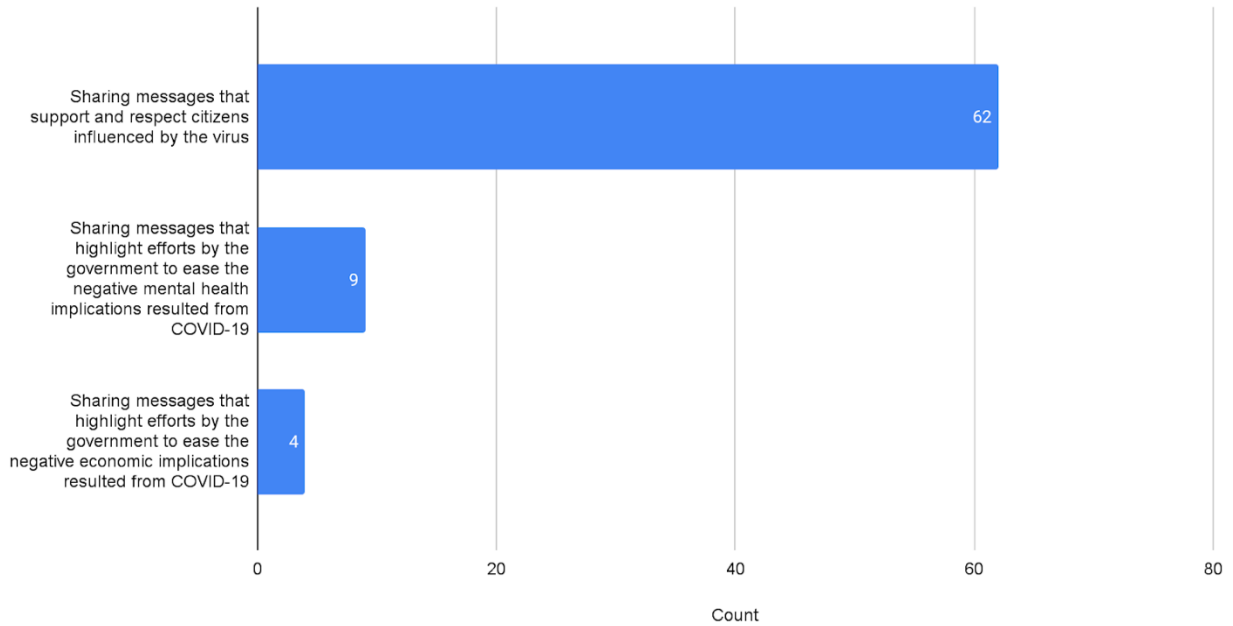


Figure 15/ 2.D. The types and frequencies of Show Respect (CERC principle) found in COVID-19 tweets posted by the Egyptian MOHP

Last but not least, in Figure 2.D, the ‘Show Respect’ principle was achieved in three ways:

1. It was obtained when the Ministry mentioned 62 times different kinds of support and respect citizens were influenced and infected by the virus, by which acute medical care for positive cases has been noted.
2. This principle was attained when the Ministry referenced nine times all types of support done by the government to help in uplifting the negative mental health impact on the Egyptian community.
3. ‘Show Respect’ was shown around four times, where the Ministry expressed all types of support provided by the government to help uplift the negative financial impact on the Egyptian community and country.

- RQ3. How **engaged was the public** with the Egyptian Ministry of Health's Tweets during the COVID-19 pandemic?

Table 3	Mean	Mode	Highest	Lowest
retweet_count	76.06246575	6	1713	0
likes_count	395.1775342	49	5075	0

Table 6 The average, the most repeated, highest, and lowest number among the Retweets and Likes count

As presented in Table 6, the average number of Retweets by followers is approximately 76.06. Additionally, the “6” is the Retweet value that appeared most often in the analyzed tweets. Out of the same set, the highest Retweet number reached 1713, while the lowest was zero. On the other hand, the average number of Likes done by followers is approximately 395.17. Moreover, the “49” is the Likes value that appeared most often in the set of the analyzed tweets. Out of the same bundle, the highest Likes number reached 5075, while the lowest was zero.

Figure 4. Combinations of Risk Messages that received more retweets than the average

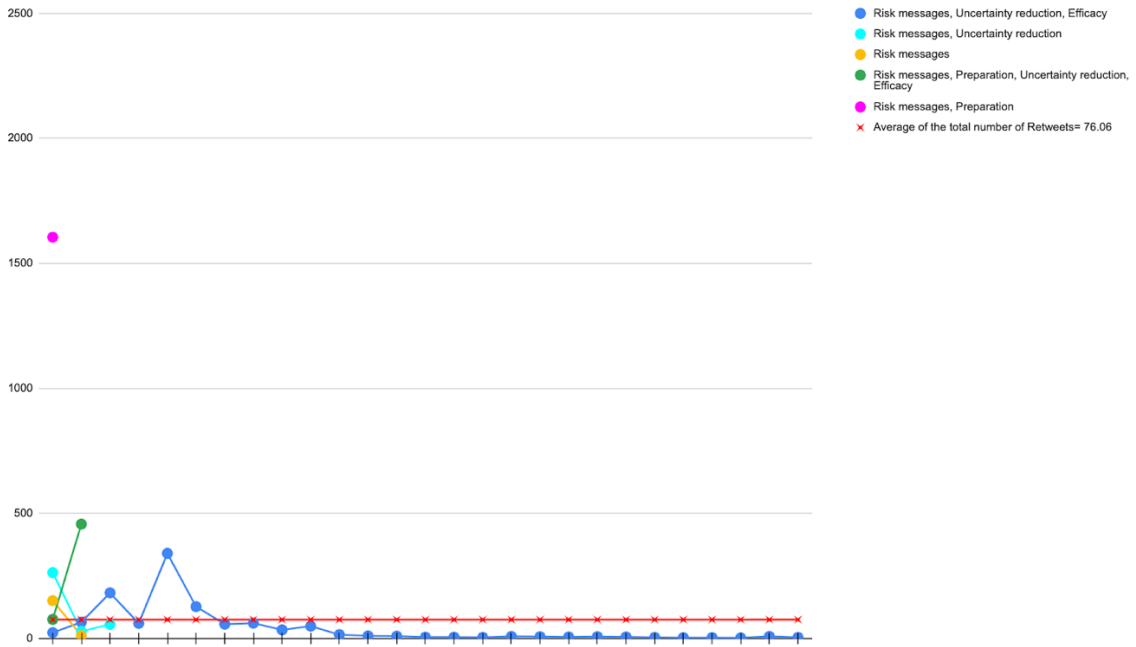


Figure 5. Combinations of Risk Messages that received more likes than the average

