Research Article

Audio misinformation on WhatsApp: A case study from Lebanon

Since 2019, Lebanon has witnessed sequential crises that have routinely spurred media attention. A great deal of misinformation has proliferated during these events, much of it spreading on WhatsApp. One format is particularly understudied: audio instant messages, otherwise known as voice notes. Utilizing a grounded theory approach to examine 35 misleading WhatsApp voice notes collected between October 2019 and October 2020, this study documents how audio misinformation on Lebanese WhatsApp follows a consistent structure through the manipulation of interpersonal relationships, the establishing of source credibility, the imbuing of negative discrete emotions, and the inclusion of calls to action.

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Research questions

- What features distinguish the format of misleading voice notes circulated on WhatsApp in Lebanon between October 2019 and October 2020?
- What topics emerge among these misleading voice notes?
- To what extent is the structure of misleading voice notes stable across different topics?

Essay summary

- Contemporary platforms with audio-based features significantly expand the number of actors that now have the tools to join in on manipulating information to sow widely varying political, health-related, and economic messages.
- WhatsApp voice notes are avenues of misinformation that have only recently begun to catch academic interest but lack rigorous examination.
- Employing a grounded theory approach to examine 35 voice notes circulated in Lebanon between October 2019 and October 2020, this study found that misleading WhatsApp voice notes—audio messages laden with false information—all follow a similar structure: an emotionally-charged sender establishes an interpersonal relationship with the original receiver, then ascertains their

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credibility as an eyewitness, expert, or insider before finally delivering the misleading information.
- A third of the voice notes that we analyzed also included an explicit call to action.
- As a result of this case study, we define audio misinformation on WhatsApp as false information conveyed through emotionally charged speech with the potential to confuse, cause panic, and mislead.

Implications

Through a case study of voice notes shared on WhatsApp in Lebanon, this study sheds light on one specific format of audio misinformation on encrypted messaging apps. We describe the nature of voice notes conveying false information, which provides a blueprint for fact-checkers to identify, assess, and counter audio misinformation on WhatsApp. Raising awareness about the format and main components of misleading voice notes might help fact-checkers in designing interventions and educational toolkits on how to assess the veracity of voice notes before sharing. Furthering knowledge about their structure could also inform technological interventions aimed at detecting audio misinformation within large datasets.

We focus on Lebanon, a small religiously and ethnically diverse country which, unlike its neighbors and other countries in the Middle East, counts 18 official sects and has historically been a refuge for Syrian, Iraqi, Palestinian, and Armenian refugees. A geopolitical battleground, it has undergone an eventful two years, encompassing a WhatsApp tax that lit the flames of an unprecedented revolution in October 2019 (Constable, 2019), a precipitous and catastrophic economic collapse that saw the local currency lose over 90% of its value (Meyer, 2021), a pandemic that crushed its healthcare system (El Deeb, 2021), and a devastating non-nuclear explosion that obliterated half of its capital, Beirut (Azhari, 2020). This amalgamation of disastrous events between October 2019 and October 2020—the time frame of our study—allows us to compare false and misleading voice notes across a range of different topics.

