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“WhatsApp me!” Conversational Interfaces as Digital Tools for Global Health – A Perspective on Design and Data in Portuguese-Speaking Countries

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An abstract of
A thesis submitted to the Faculty of the
Rollins School of Public Health of Emory University
in partial fulfillment of the requirements for the degree of
Master of Public Health
in Global Health
2024

Abstract

"WhatsApp me!" Conversational Interfaces as Digital Tools for Global Health — A Perspective on Design and Data in Portuguese-Speaking Countries

By Maria Bolina Kersanach

Background: COVID-19 accelerated the digital transformation in the health sector worldwide. The widespread use of technology can widen or narrow the health equity gap within populations, depending on how interface design and data collection decisions are made. This study explores how conversational interfaces are being used as digital tools in healthcare and public health.

Objective: This study's objectives were to document how public health and healthcare professionals use instant messaging in health-related initiatives. The utilization of WhatsApp in the eight Portuguese-speaking countries illustrates different use cases and the reasons, challenges, and concerns surrounding the application of this popular instant messaging mobile app in global health initiatives.

Methods: We ran a self-administered online survey with 20 close-ended questions through convenience sampling. The questionnaire was answered by public health or healthcare professionals using WhatsApp as a work tool on projects, healthcare facilities, startups, or research in Portuguese-speaking countries.

Results: 89 respondents completed the survey over one month. This was the first study mapping the use of instant messaging in global health throughout Portuguese-speaking countries. This is also the first research to document the mixture of personal and professional life as a significant concern public health and healthcare professionals have (48%), being even more prevalent with professionals in clinical roles (63% of clinicians indicated this as their top three concerns, compared with 39% of non-clinicians). Another highlighted concern was the privacy and safety of patient data (38.4%), a well-documented issue in the literature. 71% of respondents reported that their initiative collects patient data, and from those, 28% do not implement any action towards the safety and security of patient data. In our sample, the most frequent applications of WhatsApp were field coordination (39.3%), patient communication (34.5%), and telemedicine (31%). The main reasons for using it were real-time engagement with users (57%) and low-cost implementation (51.2%).

Conclusion: The study suggests instant messaging mobile applications, like WhatsApp, as viable digital tools for public health and healthcare initiatives. By leveraging its conversational design and familiarity among users, WhatsApp tends to be easily adopted and can work as an effective support tool, particularly when high levels of user engagement are necessary.

Keywords: Digital Health, mHealth, WhatsApp, Conversational Interfaces, Health Equity, LMIC.

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Chapter 1: Literature Review

Digital Transformation in the Health Sector

The release of the Intel microprocessor in 1971 inaugurated the "Age of Information and Telecommunication," the fifth technological revolution described by Carlota Perez (Perez, 2010). According to her work on techno-economic paradigms, a revolution is marked by the ability to significantly transform the economy and, ultimately, society. After the Industrial Revolution, the Age of Steam, the Age of Electricity, and the Age of Oil, we now have information and communication technologies penetrating our personal and professional lives. Beyond the mere digitization, the act of making the analogic digital, this new age is typified by shifts in mindset with decentralized networks, knowledge as capital, diversity and adaptability, globalization, instant contact, and economies of specialization combined with scale (Perez, 2010).

Like almost every sector and industry, healthcare and public health also embodied aspects of **digital transformation** in their processes, services, and products. In the earlier stages, using electronic healthcare records was marked by physicians' frustrations adapting to new work tools while maintaining traditional workflows (Magsamen-Conrad & Checton, 2014). With the COVID-19 pandemic, embracing technology shifted from convenience to necessity. The outbreak spotlighted the health sector, boosting efforts in technology development, advancement, and adoption — at first due to the disease's transmission characteristics, but then for being an enabling tool to health care delivery beyond physical boundaries (Anniciello et al., 2022). In conjunction with the COVID-19 pandemic, several factors have contributed to establishing digital health as a growing market. These include the widespread use of smartphones, internet connectivity improvements, healthcare information technology (IT) infrastructure advancements, healthcare cost escalation, and a higher prevalence of chronic diseases. In 2022, North America dominated 44% of the digital health

revenue share, followed by Europe with a 35.4% share (Grand View Research, 2023), marking a market dominated by the "global north."

'Digital health' has been used as an umbrella term for applying digital technologies to address health needs (WHO, 2019). It encompasses interventions in clinical care delivery, management, and research. Some examples are: (1) Clinical care delivery: diagnosis/imaging, virtual/hybrid care, patient monitoring, clinical decision support, robotic surgery, and fitness/well-being. For (2) Management: revenue cycle management, care coordination, workforce management, and data interoperability. For (3) research: clinical trial tech and AI drug discovery (CB Insights Research, 2023).

The Optimistic and Pessimistic Lenses to Digital Health

Digital health, at the individual level, promises uninterrupted personalized experiences, along with increased accessibility, convenience, and the potential for improved patient outcomes with greater efficiency. However, despite the health tech industry's marketing of these potentials, the sector's rapid expansion may inadvertently worsen health and healthcare disparities among underresourced populations (Richardson et al., 2022; Sieck et al., 2021; Veinot et al., 2018; Yao et al., 2022), leading to a phenomenon known as **intervention-generated inequality** (Veinot et al., 2018; Yao et al., 2022). Image 1 uses a hypothetical curve to illustrate that the gap between health outcomes always existed between persons with different socio-economic levels. Yet, this gap can be even more expansive with the influence of technology, as digital health is highly dependent on access and literacy. The literature describes this phenomenon as a **digital divide** — different levels of IT infrastructure, digital literacy levels, and ownership of information and devices. (Ho & Tseng, 2006; Koehle et al., 2022; McAuley, 2014).

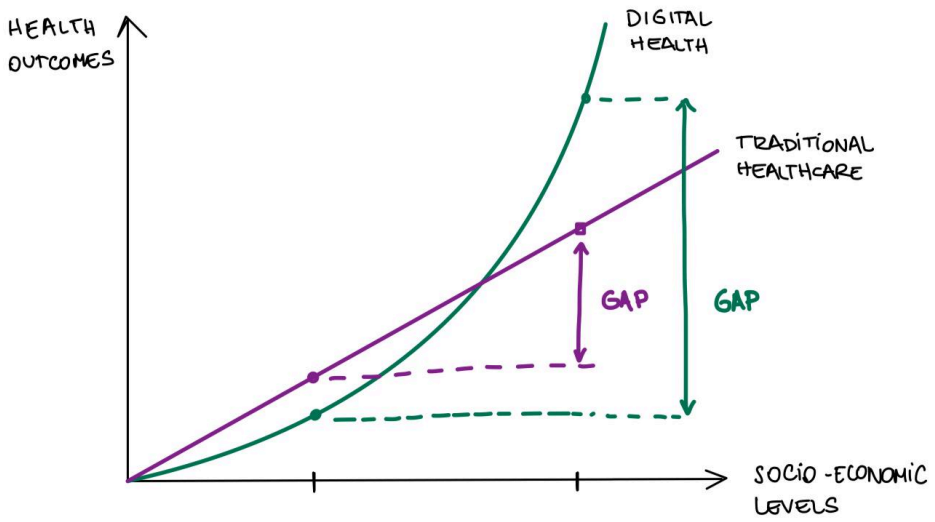

Figure 1. Digital health widening the health gap for different socio-economic levels

The digital divide, however, is not just a technological merit (Ho & Tseng, 2006); other indicators affecting digital inequity among groups are age, race, socioeconomic status, education, and geographic location (Yao et al., 2022). The digital divide is present within different levels and stratifications of society, domestically and globally, in all income levels, being more expressive in lower-income countries (Ho & Tseng, 2006). To this extent, **digital literacy** and internet connection are being called super determinants of health, as they progressively influence all the other social determinants of health (Sieck et al., 2021).