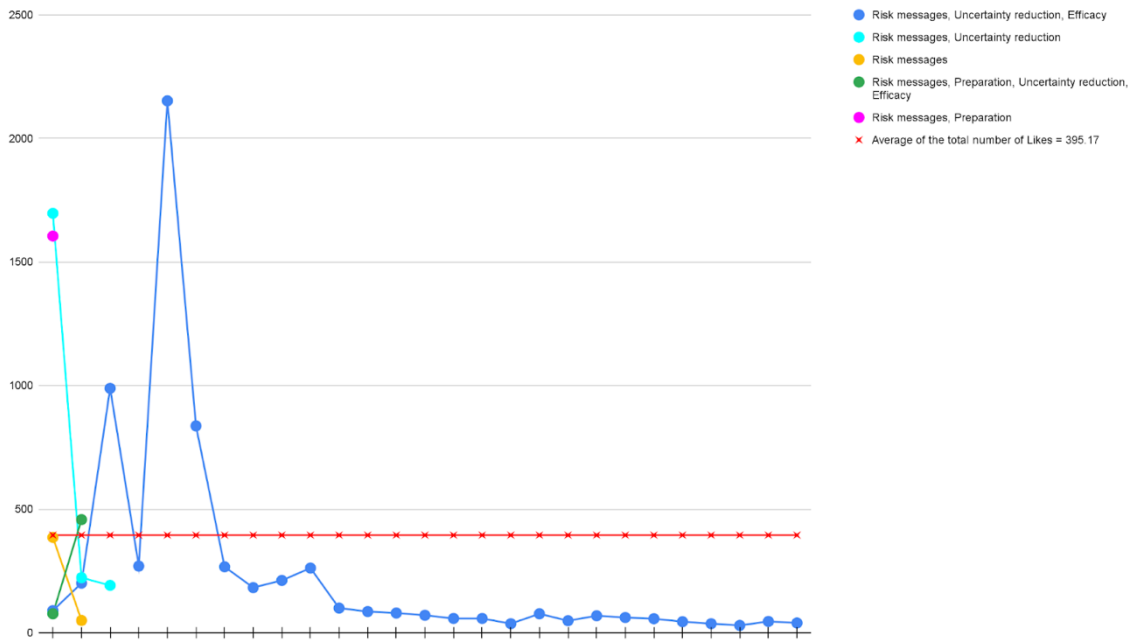


Figure 16/ Fig 4 Combinations of Risk Messages that received more Retweets than the average
Figure 17/ Fig 5 Combinations of Risk Messages that received more Likes than the average

As shown in Figures 4 & 5, a collection of combinations for the Risk Messages characteristic — namely and respectively [Risk messages, Preparation], [Risk messages, Preparation Uncertainty reduction, Efficacy], [Risk messages, uncertainty reduction, Efficacy], [Risk Messages, Uncertainty reduction], and [Risk Messages]— received a notable number of Retweets that went above the total average number. However, the highest number of Retweets fell under the combination of [Risk messages & Preparation] (count= 1605).

In terms of Likes, a group of combinations for the Risk Messages characteristic, particularly and respectively [Risk messages, uncertainty reduction, Efficacy], [Risk Messages, Uncertainty reduction], [Risk messages, Preparation], [Risk messages, Preparation Uncertainty reduction, Efficacy] — received a sizeable number of Likes that were above the overall average number. Nevertheless, the combination of [Risk warnings, Uncertainty Reduction, and Effectiveness] received the most Likes (count = 2152).

Figure 6. Combinations of Warnings that received more retweets than the average



Figure 7. Combinations of Warnings that received more likes than the average

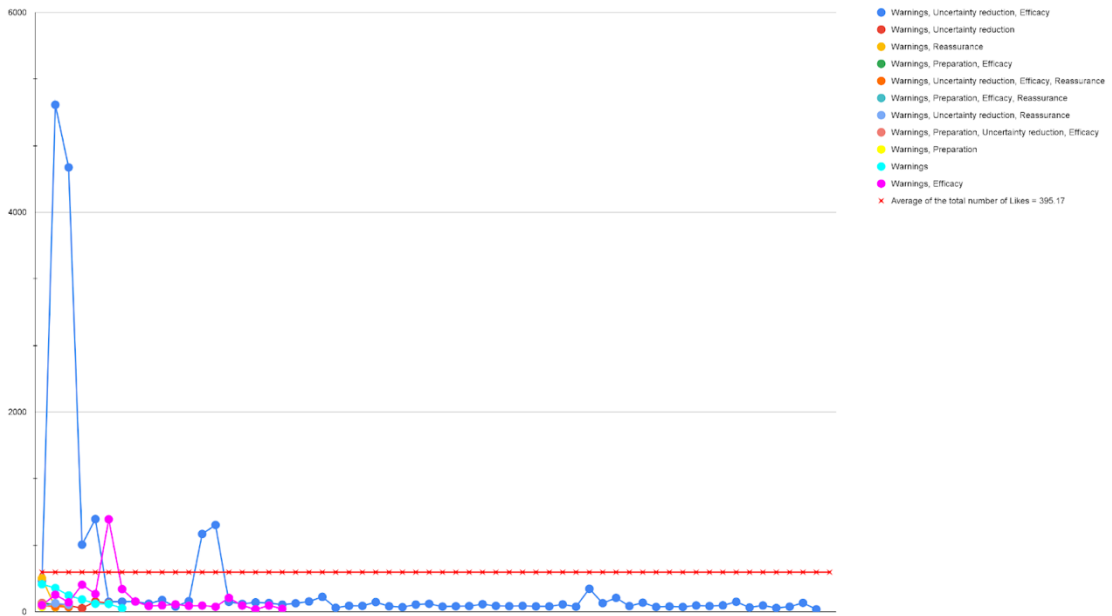


Figure 18/ Fig 6 Combinations of Warnings that received more Retweets than the average
 Figure 19/ / Fig 6 Combinations of Warnings that received more Likes than the average

Figures 6 and 7 depict a variety of combinations for the Warnings characteristic, precisely and respectively [Warnings, Uncertainty Reduction, Efficacy] and [Warnings, Efficacy] — received a remarkable number of Retweets that went above the total average number. Nonetheless, [Warnings, Uncertainty Reduction & Efficacy] received the most Retweets (count = 1109).

In relation to the Likes numbers, a set of combinations for the Warnings characteristic— namely and respectively [Warnings, Uncertainty Reduction, Efficacy] and [Warnings, Efficacy] — received a recognizable number of Likes that went above the total average number. However the highest number of Likes fell under the combination of [Warnings, Uncertainty Reduction & Efficacy] (count= 5075), which is also the highest number of Likes among all CERC characteristics.

