

Exploring Public Engagement Trends of Health Information on AIDS in Social Media Platforms: A Case Study of Twitter

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Abstract

This study conducts a robust examination of AIDS-related health communication on Twitter, encompassing content classification, public engagement analysis, sentiment analysis, and an evaluation of public understanding and perceptions. A corpus of 154 tweets was dissected to reveal four key categories of communication: prevention advice, research updates, personal experiences, and miscellaneous communications. Prevention advice, presented mostly in a factual tone, dominated the content, emphasizing social media's role in disease prevention. Personal experiences, laden with emotional tones, achieved the highest public engagement, affirming the significance of relatability and emotional resonance in health communication. Sentiment analysis delineated positive, negative, and neutral sentiments, signalling varied public responses. Positive sentiments, particularly towards prevention advice and information from healthcare organizations, denoted approval and engagement. Negative sentiments mostly critiqued societal stigma and administrative challenges. Neutral sentiments reflected an informational stance towards trial updates, epidemiological data, and official reports. The evaluation of public understanding and perceptions confirmed that Twitter's perceived credibility varies with the source, indicating a higher prevalent perception in healthcare organizations and government bodies. However, we also detected significant engagement with emotionally resonant and relatable narratives from less traditionally 'credible' sources. The study concludes with recommendations for optimizing AIDS-related health communication, emphasizing the need for sharing personal experiences, adopting emotional and advisory tones, enhancing institutional communication appeal, tackling negative sentiments and misinformation, and encouraging anti-stigma campaigns. In so doing, this research underscores Twitter's potential as a powerful tool for effective AIDS-related health communication, providing valuable insights for health communicators, social media platforms, and policy-makers.

Keywords: AIDS communication; Twitter; public engagement; sentiment analysis; health communication; stigma reduction; social media

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1. Introduction

In the era characterized by digital revolution and ubiquitous internet accessibility, the paradigms of human communication have witnessed transformative shifts, significantly affecting the domain of health communication. Health communication, as defined by Rogers (1983), encapsulates all forms of human interaction that involve health-related information. At present, this mode of communication predominantly transpires in the digital sphere, where the internet has emerged as an influential platform for the dissemination and assimilation of health information (Kushniruk, 2019).

The ascendancy of the internet as a major source of health-related information is evidenced by increasing reliance on it by users worldwide. A study by Jia et al (2021) found that 61.2% of internet users sought health information online first as their most recent search, encompassing diverse aspects such as specific diseases, treatments, and strategies for health improvement. This statistic underscores the vital role of the internet in health communication in the contemporary digital era, emphasizing the necessity for the availability of precise, comprehensible, and easily accessible yet accurate health information on online platforms (Jia et al, 2021).

Amid the continually evolving digital landscape, social media platforms, particularly Twitter, have emerged as pivotal players in reshaping health communication. With a user base exceeding 353.9 million globally in 2023 (Statista, 2023), Twitter has evolved as a predominant channel for the dissemination and reception of health information. The dynamic and interactive nature of this platform not only facilitates information sharing but also stimulates dialogue and engagement, rendering it a powerful instrument for public health communication (Ferrell & Campos-Castillo, 2022).

The dissemination of health information related to AIDS in particular holds a crucial position within the context of health communication on Twitter (McLaughlin et al, 2016). AIDS, an infectious disease that has posed considerable global health challenges for decades, has continued to receive significant academic and practitioner attention due to its far-reaching health consequences (Nyblade et al, 2021). As indicated by the latest data from the World Health Organization (2023), nearly 39 million individuals worldwide were living with HIV by the end of 2022. Despite advancements in the understanding and management of AIDS, it is still often mired in misconceptions and stigma, highlighting the indispensable role of accurate and effective health communication in addressing this disease as suggested by Franzini (2014).

In the specific context of Twitter, garnering insights into public engagement with AIDS-related health information could provide invaluable guidance for developing more impactful communication strategies. Consequently, this research endeavors to investigate public engagement patterns with AIDS-related health information on Twitter, probing the types of information that provoke the highest levels of engagement, and examining the prevailing understanding of AIDS amongst Twitter users. The above considerations underscore the relevance and timeliness of this research, shedding light on an essential aspect of health communication in the digital era.

1.1 Research rationale

The relevance of exploring public engagement trends on social media platforms, specifically Twitter, concerning health information on AIDS, stems from multiple factors and observed gaps in existing literature. While health communication has been extensively studied, there has traditionally been a noticeable dearth in literature concerning health communication within the realm of social media (Moorhead et al, 2013). Despite an apparent rise of relevant studies in recent years, Zhao & Zhang's (2017) systematic review of consumer health information seeking in social media literature identifies an apparent gap on how the public critically engages in health information shared on social media, as mainstream research trends commonly adopt a health empowerment perspective to online health information without acknowledging its potential negative consequences (Song et al, 2016; Zhou et al, 2018).

Moreover, the significance of social media in contemporary society is profound, given its widespread usage and potential reach, making it an ideal platform for public health communication. Yet, current academic understanding of how health information is received and engaged with on such platforms remains insufficient, illustrating an apparent research gap for this study to address. Additionally, research on health communication related to specific conditions such as AIDS, particularly in a social media context, is vastly limited. Though there have been some investigations on HIV/AIDS-related health communication (Heldman et al, 2013; Moorhead et al, 2013; Taggart et al, 2015), these studies offer limited applications in the modern, rapidly evolving social media landscape. Furthermore, there is a gap in terms of examining public engagement trends and gauging public understanding based on social media activity (Valkenburg et al, 2022).

Subsequently, this research aims to address these gaps by focusing on AIDS-related health information on Twitter, expanding upon empirical literature within the intersection of health communication, social media, and specific disease contexts. This research can adequately fulfil this gap by investigating public responses to different types of health information related to HIV and examines the current understanding of the general public on Twitter regarding AIDS. This study would offer practical insights that could guide the development of more effective health communication strategies, by understanding what type of AIDS-related health information generates the most public engagement, health organizations, advocacy groups, and public health officials may be better equipped to design and disseminate messages that not only reach wider audiences but also foster improved understanding and dialog about AIDS. Moreover, by utilizing real-time, user-generated data on Twitter, this research mirrors contemporary discussions and perceptions about AIDS, thereby contributing an up-to-date perspective on public understanding and engagement with AIDS-related health information in the era of social media.

1.2 Research aims & objectives

The primary aim of this research is to examine and understand how the public interacts/ engages with AIDS-related health information on Twitter. In today's digital age, social media platforms are often used to share and discuss information. Therefore, it's important to understand how health information, especially about AIDS, is received and responded to by the public. This study will help fill gaps in current research by focusing on AIDS-related information shared on Twitter, a popular social media platform. The insights gained from this study will help develop effective ways to communicate about AIDS on social media. To achieve this aim, the following research objectives will be met:

- To categorize the types, tones, and sources of AIDS-related health communication on Twitter: This involves a detailed content analysis of tweets, classifying them based on the nature of the information (such as prevention advice, research updates, personal experiences), the tone (factual, emotional, advisory), and the source (healthcare organizations, individuals/ user generated, government bodies).
- To assess the level of public engagement with different types of health communication. This is achieved through a quantitative analysis of likes, retweets, and replies for different types of AIDS-related health communication. The objective is to identify which types of information garner the most engagement and to detect any patterns or trends in this engagement.
- To analyse the sentiment expressed in public responses to AIDS-related health communication: This involves conducting sentiment analysis on public responses, categorizing them as positive, negative, or neutral. The aim is to understand the public's attitudes towards the various types of AIDS-related health information.
- To discern public understanding and perceptions of AIDS based on the content of public responses: This objective involves a qualitative analysis of public responses, focusing on prevalent perceptions, misconceptions, stigmas, and knowledge gaps related to AIDS. This will provide insights into the current state of public understanding of AIDS.
- To formulate recommendations for optimizing the dissemination of AIDS-related health communication on Twitter: Based on the findings from the previous objectives, this objective seeks to provide actionable recommendations for health communicators. This involves suggesting ways to increase engagement, address misconceptions, combat stigma, or improve overall public understanding of AIDS.

1.3 Research questions

Each of the following research questions below are specifically aligned with the aforementioned research objectives, aimed at fulfilling the overarching aim of understanding the public engagement trends with AIDS-related health information on Twitter.

- RQ1: What are the various types, tones, and sources of AIDS-related health information shared on Twitter?
- RQ2: How does public engagement with AIDS-related health information on Twitter vary with different types of health information?
- RQ3: What is the sentiment of public responses to different types of AIDS-related health information on Twitter?
- RQ4: What are the prevalent perceptions, misconceptions, and stigmas related to AIDS among Twitter users?
- RQ5: Based on the findings, how can the dissemination of AIDS-related health information on Twitter be optimised?

1.4 Structure of study

This research study is systematically arranged into six significant chapters, each contributing a distinct aspect to the overall development and presentation of the study. The first chapter introduces the research, providing an overview of the study's context, aims, objectives, and associated research questions. It elucidates the importance of the research topic, simultaneously emphasizing the existing gaps in the current literature that this research intends to address. The second chapter conducts a comprehensive review of the existing literature surrounding health communication, emphasizing social media's role in health communication, and specifically on the dissemination and public engagement of AIDS-related information. This chapter aids in placing the research within the larger academic discourse, underscoring the gaps that this study fills.

The third chapter explicates the methodology employed in this research. It details the design of the research and the methods used for data collection and analysis. This chapter includes an explanation of the Web Data Research Assistant (WDRA) extension for Google Chrome, a tool used for data collection and the analytical methods used for both qualitative and quantitative data. The fourth chapter unveils the findings of the research, which are organized systematically, aligning with the research questions. It offers an objective report of the data collected and the results derived from the analysis, which include the types of AIDS-related health information shared, trends in public engagement, sentiments expressed in responses, and prevailing public perceptions of AIDS.

The fifth chapter delves into a detailed discussion of the findings, interconnecting them with the research questions and objectives. The results are interpreted within the context of the existing literature as reviewed in the second chapter. Further, the chapter discusses the implications of the findings on health communication on social media, particularly focusing on the context of AIDS. The sixth and final chapter concludes the research, summarizing the key findings and their implications. It reflects upon the research process, emphasizing the study's contribution to the

existing body of knowledge. The chapter also proposes potential directions for future research, building upon the insights this study has generated.

2. Literature review

This literature review is structured to provide a comprehensive and critical understanding of health communication, with a specific focus on AIDS-related communication on social media. The intention is to delve deep into existing research, theories, empirical findings, and ongoing trends to generate a holistic perspective on this intricate facet of public health. The review is organized to progressively build upon core concepts, moving from theoretical foundations to more complex discussions surrounding the specific nuances of AIDS-related communication on social media. The chapter opens with an examination of the concept of health communication (2.1). This section sheds light on the foundational theories that form the basis of health communication, specifically focusing on how these theories apply and adapt within the digital landscape (2.1.1). It explores how the emergence of social media platforms has fundamentally changed the way health information is shared and consumed and the implications these changes have for public health.

Following the theoretical underpinnings, the review turns to the types of health communication found on social media (2.2). It discusses the diverse range of tones and sources that characterize health communication on these platforms (2.2.1), and how these different aspects can influence the reception of health messages. The review then proceeds to explore the intricacies of measuring public engagement with health communication on social media (2.3). It offers a thorough understanding of how the type of health information can affect public engagement (2.3.1) and the sentiments evoked by these messages (2.3.2). With this groundwork in place, the chapter transitions to a detailed discussion on perceptions, misconceptions, and stigmas associated specifically with AIDS-related health communication on social media (2.4). It examines the various factors that contribute to these phenomena (2.4.1), the propagation of misconceptions (2.4.2), and the prevalence of stigma (2.4.3) within this context.

The final section in this chapter concludes with a summary of the literature, encapsulating the current research trends and identified research gaps for this study to address. By integrating theoretical frameworks with empirical evidence, this literature review seeks to enhance our understanding of AIDS-related health communication on social media. The ultimate aim is to inform the design of communication strategies that are not only effective in transmitting information, but also sensitive to the challenges and potential risks present within the dynamic and complex social media landscape.

2.1 Conceptualizing health communication

Academic studies on health communication posits at the intersection of multiple disciplines, revolving around the deployment of communication strategies to inform and influence both individual and community health-related decisions, ultimately facilitating improved health outcomes (Borg et al, 2019). A rich body of literature exists which affirms the crucial role of health communication in the spectrum of health domains, spanning across disease prevention to health promotion (Reinecke & Oliver, 2017), the management of diseases (Tra et al, 2018) and policy-making in health (Oxman et al, 2022).

An essential characteristic of health communication, as echoed in the literature, is the central focus on the message recipient (Barnett et al, 2011). Research attention on health communication is often placed on making health information accessible and comprehensible to different audiences, each defined by unique socio-cultural and individual traits (Moorhead et al, 2013). Moreover, health communication transcends from traditional transmission of health information and extends into an understanding of, and addressing socio-cultural and psychological factors influencing how people receive, interpret and act on health information according to Chinn & Homeyard, 2017).