WhatsApp is a widespread instant messaging and Voice over Internet Protocol (VoIP) app that was launched in 2009 and acquired by Meta in 2014 (Cruz & Harindranath, 2020; Pang & Woo, 2020). In 2020, the app exceeded 2 billion users (WhatsApp, 2020). It enjoys popularity in the Global South (Cruz & Harindranath, 2020) as well as parts of the Global North (Matassi et al., 2019; Paul, 2015; Sykes, 2018; Taipale & Farinosi, 2018), allows for end-to-end encrypted communication (Santos & Faure, 2018), and is a cheap way of communication that works through WiFi as well as through mobile Internet (Pereira & Bojczuk, 2018). WhatsApp constitutes a critical space for a broad array of activities of work and play, political debate, and the maintenance of authentic connections between members of trusted communities (Cruz & Harindranath, 2020; Gursky et al., 2022; Matassi et al., 2019; Rossini et al., 2021). Aside from voice calls, video calls, text, video, and photos, WhatsApp also affords the possibility to send audio messages. WhatsApp voice notes were introduced in 2013 (WhatsApp, 2013). It received a major update in 2022, rendering functionalities for users regarding playback speeds, visualization, and recording (WhatsApp, 2022a). In the same year, the company reported that users send an average of 7 billion voice notes per day (WhatsApp, 2022a). Voice notes are treated like other forms of content on the platform, and as such, fall under forwarding restrictions aimed at curbing the rapid spread of false information (Melo et al., 2019). Voice notes can be played/replayed, and length restrictions to recordings are imposed at a maximum file size (for any format) of 16MB (WhatsApp, 2022b). As the company writes, "[s]howing emotion or excitement through voice is more natural than text" (WhatsApp, 2022a), suggesting that the format of voice notes is conducive to the emotionally laden types of communication that this study investigates. Additionally, voice notes allow for quick and easy communications in familiar languages and settings (Taipale & Farinosi, 2018).

Research into the flow of false political content on WhatsApp has mainly focused on Brazilian elections and on mob violence in India (e.g., Banaji et al., 2019; Recuero et al., 2021; Resende et al., 2019; Soares

et al., 2021). This may be explained by the fact that Brazil and India constitute WhatsApp's largest user bases (Carnahan, 2020). WhatsApp misinformation research has primarily tackled textual (e.g., Resende et al., 2018; Resende et al., 2019) and visual misinformation (e.g., Garimella & Eckles, 2020), with less attention being paid to audio content. Voice notes are important vehicles for political conversation and information dissemination as they provide an accessible and convenient way to share one's thoughts on complex issues. Analyzing over 20,000 voice notes in public WhatsApp groups in Brazil over a span of six months, Maros et al. (2020) found that voice notes tend to spread more slowly than text messages, but that voice notes with negative and sad connotations tend to be more popular than other ones. A more recent examination exploring the same dataset found that these audio messages were repeatedly shared across hundreds of public WhatsApp groups, included a call to action, and were imbued with negative emotion (Maros et al., 2021). This is in line with recent literature on the behavioral effects of misinformation which finds that negative emotions such as fear and anger are associated with misinformation sharing; misinformation can instigate negative emotions, but negative emotions are also often harnessed to spread false and misleading information (Alimardani & Elswah, 2020; Han et al., 2020; Vosoughi et al., 2018). Recent research has also found that audio messages on WhatsApp are considered more credible than other formats such as text or images (Pasquetto et al., 2022), furthering the importance of research about WhatsApp voice notes.

Academic interest in the interplay between speech, source credibility, and propaganda is not new; for a long time, it was focused on radio, primarily in times of war or international conflict (e.g., Cantril, 1940; el-Nawawy, 2006; Hovland & Weiss, 1951; Miller, 1941; Robles, 2021; Somerville, 2012). This interest stemmed from the fact that radio was able to reach the homes of thousands of people across large distances instantly, and successfully tap into their fears and hopes through impassioned, emotional, audio content (Cantril, 1940; Miller, 1941). Encrypted messaging applications' audio affordances—including WhatsApp voice notes and the introduction of sparsely moderated audio-based social media platforms such as Clubhouse and Twitter Spaces (e.g., Bajpai et al., 2021; Jiang et al., 2019)—may very well present a 21st-century expansion of a problem first extensively explored in the 20th century.