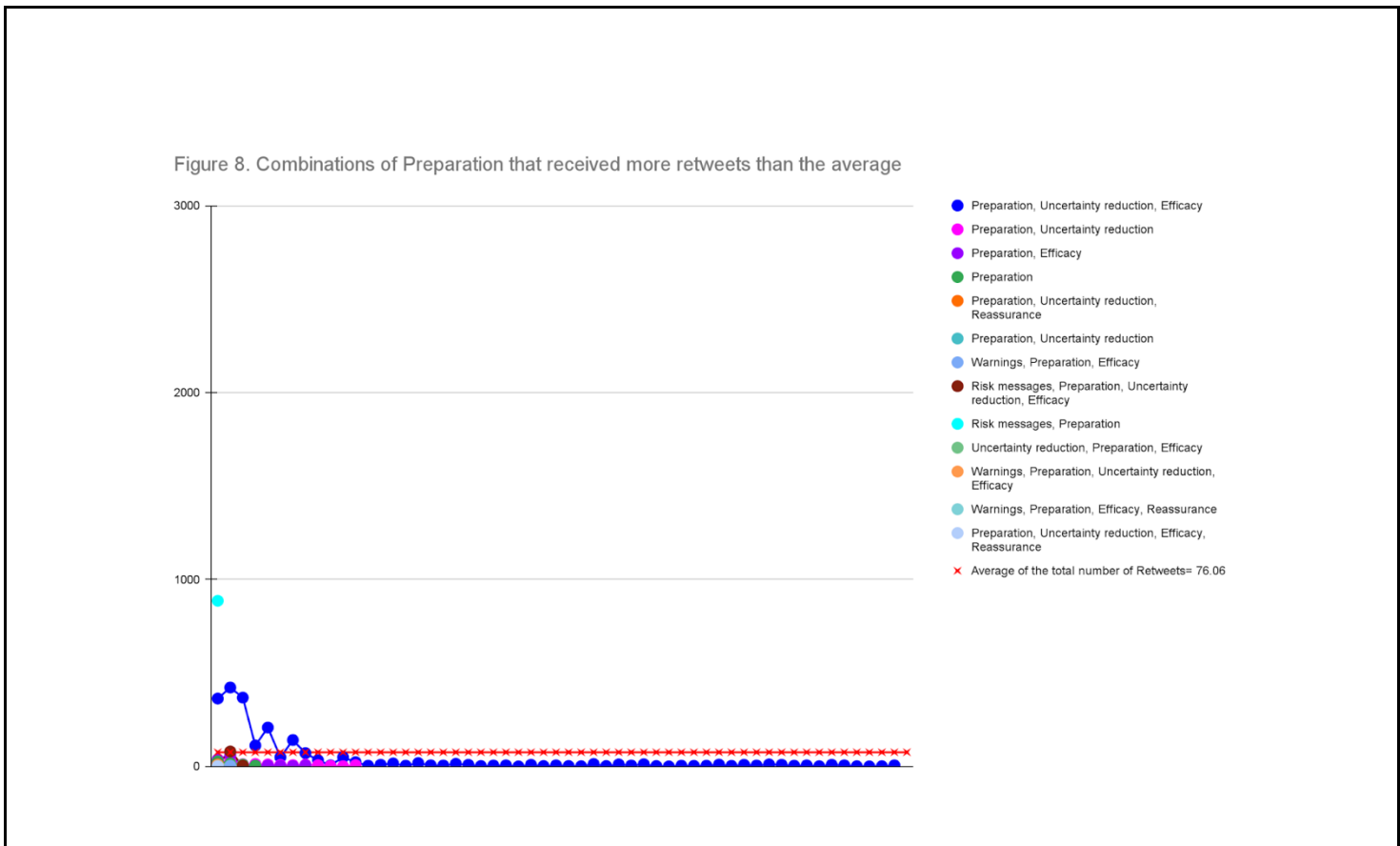


Figure 9. Combinations of Preparation that received more likes than the average

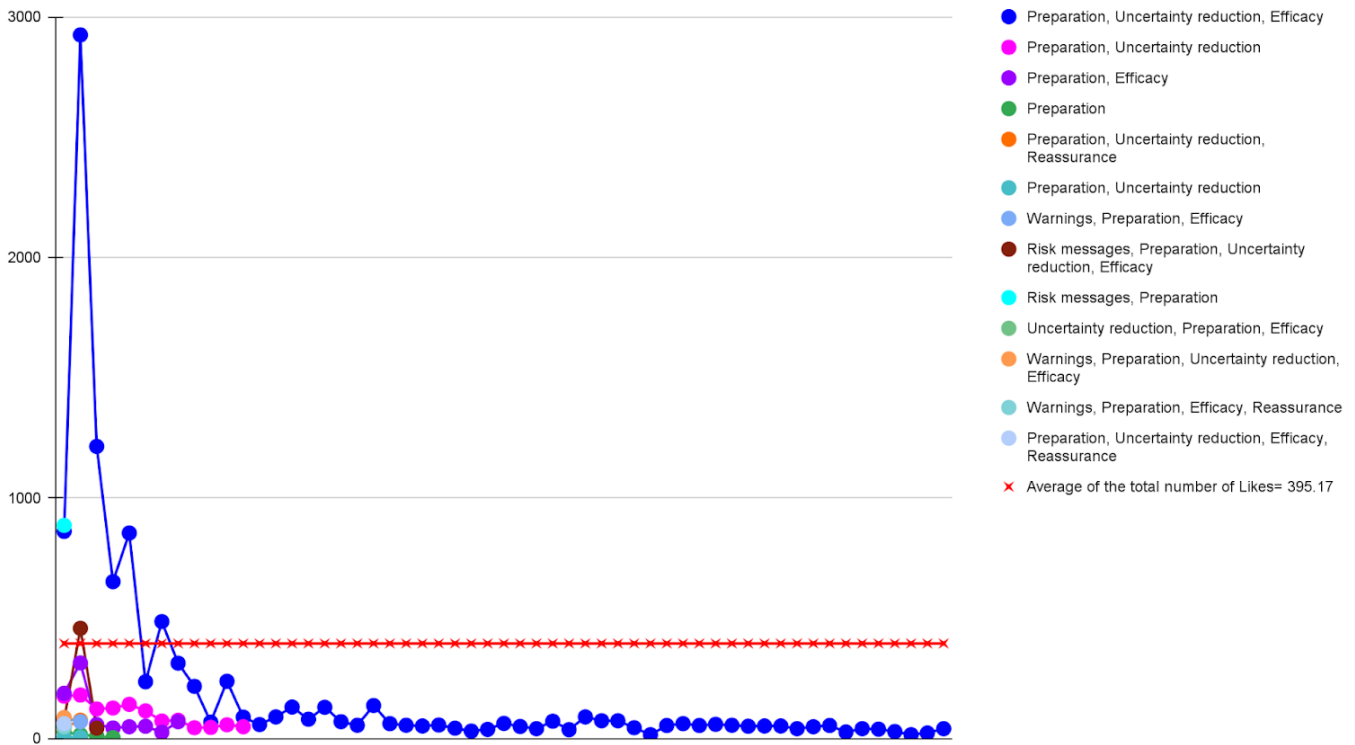


Figure 20/ Fig 8 Combinations of Prepatation that received more Retweets than the average
 Figure 21/ Fig 9 Combinations of Preparation that received more Likes than the average

Figures 8 and 9 demonstrate how a group of combinations for the Preparation characteristic, namely and respectively [Risk Messages, Preparation], [Preparation, Uncertainty Reduction, Efficacy], and [Risk Messages, Preparations, Uncertainty Reduction, Efficacy], received a fine number of Retweets that went above the total average number. The combination of [Risk Messages, Preparation] received the most Retweets (count = 886)

In terms of Likes, a combination of the Preparation characteristic, primarily and respectively [Preparation, Uncertainty Reduction, Efficacy], [Risk Messages, Preparations, Uncertainty Reduction, Efficacy], and [Risk Messages, Preparations, Uncertainty Reduction, Efficacy], received

a distinctive number of Likes that went above the overall average number. The combination of [Preparation, Uncertainty Reduction, and Efficacy] received the most Likes, (count=2924).

Figure 10. Combinations of Uncertainty Reduction that received more retweets than the average

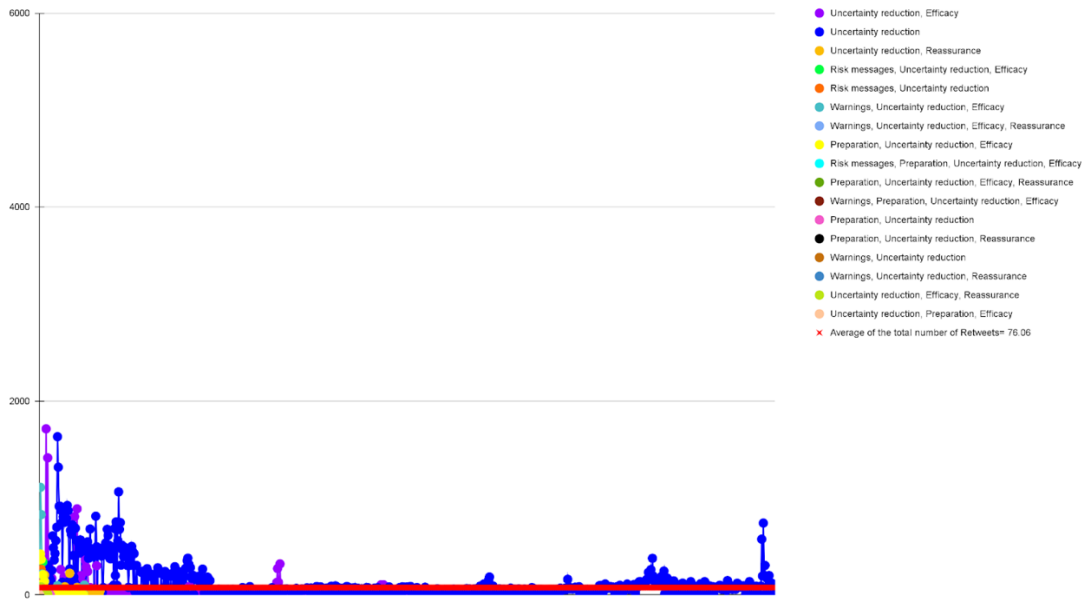


Figure 11. Combinations of Uncertainty Reduction that received more likes than the average