In terms of methodological approaches, empirical studies on health communication have adopted a broad spectrum of techniques according to Laranjo et al's (2015) in-depth meta-analysis, including interpersonal communication, mass communication, and particularly digital communication in recent years. The selection of a technique primarily rests upon the specific goals of the health communication initiative, the target population, and the socio-cultural context. The digital revolution has propelled a significant transformation in health communication, as the emergence of social media platforms have not only expanded the reach of health communication efforts, but also enriched their potential for customization, interaction and feedback (Laranjo et al, 2015). According to Garrisson-Joyner & Caravella (2020), health communication is conceptualised as a dynamic and evolving field that plays a pivotal role in health promotion and disease prevention. Moreover, the research field of health communication is continuously adapting and evolving in the face of new changes and opportunities presented by a rapidly transforming socio-technical environment (Mheidly & Fares, 2020), illustrating substantial research importance for the study to contribute to.

2.1.1 Theoretical underpinnings of health communication in the digital age

According to Sachiavo (2013), health communication is anchored in a variety of theories and models derived from multiple disciplines including communication, psychology, sociology, and public health studies. The Health Belief Model (HBM), established by Rosenstock et al (1988), is a crucial theoretical construct grounded in the social learning theory and predicates health behaviours on personal health beliefs, perceived advantages and hindrances to actions and self-efficacy. The HBM encompasses five primary constructs including perceived susceptibility,

perceived severity, health motivation, perceived benefits and perceived barriers as shown in figure 1 (Rosenstock et al, 1988).

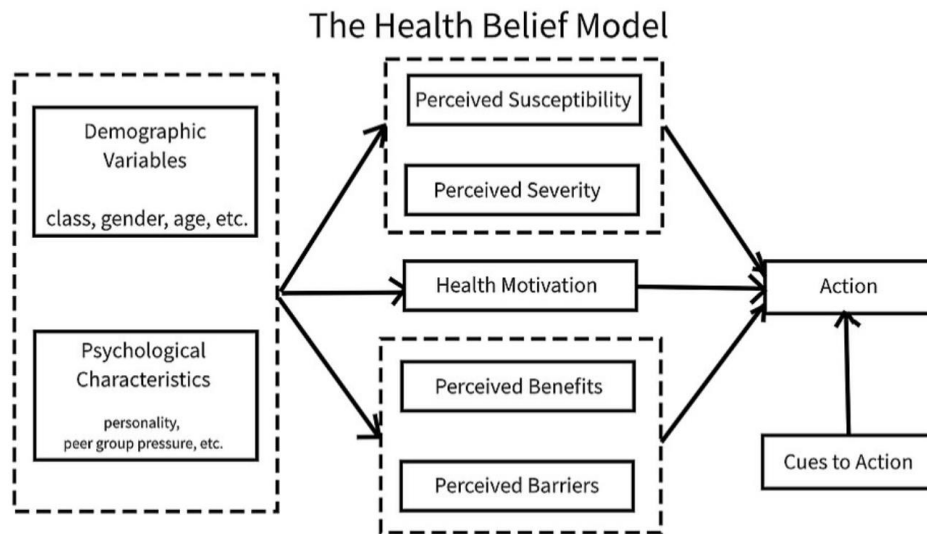


Figure 1: Health Belief Model (Rosenstock et al, 1988)

The HBM presents a comprehensive framework to understand how health messages are perceived and acted upon by individuals, proposing that health messages are perceived differently in accordance to the demographic and psychological characteristics of the recipient (Jones et al, 2015). This model has allowed health communication professionals to address these factors effectively, which is particularly important in the realm of digital health communication as shown in the study of Sheppard & Thomas (2021), informing the creation of nuanced health messages designed to prompt health-protective behaviours such as increased awareness, prevention, and treatment during the COVID pandemic. Through the HBM's lens, Sheppard & Thomas (2021) argues that the multifaceted factors influencing how individuals perceive health related information and the subsequent influence on health behaviours, echoing the findings of Becker et al's (2014) HBM pilot study across Europe, finding that a standardised health communication approach would not adequately influence all recipients with desired outcomes.

Another theory that lays important foundation for the understanding of health communication is often recognised as the Social Cognitive Theory (SCT) proposed by Bandura (1986). According to Bandura (1986), the process of learning is rooted in a social context and involves a dynamic and reciprocal interplay between the person, environment, and behaviour as shown in figure 2, challenging the traditional knowledge that individuals are passive recipients of information. Alternatively, it is argued that individuals actively engage in interpreting and applying the information they receive, especially regarding health decisions as shown in the study of Noar et al (2015) that found positive implications of the SCT theory for skin cancer prevention messages. In

the context of social media, Lin et al (2018) examined the role of the social cognitive theory is examined in relation to the perceived interactivity of social media users and the motivation of health information exchange, finding possible correlations behind the socio-cognitive influences of health communication messages in shaping the behaviours of the social media user.

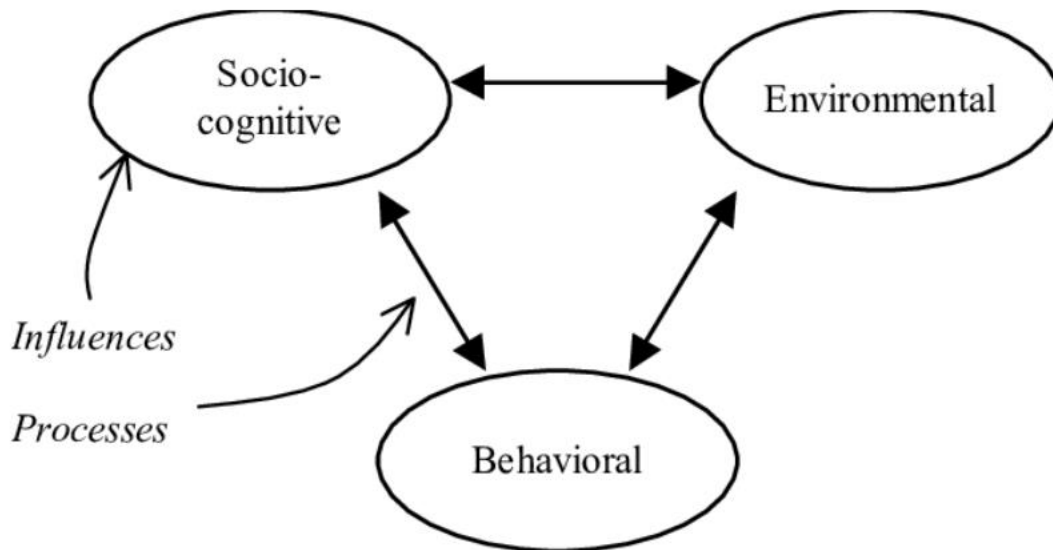


Figure 2: Social Cognitive Theory (Bandura, 1986)

The Transactional Model of Communication (TMOC) proposed by Barnlund (2008) provides a dynamic perspective of communication, acknowledging the fluidity of sender and receiver roles in interactive communication environments, such as social media as illustrated in figure 3. This model has been widely utilized in communication studies to explain and understand various communication phenomena and has gained significant attention in health communication research in the digital era (Parackal et al, 2021; Paige et al, 2018; Sun et al, 2023). Under this model, communication is viewed as a process rather than an event, where both sender and receiver are considered communicators and participate simultaneously in the communication process (Barnlund, 2008). According to Vaterlaus et al's (2015) study on perceived influence of social media, the application of the TMOC encapsulates the dynamic nature of social media, where there's no strict delineation between senders and receivers as everyone can create, share, and react to content (Vaterlaus et al, 2015).

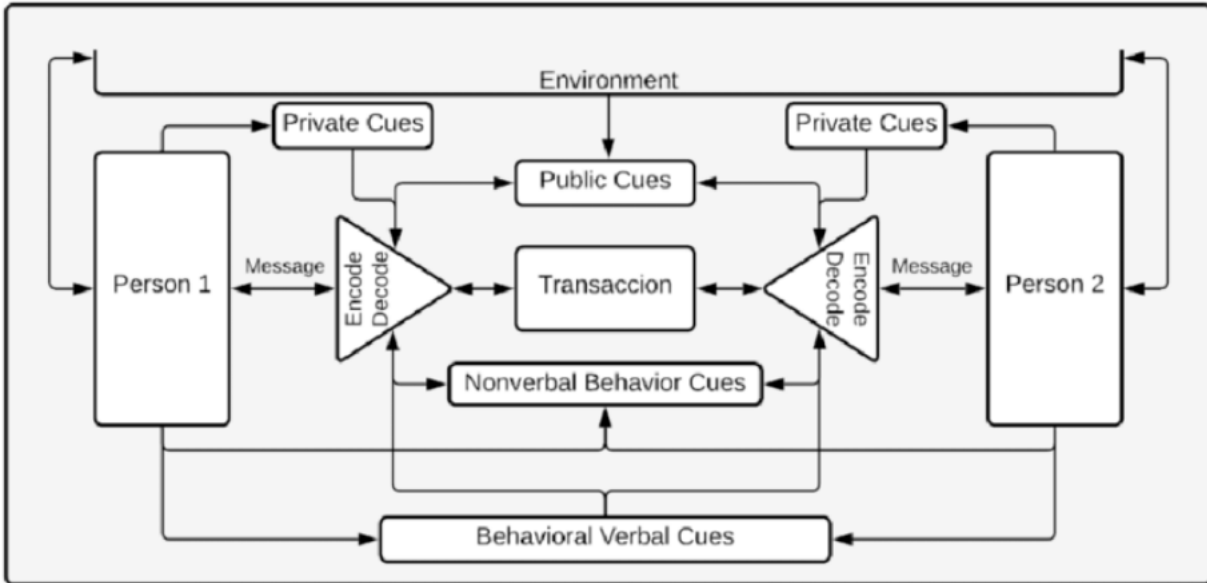


Figure 3: Transactional Model of Communication (Barnlund, 2008)

In the context of health communication, TMOC underscores the active role of the audience in constructing meaning from health-related information. According to Kim & Yang (2016), the interactive nature of social media provides a platform for a 'transactional' process where health information is continuously created, interpreted, and reshaped by the users. This aspect has been demonstrated in studies investigating patient communities online, where the sharing of personal health experiences and peer support form an integral part of the health communication process (Wang et al, 2017). Moreover, through the TMOC's lens on health communication is congruent with the need for feedback, a key factor for successful health communication on social media (Moorhead et al, 2013). Instant feedback through likes, comments, and shares can provide valuable insights into the audience's perception, understanding, and reaction to health-related information (Sinnenberg et al, 2017). This aspect of the model lends itself to understanding public engagement trends and sentiment analysis related to AIDS-related health information on social media platforms.

2.2 Types of health communication on social media

According to Moorhead et al (2013), health communication on social media can be categorised in diverse types, largely attributable to the versatile nature of the platforms, which accommodate varied content formats and facilitate distinct interaction modes. Similarly, empirical literature identifies the sharing of health-related news and updates, educational content, health campaigns, personal health stories, and online support groups as among the popular types of health communication on social media in a western context (Jenkins et al, 2020), in Africa (Fayoyin, 2016) and across developing countries (Sood et al, 2014). One significant category involves the

dissemination of health-related news and updates, encompassing scientific research findings, medical breakthroughs, policy changes and health alerts (Hartoonian et al, 2014). This type of health communication is found to serve as a critical conduit for relaying emergent and time-sensitive information to the public, facilitating rapid response and policy compliance (Nabi et al, 2013).

Educational content is another significant category, purposed to raise public health literacy, provide disease prevention guidelines, and promote healthy behaviours (Chou et al, 2009). This echoes the arguments of Freeman et al (2015), as this content is designed to be highly engaging, using multimedia elements such as images, infographics, and videos to deliver complex health messages in understandable and memorable ways particularly in the corporate sector and social change marketers. According to Freeman et al (2015), educational based health communication campaigns represent a type that takes advantage of the widespread reach and interactivity of social media to mobilise health initiatives, including disease awareness, health screening, or fund-raising for health causes. Moreover, Park et al's (2023) systematic review on healthcare education communication found that personal health stories shared by users contribute significantly to health communication on social media, offering first-person perspectives and experiential knowledge on health matters, as these stories not only humanize health issues but also inspire and empower others in similar situations.

Another important type of health communication includes online support groups, which act as safe harbours for individuals dealing with particular health conditions, in these virtual spaces, users can exchange experiences, seek advice, and gain emotional backing (Bender et al, 2013). According to Smailhodzic et al (2016), online support groups are not only platforms for shared experiences but also facilitate peer-to-peer interaction that encourages a sense of community among users. This form of communication is found to significantly aid individuals in coping with their health issues, as it provides an empathetic and understanding environment, which is often not achievable in formal healthcare settings (Smailhodzic et al, 2016). Under the general research consensus, the versatility and adaptability of social media have fostered the development of diverse health communication forms, ranging from preventive health messages, dissemination of health research, patient experiences, testimonials, to the promotion of health-related events and campaigns (Chou et al, 2009; Moorhead et al, 2013). Overall, empirical literature recognises various types of health communication on social media, each carry unique implications for how the public perceives and interacts with health-related information.