At the systems level, digital health can improve healthcare services' quality, efficiency, universality, and sustainability. It can significantly contribute to the amplification and effectiveness of health promotion, disease prevention, diagnosis, and management (WHO, 2021). As the WHO's Global Strategy on Digital Health envisioned, health technologies increasingly contribute to health equity and the 2030 Sustainable Development Goals (SDG) achievement (Novillo-Ortiz et al., 2018). Image 2 points out the potential impact on health outcomes when designing digital health with equity in mind. Digital health can improve health indicators for individuals across different income levels while lowering the gap between them.

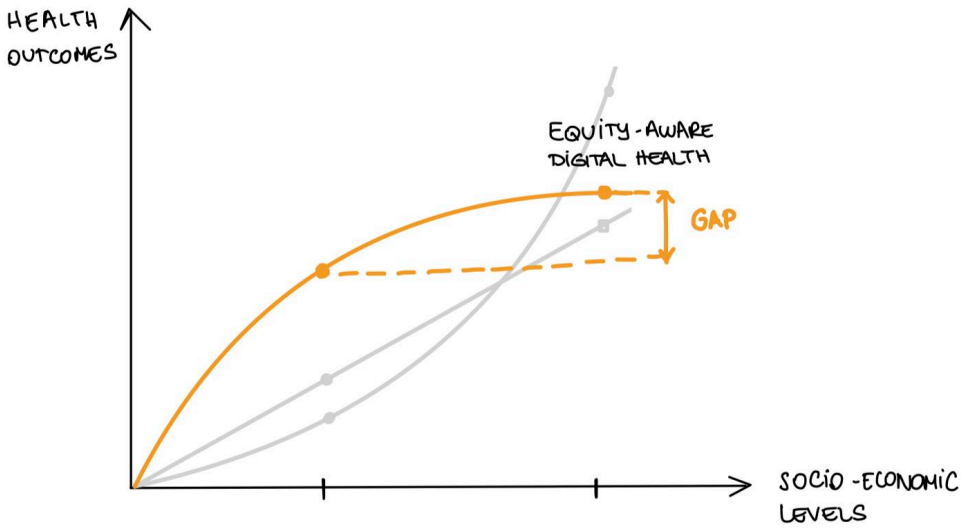

Figure 2. Equity-aware digital health design can potentially widen the health gap between different socio-economic levels.

These divergent perspectives, **optimists and pessimists** (Ho & Tseng, 2006), on digital health lowering or increasing health inequalities emphasize the importance of well-thought design, governance, implementation, and evaluation decisions for digital health projects, products, and services. This study focuses on the decisions that pertain to **design and data**, encompassing factors such as the platform, interface, user experience, data collection, and workflow.

The Design Perspective – Choosing Technology with Equity in Mind

In a systematic literature review on usability challenges in mobile health applications (apps) (Al-Saadi et al., 2015), authors found that parameters related to the app design (such as user interface and tasks) have similar importance to device-related parameters (such as network or screen size). As global health decision-makers, designers, implementers, and evaluators, we can influence the problems directly related to the apps by choosing a better design from the beginning.

The current consensus among experts and researchers acknowledges that deficiencies in the design of digital health technologies lead to reduced and eventual abandonment of their usage and, even more dangerously, contribute to adverse health outcomes (Koehle et al., 2022). Excessive or

incorrect mouse clicks to complete a task, for example, can negatively impact patient health and safety, highlighting how the software and interface design can affect the healthcare routine of providers and patients (Gotsis & Jordan-Marsh, 2018).

A good design should account for different users, behaviors, and contexts, i.e., family dynamics, neighborhood, internet availability, and social identities (Koehle et al., 2022). These cultural dimensions of usability (Wallace et al., 2013) are essential for patients and providers interacting with the technology in their routines. **Human-centered design** (HCD), a widely recognized framework for technology design, is suggested to have a beneficial impact on digital health equity and has been extensively used (Holeman & Kane, 2020). However, the lack of adequate evaluation studies and the frequent misuse of terms, especially after HCD's rise in popularity, has made it challenging to establish robust evidence to support this association (Evans et al., 2023). It is also important to note that the conception and evaluation of what characterizes a "good HCD" are, to this day, mainly concentrated in the standpoints of the United States and European countries, with some marginal cultural adaptations to different contexts.

Moreover, funders might adopt this terminology as self-reassurance to avoid partaking in neo-colonial practices — even though they are framing healthcare practices for populations that are geographically distant and underrepresented in their perspectives ("Secret Aid Worker," 2016). Holeman and Kane, in their work on HCD for global health equity, summarize central principles of sincere HCD practices: *"meaningful and documented participation of people who will use new systems in their routine activities or otherwise be affected by them; supporting cooperative activity and augmenting people's skills, rather than using technology primarily for purposes of efficiency or managerial control; and concern for the whole person and their life experiences, reframing purely technical issues in relation to people's values and the broader human context of implementation."* (Holeman & Kane, 2020) (p.15).

Current investments in digital health in the global health context can incentivize funding agencies to launch grants centered on software development and its implementation, sometimes positioning the technology itself as the solution to health issues (Evans et al., 2023). This scenario can lead to the extrapolation in the development of new apps and software, a time- and money-consuming pursuit that could be avoided by using open-source or adapting software already in place. The WHO's guideline, *"Recommendations on Digital Interventions for Health System Strengthening,"* points out that the widespread excitement for digital health has led to a proliferation of short-lived implementations and a wide variety of digital tools with a restricted comprehension of their influence on health systems and the well-being of individuals (WHO, 2019). Implementers should move towards approaching technology as a means to better health outcomes, a support tool that will improve indicators in conjunction with its other theory of change components (Evans et al., 2023).

Conversational Interfaces as a Strategy for Technology Adoption

The human-centered design framework defends the conception of solutions based on current users' behaviors and preferences, deviating as low as possible from their routine and already-known tools (Norman & Draper, 1986). As a paradigm for user interaction, **conversational design** has been proposed as a more natural and intuitive approach to mobile interface design (Leong, 2004). This approach, used on instant messaging apps, emphasizes the flow and structure of human conversation, aligning the user experience more closely with everyday communication behaviors. Unlike traditional app interfaces that require users to navigate through menus and buttons, conversational interfaces allow for more fluid, language-based interactions. This mimics how people naturally seek and process information, making it an interesting alternative for digital health interventions where clarity and ease of use are essential across different age groups and technological proficiencies. Because instant messaging platforms are already widely adopted and familiar to many users, they have a lower learning curve and increased accessibility. This study proposes that, by leveraging instant messaging platforms, health interventions can reach a broader

audience, including those who might be intimidated by or need help navigating more complex app interfaces.

In the current technology landscape, the most common embodiment of conversational design are instant messaging apps, like WhatsApp, iMessage, SMS text, Telegram, Facebook Messenger, WeChat, etc. **WhatsApp** is one of the most popular apps used daily by more than two billion people worldwide – this number is even more accentuated in LMIC, with India and Brazil being the world's largest markets for the app (Dean, 2023). WhatsApp is a privately owned mobile application that delivers a high volume of messages between users and groups quickly and efficiently (cost-free, low internet data usage, low storage use, and a considered easy onboarding process for new users due to its similarity with the SMS text interface). Because it is a mobile app they already utilize in their daily routine, clinicians, technicians, CHWs, managers, and patients also adopt it in public health and health care. However, its use is often seen as informal or even a non-disclosed solution, making the use of this technology in global health poorly standardized, documented, or discussed.