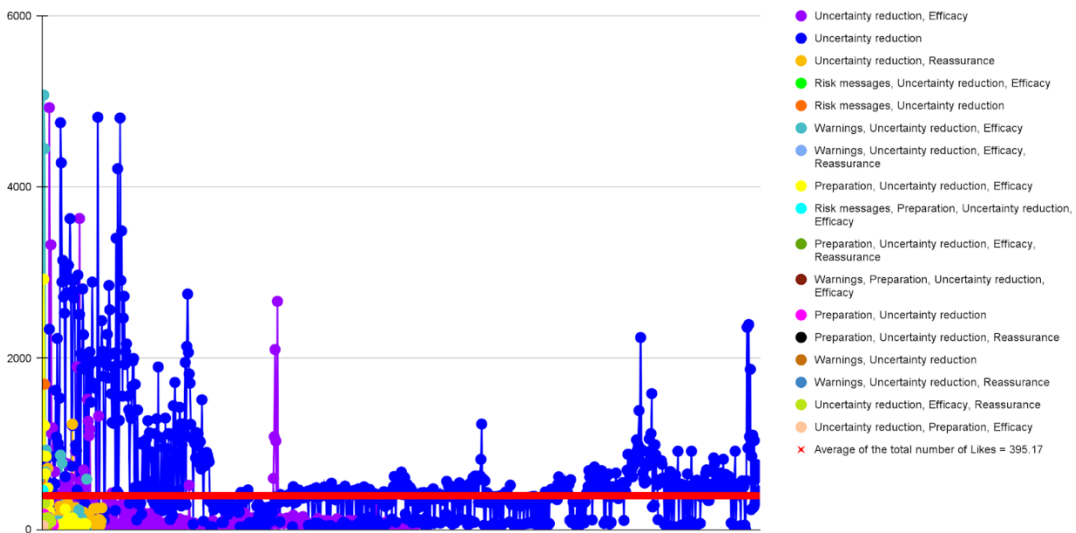


Figure 22/ Fig 10 Combinations of Uncertainty Reduction that received more Retweets than the average
Figure 23/ Fig 11 Combinations of Uncertainty Reduction that received more Likes than the average

As illustrated in Figures 10 & 11, the majority of the combinations for the Uncertainty reduction characteristic reached a valuable number of Retweets except for [Warnings, Uncertainty reduction, Efficacy, Reassurance], [Preparation, Uncertainty reduction, Efficacy, Reassurance], [Warnings, Preparation, Uncertainty reduction, Efficacy], [Preparation, Uncertainty reduction, Reassurance], [Warnings, Uncertainty reduction], [Warnings, Uncertainty reduction, Reassurance], and [Uncertainty reduction, Preparation, Efficacy]. However, the highest number of Retweets fell under the combination of Uncertainty reduction & Efficacy (count= 1713).

In connection with the Likes numbers, a number of combinations for the Preparation characteristic— namely and respectively [Warnings, Uncertainty reduction, Efficacy], [Uncertainty reduction, Efficacy], [Uncertainty reduction], [Uncertainty reduction, Reassurance], [Risk messages], [Warnings, Uncertainty reduction, Efficacy], [Preparation, Uncertainty reduction, Efficacy], and [Risk messages, Preparation, Uncertainty reduction, Efficacy] — received a remarkable number of Likes that went above the total average number. However, the highest number of Likes fell under the combination of Warnings, Uncertainty reduction, & Efficacy] (count= 5075), which is also the highest number of Likes among all CERC characteristics.