2.2.1 Tones and sources of health communication on social media

The tone of health communication on social media can significantly shape public engagement and influence health outcomes. Akin to types, the tone of health messages ranges broadly, spanning from factual and formal, advisory, to emotional and personal, each eliciting distinct audience responses according to Neiger et al's (2012) key performance indicators and evaluation metrics of

social media use in health promotion. Factual and formal tones are often utilized in sharing health news updates, research findings, and educational content, as these messages emphasize precision and reliability, aiming to build public trust in the information shared that is found to stimulate effective health related behaviour change in the study of Korda & Itani (2013). Factual tones are also found to complement the authoritative sources from which they originate, such as health organizations, government bodies and research institutions, overcoming the limitations of traditional health communication interventions that have often failed to stimulate desired changes in people's behaviours according to Kreps & Neuhauser's (2010) study.

Alternatively, Gough et al (2017) argues that advisory tones are predominant in health campaigns and preventive health information on the Twitter social media platform, providing guidance and recommendations for health behaviours to advocate for desired health related behaviour change. This echoes the findings of Mahoney et al's (2015) longitudinal infodemiology study to examine the digital distribution of advisory health information surrounding the human papillomavirus vaccination, finding that the advisory tone can inspire proactive health actions, particularly when coupled with persuasive strategies such as fear appeals or calls to action. In addition, emotional and personal tones tend to feature in personal health stories and discussions in online support groups, as are found to positively evoke empathy and foster a sense of connection among users, thereby creating supportive online communities as show in the study of Han et al (2018) across the Chinese social media platform Weibo.

In regards to the sources of health communication across social media platforms, these are broadly be classified into two mainstream groups of official sources and user-generated sources as discussed in Ma & Atkin's (2017) meta-analytic study on the credibility evaluation of social media health information. Official sources encompass health organizations, government bodies, research institutions and the media, which are conventionally recognized as authoritative and reliable (Sinnenberg et al, 2017). On the other hand, user-generated sources include individual users and online communities, contributing user-experiences and peer-to-peer communication especially in the early childhood healthcare sector as shown in the study of Degotardi et al (2022).

However, although these sources may lack the formal credibility in comparison to official sources, they are argued to offer higher personal relevance and relatability that can be equally impactful in shaping health attitudes and behaviours under the process of social media health information sharing (Ziebland & Wyke, 2012). Overall, the tone and source of health communication on social media play a significant role in determining the reception and impact of health messages, recognizing the interplay between the tone, source, and type of health communication is key to a comprehensive understanding of health communication dynamics on social media.

2.3 Measuring public engagement with health communication on social media

Public engagement with health communication on social media can be determined through various interaction metrics, often referred to as 'vanity metrics' (Rogers, 2018). These are predominantly quantitative measures such as likes, shares, comments, retweets and mentions, serving as tangible evidence of the reach and impact of health-related messages, offering an overview of public sentiment and engagement, contributing to the understanding of how health information is perceived and interacted with on social media platforms (Rogers, 2018). This echoes the arguments of Guidry et al (2017), suggesting that the “like” function on Twitter serves as an easily accessible and quantifiable metric, symbolising a user's passive agreement or support for the content, which can be seen as an endorsement of the information or a signal of its perceived credibility. Additionally, the functions of “shares” and “retweets” are found to act as propagation mechanism that broadens the message's reach, thus expanding its audience and potential influence (Naslund et al, 2016).

The function of “comments” is found to offer a more nuanced view into public engagement, indicating a higher level of interaction as they represent users' thoughts, beliefs, and attitudes towards the health content. As such, comments constitute an arena for active engagement, often triggering dialogues and exchanges of ideas that can enrich the content's context and potentially influence other users' perceptions (Klassen et al, 2018). However, despite the recognition of measurement metrics on public engagement with health communication on social media in empirical literature, it is argued that the validity of measurement metrics differs due to the unique functions of each social media platform in Alhabash & Ma's (2017) study on the motivations and uses of Facebook, Twitter, Instagram and Snapchat. In the context of Twitter, Alhabash & Ma (2017) argues that the incorporation of other indicators such as the use of specific hashtags, clicks on embedded links, and time spent on posts, can yield deeper insights into the audience's level of interest and involvement.

2.3.1 Influence of health information types on public engagement

The type of health information disseminated is found to have a significant correlation to the subsequent impacts of audience engagement as proposed by Denecke & Deng (2015). Users' interests and concerns can vary widely, influencing how they engage with different health topics, practical health advice or breaking research news is found to attract more shares or comments than generic health promotion messages, as this type of engagement is further modulated by the relevance of the information to the users' immediate health needs and experiences (Denecke & Deng, 2015).

Furthermore, the presentation style of the health information plays a crucial role in engagement, whereby visual content, such as infographics or video clips, has been found to garner higher levels of engagement than text-only posts (Yoo et al, 2016). Alternatively, the use of storytelling,

particularly involving personal experiences, has been identified as a powerful tool to stimulate emotional engagement and deepen users' understanding of the health issues (Yue et al, 2019).

Interactive elements incorporated into health communication on social media, such as polls or quizzes, can stimulate active user engagement and participation, fostering a more immersive experience (Carr et al, 2018). These features enable users to become active contributors to the dialogue around health, as opposed to being passive recipients of health information. Naslund et al. (2016) substantiate this claim, suggesting that interactive elements bolster engagement, creating a sense of community and shared learning. Their study on mental health communities found that active involvement through such features led to improved user retention and meaningful peer-to-peer interactions. Furthermore, the effects of interactive elements in health communication extend to health behaviour outcomes.

In a study by Maher et al. (2014), the use of interactive games in a Facebook community led to increased physical activity among young adults, this finding suggests that interactive features not only stimulate engagement but may also spur positive health actions. Another study by Zhang et al (2020) emphasized that the types of health information and its presentation style can significantly impact public engagement on social media, finding that audience-specific tailoring of health messages and creative use of various multimedia formats can enhance public receptiveness and interaction. This study suggest that a one-size-fits-all approach would not be as effective in capturing diverse audiences' attention and interest.

2.3.2 Sentiments toward health information on social media

Sentiment towards health information on social media plays a crucial role in public engagement and has a direct bearing on how users perceive, interact with, and disseminate information (Stieglitz & Dan-Xuan, 2013). A broad classification of sentiment includes positive, negative, or neutral categories, each of which is decipherable through user behaviours like comments, shares, reactions, and the tone of retweets (Stieglitz & Dang-Xuan, 2013). According to Hutto & Gilbert (2014), positive sentiment is generally indicative of agreement, approval, or an overall favourable attitude towards health information, promoting a more active and positive engagement. Conversely, negative sentiment, often signalling disagreement, criticism, or adverse reactions, may impede the spread of health messages or, in some cases, generate discussions that lead to a better understanding of contentious issues (Hutto & Gilbert, 2014).

However, neutral sentiment is found to represent an informational or detached stance, where users merely consume information without demonstrating emotional investment (Paltoglou, 2011). A study by Ma et al (2013) suggests that neutral sentiment often results from factual, non-controversial information, where users feel less compelled to engage emotionally as evidential in their study on social media for public opinion management during the COVID pandemic. According to Ma et al (2013), the sentiment elicited by health information is often influenced by

various factors, including the tone, content, and source of the health information, as well as users' pre-existing beliefs and attitudes, whereby trusted and credible sources disseminating factual, balanced health information often elicit more positive sentiment, as opposed to misinformation or alarmist messages that can provoke negative sentiment.

Nonetheless, as an advanced text analytic technique, sentiment analysis provides profound insights into public emotional responses, attitudes, and perceptions towards different health topics (Hutto & Gilbert, 2014). Sentiment analysis is found to contribute to unearthing potential misconceptions, fears, stigmas, or misinformation that necessitates addressing. By revealing these sentiments, health communicators can better tailor their messages to foster more positive sentiment and effective engagement (Hutto & Gilbert, 2014). Similarly, Ahmed et al. (2020) employed sentiment analysis to identify public sentiment and misinformation about vaccines on Twitter, informing their targeted communication strategies on reopening from national lockdown protocols implemented during the COVID pandemic. Overall, understanding sentiment towards health information on social media enables a nuanced perspective on the public's attitudes and emotional responses. This understanding can, in turn, guide the development of more effective health communication strategies, ultimately driving better health outcomes and informed public discussions (Stieglitz & Dang-Xuan, 2013).

2.4 Perceptions of AIDS related health communication on social media

The public perception of AIDS-related health communication on social media has a direct bearing on how information is received, interpreted and acted upon. A burgeoning body of research (Smith et al, 2018; Jones et al, 2013) has highlighted the increased reliance on social media platforms as a source of AIDS-related health information, given their ease of access and convenience. However, the perceived trustworthiness and credibility of these platforms for disseminating AIDS-related health information are not universally consistent (Smith et al, 2018). A study by Xu et al (2016) revealed discrepancies in the perceived credibility of AIDS-related health information contingent on the source, as institutional entities such as health organizations and government health departments were viewed as more credible than individual users.

Furthermore, empirical health information derived from studies was perceived as more reliable than experiential knowledge or personal anecdotes (Chou et al, 2018), representing a critical factor given the medical complexity and the stigma associated with AIDS. The perception of credibility is found to not exclusively dictate user engagement with AIDS-related health information on social media, instead, Holdman et al (2018) argues that emotional resonance and relatability would significantly shape engagement patterns (Green et al, 2019). Content that emotionally resonates or presents relatable narratives tends to elicit more engagement, even if it originates from less traditionally 'credible' sources. This is found to be particularly relevant in the context of AIDS, where personal stories and community support can play a crucial role in raising awareness and combating stigma (Holman et al, 2018).

2.4.1 Misconceptions in AIDS related health communication on social media

Misconceptions in AIDS-related health communication on social media is found to profoundly affect public comprehension of the disease and its related health behaviours as seen from the dissemination of Ebola related health communication on Twitter (Oyeyemi et al, 2014). Social media platforms, due to their participatory nature can inadvertently foster the proliferation of misconceptions and inaccuracies about diseases, which are frequently perpetuated due to a lack of critical assessment or verification (Oyeyemi et a, 2014). The spread of misconceptions about AIDS on social media has been particularly problematic, given the stigma and misinformation often associated with the disease. For example, a study by Chan et al (2015) found a significant portion of AIDS-related posts on social media contained misinformation, outdated perspectives, or promoted stigmatizing attitudes. These misconceptions can perpetuate stereotypes, fuel stigmatization, and lead to risky behaviours or a reluctance to seek testing and treatment (Taggart et al, 2015).

This poses a significant challenge for health communicators and professionals who must work to dispel these misconceptions on social media and promote accurate, evidence-based information about AIDS representing an important research area to address (Chan et al, 2015). Addressing the spread of AIDS-related misinformation also requires understanding the contributing factors, as studies suggest that factors such as the emotional appeal of the message (Vosoughi et al, 2018), cognitive biases (Pennycook & Rand, 2020), and the structure of social networks (Del Vicario et al, 2016) can significantly contribute to the spread of misconceptions. Additionally, tackling these challenges demands collective efforts from health professionals, social media companies, policymakers and the public in a collective manner, ensuring accurate and responsible AIDS-related health communication on social media platforms and contribute to improving public understanding and responses to the disease which remains an apparent gap in real world practice (Valkenburg et al, 2022).

2.4.2 Stigmas related to AIDS health communication on social media

Stigmas associated with AIDS, particularly prevalent on social media is found to significantly influence public health communication about the disease (Hatzenbuehler et al, 2013). Stigma, as described by Link & Phelan (2001), encompasses the actions of labelling, stereotyping, separation, status loss, and discrimination in a context where power is exerted. For people living with AIDS, such stigma can lead to marginalization, social exclusion, and diminished quality of life (Hatzenbuehler et al, 2013). In the context of AIDS communication on social media, stigma can discourage individuals from seeking help, sharing their experiences, or disclosing their HIV status (He et al, 2022). While social media has the potential to provide support networks and crucial health information, it can also perpetuate AIDS-related stigmas. For instance, He et al (2022) found that negative or stigmatizing language in social media posts about HIV/AIDS could reinforce discrimination against people living with the disease.

Despite the propensity for social media to amplify stigmatizing behaviours, these platforms also present considerable opportunities for anti-stigma campaigns and interventions specifically focused on AIDS (Thorncroft et al, 2016). The open and expansive nature of social media allows health communicators and advocates to reach a broad audience, fostering widespread understanding and acceptance. According to Thorncroft et al (2016), the first step to counteracting stigma involves creating supportive digital environments. This could be achieved through the moderation of online discussions to prevent harmful stereotypes or misinformation from being disseminated. Simultaneously, fostering conversations that promote empathy, respect, and factual understanding can help construct a more positive digital environment. Studies like that of Lelutiu-Weinberger et al (2015) have shown the benefits of such moderated online platforms in reducing HIV-related stigma and promoting HIV prevention behaviours.

The implementation of campaigns that challenge stereotypes and misconceptions about AIDS is another effective approach, as this could involve sharing content that humanizes individuals living with AIDS, such as personal success stories, testimonials, or narratives highlighting their resilience and strength (Lelutiu-Weinberger et al, 2015). An empirical study by Pedrana et al (2013) found that an online campaign using personal narratives was successful in promoting HIV testing among men who have sex with men, a group often stigmatized in the context of AIDS, illustrating the potential power of social media campaigns that emphasize shared humanity. Furthermore, engaging influential figures or celebrities in these campaigns can enhance their reach and impact. For instance, the involvement of popular celebrities in the "HIV Stigma: Not Retro, Just Wrong" campaign significantly increased its visibility and audience engagement (Jain & Bhargava, 2021).