In this study, Lebanon serves as a strategic case study in that it enables logical generalization (Luker, 2008) wherein findings translate to other settings and locales experiencing similar political, health, and socio-economic crises, and whose peoples rely on encrypted messaging applications such as WhatsApp not only for communicative purposes but also for news gathering and dissemination (Merhej & Qureshi, 2020). A poll conducted by the Pew Research Center in 2018 showed that 84% of Lebanese adults used WhatsApp, surpassing countries like Jordan, Mexico, and the Philippines (Mordecai, 2019). In 2019, 52% of Lebanese respondents trusted the information they received from social media more than local television and newspapers (Wee & Li, 2019). The October 2019 protest movement laid bare this longstanding popular distrust and antagonism against a partisan, privately-owned mainstream media landscape that has toed the line of sectarian establishment political parties (Bakr et al., 2020). This led to an increasing reliance on independent digitally native media outlets, social media platforms such as Instagram and Twitter, as well as informal, hyperlocal, public news WhatsApp groups (Arab Barometer, 2021; Bakr et al., 2020; Dennis et al, 2019). At the same time, digital tools were also used by the political establishment and their supporters to persecute and harass high-profile pro-uprising journalists and activists as well as discredit the protest movement through online disinformation campaigns (Freedom House, 2021; Merhej & Qureshi, 2020). Past literature has shown that countries undergoing crises, where there are fraught political contests such as elections or uprisings, and where there are ethnic social tensions, are also milieus of rampant misinformation (Huang et al., 2015; Nied et al., 2017; Woolley & Howard, 2019). This makes findings from a Lebanese case study relevant and potentially applicable not only to other contexts in the Middle East, but also to other countries in the Global South and beyond.

Findings from our study suggest that source credibility—the credibility of the message sender—is displayed in three ways: as an insider (e.g., "my husband's siblings work in the UN"), as an expert (e.g., "I am an analyst at a DC think tank"), or as an eyewitness (e.g., "I saw it with my own eyes"). This sense of authority is further entrenched as the source imbues their misleading audio message with a negative discrete emotion, mainly panic (e.g., "I saw it, I saw, it, I saw it!"), fear (e.g., "please be careful") or anger (e.g., "everyone who's saying otherwise is wrong and an idiot"), mirroring findings from Maros et al.'s (2021) study. In that sense, emotion and source credibility work together to cement the urgency and authority of the message. Finally, we found that there was an explicit call to action added to a third of the misleading voice notes. However, we stop short of making claims of intentionality as we are unable to concretely verify their originators' motivations by virtue of their anonymity (Jack, 2017).

Overall, our findings suggest that misleading voice notes examined in the Lebanese context share a great deal of overlap in their construction. The speakers in these voice notes regularly and intentionally manipulated the trusted communicative space provided through WhatsApp; utilized emotionally charged words that conveyed urgency that might activate receivers' fight-or-flight response; established their credibility as an authoritative source; and identified a nefarious political "other" entangled in the complex Lebanese political sphere who is guilty of distracting or endangering a seemingly agentless, thoughtless public. A third of these voice notes also urged their recipients to spread the message far and wide in a bid to educate and illuminate.