Figure 12. Combinations of Efficacy that received more retweets than the average

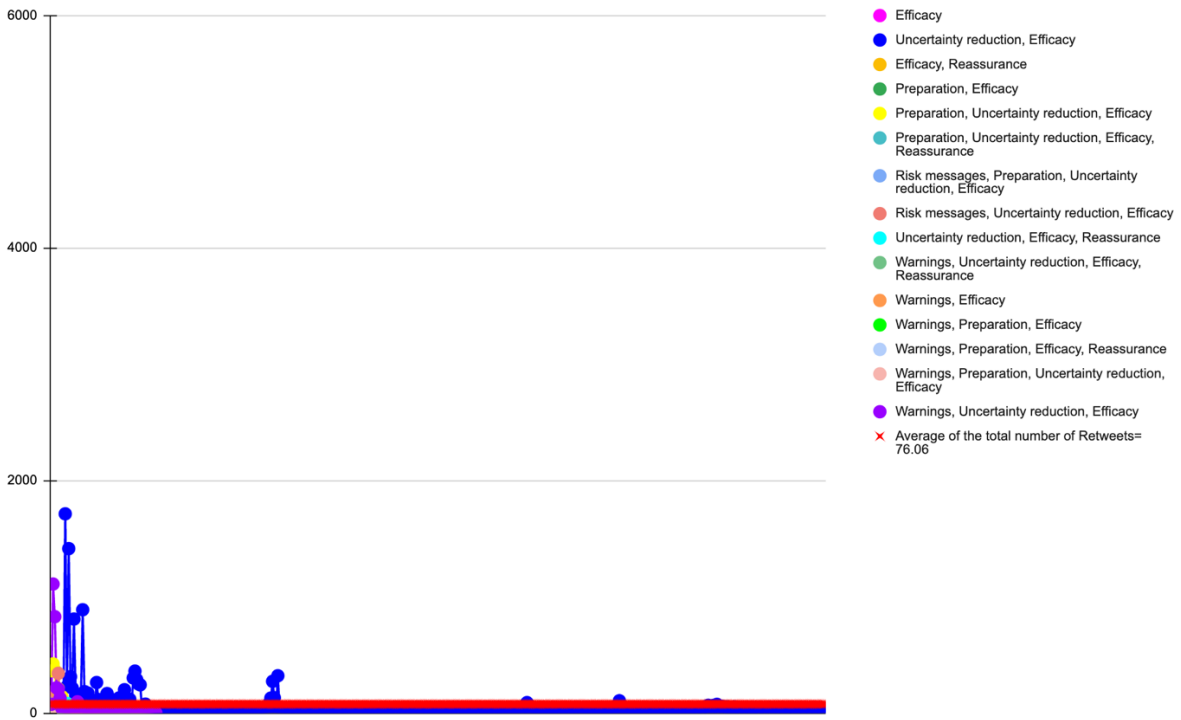


Figure 13. Combinations of Efficacy that received more likes than the average

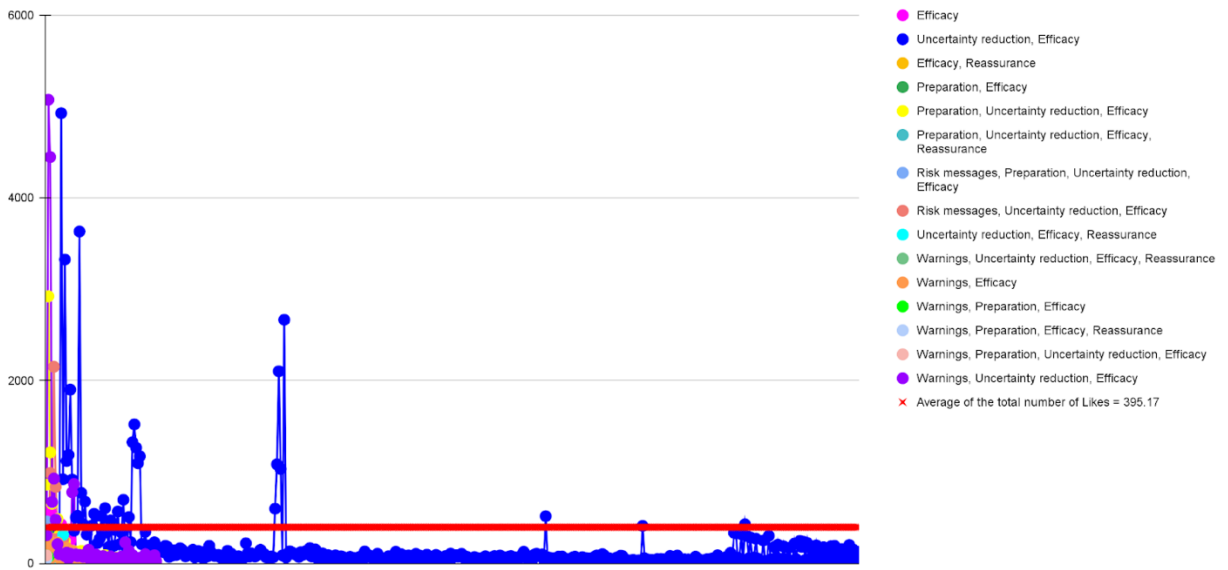


Figure 24/ Fig 12 Combinations of Efficacy that received more Retweets than the average
Figure 25/ Fig 13 Combinations of Efficacy that received more Likes than the average

Figures 12 and 13 depict a number of combinations for the Efficacy characteristic, including respectively, [Uncertainty reduction, Efficacy], [Warnings, Uncertainty reduction, Efficacy], [Preparation, Uncertainty reduction, Efficacy], [Risk messages, Uncertainty reduction, Efficacy], [Warnings, Efficacy], [Efficacy], [Uncertainty reduction, Efficacy, Reassurance], and [Risk messages, Preparation, Uncertainty reduction, Efficacy], garnered a significant amount of Retweets above the overall average. The mix of [Uncertainty reduction & Efficacy] received the most Retweets, (count = 1713).

In respect to the Likes numbers, a number of combinations for the Efficacy characteristic—namely and respectively [Warnings, Uncertainty reduction, Efficacy], [Uncertainty reduction, Efficacy], [Preparation, Uncertainty reduction, Efficacy], [Risk messages, Uncertainty reduction, Efficacy], [Warnings, Efficacy], [Risk messages, Preparation, Uncertainty reduction, Efficacy], and [Efficacy]—received a good number of Likes that went above the total average number. However, the highest number of Likes fell under the combination of [Warnings, Uncertainty reduction, & Efficacy] (count= 5075), which is also and again the highest number of Likes among all CERC characteristics.

Figure 14. Combinations of Reassurance that received more retweets than the average

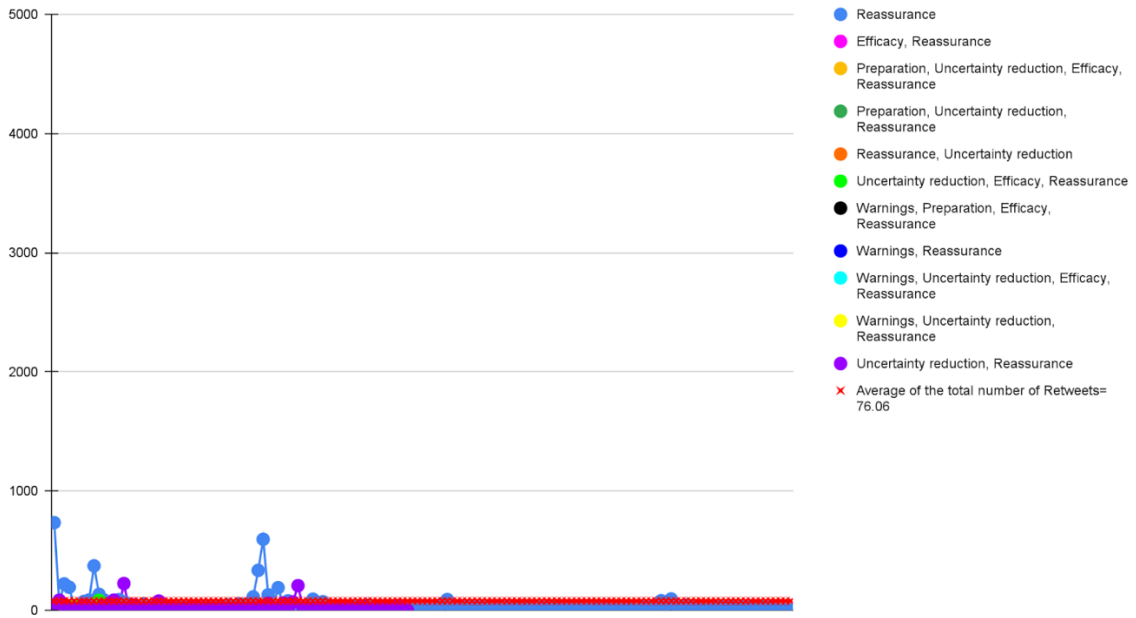


Figure 15. Combinations of Reassurance that received more likes than the average

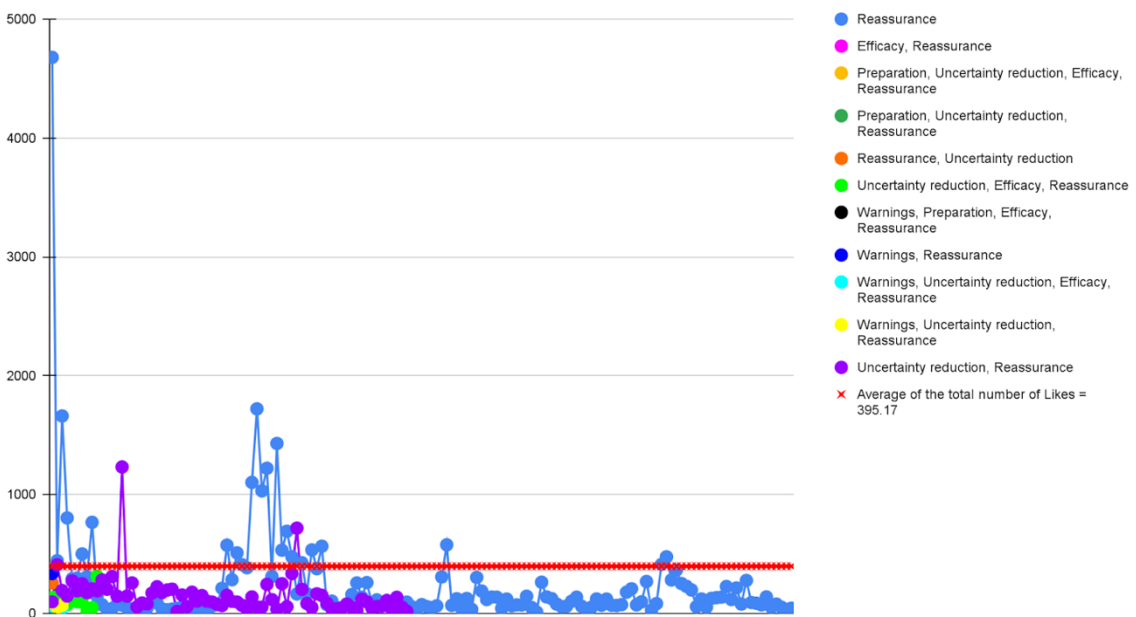


Figure 26/ Fig 14 Combinations of Reassurance that received more Retweets than the average
Figure 27/ Fig 15 Combinations of Reassurance that received more Likes than the average

Figures 14 and 15 depict, respectively, the group of combinations on the Reassurance characteristic, which include [Reassurance], [Uncertainty reduction, Reassurance], and [Uncertainty reduction, Efficacy, Reassurance]. All received a fine number of Retweets that went above the total average number. However, the highest number of Retweets fell under [Reassurance] (count= 734).