2.5 Summary of Literature

The growing use of social media as a means of health communication is a significant trend, shaping the ways people perceive, interact with, and respond to health-related information. This shift has led to the emergence of several key research strands, including the exploration of various types and tones of health communication on social media, the evaluation of public engagement with health information, and the critical investigation into the perceptions, misconceptions, and stigmas prevalent in health discourse on these platforms (Chou et al, 2018; Laranjo et al, 2015). A large portion of the literature has focused on the content of health communication, exploring the types, sources, and tones of health-related messages on social media. Studies have classified these messages based on various criteria, from the nature of the information to its source, revealing diverse trends and practices across different platforms and health topics (Sinnenberg et al, 2017; Bhattacharya et al, 2014).

Public engagement has also emerged as a key topic in this area, with researchers employing quantitative and qualitative methods to measure and understand public interactions with health-related content on social media. These interactions are being analysed to gauge public interest,

sentiment, and behaviour regarding different health topics, offering insights into the impact and effectiveness of health communication efforts on these platforms (Thackeray et al, 2012).

However, the exploration of perceptions, misconceptions, and stigmas related to ADIS related health communication on social media is an area that requires further investigation. While some studies have shed light on the issue, especially concerning HIV/AIDS (Lelutiu-Weinberger et al, 2015), the breadth and depth of the problem, particularly in relation to the dissemination and reception of health information on Twitter, remain largely underexplored. In summary, while the current literature provides valuable insights into health communication on social media, further studies, particularly on Twitter's specific context, are warranted. These studies should aim to enhance our understanding of public engagement with AIDS-related health information on Twitter, the sentiment of public responses, the prevalent perceptions, misconceptions, stigmas and ways to optimize the dissemination of such information.

3. Methodology

This chapter outlines the methodological system deployed in the research processes of this study, providing a comprehensive overview of the research design and the strategies employed for data collection and analysis. The structure and design of this chapter are underpinned by Saunders et al's (2009) research onion framework as shown in figure 4. This framework provides a robust and systematic approach to constructing a research methodology, peeling back the layers of the 'onion' to offer an increasingly detailed view of the decisions made at each stage of the research process from the research philosophy, to the research approach, strategy, choice, time horizon, data collection and analysis stages (Melnikovas, 2018).

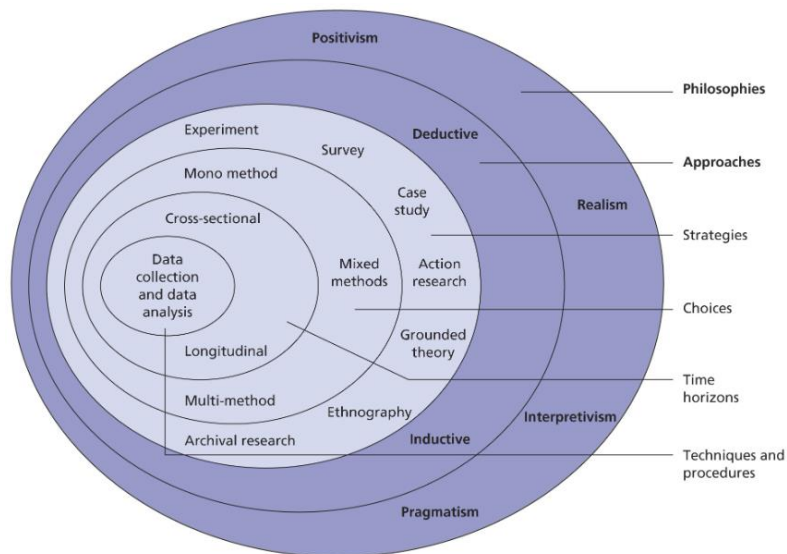


Figure 4: Research onions framework (Saunders et al, 2009)

The main goal of this chapter is to firstly clarify the research's philosophical and methodological underpinnings, thereby providing an understanding of the rationale behind the methodological choices. Secondly, this chapter aims to offer a transparent account of how the research was conducted. This dual objective facilitates the reproducibility of the research, an essential aspect of research credibility, and allows readers to assess the quality and rigor of the research process (Yin, 2018).

This chapter provides the justification of the core philosophy chosen to drive the research through to the practical details of data collection and analysis, providing a comprehensive view of the research process. Each stage of the research is discussed in alignment with chosen methods and tools, explaining why they were chosen to fulfil the overarching research objectives, providing a clear linkage between the what (the research objectives) and the how (the methodological approach). Thus, this chapter forms an essential bridge between the theoretical foundations outlined in the literature review and the empirical findings that emerge from the analysis (Creswell & Creswell, 2017).

3.1 Research Philosophy

The philosophical underpinnings of a study play a crucial role in shaping the research design, methodological choices, data collection and analysis techniques, and ultimately, the interpretation and generation of findings (Easterby-Smith et al, 2012). This study is guided by the interpretivist paradigm, which carries significant methodological implications. Interpretivism, as a research philosophical stance posits that knowledge is derived from understanding the meanings that individuals attribute to their experiences (Schwandt, 2000). It is rooted in the ontological assumption that reality is socially constructed and subject to variation among different social actors (Bryman, 2016). This perspective recognizes that the understanding and interpretation of phenomena are inherently subjective, moulded by individuals' unique socio-cultural contexts and personal experiences.

Aligning with an interpretivist paradigm is particularly relevant for this study, which seeks to investigate public perceptions, engagement, and sentiment towards AIDS-related health information on the Twitter social media platform. By acknowledging the subjective nature of these experiences, an interpretivist approach enables the research to delve into the individual perspectives and lived experiences of social media users. This allows for an in-depth exploration and understanding of how AIDS-related health information is received, interpreted, and acted upon, thus facilitating the uncovering of underlying patterns, themes, and trends within the data (Creswell & Poth, 2017).

The interpretivist paradigm further aligns with the study's focus on the interactive dynamics among social media users. In line with Berger & Luckmann's (1966) constructionist view of social reality, this research recognizes that the interpretation and response to AIDS-related health information on

social media are not static. Instead, they are continually shaped and reshaped by the interactions and dialogues among the users. Therefore, adopting the interpretivist paradigm is justified on the grounds that it provides a robust framework for understanding and interpreting the complex, nuanced, and context-dependent nature of public engagement with AIDS-related health communication on Twitter. It acknowledges the subjective realities of social media users and allows for an in-depth exploration of their experiences, perceptions, and interactions, thereby enriching the study's findings and contributions.

3.2 Research approach

According to Saunders et al (2009), the research approach delineates the overarching methodological trajectory of a study. It's typically classified as either deductive, which involves developing hypotheses based on existing theories and then testing them against empirical observations, or inductive, where researchers generate new theories based on the analysis of collected data. This study embraces an inductive research approach, which aligns closely with the research's interpretivist philosophical underpinnings. The inductive methodology allows for the emergence of novel insights and themes directly from the collected data, rather than testing predefined hypotheses (Thomas, 2006). Given the dynamic and relatively unexplored nature of public engagement with AIDS-related health information on Twitter, it is essential to allow the data to 'speak for itself' rather than imposing pre-existing theoretical frameworks on it.

By employing an inductive approach, this research can generate new understanding and perhaps develop emergent theories regarding the public's engagement with, perceptions of, and sentiments towards AIDS-related health information on Twitter. This is particularly pertinent as the social media landscape and public health communication practices are ever-evolving, and previous theories might not fully encapsulate the nuances of this context (Venturini, 2010). Moreover, the inductive approach aligns with the interpretivist research philosophy, as it underscores the complexity and diversity of human experiences and perspectives, making it well-suited to investigating the varied responses to AIDS-related health information on social media (Schwandt, 2007).

It enables the researchers to delve into the subjective meanings and interpretations attached by Twitter users to such health information, revealing the multifaceted nature of their engagement, understanding, and sentiment. Hence, the inductive approach facilitates a comprehensive and nuanced exploration of the research phenomena, allowing for the emergence of new theoretical insights and providing a rich, detailed understanding of public engagement with AIDS-related health information on Twitter.

3.3 Research strategy

A research strategy serves as the navigational guide for a research study, helping to ensure alignment between the research philosophy, the chosen research approach and the methodologies employed for data collection and analysis (Saunders et al, 2009). In order to fulfil the proposed research objectives, a combination of content analysis and sentiment analysis are employed, ensuring a coherent strategy that aligns well with the interpretivist paradigm and inductive research approach.

Content analysis, as defined by Neuendorf (2017), provides a systematic and objective method to quantify and interpret messages. In line with the first objective of this research, content analysis emerges as the most appropriate strategy to categorize the types, tones, and sources of AIDS-related health information disseminated on Twitter. With a meticulous approach, tweets containing AIDS-related information will be thoroughly examined, categorized, and coded based on several attributes. This includes the nature of information, whether it pertains to preventative measures, research updates, or personal experiences; the tone of the content and identifying if it is factual, advisory, or emotional and the source of the message, distinguishing between healthcare organizations, individuals, and government bodies.

Furthermore, the application of content analysis significantly contributes to achieving the second objective of the study. By quantitatively assessing the level of public engagement measured through likes, retweets and replies, this strategy can help identify which types of AIDS-related health information resonate most with the Twitter audience. Through the identification of such patterns or trends, content analysis offers valuable insights into crafting more effective health communication strategies on social media.

Additionally, sentiment analysis as described by Liu (2015), serves as a computational study that seeks to understand and interpret people's sentiments, attitudes, and emotions related to various topics. This approach dovetails with the third and fourth objectives of the research. Conducting sentiment analysis allows for an in-depth understanding of the public sentiment categorized as positive, negative, or neutral - towards AIDS-related health information disseminated on Twitter. This analysis uncovers the broader public attitude towards AIDS, providing insights that can guide more effective health communication strategies.

Furthermore, a detailed sentiment analysis aids in achieving the fourth objective of this research by uncovering public understanding and perceptions of AIDS. By diving into the content of public responses, it is possible to unearth prevalent misconceptions, stigmas, and knowledge gaps related to AIDS, providing a more comprehensive picture of public sentiment and understanding. Therefore, aiding the generation of actionable insights to address these gaps and misconceptions in future health communication initiatives.

Consequently, the culmination of the findings derived from the content and sentiment analyses directly feeds into the final objective of this research with the gained insights and understanding,

the research can formulate practical recommendations for health communicators. This would result in suggestions on increasing public engagement with health messages, strategies to debunk prevalent misconceptions, initiatives to counter stigmas, or methods to improve the overall public understanding of AIDS. Overall, the chosen research strategies of content and sentiment analyses offer an effective methodological framework to achieve the objectives of this study. By scrutinizing the vast Twitter data related to AIDS, these strategies pave the way for a comprehensive understanding of the patterns, perceptions and sentiments towards AIDS-related health information.

3.4 Research Choice

The research choice signifies the selection between mono method, mixed method, and multi-method research designs, forming the backbone of how a researcher collects, analyses and intertwines the quantitative and qualitative data within the study (Saunders et al, 2012). In harmony with the interpretivist paradigm that governs this research, a mixed-methods design is elected as the research choice. As endorsed by Johnson et al. (2007), a mixed-methods research design embraces the amalgamation, analysis, and integration of both quantitative and qualitative data within a study. This approach expands the scope of understanding by utilizing the strengths of both types of data, thereby offering a holistic understanding of the research problem.

Specifically for this study, the quantitative facet of the research design is intertwined within the content analysis and assessment of public engagement with AIDS-related health information. The goal is to quantify and categorize tweets based on types, tones, and sources of such information, complementing the first research objective. Furthermore, it helps assess the level of public engagement with different types of health information shared on Twitter, reflecting the second research objective. The statistical data generated through this part of the mixed-method design aids in identifying patterns, trends, and predominant themes of public engagement with AIDS-related health information.

The qualitative component of the research strategy is actualized through the sentiment analysis and interpretative analysis of public responses. This part is more explorative, focusing on the nuances of public sentiment, understanding, and perceptions of AIDS-related health information. This qualitative dimension dovetails with the third and fourth research objectives, aiming to analyse the sentiment expressed in public responses to AIDS-related health information and discern public understanding and perceptions of AIDS. The depth of qualitative data allows for a rich interpretation of the sentiments behind the public responses, offering insights into the subjective world of the users.

The integrative mixed-methods design ultimately allows for the collection of rich, multifaceted data that aligns with the research's interpretivist philosophy. The convergence of qualitative and quantitative data provides a rounded understanding of the phenomenon under study, offering a

strong foundation for the final objective of formulating recommendations to optimize the dissemination of AIDS-related health information on Twitter. By providing a comprehensive picture of both the nature and nuances of public engagement with AIDS-related health information, the chosen mixed-methods approach allows for the creation of informed, effective strategies for health communication in the digital age.

3.5 Time horizon

The time horizon in research delineates the temporal aspect of the investigation, classifying it as either cross-sectional or longitudinal (Saunders et al, 2012). A cross-sectional research approach captures a 'snapshot' of the phenomenon under investigation at a specific point in time. Conversely, a longitudinal research approach explores the changes or developments in a phenomenon over an extended period. Aligned with the objectives and scope of this study, a cross-sectional time horizon is chosen as the most suitable strategy. This decision resonates with the essence of this study, as it aims to delve into the AIDS-related health communication on Twitter within a precise timeframe, thereby capturing the current scenario in a 'snapshot' manner (Bryman, 2016).