Most recently, the popularization of generative Artificial intelligence (AI) models has ushered in a novel application of conversational design. Instead of clicking and navigating on the web, people now engage in dialogues with algorithms that can respond, interact, and even crack jokes. Cassie Kozyrkov, the former Chief Decision Scientist at Google, refers to this development not as an "AI revolution" but as a revolution in User Experience (UX) (Kozyrkov, 2023). She argues that although the computational field of natural language processing (NLP) traces back several decades, its access was restricted to experts. With ChatGPT-3.5 (*ChatGPT*, n.d.) release in late 2023, OpenAI made this technology accessible to the mainstream public through a straightforward interface. ChatGPT-3.5 reached one million new users in one week, breaking records for consumer application adoption (Brandl, 2023). As illustrated in Image 3, by incorporating AI into a conversational interface, ChatGPT has made advanced NLP technology widely accessible, marking a new era in human-computer interaction. The use of conversational architecture, however, is not

only about design. Digital health, and in this case AI applied to health, requires extensive data to evolve and become more effective in its responses and functionalities, creating a new branch of possible inequalities generated by technology.

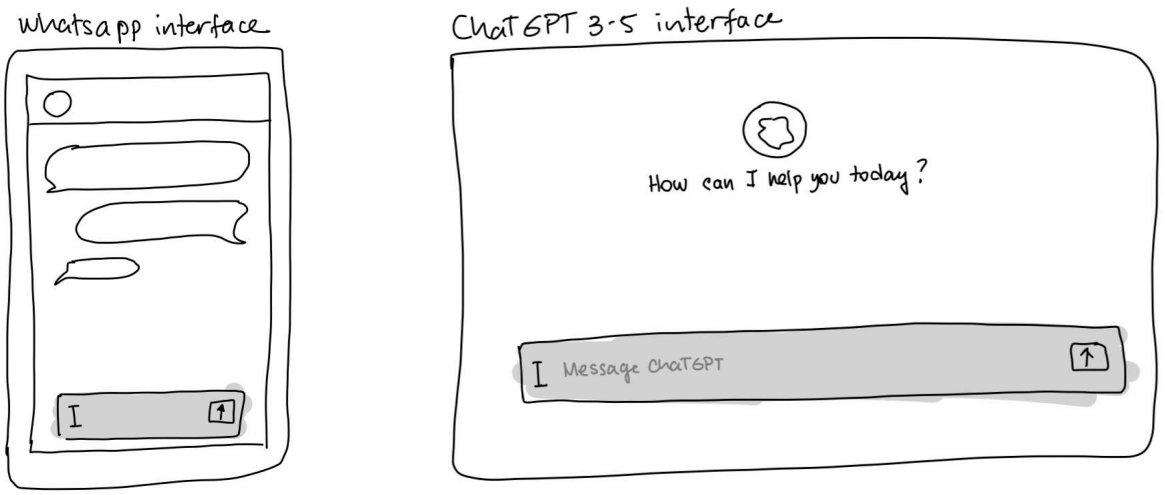

Figure 3. ChatGPT's interface mimics a chat with a friend on an instant messaging app.

The Data Perspective – Who is Being Represented in Healthcare Data?

From a simple electronic health record (EHR) system in a physician's office to a futuristic artificial intelligence algorithm to drug discovery, digital health development highly depends on data generation, consultation, or analysis. Beyond the "buzz" of technology-disrupting industries, if you – as a company or as a country – do not have data, you are behind the game; even worse, if you – as a person – are not represented in the data, digital health could even be harmful to you (Ibrahim et al., 2021).

Health data can have primary or secondary applications. Primary applications benefit the individual from whom the data was collected, whereas the secondary use of data involves population-level applications (Rabianski, 2020). One example of a secondary health data application includes the

analysis of millions of thousands of big data points to develop research, programs, and policies. Ibrahim et al. (2021) conceptualize **health data poverty** as *"the inability of individuals, groups, or populations to benefit from a discovery or innovation due to a scarcity of data that are adequately representative."* In addition to women, and ethnic, sexual, and age minorities, other groups highly excluded from databases are entire populations of non-English speaking countries. This section argues how language influences inequalities, focusing on countries where Portuguese is the official language.

Besides a common language, the eight countries in the Community of Portuguese Language Countries (CPLP) differ in their economies, cultures, and locations. Angola, Brazil, Cape Verde, Mozambique, Guinea-Bissau, São Tomé and Principe, and Timor Leste are still experiencing the economic consequences of their past colonization by Portugal. The choice of Portuguese-speaking countries is driven not only by their diverse geographic locations, varied levels of healthcare infrastructure, and differing stages of economic development but also by the Portuguese language's still shy influence on current technological advancements. Caetano Veloso, a Brazilian artist, sings, "Portuguese is the black among the Euro-languages," highlighting the linguistic marginalization.

The inequality in technology use due to language barriers does not happen only in healthcare or digital health mobile applications. Whether you speak English determines if and how you access the internet itself. The internet demographics do not match the real-world demographics, creating what authors call ***"digital ghettos"*** (Brown, 2016) where you either do not have access to media content because your language is not represented on the internet or you are forced to renounce your first language to be included in the digital life. As an example of digital exclusion, Apple released *Siri voice assistant* in 2011 in English and did not release Siri in Portuguese until 2015. As of today, Amazon's assistant, *Alexa*, can only be used in eight of the more than 7,000 existing languages worldwide (Summa Linguae, 2021). This example can sound harmless, but many other computational advancements depend on similar types of databases and algorithms used by voice assistants; for example, some deep learning and natural language processing techniques interpret

electronic health records (EHR) texts to predict health outcomes. More recently, this problem has become even more relevant due to the popularization of large language models (LLM) and generative AI. Although *ChatGPT* is available in more than 50 languages, it has been mainly trained and optimized in English using direct translation to other languages, which proposes quality limitations and ignores cultural and linguistic aspects in its outputs (Lai et al., 2023), homogenizing knowledge through North American lenses.

Companies and researchers are already developing and testing AI technologies in various healthcare applications, such as disease diagnosis, ophthalmology, radiology, psychiatry, pharmacology, health coaching, medical devices, surgery, etc. In the current context, non-English-speaking countries will not have access to part of these advancements (or late access) depending on the timing and interest of tech companies – just like the "inoffensive" *Siri* example. As a first step towards overcoming this, the CLPL countries should conceive their national strategies and start cooperating to create shared open datasets to design and train models with data from their countries. This initiative has been discussed in recent forums, such as the "1st Lusophone Internet Governance Forum" hosted in Brazil in September 2023, almost one year after the *ChatGPT* release. Yet in 2023, *Maritaca AI*, a Brazilian startup, launched *MariTalk*, a chatbot using *Sabiá-2* – their large language model with specialized training in Portuguese (Almeida et al., 2024). The group received funding from *Google*, and their best model outperform *ChatGPT-3.5* in Portuguese tasks, supporting the case of having dedicated language datasets to output quality.

As a step back on discussing the creation of AI implications, this study maps various instances of how the most used conversational app, WhatsApp, is being utilized in public health programs and healthcare delivery. The use cases and pros/cons arguments described in this section are from various countries worldwide, as published data from Portuguese-speaking countries is scarce.

Chapter 2: Manuscript

Background

The most frequently reported applications of WhatsApp in public health and healthcare literature were telehealth/telemedicine (e.g., using video calls and text messaging); community outreach and health education (e.g., public health campaigns); care coordination with patients (e.g., appointment scheduling, medication reminders), data collection and reporting for surveillance (e.g. during emergency responses); follow-up with patients participating in research; peer-to-peer consulting and case discussion (e.g., shared clinical decision-making to complex patient cases); professional development support (e.g., sharing resources, courses or conferences); coordination with fieldworkers; team management; and project administration (Benedictis et al., 2019; Manji et al., 2021; Pimmer et al., 2018; Weaver et al., 2022).