Evidence

This study employed an iterative and purposive sampling approach to collect 66 WhatsApp voice notes between October 2019 and October 2020. Through fact-checking and verification processes, this sample was narrowed down to 35 misleading voice notes. The 35 voice notes encompassed the following topics (see Figure 1): the October 2019 protest movement, the economic crisis, the COVID-19 pandemic, the August 4 Beirut Blast, and sectarian clashes.
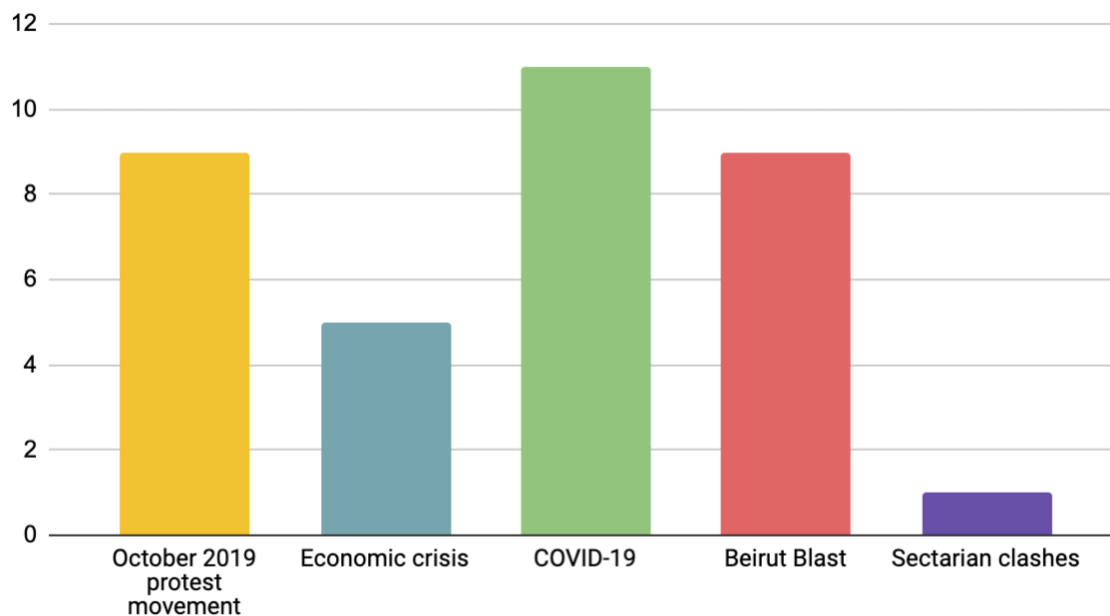

Figure 1. Misleading voice notes by topics.

By illuminating cross-subject commonalities in structure, the following section will answer the research questions in tandem. It will (1) describe the format of misleading voice notes, (2) draw on examples, and (3) demonstrate stability of their structure across different topics. Figure 2 presents the main components of the format of a misleading voice note, as well as the order in which they tend to occur. Subsequent results are organized along the arc of voice notes.
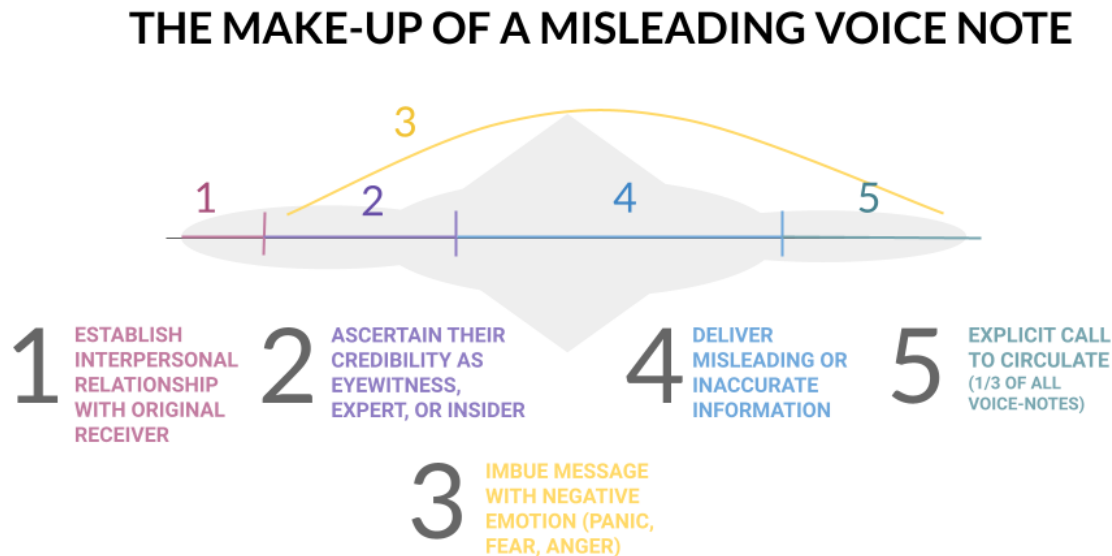
THE MAKE-UP OF A MISLEADING VOICE NOTE

Figure 2. Structure of a misleading voice note.