There are two primary justifications for employing a cross-sectional time horizon in this research. The first pertains to the specific goals of the study: exploring the contemporary trends and patterns in AIDS-related health communication on Twitter. The research objectives are formulated with a clear focus on understanding the current state of the phenomenon, rather than its evolution over time. This includes analysing types, tones, sources of AIDS-related health information, assessing the level of public engagement, and analysing the sentiments expressed in public responses. The second justification concerns practical constraints such as limited resources and time, which restrict the feasibility of a longitudinal study. A cross-sectional study allows for the analysis of data from a predefined and manageable timeframe (Rindfleisch et al, 2008). Hence, while limiting the study to a specific point in time, it ensures a more in-depth and focused investigation.

Despite this apparent time-bound constraint, the cross-sectional approach does not compromise the significance or relevance of the research findings. It offers valuable insights into the state of AIDS-related health communication on Twitter during the data collection period. Therefore, it provides a robust reference point for future studies, contributing to the ongoing discourse and research on health communication in digital spaces.

3.6 Data collection

According to Saunders et al (2009), the method of data collection for any research is largely dictated by the research approach, strategy and time horizon. The chosen interpretivist paradigm and an abductive approach form the backbone of this research, a mixed-methods approach for data collection is employed. This approach will allow for the integration of both quantitative and

qualitative data, thus offering a holistic understanding of the phenomena under investigation. As pointed out by Creswell & Plano-Clark (2017), such a comprehensive approach enhances the depth, richness, and validity of the research findings.

Primary data collection for this research will be conducted using Twitter as the primary source. The Web Data Research Assistant (WDRA) extension for Google Chrome will be the key tool employed to extract relevant data. WDRA is capable of extracting significant data related to tweets, such as replies, retweets, mentions, and hashtags, particularly focused on AIDS-related health information (Jünger et al, 2017). This extraction process allows us to capture a broad spectrum of public opinions, sentiments, and interactions related to AIDS, thereby forming the backbone of our content and sentiment analyses.

The data procured will be comprehensive, including the content of tweets (such as the message, any embedded URLs or images), metadata associated with each tweet (like the date and time of posting, the number of retweets, likes, and replies), and the profile information of the authors of these tweets (including the number of followers, the accounts they follow, and their total tweets). To ensure ethical integrity, all data will be anonymized to respect privacy concerns and adhere to research ethical guidelines.

To ensure a representative and meaningful sample of AIDS-related health information on Twitter, the WDRA tool is configured to extract tweets based on specific keywords and hashtags related to AIDS. This includes key terms like 'AIDS', 'HIV', 'AIDS prevention', 'AIDS treatment', and others. The use of these specific search parameters is expected to generate data that is both comprehensive and highly relevant to the research objectives. By doing so, the research ensures that the data collected is capable of providing the most relevant and insightful conclusions and recommendations about AIDS-related health communication on Twitter.

3.7 Data analysis

Following the data collection phase, a thorough data analysis process is conducted. This study's mixed-methods design permits an analysis that integrates both quantitative and qualitative approaches, aligning with the research strategy to generate comprehensive insights (Bazeley, 2018).

The quantitative aspect of the analysis will focus on the numerical data obtained, including the count of likes, retweets, and replies each AIDS-related tweet received. This part of the analysis directly caters to the second research objective, to assess the level of public engagement with different types of health information. For the quantitative aspect, descriptive statistics will be applied, with a focus on frequency distributions. This will provide an understanding of how often certain types of tweets or responses occur in the dataset. The frequency of likes, retweets, and replies can indicate the level of engagement with various types of AIDS-related information. These frequency distributions can help identify patterns or trends in the data, such as which types of information are most often shared or most engaging for the audience.

For the qualitative aspect, the text data from tweets and public responses will be subjected to thematic content analysis. This involves coding the data into categories and identifying themes or patterns. A codebook will be developed to guide this process, based on the research objectives. For example, tweets and responses may be coded based on the tone, content, and source of information, as well as the sentiments expressed. The analysis of this coded data can provide rich insights into public perceptions, misconceptions, and stigmas related to AIDS, thus addressing several of the research objectives. Furthermore, the sentiment analysis will be employed to interpret the attitudes and emotions in the public responses to AIDS-related health information. This analysis can further enhance the understanding of public sentiment towards AIDS and the types of health information that evoke certain reactions. For example, a theme of "fear" or "misunderstanding" might be identified within tweets discussing certain aspects of AIDS. This theme could then be analysed to recognize a negative sentiment towards that particular aspect of AIDS. On the other hand, a theme of "support" or "encouragement" might suggest a positive sentiment.

Overall, the integration of findings from both quantitative and qualitative analyses provides a holistic overview of the current state of AIDS-related health communication on Twitter. This synthesis will facilitate the fulfilment of the ultimate research objective, which is to propose recommendations for optimizing the dissemination of AIDS-related health information on Twitter. The in-depth, multi-faceted analysis made possible by the chosen mixed-methods approach offers a strong foundation for these evidence-based recommendations.

3.8 Ethics

As this research involves the collection and analysis of publicly available data from Twitter, it is crucial to uphold the highest ethical standards. Given the relatively new terrain of social media research and the inherent potential risks, an emphasis on ethical considerations is indispensable (Markham & Buchanan, 2012). This study adheres strictly to the University of Sheffield's ethical guidelines. Prior to the commencement of the data collection process, necessary permissions have been obtained with approved ethical application forms, in accordance with the university's research policies. The use of the Web Data Research Assistant (WDRA) extension for data collection strictly aligns with its user agreement, and it is in full compliance with Twitter's policies regarding data scraping.

Preserving the privacy of Twitter users involved in this study is a top priority. Although the tweets are publicly available, all identifiable user information will be anonymized during the data collection phase, thereby eliminating the possibility of individual user identification (Zimmer, 2010). It is also worth noting that the collected data will only be used for the purposes of this study, and there will be no dissemination of the data to any third parties. In terms of data storage, stringent security measures will be implemented as per the University of Sheffield's guidelines. The collected data will be securely stored, and access will be strictly limited to the research team. Upon

completion of the research, the data will be disposed of in an ethically appropriate manner, adhering to the university's data management regulations.

During the interpretation and presentation of findings, ethical considerations will continue to be paramount. Researchers will ensure any quotations from tweets, or examples used to support the study's findings, are sufficiently anonymized to prevent the identification of users, in accordance with the ethical standards upheld by the University of Sheffield (Moreno et al, 2013).

4. Results & findings

This chapter presents the detailed findings of the research drawn from the comprehensive and rigorous data collection and analysis process. Utilizing the Web Data Research Assistant (WDRA), an extensive dataset of tweets and related metadata was gathered from the first 154 tweets searched based on the keywords 'AIDS', 'HIV', 'AIDS prevention', 'AIDS treatment', offering a valuable glimpse into the nature and dynamics of AIDS-related health information disseminated on Twitter. This dataset has been systematically sorted, analysed, and interpreted in line with the study's research objectives, providing valuable insights into the types, tones, and sources of AIDS-related information, the level of public engagement, the sentiment of responses, the prevalent public understanding and perceptions, and potential avenues for optimizing health communication on Twitter. Each section of this chapter is dedicated to addressing a specific research objective. By providing a clear outline of the processes and results for each objective, the findings will be presented in a coherent and structured manner. This will enable a holistic understanding of the complex phenomenon of AIDS-related health communication on Twitter.

4.1 Categorisation of AIDS related health communication on Twitter

4.1.1 Types of AIDs related health communication

In the examination of the collected 154 tweets, we have categorized the AIDS-related health communication into four primary types as shown in Table 1. The most common type of communication, constituting approximately 51% (78 tweets) of the dataset, cantered around prevention advice. These tweets often imparted knowledge about HIV/AIDS preventive measures such as consistent testing, safer sexual practices, and usage of prophylactics, drawing attention to the essential role of prevention in controlling the spread of HIV/AIDS. These messages were majorly disseminated by health bodies and organizations. The second most prevalent type of communication was research updates, which made up roughly 19% (30 tweets) of the dataset. These tweets communicated recent advancements and studies related to HIV/AIDS, spotlighting new treatment methodologies, breakthroughs in vaccine research, or updated statistical data on HIV/AIDS prevalence and management.

Personal experiences represented a significant component of the HIV/AIDS communication on Twitter, accounting for approximately 10% (15 tweets) of the total. Primarily posted by individuals living with HIV/AIDS, their caregivers, or healthcare professionals involved in HIV/AIDS care and treatment, these tweets shared personal stories and narratives to raise awareness, reduce stigma, or provide support to others navigating similar circumstances. The remaining 20% (31 tweets) of the dataset comprised of miscellaneous HIV/AIDS-related communications. These encompassed a variety of topics such as general awareness campaigns, advocacy for policy alterations, commemorations of HIV/AIDS-related observances, and calls for more resources or efforts in combating HIV/AIDS. By understanding these various types of AIDS-related health communication on Twitter, we can gain a more nuanced comprehension of the online conversation surrounding this critical public health issue.

Table 1: Types of AIDS related health communication

| Type | No of Tweets | Description |
|----------------------|---------------------|---|
| Prevention Advice | 78 (~51%) | These tweets often disseminated information about strategies for HIV/AIDS prevention, promoting regular testing, usage of prophylactics, and safer sexual practices. They were mainly from health bodies and organizations. |
| Research Updates | 30 (~19%) | These tweets usually reported on the latest studies and advancements related to HIV/AIDS, highlighting new treatment approaches, breakthroughs in vaccine development, or updated statistical data on HIV/AIDS prevalence and management. |
| Personal Experiences | 15 (~10%) | These tweets were primarily from individuals living with HIV/AIDS, their caregivers, or healthcare professionals involved in HIV/AIDS care and treatment. They shared personal stories or narratives to raise awareness, reduce stigma, or offer support to others in similar situations. |
| Others | 31 (~20%) | These tweets consisted of general awareness campaigns, advocacy for policy changes, commemorations of HIV/AIDS-related observances, and calls to action for more resources or efforts in the fight against HIV/AIDS. |

4.1.2 Tones of AIDs related health information

Analysing the tone of tweets is crucial in understanding the communication style and the intended message conveyed by the tweet. In the analysed dataset, a variety of tones were employed in AIDS-related health communication, each serving a unique purpose and targeting a specific audience response as summerised in table 2.

The largest proportion of tweets, almost half (48.7%), adopted a factual tone, underscoring the importance of providing clear, accurate information to the public. These tweets, often posted by health organizations, research institutions or government bodies, were instrumental in conveying data-driven information, such as recent research findings or statistics on the prevalence of HIV/AIDS. This indicates a commitment to fostering an informed public, capable of understanding the scale and impact of the AIDS. Emotional tweets, accounting for 13% of the dataset, serve a different yet equally important function. By incorporating personal stories or evoking specific emotions, these tweets aim to humanize the HIV/AIDS discourse, highlighting the individual lives affected by the disease. These emotionally-charged tweets can galvanize the audience to take action, either by following prevention advice or advocating for the needs of those affected by HIV/AIDS.

Nearly 30% of the tweets were advisory in nature, offering advice or guidance on various aspects of HIV/AIDS. Whether providing prevention tips, guidance for living with HIV/AIDS, or recommendations for supporting those affected, these tweets serve a crucial role in shaping the behaviours and attitudes towards HIV/AIDS. Lastly, 9.1% of tweets fell into the 'others' category. This diverse group included advocacy tweets calling for policy changes, tweets aimed at raising general awareness, and those highlighting specific events or campaigns. This variety underlines the multi-faceted nature of the fight against HIV/AIDS, incorporating elements of policy, awareness and activism. The blend of tones seen in these tweets reflect the complexity of communicating about HIV/AIDS. It highlights the need for diverse approaches in order to provide information, evoke empathy, guide behaviours and advocate for necessary changes.

Table 2: Tones of AIDS related health information

| Tones | No of Tweets | Description |
|--------------|---------------------|---|
| Factual | 75 (~49%) | These tweets deliver concrete information or data related to HIV/AIDS. They may contain statistics, recent research findings, or statements of fact. These tweets serve to inform the audience about various aspects of the disease, including prevalence, advancements in treatment, and the ongoing impact of the pandemic. |

| | | |
|-----------|-------------|---|
| Emotional | 20 (13%) | These messages are characterized by the expression of emotions, whether it's empathy, compassion, frustration, or even fear. They often contain personal stories or reflections and are meant to provoke an emotional response from the reader, often aimed at raising awareness or prompting action regarding HIV/AIDS. |
| Advisory | 45 (~29.2%) | These tweets are intended to guide behaviour or advise the audience. They may include prevention tips, advice for living with HIV/AIDS, or recommendations for supporting those affected by the disease. They often come from health organizations or professionals, but can also come from individuals sharing their personal experiences or insights. |
| Others | 14 (~9%) | This category captures a variety of tweet types that don't fit neatly into the other categories. This could include advocacy tweets calling for policy changes or greater funding for HIV/AIDS initiatives, tweets raising general awareness about the disease, or tweets highlighting specific events or campaigns. |

4.1.3 Sources of AIDs related health information

The tweets analysed in this study demonstrate a notable diversity in the sources of AIDS-related health communication as shown in table 3. Individual user-generated content emerged as the leading source, accounting for approximately 61% (94 tweets) of the total sample. This user-driven dissemination of information highlights the central role of individuals in health-related discussions on social media platforms. The personal experiences (especially in relation to prevention), opinions and emotional responses shared through these tweets serve to humanize HIV/AIDS and offer valuable peer-to-peer support within the Twitter community. These tweets often embody stories of personal struggles and triumphs, advocacy, or shared prevention advice based on personal experience.