Some of WhatsApp's reported positive aspects are its accessibility, ease of use, convenience, user-friendliness, scalability, affordability, and the fact that it does not require a computer (Manji et al., 2021; Pimmer et al., 2018; Weaver et al., 2022). A highlight present in most studies was WhatsApp's high responsiveness. From the patient-provider relationship, the potential quick response from both actors can boost engagement (Manji et al., 2021) and elevate the frequency of communication, resulting in higher follow-up treatment adherence (Weaver et al., 2022) and a reduction in the provider-patient divide (Pimmer et al., 2018). In provider-provider communication, WhatsApp's asynchronous functionality enables ongoing interaction and feedback, eliminating the necessity for frequent meetings (Pimmer et al., 2018; Weaver et al., 2022). Another highlight was WhatsApp's non-hierarchical characteristics, standing out as a critical advantage in healthcare/global health settings, where rigid hierarchies often impede effective communication (Weaver et al., 2022). Most communications in the app are decentralized and can smooth hierarchies and lower organizational, geographical, social, and cultural barriers, boosting team

morale and fostering community between teammates (Benedictis et al., 2019; Pimmer et al., 2018; Weaver et al., 2022).

Meanwhile, the literature also points out the opposing sides of using WhatsApp in healthcare and public health efforts. At an organizational level, these are a possible increased workload, unfiltered sense of urgency, pressure to answer messages outside working hours promptly, space for unprofessional behavior, and disagreements on WhatsApp groups' scope and etiquette (Benedictis et al., 2019; Pimmer et al., 2018). Some equity challenges discussed were reliable internet infrastructure (Pimmer et al., 2018) and gender gaps in access to mobile technology (Manji et al., 2021).

A relevant group of challenges of using a mobile application not designed for healthcare concerns data collection, storage, privacy, and security. Key literature reviews highlight that *"instant messaging is a form of store-and-forward telemedicine not envisioned when most guidelines were developed"* (Mars, M. et al., 2019) and that *"its informality and spontaneity are associated with lack of policy and guidelines"* (Morris et al., 2021). A usual misunderstanding is that WhatsApp's end-to-end encryption is sufficient to make it a compliant application for health data use. In fact, during communication between parties, the data is safely transmitted and HIPAA compliant, but after being stored, it could be retrieved by Meta (former Facebook, the company that owns WhatsApp) (Zanon, 2019). Comments are made about good practices and guidance, such as deleting patient data from both the sender's and receiver's phones ("mobile phone stewardship"), using patient's initials when sending pictures with body parts, and not using WhatsApp Business to transmit patient data as it does not encrypt data during message transmission (Morris et al., 2021). As alternatives, instant messaging apps designed to be used in healthcare have been created, but their adoption rates are not comparable with WhatsApp due to WhatsApp's ubiquitous characteristics of already being used in professionals' and patients' personal routines (Mars, M. et al., 2019; Morris et al., 2021).

Objectives

This study aims to document WhatsApp usage patterns in public health and healthcare settings across Portuguese-speaking countries. This includes, for example, the nature of interactions, their frequency and scale, and the parties involved. The research also investigates professionals' perspectives on the reasons behind incorporating WhatsApp as a working instrument, alongside their concerns and measures taken by their organization regarding patient data privacy and security.

Methods

The population surveyed was adult professionals who had participated in public health or healthcare-related intervention, research, project, company, etc., and used WhatsApp to operate, manage, or deliver their goals in one or more Portuguese-speaking countries. They could work for the government, non-profits, healthcare facilities, consulting firms, for-profit companies, or academia. The countries included are Angola, Brazil, Cape Verde, East Timor, Guinea-Bissau, Mozambique, Portugal, and Sao Tome and Principe.

The survey had two screening questions, followed by 20 multiple-choice questions written with inputs from the literature review and informal interviews with public health professionals using WhatsApp as a work tool. It was self-administered online using *Qualtrix XM* software, an online platform that can be accessed on a web browser via computer or cellphone. The participants provided their emails before answering the survey. The questionnaire underwent a pilot testing phase with Portuguese-speaking healthcare/public health professionals to assess its clarity, comprehensibility, and cultural relevance. The final version had four sections: respondent’s information, use case description, personal opinions, and technical questions. The average response duration was 11 minutes. Emory University’s Ethical Committee approved the study with an exemption status. The questionnaire instrument is available in Appendix 1 in its English translation.

Recruitment was done through partnerships with local organizations and research centers, online email forums on digital health, and LinkedIn by convenience sampling method. Participants were encouraged to send the survey link to other professionals. Eligibility was assessed at the beginning of the survey, checking if the person had used WhatsApp as a health professional before and if it was in a Portuguese country. Patient data was not collected, and participants could not respond as a patient. The data was collected during February 2024, lasting one month. Data analysis was exploratory and made by applying descriptive statistics using the software R Studio and *Qualtrics XM Statis* feature. Only eligible respondents and complete answers were included in the analysis dataset.

Results

Sample

During the recruitment period, 188 people answered the screening questions, 149 of whom were eligible to answer the questionnaire. Of these, 89 completed the survey entirely and were included in the results. The words “initiative” and “use case” refer to projects, programs, products, clinics, or research to which the respondents were referring when they completed the survey. Table 2 summarizes the respondent’s profiles and their initiative characteristics.

Table 2. Respondent's Profiles (N= 89)

	Frequency (n)	Percentage (%)
COUNTRY		
Brazil	47	50.0%
Mozambique	21	22.3%
Guinea Bissau	8	8.5%
Angola	6	6.4%
Portugal	4	4.3%
Sao Tome and Principe	4	4.3%
Cape Verde	3	3.2%
Timor East	1	1.1%
RESPONDENT'S ROLE		
Management	38	42.7%
Clinical	33	37.1%
Field Work	9	10.1%
Research	7	7.8%
SECTOR		
Government	31	34.8%
Non-profit	22	24.7%
For-profit	20	22.5%
Research	11	12.4%
CARE LEVEL		
Primary Care	49	42.6%
Tertiary Care	23	20.0%
Secondary Care	22	19.1%

Respondents could choose more than one country where the initiative was implemented, bringing the total to more than 89. The respondents' roles, sectors, and care levels didn't allow multiple-choice answers. Regarding the Repondent's Role category, "Management" includes coordination, administrative back office, IT and data management, design, monitoring, and

evaluation professionals. “Clinical” refers to physicians, nurses, and other clinical professions. “Field Work” indicates data collectors and community health workers. For the sector category, “Non-profit” covers NGOs and non-profit public-private partnerships. The “for-profit” label includes private for-profit companies, startups, and clinical facilities such as hospitals and physician’s offices.

Motivations and Concerns Around WhatsApp Use

Respondents could choose the three most prominent use cases for which their initiatives used WhatsApp. Options were drawn from literature and informal interviews. The most chosen use cases were “Fieldwork Coordination” (19%), followed by “Healthcare-related communications with Patients” (17%) and “Telemedicine” (16%). Figure 4 shows the column percentage of WhatsApp use cases by sector. The y-axis is organized from the top to the bottom, with use cases ranging from “more contact with patients” to “less contact with patients.”