Step 1: Establishing an interpersonal relationship between sender and original receiver

Consistently across all 35 misleading voice notes examined, within the first few seconds the sender begins by greeting their interlocutor, whether it is an individual or a group. Examples include "Guys, I hope you're well" (VN001, 20 October 2019) or "Serine, listen carefully" (VN022, 22 February 2020). The greetings establish that the senders know their interlocutors, therefore entrusting them with the information they are delivering and affirms the existence of a level of intimacy and connection or association between both parties. This is especially apparent when the original receiver is an individual rather than a group of people, such as here: "Hi Ahmad, how's the family, how are you?" (VN044, 26 July 2020).

Step 2: Establishing source credibility through three communicative practices

All 35 voice note senders, regardless of the topic they were discussing, established their source credibility to convey the information they were about to present as accurate on one side but also to cast themselves as sources with no ulterior motives other than to inform. Our careful examination found that the senders took on one of three source types: an eyewitness, an insider, or an expert. By and large, roughly half of the voice notes investigated used insiders as a source, followed closely by experts, and finally, eyewitness accounts.

Senders who presented themselves as *eyewitnesses* tended to reinforce their firsthand knowledge and spoke in the first person. Voice notes with "eyewitness accounts" were particularly prevalent when the threat of violence was supposedly imminent or had just occurred. This was evident in data pertaining to the October 2019 protest movement such as: "I'm here, the Aounists sent someone with a car to run

into protesters" (VN007, 25 October 2019). It was also evident in voice notes related to the August 4 Beirut Blast: "I saw it, I saw it, I saw it! Nobody tell me it was an explosion; I saw the Israeli fighter jet drop something!" (VN045, 4 August 2020).

We categorize *insider* sources as voice note senders who assert their relationship to someone—usually a relative, friend, or acquaintance—who supposedly holds a respected position at a known institution. Insiders were likely to frame their message as though it contained classified information that they had been privy to. Examples included political institutions ("I'm delivering direct orders from Hezbollah leadership…"; VN006, 24 October 2019)*,* health organizations ("I was just in a meeting with the bank's doctor, who's also in the National COVID Council"; VN043, 23 July 2020) as well as intergovernmental organizations ("My husband told me his brother and sister who work in different departments at the UN were told"; VN054, 12 August 2020).

Finally, sources who presented themselves as *experts* usually cast themselves as individuals with specialized knowledge of the topic at hand, for example as chemical or diplomatic experts when discussing the Beirut Blast, or as health experts who had advised other countries concerning their COVID-19 response. Voice notes often utilized words of warning to indicate that the receiver would be taken for a fool if they didn't heed the sender's advice. One note said: "The Omanis went into lockdown after I spoke with them… you'll see that experts like me will say the same" (VN044, 26 July 2020). Another stated: "I am an analyst at a DC think tank… are you going to believe every person who pretends to be a forensic, chemical, or military expert? For the last time, listen to me…" (VN052, 6 August 2020).

Step 3: Manipulation of tone and emotions to increase panic

Studies on vocal emotional intonations have consistently shown that emotional valence in speech allows interlocutors to infer communicative functions such as comforting, alerting, disapproving, or alarming (Dolan, 2002; Fernald, 1992; Filippi, 2020; Trainor et al., 2000). Fernald and colleagues (1989) found this to be consistent across human societies. In our examination of these misleading voice notes, we identified three emotional intonations: panic, fear, and anger. Fear-based intonations appeared in slightly over half of the voice notes that we studied, panic in about a third, and anger in a fifth of them.