Healthcare organizations contributed to 27% (41 tweets) of the overall health communication. The tweets from these sources typically present factual information, research updates, or advisory messages. They serve as a crucial source of medically accurate information, helping to educate the public and disseminate recent data and advice regarding HIV/AIDS. Although fewer in number compared to user-generated content, these tweets hold considerable weight due to their authoritative and trustworthy nature. Government bodies, such as health departments or health-

related government initiatives, made up 12% (19 tweets) of the tweets. These sources, while fewer in number, are of great importance as they provide official data, policy updates, and strategic guidance concerning HIV/AIDS. The authoritative and formal tone associated with these sources lends an additional layer of credibility to the information shared, thereby playing a crucial role in public health communication.

Table 3: Sources of AIDS related health information

| Source | No of Tweets | Description |
|----------------------------|---------------------|---|
| Healthcare Organizations | 41 (~27%) | These tweets were disseminated by health-centric organizations such as hospitals, clinics, research institutions, or health awareness foundations. They typically encompassed factual information, research updates, or advisory tweets, aiming to educate the public and provide the most recent data and advice regarding HIV/AIDS. |
| Individuals/User Generated | 94 (~61%) | These tweets were user-generated content often embodying personal experiences or emotional content. They served to humanize the disease, share personal stories, or offer support and encouragement to others living with HIV/AIDS. Some also shared prevention advice based on personal experience. |
| Government Bodies | 19 (~12%) | Tweets from government bodies, such as health departments or health-related government initiatives, were primarily factual or advisory. They provided official data, policy updates, or guidance on HIV/AIDS, thus playing a key role in public health communication. |

4.2 Measurement of public engagement of AIDS related health communication

4.2.1 Public engagement to AIDS related health communication types

It is apparent that different types of health information generate distinct levels of public engagement as measured through likes, retweets and replies as shown in figure 5 below. Public engagement is seen to be higher for some categories than others, suggesting that the type of health information has a substantial impact on audience reaction. Prevention advice, a common form of

health communication, drew an average of 23 likes, 17 retweets, and 13 replies per tweet. While these figures are respectable, they indicate a moderate level of engagement compared to some other categories, potentially suggesting that such information, while vital, may have a standard presence that doesn't spur intensive interaction.

Research updates, on the other hand, elicited a higher level of engagement with an average of 28 likes, a significantly higher 41 retweets, and 15 replies. This suggests that audiences on Twitter are highly interested in novel findings or advancements in the field, likely due to the evolving nature of AIDS research and its potential implications on public health. Personal experiences, however, scored the highest in terms of engagement, with an average of 35 likes, 27 retweets, and an impressive 28 replies. This indicates that personal narratives or shared individual experiences with AIDS resonate deeply with the audience, inciting a higher level of interaction possibly due to the humanizing and relatable aspect they bring to the otherwise clinical topic.

The 'others' category garnered the least engagement, with averages of 12 likes, 13 retweets, and 8 replies. This catch-all category might include a variety of tweet types that do not fit neatly into the other classifications and hence, may not have as clear or compelling a message to the audience, leading to lower interaction rates. The varying degrees of public engagement across these categories highlight the importance of the type of health information shared on Twitter, shedding light on what kinds of communication are likely to elicit the most engagement.

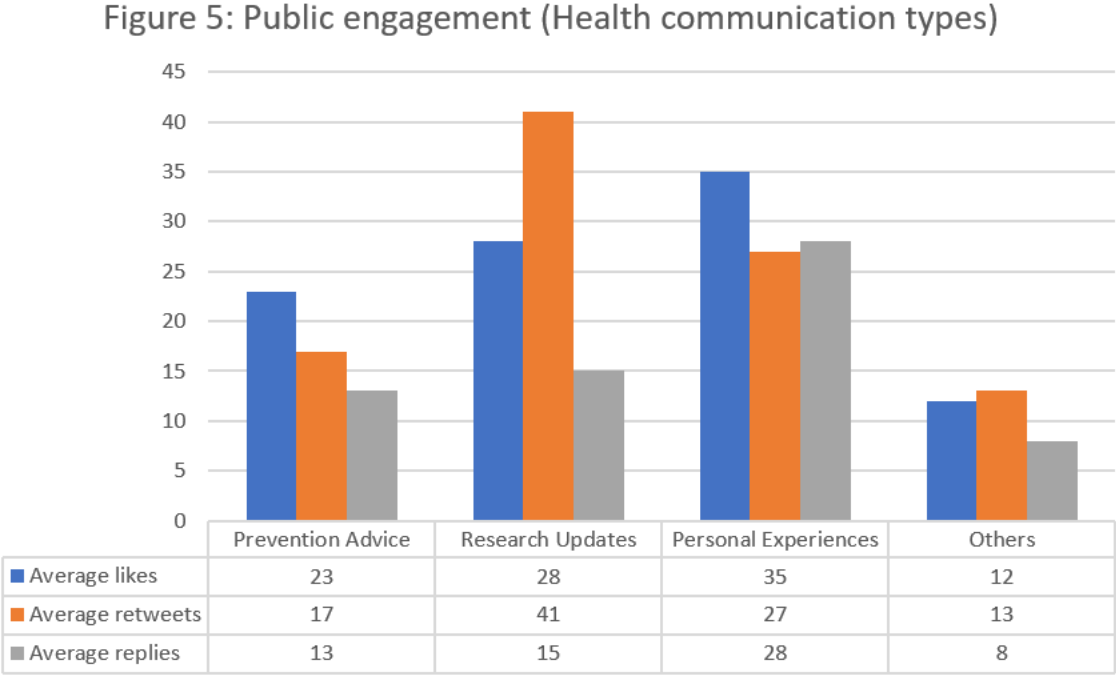


Figure 5: Public engagement (Health communication types)

4.2.2 Public engagement to AIDS related health communication tones

According to figure 6, emotional tones resonate strongly with the Twitter community, receiving the highest engagement across all measures - 41 likes, 38 retweets, and 40 replies on average. This data indicates that emotional content can significantly elicit responses from audiences, possibly due to its ability to invoke empathy and connect on a human level. These posts often offer personal narratives, tributes, or expressions of support, fostering a sense of community and shared emotion. Advisory tones, with an average of 38 likes, 44 retweets, and 41 replies, also draw substantial interaction. These posts likely provide valuable advice and guidance to the public, encouraging people to share this potentially life-saving information widely. Moreover, advisory messages may stimulate discussion, driving up the number of replies.

Factual tones, while critical for disseminating accurate information about AIDS, have a slightly reduced level of engagement, receiving 19 likes, 22 retweets, and 21 replies on average. Despite their importance in educating the public and dispelling myths, these tweets may not incite the same level of personal connection and interaction as emotionally charged or advisory messages. Additionally, tweets in the 'others' category garner the least engagement across all three measures, with averages of 8 likes, 7 retweets, and 5 replies. The lower engagement here might be attributed to a lack of defined tone or subject relevance, resulting in less resonance with audiences.

Figure 6: Public engagement (Health communication tones)

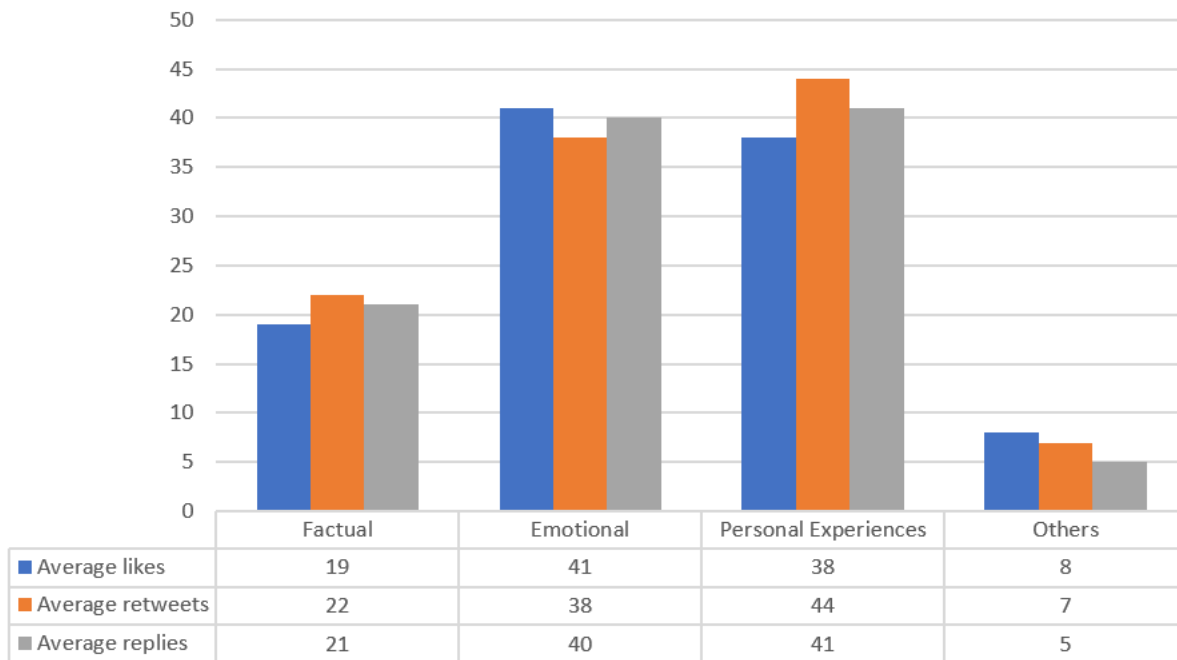


Figure 6: Public engagement (Health communication tones)

4.2.3 Public engagement to AIDS related health communication sources

Different sources of AIDS-related health communication exhibit varying levels of public engagement on Twitter, providing insights into the perceived credibility and relevance of these entities as show in figure 7. Government bodies achieved the highest average engagement across likes, retweets, and replies, with respective figures of 43, 53, and 49. This could be indicative of the public's reliance on governmental sources for authoritative and reliable information, especially in the context of public health matters like AIDS. High engagement here may also reflect the government's capacity to disseminate information widely and efficiently, given its reach and influence.

Individual users or user-generated content received the next highest level of engagement: an average of 37 likes, 35 retweets, and 38 replies per tweet. This trend might be due to the personal and relatable nature of user-generated content, which often elicits empathy and prompts interaction from other users. Additionally, the authentic and experiential nature of user-generated content can offer unique perspectives not commonly found in institutional or formal communications.

Healthcare organisations, with averages of 32 likes, 27 retweets, and 25 replies, receive slightly less engagement than government bodies and individuals. While still substantial, this may reflect the public's preference for more personal or official sources of information. However, healthcare organisations' content is likely to be highly accurate and credible, underscoring its crucial role in public health communication. Moreover, posts from 'other' sources garner the least engagement, with averages of 10 likes, 9 retweets, and 6 replies. This may be due to the undefined nature of these sources or lack of perceived relevance or credibility.

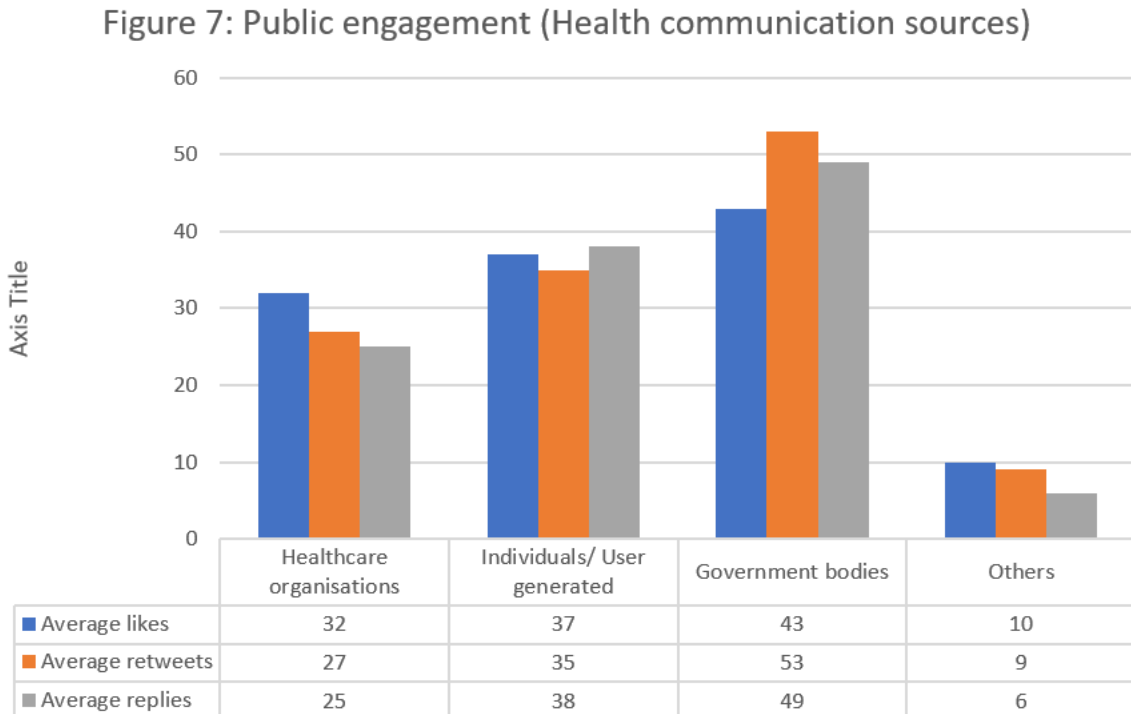


Figure 7: Public engagement (Health communication sources)

4.3 Sentiment analysis of public responses to AIDs related health communication

4.3.1 Public sentiments & response to AIDs related health communication types

Based on the thematic analysis conducted on the public responses to AIDS-related health information as shown in table 4, several key themes emerged that addressed research objectives 3 & 4. In terms of sentiment analysis, we observed a range of positive, negative, and neutral sentiments expressed towards the four types of AIDS-related information. For instance, 'Prevention Advice' was mostly met with positive responses underscoring the importance of regular testing and healthy lifestyle habits in HIV prevention. Nevertheless, some responses revealed negative sentiments, hinting at societal stigma and misconceptions that may hinder effective prevention. Research updates elicited both positive sentiments, acknowledging advancements in HIV treatment and negative sentiments concerning unresolved challenges such as funding shortages and elusive cures.