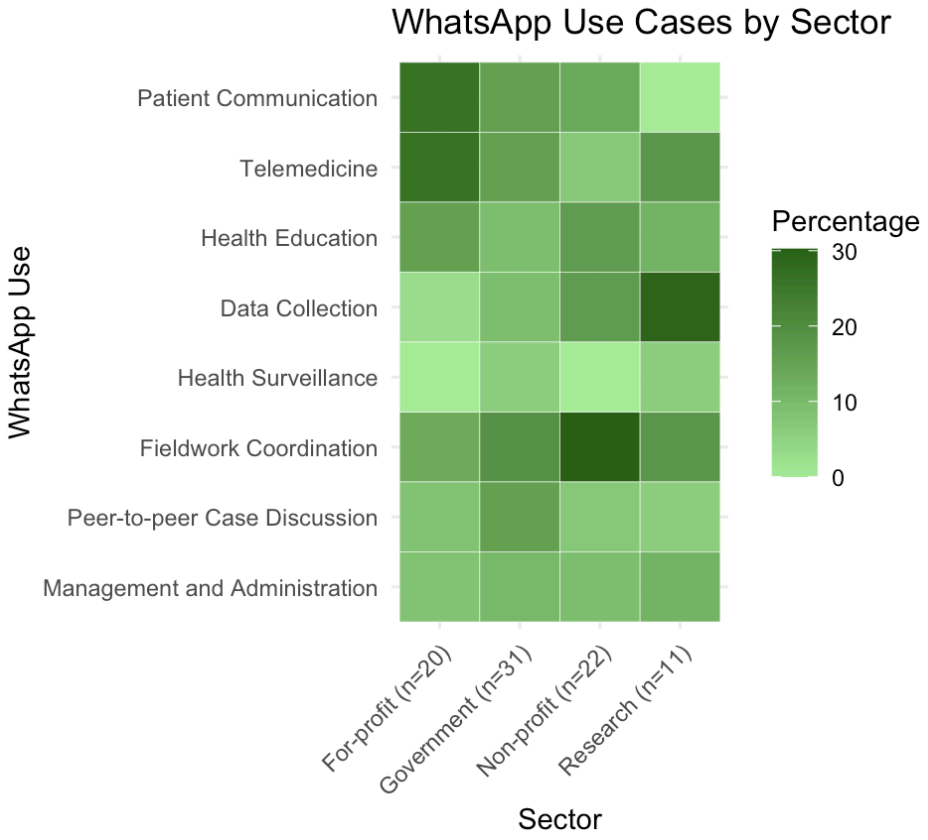

Figure 4. Column Percentage of WhatsApp uses by sector when asked 1-3 applications their initiative uses WhatsApp for.

Respondents were inquired about their perspectives on the main reasons for adopting WhatsApp in the initiative they were describing. The most frequent answers were "real-time user engagement" (57% of the total answers) and "low cost/no cost of implementation" (51.2% of the total). Real-time engagement means users can interact quicker and with lower entry barriers (compared to email, other mobile apps, or physical means). Figure 5 shows the column percentage of reasons to use WhatsApp by sector when asked 1-3 main reasons the initiative uses WhatsApp.

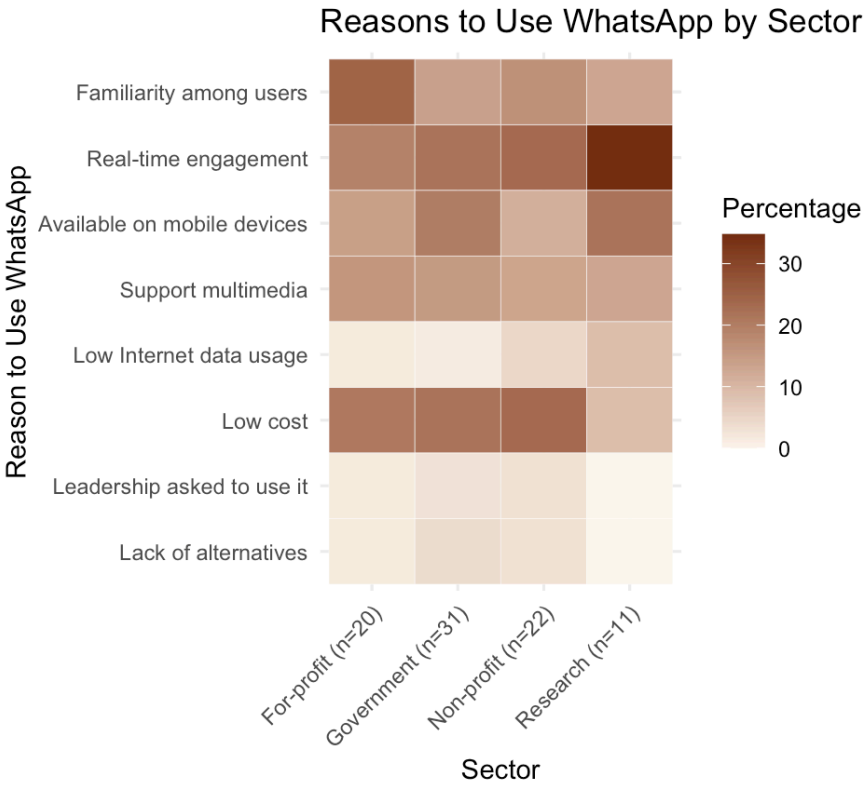

Figure 5. Column percentage of reasons to use WhatsApp by sector when asked 1-3 reasons the initiative uses WhatsApp.

The survey prompted respondents to choose their top three concerns (if any) when using WhatsApp for work. The most pointed concern across professionals and sectors was mixing personal and professional life, with 48% of respondents indicating this as one of their top three concerns. From the authors' knowledge extent, this result has not yet been documented in the literature on instant messaging in the health sector. 63% of clinicians had this as their top 3 concerns, compared with 39% of non-clinicians. The second most frequent concern is patient data security (38%). Figure 6 illustrates the column percentage distribution of concerns per respondent's role.

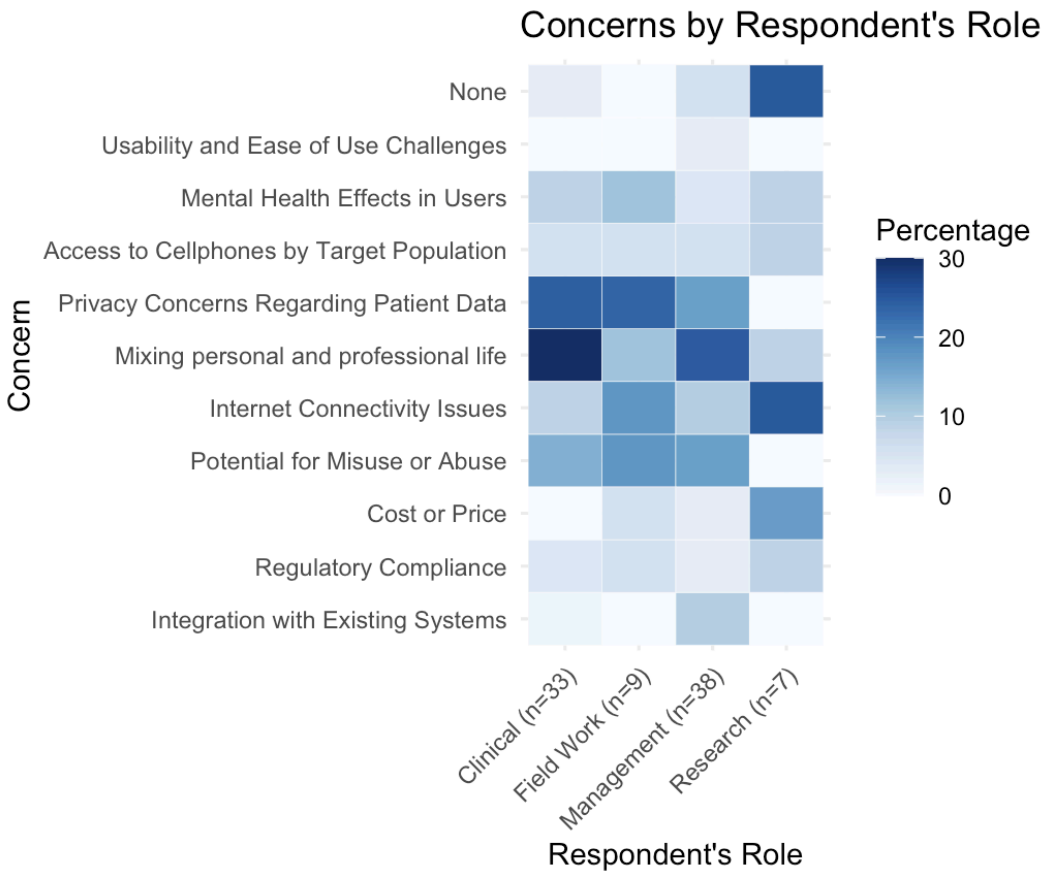

Figure 6. Column percentage of concerns about using WhatsApp by sector when asked 1-3 concerns the respondent has about using WhatsApp in their initiative.