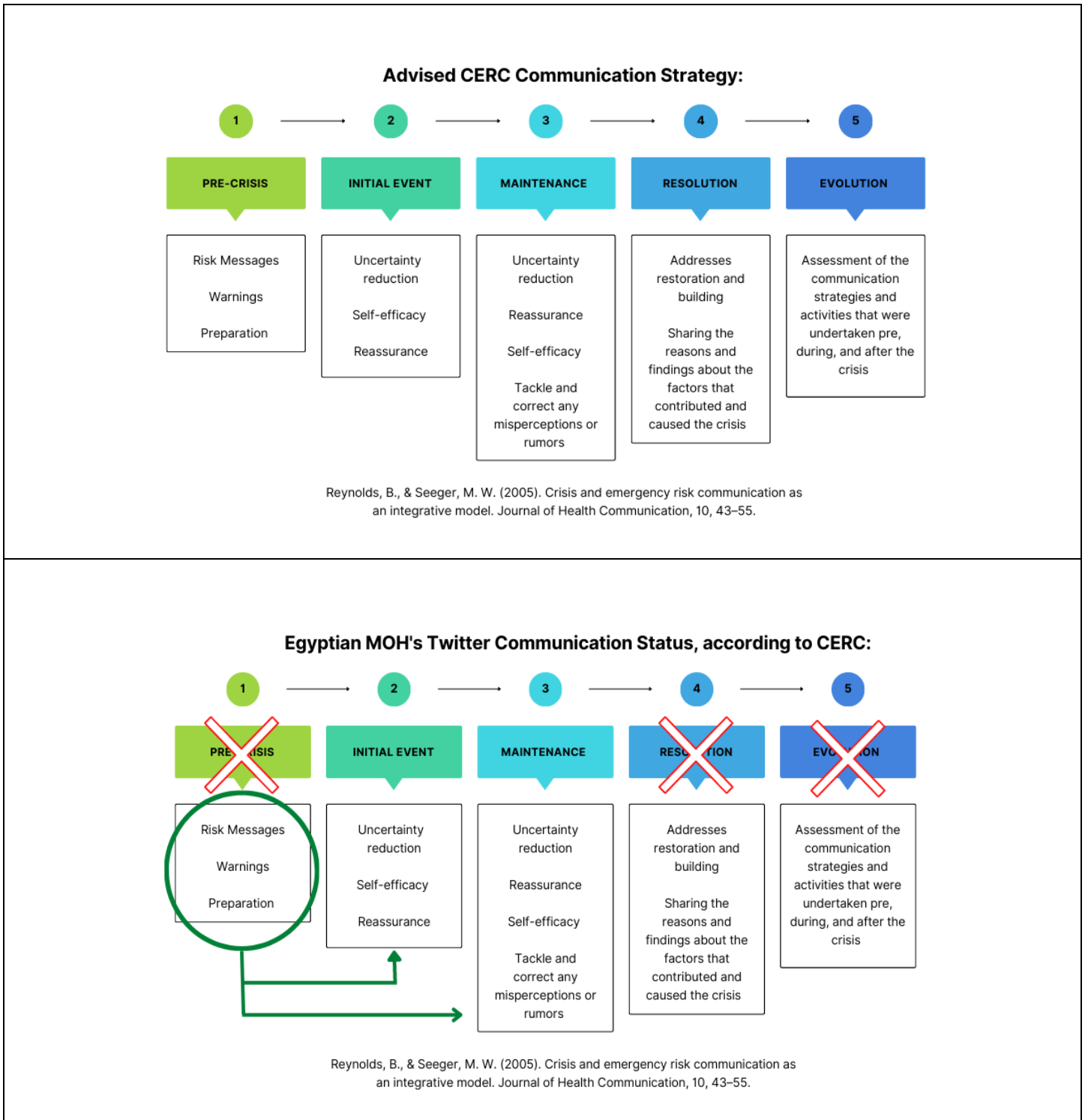
As to the Likes numbers, a number of combinations for the Reassurance characteristic—namely and respectively [Reassurance] & [Uncertainty reduction, Reassurance] — received a good number of Likes that went above the total average number. However, the highest number of Likes fell under [Reassurance] again (count= 4678)

Discussion and conclusion

CERC communication characteristics during the crisis and emergency stages

Crisis and Emergency Risk Communication (CERC), a five-staged theory, recommends a set of messaging and pertained communication characteristics to implement at each stage of the identified following stages: (1) *“Pre-crisis*, (2) *Initial event*, (3) *Maintenance*, (4) *Resolution*, and (5) *Evaluation*”. The Egyptian Ministry of Health succeeded in applying all of the recommended messaging and communication characteristics with varying frequency levels; however, it did not comply with the recommended order of stages while applying these characteristics. Generally, the Egyptian Ministry of Health and Population communication strategy for COVID-19 on Twitter was consistently complying with and applying the characteristics of the “initial event” and “maintenance” phases only and less profoundly consistent with the CERC characteristics noted in the “pre-crisis,” “resolution,” and “evaluation” phases.

Figure 28/ Illustrative Figure for CERC model Vs. the Egyptian context for CERC model



- **Pre-crisis**

According to the CERC model, the “pre-crisis” phase aims to reduce the potential risks and prepare communities in case the likelihood threat turns into an emergency. The Egyptian Ministry of Health’s Twitter account was created and founded during the pre-crisis stage in January 2020. However, it was not until the 14th of February that the Ministry announced the first COVID-19 case in Egypt. In early February, there were zero tweets on the pandemic. While most governments closed their borders to limit the vast spread of the virus between countries, Egypt did not apply direct and decisive actions toward this global crisis, believing that it would not heavily reach or aggressively impact the country at the time (Abdelaziz, 2020). In his brief analysis, Abdelaziz (2020) noted that Egyptian Health Minister Hala Zayed surprised the public by asserting that the virus “lives in China, not in Egypt” and won’t harm or impact the country. It was even pointed out that the virus is not contagious, according to Zayed, and therefore she had no plans to prevent Chinese tourists from visiting the nation “since WHO hasn’t suggested doing so.” Thus, the researcher inferred that no communication was made during the pre-crisis stage to protect the travel and tourism sector, which is one of Egypt’s leading economic sectors.

Similar to the Egyptian context, the Swiss government's communication strategy on Twitter did not match and comply with the pre-crisis phase and its advised communication tactics (Bjorck et al., 2022). During this phase, there was also a clear absence of risk, warning, and preparedness information, which was also observed in the communication strategy of the Saudi Arabian Ministry of Health (Alhassan, & AlDossary, 2021). This can be also explained due to the scientific ambiguity that revolves around COVID-19 (Bjorck et al., 2022).