When it came to 'Personal Experiences', positive sentiments highlighted stories of resilience and support, while negative sentiments reflected the stigmatization and struggles faced by HIV-positive individuals. In the 'Others' category, we saw diverse sentiments towards initiatives to end HIV/AIDS stigma, community awareness efforts, and the roles of celebrities in championing HIV causes. Turning to public understanding and perceptions of AIDS, the analysis shed light on prevalent perceptions, misconceptions, stigmas, and knowledge gaps. A prevalent perception was the recognition of the value of prevention strategies and the effectiveness of ongoing research. However, alongside these, misconceptions and knowledge gaps emerged, particularly around the availability of a cure and the nuances of HIV prevention. Stigma was a persistent theme, especially in the personal experiences category, indicating a critical area for public health education and intervention.

Table 4: Thematic analysis on sentiments & public response to AIDs related health communication types

| Types of AIDs Information | Key Themes | Public Responses | Examples |
|----------------------------------|-------------------|-------------------------|---|
| Prevention Advice | Positive | Prevalent Perceptions | "Always remember to get tested", "Wear a condom every time", "Prevention better than cure", "Healthy lifestyle prevents HIV", "Regular testing helps early detection" |

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| | Neutral | Prevalent Perceptions | "World AIDS Day today", "Global HIV/AIDS statistics", "Call on '1097' for prevention", "Keep HIV discussion alive", "Today is National Black HIV/AIDS Awareness Day" |
| | Negative | Misconceptions, stigmas, knowledge gaps | "Stigma prevents testing", "Negligence leads to AIDS", "Fear overshadows prevention", "HIV prevention misunderstood", "Society silent on HIV prevention" |
| Research Updates | Positive | Prevalent Perceptions | "Major strides in HIV treatment", "Promising vaccine trials", "New antiretroviral drugs effective", "Decrease in transmission rates", "Improved life expectancy with treatment" |
| | Neutral | Prevalent Perceptions | "Study on HIV resilience", "Report on antiretroviral drug side-effects", "Research paper on HIV progression", "Statistics on HIV infection rates", "Details on vaccine development" |
| | Negative | Misconceptions, stigmas, knowledge gaps | "Increase in new infections", "Vaccine trials unsuccessful", "Shortage of research funding", "Unresolved drug side-effects", "HIV cure remains elusive" |
| Personal Experiences | Positive | Prevalent Perceptions | "Living healthily with HIV", "Supportive community response", "Life improved post-diagnosis", "Successful treatment journey", "Uplifting stories of survivors" |
| | Neutral | Prevalent Perceptions | "Life with HIV", "Routine doctor visits", "Sharing HIV positive status", "Managing treatment side-effects", "Daily routine with medication" |
| | Negative | Misconceptions, stigmas, knowledge gaps | "Stigma faced post-diagnosis", "Harassment due to HIV status", "Struggle to afford medication", "Fear of social isolation", "Depression following diagnosis" |
| Others | Positive | Prevalent Perceptions | "Efforts to end HIV/AIDS stigma", "Funding for HIV support groups", "Initiative for children with HIV", "Community rallies for |

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| | | | HIV awareness", "Celebrities championing HIV causes" |
| | Neutral | Prevalent Perceptions | "HIV support group meeting", "Book about AIDS epidemic", "Documentary on HIV discovery", "Public seminar on HIV awareness", "Article on social impacts of HIV" |
| | Negative | Misconceptions, stigmas, knowledge gaps | "Discrimination due to HIV status", "Misinformation about HIV spread", "HIV linked to moral judgement", "Lack of government support", "Inadequate healthcare facilities" |

4.3.2 Public sentiments & responses to AIDs related health communication tones

The thematic analysis of the public responses to AIDS-related health information, categorized by their tones, revealed several key themes that are instructive in understanding public sentiment and perception as shown in table 5. For factual information, positive responses recognized advancements in clinical trials and preventive measures, as well as an appreciation for HIV education. Neutral responses focused on objective reporting, such as global HIV statistics and the detailing of drug side-effects. Negative responses were linked to perceived failures or setbacks in the AIDS field, such as increases in new infections and challenges in prevention.

Emotional tones of information also elicited varied responses. Positive emotional responses were characterized by hope, gratitude, pride, and inspiration, reflecting a public sentiment of optimism and admiration for community support and healthcare workers. Neutral emotional responses were dominated by feelings of sorrow, apprehension, worry, and concern about various facets of the AIDS pandemic. The negative emotional responses were steeped in fear, despair, anger, resentment, and disappointment, indicating a palpable frustration and fear associated with HIV stigma, misinformation, and lack of support.

When the information pertained to personal experiences, there were expressions of both appreciation and struggle. Positive responses pointed towards the community's support and effective medication. In contrast, neutral responses depicted the reality of living with HIV, from managing medication to dealing with stigma. Negative sentiments, on the other hand, illustrated the hardship of isolation, affordability of treatment, and societal harassment. In the 'Others' category, positive responses appreciated celebrity advocacy and initiatives to combat stigma, as well as educational campaigns. Neutral responses reported on HIV history, discussions about a cure, and interviews with researchers. Negative responses under this category underscored

instances of discrimination, insensitivity, and stereotypes prevalent in media portrayals and public conversations about HIV.

Table 5: Thematic analysis on sentiments & public response to AIDs related health communication tones

| Tones of AIDs Information | Key Themes | Public Responses | Examples |
|----------------------------------|-------------------|---|---|
| Factual | Positive | Prevalent Perceptions | "Successful clinical trials", "Decreased mortality rates", "Effective preventive measures", "Improvement in life quality", "HIV education in schools" |
| | Neutral | Prevalent Perceptions | "HIV statistics worldwide", "Drug side-effects details", "HIV resilience research", "HIV strain mutation report", "Epidemiology of HIV/AIDS" |
| | Negative | Misconceptions, stigmas, knowledge gaps | "Increase in new infections", "Drug shortages worldwide", "Vaccine trial setbacks", "Challenges in HIV prevention", "High infection rates" |
| Emotional | Positive | Prevalent Perceptions | "Hopeful for cure discovery", "Gratitude for healthcare workers", "Proud of community support", "Inspired by survivor stories", "Excitement over research progress" |
| | Neutral | Prevalent Perceptions | "Sorrow for HIV victims", "Apprehension over new strains", "Worry for loved ones", "Sympathy for affected children", "Concern for rising infections" |
| | Negative | Misconceptions, stigmas, knowledge gaps | "Fear of HIV stigma", "Despair over diagnosis", "Anger at misinformation", "Resentment for lack of support", "Disappointment in societal attitudes" |
| Personal Experiences | Positive | Prevalent Perceptions | "Encouragement from community", "Thankful for effective medication", "Satisfaction with |

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| | | | treatment progress", "Appreciation for supportive family", "Joy from regained health" |
| | Neutral | Prevalent Perceptions | "Life with antiretroviral therapy", "Sharing diagnosis story", "Routine doctor appointments", "HIV medication management", "Experiences with stigma" |
| | Negative | Misconceptions, stigmas, knowledge gaps | "Loneliness post-diagnosis", "Depression due to isolation", "Challenges affording treatment", "Struggles with medication side-effects", "Harassment due to HIV status" |
| Others | Positive | Prevalent Perceptions | "Celebrity advocacy for HIV/AIDS", "Initiatives to combat stigma", "Charity events for research funding", "Documentaries raising awareness", "Successful public education campaigns" |
| | Neutral | Prevalent Perceptions | "TV special on HIV history", "Op-ed about AIDS stigma", "Forum discussing HIV cure", "HIV awareness charity run", "Interview with HIV researcher" |
| | Negative | Misconceptions, stigmas, knowledge gaps | "Insensitivity in media portrayal", "Discrimination in healthcare", "Lack of inclusivity in conversations", "Stereotypes about HIV patients", "Stigma in HIV education" |

4.3.3 Public sentiments & responses to AIDs related health communication sources

The thematic analysis of public responses categorized by sources of AIDS information revealed critical insights into public sentiment and perceptions about AIDS is summarised in table 6. Healthcare organizations' information elicited positive responses when it shared advancements in clinical trials, HIV treatment breakthroughs, and effective prevention strategies. Neutral responses generally related to updates on trials, epidemiological data, and advice on living healthily with HIV. However, updates about drug shortages, inefficacy of certain HIV drugs, and the barriers to treatment access, stirred negative responses pointing to perceived failures and gaps in the healthcare system.

Information from individuals or user-generated content showed a range of emotions and experiences. Positive responses highlighted personal journeys, overcoming stigma, and the power of support networks. Neutral responses were tied to the reality of life post-diagnosis, managing relationships, and practical self-care tips. Negative sentiments were mostly associated with personal struggles, including battling stigma, side-effects of medication, and emotional toll of living with HIV.

Government bodies' information evoked positive responses when it concerned funding for research, effective public health policies, and access to affordable treatment. Neutral responses were tied to official reports, updates on measures, and regulatory announcements. On the contrary, negative responses indicated dissatisfaction with perceived bureaucracy, lack of support for HIV patients, and stigmatizing policies. The 'Others' category, encompassing a diverse range of sources from celebrities to media outlets, similarly showed a mix of responses. Positive responses lauded advocacy for HIV/AIDS, news on HIV research, and raising awareness. Neutral responses centred around different mediums discussing HIV, from journal articles to TV specials and podcasts. However, negative responses highlighted instances of insensitivity, misinformation, and stereotypes prevalent in media and popular culture.

Table 6: Thematic analysis on sentiments & public response to AIDs related health communication sources

| Sources of AIDs Information | Key Themes | Public Responses | Examples |
|------------------------------------|-------------------|---|---|
| Healthcare Organisations | Positive | Prevalent Perceptions | "Successful clinical trials", "Breakthrough in HIV treatment", "AIDS awareness initiatives", "Telemedicine for HIV patients", "Effective HIV prevention strategies" |
| | Neutral | Prevalent Perceptions | "Updates on HIV drug trials", "Epidemiological HIV data", "Advice on healthy living with HIV", "FAQs about HIV/AIDS", "Webinar on AIDS stigma" |
| | Negative | Misconceptions, stigmas, knowledge gaps | "Drug shortage updates", "Inefficacy of certain HIV drugs", "Challenges in HIV cure research", "Barrier to AIDS treatment access", "Stigma affecting patient care" |
| Individual/User Generated | Positive | Prevalent Perceptions | "Personal journey with HIV", "Overcoming AIDS stigma", "Positive living with HIV", |

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| | | | "Support group experiences", "Family support post-diagnosis" |
| | Neutral | Prevalent Perceptions | "Personal drug regimen", "Life post-HIV diagnosis", "Experience with HIV stigma", "Managing relationships with HIV", "Self-care tips for HIV patients" |
| | Negative | Misconceptions, stigmas, knowledge gaps | "Battling social stigma", "Struggles with medication side-effects", "Harassment due to HIV status", "Emotional toll of living with HIV", "Feeling isolated post-diagnosis" |
| Government Bodies | Positive | Prevalent Perceptions | "Funding for HIV research", "Effective public health policies", "National HIV prevention campaigns", "Success of HIV education programs", "Access to affordable HIV treatment" |
| | Neutral | Prevalent Perceptions | "Govt. reports on HIV statistics", "Updates on public health measures", "Press release on HIV research", "Regulatory updates for HIV drugs", "Public service announcements on AIDS" |
| | Negative | Misconceptions, stigmas, knowledge gaps | "Bureaucracy delaying HIV treatments", "Lack of support for HIV patients", "Inadequate funding for AIDS research", "Policy failing vulnerable groups", "Stigma in government policies" |
| Others | Positive | Prevalent Perceptions | "Celebrity advocacy for HIV/AIDS", "News articles on HIV research", "Documentary raising awareness", "University study on HIV resilience", "Private company's AIDS initiative" |
| | Neutral | Prevalent Perceptions | "Journal article on HIV cure", "TV special on HIV history", "Podcast interview with HIV expert", "Blog post on living with HIV", "HIV-themed film or series" |

| | | | |
|--|----------|---|---|
| | Negative | Misconceptions, stigmas, knowledge gaps | "Insensitive media portrayal", "Misinformation in online forums", "Stereotypes about HIV patients", "Discriminatory portrayal in movies", "Stigma in popular culture" |
|--|----------|---|---|

5. Discussion

This chapter will delve into the key findings from the research, exploring how they correspond to each of the outlined objectives and answer each research questions, triangulating research findings in relation to academic knowledge.