88% of respondents reported being satisfied with the use of WhatsApp in their work. Still, in our sample, professionals in clinical roles (physicians, nurses, etc.) tended to be significantly less satisfied with WhatsApp than professionals in non-clinical roles. All the neutral (8 data points) or dissatisfied (2) respondents were from Brazil. It is relevant to point out that, in this sampling, 65% of respondents feel very comfortable with technology, 31% feel comfortable, and only 5% feel neutral or uncomfortable with technology. In this sampling, startups and for-profit companies (non-clinical) were significantly less satisfied with WhatsApp than other sectors.

Measures on Data Security and Privacy

The survey questioned if WhatsApp was officially recognized as a working instrument at an organizational level. 55% indicated WhatsApp was formally recognized, and 45% of respondents said its use was informal (33% informal but broadly recognized and 12% informal and not openly discussed). Of the 89 responses analyzed, 71% collected patient data, and from those, 28% did not implement any action toward the safety and security of patient data. One-third of the patient data collected would usually not contain identifiers. Of those who collect patient data, 68% save the data outside WhatsApp. Of those who saved patient data, 75% saved it digitally, 17% saved both digitally and physically, and 8% saved it only physically. Only in 16.4% of the cases is the patient-transmitted data erased from mobile phones after use. As previously pointed out, the literature indicates that the most effective data security measure is erasing the data after using it. In this sample, 39% are either erasing or anonymizing as security measures.

Profile of WhatsApp Use

Most of the participant initiatives have healthcare providers (61%) or management teams (47%) as stakeholders using WhatsApp, followed by 35% having patients or community members communicating via WhatsApp. On average, 33% of initiatives have between 10 and 50 people communicating through WhatsApp monthly. Only three initiatives had more than 1,000 monthly

users, and just one had more than 10,000. Table 3 describes the profile of WhatsApp usage in the sample.

Table 3. How respondents use WhatsApp in their initiative (n=86)

	Frequency (n)	Percentage (%)
CHAT TYPE		
Group Chat	58	69.0%
1-1 Individual Chat	50	59.5%
Transmission Line	10	12.0%
TRANSMITTED DATA		
Text Message	85	98.8%
Photos	57	66.3%
Files	50	58.1%
Voice Messages	48	55.8%
Videos	39	45.3%
Links	35	40.7%
USE OF OTHER SOFTWARE		
Yes, the Microsoft Office package	40	46.5%
None	19	22.1%
Yes, another third-party application	17	19.8%
Yes, we developed an app in-house	15	17.4%
USE OF WHATSAPP PRODUCTS		
None	38	44.2%
WhatsApp Business	28	32.6%
Other	20	23.3%
Chatbots/Scripts	3	3.5%
WhatsApp APIs	3	3.5%

Discussion

Through a self-administered survey, this study mapped different cases of WhatsApp being used in global health and their positive and negative sides. Respondents working in clinical and non-clinical roles at all levels of care in the private and public sectors provided answers. Professionals in the public health and healthcare fields from the eight Portuguese-speaking countries answered a self-administered survey describing how WhatsApp is used in their work tasks. Our findings align with *Weaver et al. (2022)*, who argue that while WhatsApp cannot resolve the origins of health disparities, it can alleviate their effects by facilitating access and use of public health and healthcare initiatives utilizing the app.

Comparison With the Literature

This study was the first to document the use of WhatsApp in various public health and healthcare initiatives in Portuguese-speaking countries, which includes countries in Africa, Latin America, Europe, and Asia. The current literature reported WhatsApp use in healthcare and public health from the broader perspective of low- and middle-income countries, emphasizing African countries and sometimes Brazil and India. Most of the literature is individual case studies or literature reviews, except for *C. Pimmer et al. (2018)*, who applied close- and open-ended questions to 40 respondents from various countries, getting a comprehensive overview of WhatsApp use in global health. Our multiple-choice design gave us an operational advantage in getting a larger response scale while allowing open-ended comments in most questions. Although other studies mapped social dynamics included in utilizing WhatsApp as an organizational tool in public health and healthcare, this study was the first, to our knowledge, to point out the rising concern professionals have around blurring the lines between work and personal communication while using the app.

In healthcare literature, WhatsApp is usually considered a “backdoor” solution. This term refers to when professionals independently adopt a tool to address their work needs without formal approval or assessment at the organizational level (Mars, M. et al., 2019). More explicitly, our results

indicated the option “leadership asked us to use” as the least chosen reason to use WhatsApp as a work tool, and 45% of the cases used WhatsApp informally. Unlike traditional technological implementations that require extensive planning, such as creating policies, budgets, and training for the workforce, WhatsApp adoption is relatively straightforward (Benedictis et al., 2019; Mars, M. et al., 2019). When comparing how long WhatsApp was being used in the initiative, more recent use cases were associated with being officially recognized, while elders tended to be informal. A hypothesis to explain this trend is that as healthcare efforts went digital due to the pandemic, technological tools were officially recognized as organizations became more aware of their digitalization efforts. Before that, WhatsApp mainly used the grassroots adoption approach described in pre-pandemic literature.

An initial concern of the authors was that transmitting patient data on WhatsApp could weaken health information systems by creating a parallel form of data collection and storage, surpassing a dedicated information system. Yet, in this sample, there was an association between patient data being transmitted and saved somewhere outside of WhatsApp – a positive indication of information systems strength. However, 28% of initiatives transmitting patient data don’t have data security measures or training around data compliance. As the mobile app was not designed for health, implementers should approach its use as a supporting tool to interface with users, not as the only software to register and store health data.

Approaching Instant Messaging as a Work Tool

The lack of policies and risk assessment involving WhatsApp creates the scenario of “privacy concerns regarding patient data” as the second most popular concern among respondents. Yet, countries, states, and many organizations do not have official guidelines on utilizing the application. Some respondents indicated that exchanging patient data on WhatsApp is prohibited in their organizations, and, as a solution, their software development teams create external repositories so

users can upload files, pictures, and data safely. WhatsApp is then used to share links to these repositories with patients, maximizing engagement with some usability tradeoffs.

While security is a technical problem, blurring the lines between personal and professional interactions is a behavioral challenge. As many public health interventions do, we could address this by creating guidelines and training or relying on the "common sense" of professional etiquette (e.g., not sending messages outside working hours or on weekends). Unfortunately, this survey showed that this is not enough, so we propose solutions where technology itself could help. Currently, Meta offers users "WhatsApp Business," a separate application much like the original WhatsApp but with extra features such as automatic replies, working hours, chat labeling, and catalog display - features tailored for business needs, not necessarily professionals. If, in the past, "work-life balance" management was a concern mainly for small business owners and entrepreneurs, nowadays, employees are dealing with these challenges too. Some healthcare professionals reported using WhatsApp business as their "work number" to bypass the problem. This way, they can mute notifications on the Business App outside working hours and only read messages from work when they open it. The downside is that you must have a second number, and sometimes a second cellphone, to keep the work-related chats separate from the personal chats, which is not always viable in low-resource settings. We propose a technically feasible solution to Meta that maintains all contacts in the same app but creates a secondary tab for work-related contacts. So when the user starts a new chat, they can label that contact as "work" or "personal" and have the chat designated to the correct tab. With this, they can silence the "work tab" outside working hours and only read the messages when they choose to while maintaining personal communications running freely. This example is just one of the features Meta could implement to benefit work-life balance in healthcare and across industries by using WhatsApp as a working instrument.

As a step further, integrating large language models (LLM) and other artificial intelligence strategies into instant messaging platforms such as WhatsApp presents both opportunities and challenges for healthcare. Generative AI can be added to WhatsApp in patient education and

engagement, tailoring messages specifically to their context and conditions, improving remote monitoring and telemedicine, care coordination and appointment scheduling, health promotion, and disease prevention 24/7. On the provider side, it can support medical triage, streamlined workflows, and clinical decision-making by integrating data sources such as electronic medical records or surveillance systems with predictive analysis. While these technologies can improve the scale and the cost-effectiveness of these interventions, there is also a risk of exacerbating inequalities in the quality of care. As discussed previously, AI output highly depends on the data used to train its algorithms, and non-English speakers are mainly excluded from these datasets.