- **Initial Event and Maintenance**

Regarding the “initial event” stage, where the start of a crisis was marked in mid-February, the MOHP succeeded in sharing messages that pushed forward uncertainty reduction and promoted reassurance and self-efficacy 15 days after the first case was announced. Afterward, the maintenance phase starts when “most or all of the direct harm is contained, and the intensity of the crisis begins to subside” (CDC, 2018). As of mid-April 2020, according to the World Health Organization data, the number of COVID-19 cases started to spike and spread out, gradually reaching more than 1000 positive cases. Therefore, this vast outreach marks the start of the “maintenance” stage, as the crisis spread into different waves throughout the study for two years. Similar messages like those of the “initial event” were successfully disseminated by the Ministry of Health, besides others that tackled and corrected any misperceptions or rumors.

The CERC model advises that communication messages should lower public uncertainty and misperceptions or rumors and offer information about Efficacy and Reassurance throughout the initial and maintenance stages. In line with the model, the Egyptian MOHP tweets succeeded in posting 1601 times (58.2%) on reducing uncertainty in different ways. Firstly, the Ministry provided information on COVID-19, mainly focused on the numbers of positive cases and recovered cases, as well as the number of deaths, total number of infected patients since the start of the pandemic, total number of deaths since the beginning of the pandemic as well as information shedding light on vaccines importance, safety, effectiveness, and its types. It also includes information on how and where to get it and who should get it.

Secondly, the Ministry of Health tweets further focused on available and credible information sources for COVID-19, primarily and extensively highlighting their Hotlines (example:105/15335), followed by their website. Lastly, the Egyptian MOHP shed light 119 times on corrective information content for COVID-19 when tackling rumors or myths and clarifying misperceptions. This finding reaffirms that social media enables governments to communicate with citizens and provide them with correct and confirmed institutional information, preventing incidents where rumors or false information are transmitted by unreliable sources (Lovari & Valentini, 2019). Unlike the Egyptian government, Yang et al. (2021) noted that a third of the U.S. State Governments' COVID-19 homepages did not list the COVID-19 hotline, despite the fact that pandemic hotlines have been recommended as a crucial way to gather information from the community (CDC, 2014).

The Ministry also promoted Efficacy 663 times (23.8%) by emphasizing all possible personal and preventative measures to limit the spread of COVID-19. These findings align with a study investigating public health agencies' use of Facebook for COVID-19–related outreach in Singapore, the United States, and England, as well as corresponding public reactions to these activities. The results also reported that in the three countries mentioned above, public health officials frequently posted social media posts revolving around preventative and safety measures and status updates (Ramkumar, Tan, & Wee, 2020). On the other hand, very few tweets, out of the 25,598 analyzed ones, on the 2013 bird flu offered efficacy information regarding how to handle the problem effectively (Vos & Buckner, 2015). However, this modest number of efficacy tweets could be explained by the fact that the situation was still in its early stages and that many English-language Twitter users were geographically distant from the incident. The virus was confined to China at the time these tweets were gathered (WHO, 2013b). As this study was unable to evaluate tweets in

languages other than English, there is a chance that efficacy information was shared on Twitter or another social media platform in other languages (Vos & Buckner, 2015).

Moreover, the Egyptian MOHP provided the Reassurance characteristic 246 times (8.8%) in various ways by mainly focusing on government interventions to restrain the spread of the virus and highlighting shared responsibility and gratitude to the public or Egyptian healthcare workers. Although the CERC model advises health communicators to provide reassurance during the maintenance stage, crisis communication professionals do not recommend doing so because it could potentially damage an authority's credibility (Seeger, 2006). Instead, they advise against "too reassuring" messaging, especially during evolving pandemics like COVID-19 (Reynolds & Seeger, 2005).

Similarly, in order to better understand how social media might be used to adopt and adapt the CERC model, a study looks at how Singaporean health authorities strategically used Facebook to inform the public about the Zika epidemic. Three major Singaporean health authorities' Facebook posts about the Zika virus that were made between January 2016 and December 2016 were thematically analyzed. During the outbreak stage, the results confirmed that government posts did, in fact, support the notion of regularly updating the public on disease case reports and reassuring them with details of current government interventions (Lwin et al., 2018)

Even though the CERC model recommends that the risk messaging, warnings, and preparations should fall under the three communication characteristics in the pre-outbreak or pre-crisis phase because the public would typically be interested in information relevant to the nature of

the danger, still the outcomes of this study revealed that all three characteristics were present in the initial and maintenance phase at varying frequency levels.

Only 1.4% of the posted content held risk messaging information, most of which focused mainly on only three of the most common symptoms noted by WHO, such as coughing, sneezing, or fever, and only once on the most severe ones, such as difficulty in breathing. Less focus was drawn on all the other noted symptoms. Similarly, Ajwa (2020) reported a shortage of risk information during the early stages of the COVID-19 pandemic in her analysis of the Egyptian MOHP's usage of Facebook during that outbreak.

The Ministry highlighted the warning characteristic around 107 times (3.8%) in multiple ways, including a set of an alarming messages on the potential of severe illness or death due to COVID-19 for several targeted groups. The Ministry delivered severe illness warnings only, and it was mainly targeting smokers, along with very few ones for individuals with chronic health conditions, the elderly, and pregnant women.

There was almost zero messaging by the Ministry on the risk of death due to COVID-19, which is not in line with the media's framing of the situation for more fear-based narrative, using the "deadly disease" as the most prevalent term when reporting on the event (Wahl-Jorgensen, 2020).

Warnings were also presented in terms of potential threats resulting from COVID-19. These warnings included either mental health or economic threats types of messages, but the Ministry mainly focused on the mental health threats that can result from stress or stigma resulted due to the COVID-19 pandemic implications.

The researcher believes that this communication strategy could be part of the MOHP's efforts to support the public, particularly those at risk of poor mental health, such as psychiatric patients, who also experienced more significant stigma during the COVID-19 pandemic (Ha, Tan, Jiang, Zhang, et al., 2020), in addition to healthcare workers who suffered from several burnouts, excruciating stresss, or stigma (Chew et al., 2020; Tan et al., 2020).

In Yang et al. (2021) work on US state government's COVID-19 homepages, it was stated that more information should also be made available to help people deal with the additional COVID-19-related issues like social discrimination and stress. In their finding, the authors mentioned that the US COVID-19 homepages referenced and reported very little mentions to mental health resources (Yang et al., 2021).

In fact, the COVID-19 pandemic saw a significant increase in the number of people reporting mental health issues due to COVID-19 preventative measures such as home isolation and social interaction limitations (Panchal et al., 2020). According to Ayers et al. (2020), there were 3.4 million total Internet searches on anxiety in the U.S. alone over the next two months after COVID-19 was declared a national emergency.

Several messages regarding the Preparation characteristic were highlighted 94 times (3.4%). In its preparatory communication strategy, the MOHP was mainly targeting vulnerable and high-risk groups such as pregnant women, children, healthcare workers (HCWs), and individuals with chronic diseases, including Cancer, Chronic lung diseases such as asthma, diabetes, HIV/AIDs, obesity, chronic kidney disease, weakened immune system, besides smokers and disabled individuals.

Unlike the Egyptian context, Sri Lankan leaders and top health-related organizations used Facebook and LinkedIn to reach their audiences during the COVID-19 pandemic, with a significant prevalence for "Risk Messages," "Warnings," and "Preparations" characteristics (Nagahawatta et al., 2022).

However, similar to the Egyptian setting, the findings of a study that used also the Crisis and Emergency Risk Communication framework (CERC) to look deeply into how the governments of Scotland and Finland used Twitter to communicate the risk of COVID-19 and how their communication changed over time revealed that both governments used Twitter primarily to communicate integral information on COVID-19 as well as to lay out what they were both doing or planned to do to address the situation (Mohamed, 2021). Nevertheless, Facebook posts on social media about Dengue and Zika (diseases spread by mosquitoes), surveillance, and management during the Zika outbreak in 2016 were examined. The majority of the results fell under the Risk Message and Warning characteristics, as opposed to the less common themes of Reassurance and Uncertainty Reduction (Carvajal et al., 2022).