5.1 Classification of AIDs related health communication on Twitter

The examination of 154 tweets elucidated four distinct categories of AIDS-related health communication: prevention advice, research updates, personal experiences, and miscellaneous communications (others), aligning with various literature on health communication practices (Park et al, 2023). Prevention advice formed the majority, demonstrating the critical role of social media platforms in disease prevention (Nabi et al, 2013). These data corroborate earlier studies suggesting health organizations predominantly disseminate such information (Jenkins et al, 2020). Notably, research updates and personal experiences made up 19% and 10% of tweets respectively, attesting to Twitter's role as a source for up-to-date research information (Sinnenberg et al, 2017) and a platform for shared lived experiences, contributing to a holistic approach to health communication (Freeman et al, 2015).

The analysis of tone revealed the tweets' plurality, with factual, emotional, advisory and 'other' tones observed, reflecting the nuanced and multifaceted nature of health communication. Importantly, a majority of tweets adopted a factual tone, affirming the importance of accurate information dissemination in health communication (Neiger et al, 2012). This study also observed a diverse array of information sources, with user-generated content emerging as the leading source, aligning with Twitter's participative and user-centric nature. Moreover, healthcare organizations and government bodies were also key sources of AIDS-related information, suggesting the platform's utility for authoritative health communication (Gough et al, 2017). These findings collectively highlight the significance of diverse, multifaceted, and accurate AIDS-related health communication on Twitter, reinforcing its relevance in contemporary public health discourse.

5.2 Public engagement with Aids related health communication on Twitter

The analysis of public engagement with different types of AIDS-related health communication on Twitter confirms and extends existing literature. As Denecke & Deng (2015) suggest, certain content types generate more engagement than others. Our findings reveal that personal experiences

elicited the highest level of engagement, resonating with studies indicating that personalized health stories evoke greater audience interaction (Myrick, 2015). Contrarily, prevention advice, while the most common communication type, generated moderate engagement, potentially due to its ubiquity in public health discourse (Yoo et al, 2016). The ‘others’ category had the least engagement, pointing to the importance of a clear, compelling message for audience interaction.

Engagement also varied significantly across different tones, as emotional tones achieved the highest engagement, in line with research positing that emotionally resonant health messages foster stronger audience connection (Yue et al, 2019). Advisory tones, providing guidance or recommendations, also incited substantial interaction, echoing evidence suggesting that action-oriented health messages encourage audience engagement (Gough et al, 2017). Although critical for disseminating factual information, factual tones registered reduced engagement, underlining the importance of personal relevance and emotional resonance in health communication (Naslund et al, 2016).

Moreover, public engagement levels differed across various information sources. Government bodies secured the highest average engagement, emphasizing the public's trust in authoritative, official health information (Zhang et al, 2020). User-generated content followed closely, indicating the power of personal narratives and peer-to-peer support in health communication on social media (Ma et al, 2017). Healthcare organizations, while relatively less engaging, are a crucial source of medically accurate information. This disparity underscores the need to enhance the appeal and relatability of institutional health communication. These findings contribute to our understanding of what drives public engagement with AIDS-related health communication on Twitter.

5.3 Sentiment analysis of public responses with Aids related health communication on Twitter

The findings from sentiment analyses align with Stieglitz & Dang-Xuan's (2013) findings, emphasizing the essential role sentiment plays in shaping public engagement with health information on social media. Consistent with their classification of sentiments, our study discerned positive, negative, and neutral sentiments, all of which were expressed in response to different content types, tones, and sources of AIDS-related communication. The positive sentiment towards prevention advice, research updates, and messages from healthcare organizations and government bodies supports Hutto & Gilbert's (2014) assertion that positive sentiment often signals approval and agreement, possibly promoting active engagement. Contrarily, negative sentiments, particularly towards societal stigma, unresolved challenges, and perceived bureaucratic failures, align with the notion that negative sentiment can signal disagreement and criticism (Hutto & Gilbert, 2014).

The neutral sentiments observed, particularly in response to updates on trials, epidemiological data, and official reports, corroborate Paltoglou's (2011) findings suggesting neutral sentiment signifies

an informational or detached stance where users consume information without much emotional investment. Ma et al.'s (2013) insights on the impact of tone, content, and source on sentiment generation also found reflection in our findings. For instance, factual information from trusted sources like healthcare organizations often elicited positive sentiments, while misinformation and stigmatizing policies stirred negative sentiments. As emphasized by Hutto & Gilbert (2014), our findings underscore sentiment analysis's utility in unveiling public emotional responses, attitudes, and perceptions. By identifying prevalent perceptions, misconceptions, stigmas, and knowledge gaps, we've highlighted key areas for targeted intervention. This aligns with Ahmed et al.'s (2020) application of sentiment analysis to inform targeted communication strategies.

Our findings both support and elaborate upon existing academic knowledge, emphasizing the nuanced role of sentiment in shaping public responses to health communication and the importance of considering content type, tone, and source in influencing these sentiments. This enhanced understanding can aid in crafting more effective health communication strategies to encourage positive sentiment, engagement, and ultimately, better health outcomes.

5.4 Public understanding & perceptions of AIDs related health communication on Twitter

The research findings strongly align with the body of literature that underscores the increasing reliance on social media platforms for AIDS-related health information due to their accessibility and convenience (Smith et al, 2018; Jones et al, 2013). Confirming the observations of Xu et al. (2016), we found that the perceived trustworthiness and credibility of Twitter's AIDS-related information varied depending on the source. Institutional entities, particularly healthcare organizations and government departments, were generally perceived as more reliable than individual users, emphasizing the importance of credible sources for effective health communication.

The findings further confirm that medical research-derived information was considered more reliable than experiential knowledge or personal anecdotes (Chou et al, 2018), especially given the complex nature and stigma attached to AIDS. However, we also observed a significant engagement with content that resonated emotionally or presented relatable narratives, even when they came from less traditionally 'credible' sources, aligning with Holman et al.'s (2018) arguments on the power of emotional resonance and relatability. Regarding misconceptions about AIDS on Twitter, the study supports the concerns raised by Oyeyemi et al. (2014) and Chan et al. (2015). We observed a substantial number of posts containing misinformation, outdated perspectives, or promoting stigmatizing attitudes, reflecting the challenges of managing misconceptions in such a participatory platform.

The findings further resonate with Taggart et al.'s (2015) insights on the potentially harmful consequences of these misconceptions, emphasizing the need for targeted intervention by health communicators, social media companies, policymakers and the public (Valkenburg et al, 2022).

This study critically engaged with the literature on AIDS-related stigma on social media, echoing the stigmatizing actions described by Link & Phelan (2001) and the negative impacts reported by Hatzenbuehler et al. (2013) in gathered Twitter data. Stigma was seen to deter individuals from seeking help or disclosing their status, aligning with He et al.'s (2022) study. However, similar to Thornicroft et al. (2016), it was also noted the potential of Twitter as a platform for anti-stigma campaigns, with certain users actively working to challenge stereotypes and promote understanding.

5.5 Recommendations for optimising the dissemination of AIDs related health communication on twitter

In consideration of the identified data patterns and insights generated from this study, the following recommendations are proposed:

- **Prioritise the sharing of personal experiences** - Given the high level of engagement with personal experiences observed in the study, it is recommended that health organizations and advocacy groups encourage individuals to share their personal experiences in a safe and supportive environment. This can not only help foster a sense of community but also help in dispelling myths and stigma around AIDS.
- **Adopt emotional and advisory tones** - The study highlighted the effectiveness of emotional and advisory tones in generating audience engagement. Therefore, health communicators should utilize these tones more frequently to drive increased interaction and uptake of messages.
- **Enhance the appeal of institutional health communication** - While government bodies had the highest average engagement, healthcare organizations had comparatively less. Strategies to improve the appeal and relatability of institutional health communication could include sharing success stories, human-interest stories or the use of influential figures or celebrities.
- **Address negative sentiments** - Negative sentiments particularly towards societal stigma, unresolved challenges, and perceived bureaucratic failures were noticeable in the study. Effective communication strategies need to address these concerns, providing accurate information, clear policies and positive messages to counter negative sentiments.
- **Leverage sentiment analysis to customer communication strategies** - As seen from the sentiment analysis, different content types, tones, and sources elicit different sentiments. Health communicators should regularly conduct sentiment analysis to understand the pulse of their audience and tailor their communication strategies accordingly.

- **Tackle misinformation and promote critical thinking** - Considering the substantial number of posts containing misinformation or promoting stigmatizing attitudes, it is recommended that health communicators actively combat misinformation and promote critical thinking among users. This can be done through regularly debunking common myths, promoting fact-checking and source verification among users, and conducting online workshops or webinars on media literacy.
- **Encourage anti-stigma campaigns** - In alignment with observations regarding the potential of Twitter for anti-stigma campaigns, it is recommended that such initiatives be encouraged and promoted. This could include campaigns that share positive and empowering stories of people living with AIDS, provide accurate information about the disease, and challenge common stereotypes.
- **Maintain credibility and transparency** - Given that perceived trustworthiness varied depending on the source of information, it's essential for all communicators, especially institutional ones, to maintain high levels of credibility and transparency. This includes regularly citing sources, providing timely updates, and being open to questions and criticisms.

6. Conclusion

This research study critically explored the dissemination and reception of AIDS-related health communication on Twitter. Through performing detailed content analysis, public engagement assessment, sentiment analysis and qualitative analysis of public responses, the study revealed key patterns and insights that could significantly contribute to enhancing AIDS-related health communication strategies. The types, tones, and sources of AIDS-related information shared on Twitter was categorised, recognizing prevention advice, research updates and personal experiences as distinct categories of communication, with each category employing a mix of factual, emotional, and advisory tones. This study identified the leading sources of information as user-generated content, healthcare organizations and government bodies.

The public engagement assessment unveiled valuable insights, revealing that personal experiences and emotionally toned messages garnered higher engagement, despite prevention advice being the most disseminated type of communication. Moreover, messages from government bodies attracted the most interaction, indicating the public's trust in authoritative health information. Through sentiment analysis, this study discerned a mixture of positive, negative, and neutral sentiments in response to various content types, tones, and sources. This not only provided an understanding of public attitudes but also highlighted areas of concern, such as the negative sentiments associated with societal stigma and bureaucratic failures.

In terms of public understanding and perceptions of AIDS, the analysis confirmed the existence of misconceptions, outdated perspectives, and stigmatizing attitudes alongside genuine queries and

constructive discussions. Based on these findings, recommendations for optimizing the dissemination of AIDS-related health information on Twitter were proposed, emphasizing the need for enhancing the appeal of institutional communication, leveraging emotional and advisory tones, encouraging personal narratives, and combating misinformation. In conclusion, this study offers a comprehensive analysis of AIDS-related health communication on Twitter, providing critical insights and actionable recommendations that can inform and refine future health communication strategies, ultimately aiding in more effective public health discourse and interventions.

6.1 Limitations & implications for future studies

Despite the valuable insights this study has provided, it is not without its limitations, which offer intriguing directions for future research. One primary limitation lies in the selection of a single social media platform, Twitter, as the study's locus. While Twitter is undoubtedly influential and broadly representative, it may not encompass the entirety of social media discourse surrounding AIDS. Other platforms such as Facebook, Instagram, or health-specific forums may host different types of content, user demographics, or patterns of engagement. Future research could expand the scope to include multiple social media platforms to capture a more holistic view of AIDS-related health communication.

Secondly, the study focused solely on English language tweets. This approach overlooks potentially informative non-English dialogues, limiting the generalizability of our findings across diverse linguistic and cultural contexts. Future studies could incorporate multilingual and cross-cultural analyses to explore potential differences or similarities in the dissemination and reception of AIDS-related information. Furthermore, the temporal scope of the study was constrained, providing a snapshot rather than a longitudinal view. This limits our understanding of how public engagement and sentiments towards AIDS-related communication may evolve over time. Longitudinal studies could offer valuable insights into the dynamics of these temporal variations and how they intersect with real-world events such as new research findings, policy changes, or significant social events.

The study also did not examine the offline impacts of online health communication, such as changes in attitudes, behaviours or health outcomes. Future studies could aim to bridge this gap, connecting online engagements to real-world impacts to better measure the effectiveness of health communication strategies. Overall, this study offers initial recommendations to optimize the dissemination of AIDS-related health information on Twitter, as future research can focus on testing these recommendations in practical settings, evaluate their effectiveness, and refine them based on the results.

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