Software Ownership Challenges

Hakan Ozalp in his work "Digital Colonization of Highly Regulated Industries: An Analysis of Big Tech Platforms' Entry into Health Care and Education," (Ozalp et al., 2022) point out that big techs' strategies in highly regulated industries involve three stages: start by offering software to support operations, then collect data around the service and use behavior, to control the service itself later. Advocate for WhatsApp use in global health can be seen as to be complacent with this dynamic. A WHO-backed alternative solution is to develop, adopt, and reuse digital global goods. Digital Square, a "neutral" marketplace for these digital goods, defines them as adaptable digital health tools that are freely available, open-source, and adaptable to different countries and contexts to tackle their health system's challenges (*Global Goods Guidebook*, n.d.). *mHero Connector* (Taremwa, 2020) is an example of a solution leveraging conversational interfaces through SMS text messaging to engage patients, clinicians, and various levels of Uganda's Ministry of Health in data collection and communication while registering relevant information in official information systems through interoperability data standards and Application Programming Interfaces (APIs). A solution like mHero leverages the engagement and usability of instant messaging with data security and interoperability standards, improving both user experience and health systems strength while maintaining local ownership. Of course, open-source software adoption should not be viewed as a silver bullet but rather with caution to the specific application. At the macro level, global health

funding priorities can shift and leave the software without updates and maintenance from the original development community, and at the local level, the possible need for over-customization can lead to high development and maintenance costs for implementers using the software.

Limitations and Future Work

This study's limitations include a close-ended multiple-choice survey design, limiting the discovery of new patterns and behaviors, and possible selection bias toward respondents more acquainted with technology, as our recruitment was made digitally and by convenience sampling. Other limitations were the reliance on self-reported data, publication bias, and small sample size, which stopped us from discovering statistically significant associations. The next steps in this research are to complete in-depth qualitative interviews to explore insights into users' relationship with technology and WhatsApp in the work environment, followed by creating prototypes of WhatsApp features and guidelines to address part of the challenges mapped on the collected data.

Conclusion

WhatsApp should not be considered a substitute for established care plans but rather a viable option where the alternative may often be no care provision at all or rather as a complement where care is present but resources are scarce, and increasing engagement is desired (Weaver et al., 2022).

WhatsApp offers several reported advantages in health settings, including its user-friendly interface, low implementation costs, and widespread familiarity due to its use in non-work contexts. However, these same factors raise concerns regarding work-related communications, as the line between professional and personal life can become blurred for those using the app as a work tool. Additionally, a notable downside, reported in the survey and the literature, is the lack of embedded features and guidelines for health data security and privacy.

One key drawback of WhatsApp's use in global health is its ownership by a for-profit corporation, which can lead to limitations and dependencies when developing new features and adaptations. Furthermore, using large language models and other artificial intelligence algorithms in instant messaging could potentially exacerbate healthcare quality disparities based on language, as the effectiveness of generative AI is contingent on the availability of large datasets in the language it is used.

We hope global digital health will evolve towards popularizing digital global goods that are curated, mature, and developed by skilled digital health teams. In the meantime, we incentivize using already-known digital tools like WhatsApp instead of creating a new software application. Developing software is a money and time-consuming endeavor that requires dedicated skillsets that most global health teams do not have in-house to develop or oversee. Other solutions should be explored before software development — even if it might look like an attractive use of global health money.

Acknowledgments

Grammarly and ChatGPT were used to improve English grammar and writing clarity.

References

Almeida, T. S., Abonizio, H., Nogueira, R., & Pires, R. (2024). *Sabi\'a-2: A New Generation of Portuguese Large Language Models* (arXiv:2403.09887). arXiv. https://doi.org/10.48550/arXiv.2403.09887

Al-Saadi, T. A., Aljarrah, T. M., Alhashemi, A. M., & Hussain, A. (2015). A Systematic Review of Usability Challenges and Testing in Mobile Health. *International Journal of Accounting and Financial Reporting*, *5*(2), Article 2. https://doi.org/10.5296/ijafr.v5i2.8004

Anniciello, A., Fioretto, S., Masciari, E., & Napolitano, E. V. (2022). Covid-19 impact on health information technology: The rapid rise of e-Health and Big Data driven innovation of healthcare processes. *2022 IEEE International Conference on Bioinformatics and Biomedicine (BIBM)*, 2759–2764. https://doi.org/10.1109/BIBM55620.2022.9995515

Benedictis, A. D., Lettieri, E., Masella, C., Gastaldi, L., Macchini, G., Santu, C., & Tartaglini, D. (2019). WhatsApp in hospital? An empirical investigation of individual and organizational determinants to use. *PLOS ONE*, *14*(1), e0209873. https://doi.org/10.1371/journal.pone.0209873

Brandl, R. (2023, February 15). *ChatGPT Statistics and User Numbers 2024—OpenAI Chatbot*. Tooltester. https://www.tooltester.com/en/blog/chatgpt-statistics/

Brown, K. (2016, February 18). Unless you speak English, the Internet doesn't care about you. *Splinter*. https://splinternews.com/unless-you-speak-english-the-internet-doesnt-care-abou-1793854859

CB Insights Research. (2023). *The Digital Health 50: The most promising digital health companies of 2023*. CB Insights Research. https://www.cbinsights.com/research/report/digital-health-startups-redefining-healthcare-2023/

ChatGPT (3.5). (n.d.). [Computer software]. Open AI. Retrieved January 5, 2024, from https://chat.openai.com

Dean, B. (2023, December 12). *WhatsApp User Statistics 2024: How Many People Use*

WhatsApp? Backlinko. https://backlinko.com/whatsapp-users

Evans, L., Evans, J., Pagliari, C., & Källander, K. (2023). Scoping review: Exploring the equity impact of current digital health design practices. *Oxford Open Digital Health*, *1*, oqad006. https://doi.org/10.1093/oodh/oqad006

Global Goods Guidebook. (n.d.). Retrieved April 15, 2024, from https://globalgoodsguidebook.org/

Gotsis, M., & Jordan-Marsh, M. (2018). Calling HCI professionals into health research: Patient safety and health equity at stake. *Proceedings of the 22nd Pan-Hellenic Conference on Informatics*, 213–218. https://doi.org/10.1145/3291533.3291562

Grand View Research. (2023). *Digital Health Market Size, Share & Trends Analysis Report by Technology (Healthcare Analytics, mHealth), By Component (Hardware, Software, Services), By Application, By End-use, By Region, And Segment Forecasts, 2024—2030*. https://www.grandviewresearch.com/industry-analysis/digital-health-market

Ho, C.-C., & Tseng, S.-F. (2006). From digital divide to digital inequality: The global perspective. *International Journal of Internet and Enterprise Management*, *4*, 215–227. https://doi.org/10.1504/IJIEM.2006.010915

Holeman, I., & Kane, D. (2020). Human-centered design for global health equity. *Information Technology for Development*, *26*(3), 477–505. https://doi.org/10.1080/02681102.2019.1667289

Ibrahim, H., Liu, X., Zariffa, N., Morris, A. D., & Denniston, A. K. (2021). Health data poverty: An assailable barrier to equitable digital health care. *The Lancet Digital Health*, *3*(4), e260–e265. https://doi.org/10.1016/S2589-7500(20)30317-4

Koehle, H., Kronk, C., & Lee, Y. J. (2022). Digital Health Equity: Addressing Power, Usability, and Trust to Strengthen Health Systems. *Yearbook of Medical Informatics*, *31*(01), 020–032. https://doi.org/10.1055/s-0042-1742512

Kozyrkov, C. (2023, June 6). What's Different About Today's AI? *Medium*. https://kozyrkov.medium.com/whats-different-about-today-s-ai-380569e3b0cd