- **Resolution and Evaluation**

The COVID-19 pandemic has yet to be officially announced to end in Egypt. Consequently, the Ministry did not enter the “resolution,” which marks the end of the crisis, or follow the “evaluation stages.” However, it posted a few tweets on some of the advised characteristics of these stages, such as communicating the observed and noticed lessons learned from the pandemic.

Overall, the most prevalent CERC characteristic used by the Egyptian Ministry of Health over the two years was Uncertainty Reduction, Efficacy, and Reassurance. At the same time, the least prevalent CERC characteristics were Preparations, Warnings, and, lastly, Risk Messages.

CERC Principles:

Throughout the study, the MOHP's tweets achieved each CERC principle. Like the CERC characteristics, all CERC principles were also achieved at varying frequency levels.

The Egyptian Ministry of Health mainly worked on "Promoting Action" 1666 times (84.7%) on both the cognitive and behavioral levels. The "Be First" principle was also achieved 144 times (7.3%) in different ways by mainly announcing the status of COVID-19 interventions done by the entity in terms of receiving, admitting, or providing COVID-19 testing, plasma, vaccine kits, or batches. The "Show Respect" principle was also achieved 72 times (3.7%) by greatly posting on acute medical care for positive cases. The "Be Credible" principle was achieved 67 times (3.4%) by sharing the actions taken by MOHP to tackle COVID-19 with the support of medical professionals, experts, organizations, and/or other ministries. Besides, the "Express Empathy" principle was attained 17 times (0.9%) by sharing messages that express empathy, support, and acknowledgment of the Egyptian healthcare workers' efforts during the pandemic. Lastly, "Be Right" was the least achieved, with two times (0.1%) by posting only on the conducted health security plan for social, religious, cultural, and/or sports events.

ElGammal (2021) also concluded that the Bahrani Ministry of Health achieved all CERC principles, whereas Promoting Action was the most obtained principle. In contrast with the current study results, the Bahrani paper concluded that the "Be Right" principle was the second most achieved

principle, followed by “Be Credible,” then the “Show Respect” principle. Unlike the Egyptian research findings, ElGammal (2021) noted that the “Express Empathy” principle was the least achieved among all.

Unlike the Egyptian MOHP results, the Finnish and Schottish governments utilized Twitter to communicate what was known and what was being done at the time when the COVID-19 crisis arose, while strongly demonstrating being the First, Right, and Credible, on the top of the key CERC principles. Also, unlike the Egyptian situation, the Promote Action principle was the third main emphasized principle in the study examining the the Finnish and Schottish governments (Mohamed, 2021).

Level of Engagement:

This study also showed different levels of engagement with different CERC characteristics. A combination of [Warnings, Uncertainty reduction, & Efficacy] characteristics elicited the highest Likes count, while the combination of [Uncertainty reduction & Efficacy] received the highest number of retweets by followers.

Based on these findings, the researcher inferred that the followers are interested in understanding the situation comprehensively rather than segregating each of the CERC characteristics in a separate tweet. This assumption is reaffirmed by the different combinations of CERC characteristics that received sufficient retweets and likes counts above average.

The average number of Retweets by followers is approximately 76.06, while the average number of Likes done by followers is approximately 395.17. The following combinations received a

remarkable number of retweets and like above average: (1) [Warnings, Uncertainty Reduction & Efficacy] as well as (2) [Reassurance]. For the retweets alone, the following combinations received a satisfactory number of both retweets count: (1) [Risk messages & Preparation] as well as (2) [Uncertainty reduction & Efficacy].

Concerning the Likes alone, the following combinations received a good number of Likes count: (1) [Risk messages, uncertainty reduction, & Efficacy] as well as (2) [Preparation, Uncertainty Reduction, & Efficacy]. Therefore, increasing the frequency of tweets complying with these CERC characteristics is recommended, as they received the highest engagement levels in retweets and likes.

Also, according to a study by Elgammal (2021), during the COVID-19 epidemic, it was reported that there was more public interaction and engagement with posts promoting common responsibility.

This study looks at how government and ministry communicators interact with the public on social media during emergencies like that of the pandemic. This research assesses the Ministry's communication strategy with the intent of highlighting important strategic recommendations to inform best practices and areas for improvement that the Ministry can use to prepare for any potential future crisis in Egypt. This study demonstrates a significant value by analyzing and comprehending the messaging that the audience primarily engaged through retweeting and liking the posts. It; therefore, will benefit the Egyptian MOHP to determine the most practical, compelling, and effective messages for the Egyptian community.

Recommendations

Based on the findings of this study, the researcher advises incorporating the following recommendations with social media communication strategies on Twitter during COVID-19 pandemic or any future emergency that takes place in Egypt:

- Regarding CERC characteristics, it is advised to continue posting content that consistently aims to mitigate uncertainty and promote Efficacy and Reassurance while providing a more profound and frequent focus on preparations, warnings, and risk message characteristics.
- Ensure a close follow-up to the order of the CERC stages in relevance to the advised CERC communication characteristics.
- Certify that all communication channels are ready for future emergencies.
- Once COVID-19 is declared to face an end in Egypt, the Ministry is advised to follow the CERC communication characteristics noted at the “resolution” and “evaluation” stages.
- Concerning CERC Principles, continue posting content that promotes action, ensures ‘being first’, and ‘shows respect’ while working on more content that achieves the ‘be right’, ‘be credible,’ and ‘express empathy’ during crisis and emergencies.
- Confirm that the following combinations of CERC characteristics are being taken into consideration during emergencies to ensure a high level of engagement in terms of retweets and likes:
 - [Warnings, Uncertainty Reduction & Efficacy]
 - [Reassurance]
 - [Risk messages & Preparation]
 - [Uncertainty reduction & Efficacy]
 - [Risk messages, uncertainty reduction, & Efficacy]
 - [Preparation, Uncertainty Reduction, & Efficacy]

Limitations and Future Research

This study has several limitations and future directions to examine. Firstly, even though it concentrated on Twitter, the MOHP also used other social media platforms, such as the official website and other social media outlets, including Facebook and Instagram. In addition, MOHP used the traditional offline approaches during the COVID-19 pandemic, and future research is encouraged to explore those areas.

This study concentrated on the first three stages of the crisis (pre-crisis, initial, and maintenance stages), excluding the resolution or evaluation stages, because the pandemic is still ongoing. Future research should broaden the scope of this analysis to give a more comprehensive account of the MOHP's Twitter communication strategy on COVID-19. This paper looked to analyze the number of retweets and likes only but did not attempt to analyze the tweets' comments by followers. More research is required to look at different aspects to understand further the public's reactions and opinions about the MOHP's tweets. Although this paper bridges an explicit gap, another challenge touches upon the limited number of literature reviews on applying the CERC framework on social media. Additionally, the study is limited by the researcher's own biases because the research was conducted via content analysis.

Overall, this study provides insightful knowledge about the deft and comprehensive use of social media in crisis and emergency situations. The study's conclusions provide communication and social media experts and the MOHP officials with vital information about how social media was used during the pandemic and how their messaging complied with the CDC's CERC framework. The study's conclusions also revolutionize how public health institutions, first responders, and other government stakeholders view their role in online engagement during future crises and emergencies.

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Appendix

- Coding Sheet
<https://forms.gle/f6fWHcWX55S6SA8S7>
- Coding and Operational Book
https://drive.google.com/drive/folders/1DHo1eSJTykZxh9VQSmwBMd7Qql0nWyop?usp=share_link
- Intercoder Reliability: SPSS Data (Kappa)
https://drive.google.com/drive/folders/1DHo1eSJTykZxh9VQSmwBMd7Qql0nWyop?usp=share_link