We found that senders spoke with a panicked tone in relation to the August 4 Beirut Blast and the COVID-19 pandemic. Voice note senders' speech pace noticeably increased in tempo and volume and used words to warn receivers. In our data, this was evident in examples such as "leave the neighborhood, it's not a joke" (VN060, 10 September 2020), or "I need you to know now is the time to panic" (VN043, 23 July 2020). Senders conveying a fearful tone, on the other hand, spoke in a lower volume but with similar urgency. Voice notes imbued with fear-based intonations were associated with the October 2019 protest movement, possible sectarian clashes, and the economic crisis. In our data, this included examples such as "Wissam, listen to me brother, and listen to me carefully" (VN009, 27 October 2019), or "I'm warning you, don't trust anyone" (VN012, 25 November 2019). Angry voice note senders, however, attempted to discredit and deride scientific and public consensus about the COVID-19 pandemic and the cause of the Beirut Blast using profanities and through the gradual increase of their volume. For instance, voice notes included disparagements such as: "The Lebanese people know nothing, they're so dumb, you deserve what's happening to you because you don't think!" (VN017, 22 February 2020), or "Habibi, these people don't understand science" (VN049, 4 August 2020).

Consistently, we found that voice notes with an angry tone peddled conspiracy theories about the COVID-19 pandemic and the Beirut Blast. The pandemic was described as a local, American, or Chinese conspiracy to keep the people from the streets and sequestered in their homes, and the Beirut Blast as an Israeli operation that would lead to war and the annihilation of Lebanon and Hezbollah. Alternatively, the Beirut Blast was also described as a ploy by Hezbollah to point fingers at Israel and get public support to launch another war, among other conspiracy theories.

Step 4: Delivering misleading or inaccurate information

After greeting their interlocutors and establishing their source credibility, misleading voice note senders shared the misleading or distorted information they were supposedly privy to, the urgency of which was exacerbated by the emotional vocal intonation. Despite the different topics analyzed, every misleading voice note we analyzed identified clear ingroups and outgroups and articulated the danger of an "other," whether local, regional, or international. The voice note senders exploit the political complexity of the Lebanese geopolitical context and paint the Lebanese population as subservient to international and regional forces that control local political groups. Examples included: "The dirty Lebanese Forces thugs can't block my streets in Keserwan" (VN003, 22 October 2019), "the Americans created the virus to control the global economy and keep us home" (VN031, 19 March 2020), or "these planes that are coming from Iran have Iranian patients and Iranian Revolutionary Guard. Since when was a hospital ever heavily guarded? … They're smuggling arms for Hezbollah and setting up military operations" (VN030, 17 March 2020).

Step 5: Incorporating an explicit call to action

Although all the misleading voice notes we examined had been circulated widely on WhatsApp, only a third included an explicit call to action. Voice note senders urged their interlocutors to share their message as widely as possible. Examples included "tell everyone, quickly forward it to all your groups" (VN041, 13 June 2020) or "do me a favor and forward this voice note to as many people as possible, we want every Lebanese to know" (VN005, 23 October 2019).

Methods

Data for this study were collected between October 2019 and October 2020. To track and compile the voice notes that were studied in this article, the first author, who is a Lebanese journalist, scholar, and digital rights activist, first identified three spaces on WhatsApp with distinctive communicative functions where misleading voice notes circulated widely: 1) an extended family private WhatsApp group; 2) 14 public news WhatsApp groups that cut across the political spectrum and are unaffiliated to major local, regional, or international media outlets; and 3) a private WhatsApp group for journalists in Beirut. These spaces have been identified by previous scholarship as spaces of information dissemination and exchange (e.g., Matassi et al., 2019; Taipale & Farinosi, 2018). The encrypted spaces were either purposively accessed (like the public news WhatsApp groups which publicly disseminated through other social media platforms invitation links to join) or given exclusive access to as a member of said community group (such as the professional and personal private WhatsApp groups). Across groups, the researcher collected voice notes at a minimum of once a week per group, though the differences in speed at which misinformation was shared following different events determined that sometimes data collection efforts had to be adjusted to a daily basis to keep apace (i.e., in the case of the Beirut blast). When an overlap of voice notes occurred between multiple groups, and a message appeared in both public and private groups, the researcher took this to insinuate that the voice note required attention, and they exported it to their device. Of the totality of voice notes that the researcher observed in these spaces, 66 overlapped across several public WhatsApp groups, the private family group, and the private journalist group.

This iterative and purposive procedure to sampling and data collection takes its cues from previous research investigating difficult-to-reach informational spaces and computational propaganda (e.g., Woolley & Howard, 2019), as well as open-source investigation techniques (OSINT) that are frequently used by journalists, academics, and civil society actors to conduct inquiries (Dyer & Ivens, 2020; Jones,

2021). The first author began this research while working as an investigative journalist and fact-checker based in Beirut at the onset of the October 2019 revolution, with the aim to understand the health of the information circulated during this momentous time. However, what started as a systematic documentation of anti-revolution audio misinformation quickly expanded as Lebanon soon plunged into an economic and financial crisis, followed by the COVID-19 pandemic in early 2020, and the Beirut Blast explosion in August 2020.

We followed grounded theory procedures of systematic and sequential data collection and analysis (Corbin & Strauss, 1990), which is a qualitative research approach that involves the constant comparison of data that is collected and the creation of 'codes' to describe themes that emanate from the data. It became evident that to examine how and to what effect WhatsApp audio misinformation manifested in Lebanon, it was imperative to explore not only what made WhatsApp voice notes popular vehicles of misinformation, but also the topics that these voice notes covered. Using the fact-checking methodology pioneered through the Verification Handbook (Silverman, 2020), we began the systematic process of determining the accuracy of the 66 voice notes collected between October 2019 and October 2020. We found that 31 of the sampled voice notes presented accurate information that could be verified by news coverage and investigations conducted by mainstream and independent media organizations. The remaining 35 notes were contained misleading information and formed the basis of this exploratory study. The first author engaged with voice notes by listening to them. In public groups, there was no possibility to respond, and in private groups – depending on the proximity to group members in a friend or family context – the researcher occasionally responded through text messages. We want to note that the effects of engaging with emotionally taxing social media content can weigh on researchers doing this type of work (Steiger et al., 2021), as was the case in this study.

All voice notes were translated into English from the Lebanese-Arabic dialect, and we created pseudonyms for names mentioned in voice notes to protect the identity of those whose voice notes were studied. The pseudonyms that were selected are typical and reflective of cultural identity carried in the original names. Following this preliminary step of reducing the sample through fact-checking, we employed open and axial coding techniques developed in grounded theory (Charmaz, 2006; Corbin & Strauss, 1990) to sift through the data. Open coding is the process through which the researcher sifts through data to form comparisons and associations in the interest of creating categories that define similar phenomena. Axial coding came next and entailed the organization of closely related categories into five overarching themes that would consistently describe the arc of communicative turns and practices predominantly used in misleading audio messages. A limitation to this study is that we only analyzed misleading voice notes and did not directly compare them with accurate voice notes. Future research could focus on large-scale analysis of voice notes—both misleading and accurate—and draw direct comparisons to further our understanding of the idiosyncrasies of audio misinformation on WhatsApp.

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Ethics
Institutional review board approval was not required for this study. This report presents data anonymously and on an aggregate level, in a manner that does not identify speakers. We only report on WhatsApp voice notes that emanated in public WhatsApp groups, though we are cognizant that publicness alone does not necessarily justify data access (boyd & Crawford, 2012). The lead author's use of private WhatsApp groups helped to establish a threshold of content spread, similar to Kazemi and colleagues' (2022) comparisons of content that was shared in public WhatsApp groups vis-à-vis content from private groups reported through a WhatsApp tipline. WhatsApp messages in our dataset were anonymized, and any personal information was removed. Names that appeared in voice notes were replaced by pseudonyms. Further obfuscation was achieved by translating voice notes into English language (cf. Reagle & Gaur, 2022; Markham, 2012).

Data availability
To protect the privacy of the senders of WhatsApp voice notes, the raw content of the WhatsApp messages used in this study cannot be released.

Metadata from the sample which describes the nature of the voice notes, codes, and the research protocol is available via the Harvard Dataverse at: https://doi.org/10.7910/DVN/P7MAPH