Lai, V. D., Ngo, N. T., Veyseh, A. P. B., Man, H., Dernoncourt, F., Bui, T., & Nguyen, T. H. (2023). *ChatGPT Beyond English: Towards a Comprehensive Evaluation of Large Language Models in Multilingual Learning* (arXiv:2304.05613). arXiv. http://arxiv.org/abs/2304.05613

Leong, M.-K. (2004). Conversational Design as a Paradigm for User Interaction on Mobile Devices. In F. Crestani, M. Dunlop, & S. Mizzaro (Eds.), *Mobile and Ubiquitous Information Access* (pp. 11–27). Springer. https://doi.org/10.1007/978-3-540-24641-1_2

Magsamen-Conrad, K., & Checton, M. (2014). Technology and Health Care: Efficiency, Frustration, and Disconnect in the Transition to Electronic Medical Records. *GSTF Journal on Media & Communications*, *1*(2), 23–27. https://doi.org/10.5176/2335-6618_1.2.16

Manji, K., Hanefeld, J., Vearey, J., Walls, H., & de Gruchy, T. (2021). Using WhatsApp messenger for health systems research: A scoping review of available literature. *Health Policy and Planning*, *36*(5), 774–789. https://doi.org/10.1093/heapol/czab024

Mars, M., Morris, C., & Scott, R. E. (2019). *WhatsApp guidelines – what guidelines? A literature review*. https://journals.sagepub.com/doi/abs/10.1177/1357633X19873233

McAuley, A. (2014). Digital health interventions: Widening access or widening inequalities? *Public Health*, *128*(12), 1118–1120. https://doi.org/10.1016/j.puhe.2014.10.008

Morris, C., Scott, R. E., & Mars, M. (2021). WhatsApp in Clinical Practice—The Challenges of Record Keeping and Storage. A Scoping Review. *International Journal of Environmental Research and Public Health*, *18*(24), Article 24. https://doi.org/10.3390/ijerph182413426

Norman, D. A., & Draper, S. W. (1986). *User Centered System Design; New Perspectives on Human-Computer Interaction*. L. Erlbaum Associates Inc.

Novillo-Ortiz, D., De Fátima Marin, H., & Saigí-Rubió, F. (2018). The role of digital health in supporting the achievement of the Sustainable Development Goals (SDGs). *International Journal of Medical Informatics*, *114*, 106–107. https://doi.org/10.1016/j.ijmedinf.2018.03.011

Ozalp, H., Ozcan, P., Dinckol, D., Zachariadis, M., & Gawer, A. (2022). "Digital Colonization" of Highly Regulated Industries: An Analysis of Big Tech Platforms' Entry into Health Care and Education. *California Management Review*, *64*(4), 78–107. https://doi.org/10.1177/00081256221094307

Perez, C. (2010). Technological revolutions and techno-economic paradigms. *Cambridge Journal of Economics*, *34*(1), 185–202. https://doi.org/10.1093/cje/bep051

Pimmer, C., Lee, A., & Mwaikambo, L. (2018). Mobile instant messaging: New knowledge tools in global health? *Knowledge Management & E-Learning: An International Journal*, *10*(3),

Article 3.

Rabianski, J. (2020). Primary and secondary data: Concepts, concerns, errors and issues. *Australian Property Journal*, *38*(4), 306–313. https://doi.org/10.3316/ielapa.200500091

Richardson, S., Lawrence, K., Schoenthaler, A. M., & Mann, D. (2022). A framework for digital health equity. *Npj Digital Medicine*, *5*(1), Article 1. https://doi.org/10.1038/s41746-022-00663-0

Secret aid worker: Buzzwords are killing development. (2016, March 8). *The Guardian*. https://www.theguardian.com/global-development-professionals-network/2016/mar/08/secret-aid-worker-buzzwords-are-killing-development-human-centred-grassroots

Sieck, C. J., Sheon, A., Ancker, J. S., Castek, J., Callahan, B., & Siefer, A. (2021). Digital inclusion as a social determinant of health. *Npj Digital Medicine*, *4*(1), Article 1. https://doi.org/10.1038/s41746-021-00413-8

Summa Linguae. (2021, April 21). *Language Support in Voice Assistants Compared (2021 Update)*. Summa Linguae. https://summalinguae.com/language-technology/language-support-voice-assistants-compared/

Taremwa, A. (2020). *Uganda implements new health system integration technology | UNICEF Uganda*. https://www.unicef.org/uganda/stories/uganda-implements-new-health-system-integration-technology

Veinot, T. C., Mitchell, H., & Ancker, J. S. (2018). Good intentions are not enough: How informatics interventions can worsen inequality. *Journal of the American Medical Informatics Association*, *25*(8), 1080–1088. https://doi.org/10.1093/jamia/ocy052

Wallace, S., Reid, A., Clinciu, D., & Kang, J. (2013). Culture and the importance of usability attributes. *Information Technology & People*, *26*(1), 77–93. https://doi.org/10.1108/09593841311307150

Weaver, N. S., Roy, A., Martinez, S., Gomanie, N. N., & Mehta, K. (2022). *How WhatsApp is Transforming Healthcare Services and Empowering Health Workers in Low-and Middle-Income Countries*. https://ieeexplore.ieee.org/document/9911048

WHO. (2019). *WHO guideline Recommendations on Digital Interventions for Health System Strengthening*. World Health Organization. http://www.ncbi.nlm.nih.gov/books/NBK541902/

WHO. (2021). *Global strategy on digital health 2020-2025*. https://www.who.int/publications-detail-redirect/9789240020924

Yao, R., Zhang, W., Evans, R., Cao, G., Rui, T., & Shen, L. (2022). Inequities in Health Care Services Caused by the Adoption of Digital Health Technologies: Scoping Review. *Journal of Medical Internet Research*, *24*(3), e34144. https://doi.org/10.2196/34144

Zanon, G. (2019, September 20). No, end-to-end encryption does not prevent Facebook from accessing WhatsApp chats. *Medium*. https://medium.com/@gzanon/no-end-to-end-encryption-does-not-prevent-facebook-from-accessing-whatsapp-chats-d7c6508731b2

Appendix 1: Survey (English Translation)

Welcome to the survey about <u>the use of WhatsApp in health-related initiatives</u>.

Average completion time: 8 minutes.
Thank you for sharing your experience with us!

For more information about the research related to this questionnaire, please visit: <link>

SECTION S: SCREENING
Let's refer to the use of WhatsApp in health projects, teams, products, clinics, and services as "initiative."

	QUESTION	RESPONSE
S0.	Have you used WhatsApp in a public health or healthcare initiative?	Yes. No. Not sure.
S1.	In which country did this use case take place?	Angola Brazil Cape Verde East Timor Equatorial Guinea Guinea Bissau Mozambique Portugal Sao Tome and Principe - Other Not sure

SECTION I: RESPONDENT'S INFORMATION

Great! Before we start, we need to register some administrative information.

I1	What is your email?	_____
I2	What is the initiative name you will describe while filling out this survey?	_____
I3	What is your primary involvement with this initiative?	Coordination/Management Backoffice (administrative tasks) Design, Monitoring, and Evaluation Researcher Community Health Worker or similar Data collector IT/data management

		Provider of clinical care as a nurse Provider of clinical care as a physician Provider of clinical care -other professions Other (specify:_____)

SECTION A: USE CASE DESCRIPTION

Now we're ready to begin! Remember that we'll refer to your use case of using WhatsApp in a healthcare context as the 'initiative'.

	QUESTION	RESPONSE
A1.	Which sector best describes your organization's focus?	Non-Governmental Organization (NGO)/ Non-profits Government/Ministry of Health/Public Funded Private Hospital Private Clinic/Doctors Office Research/Academia Startup/ Private for-profit company Other (specify:_____)
A2.	What level of care is your *WhatsApp use case* involved in? (Select all that apply)	Community health center Doctor's offices and specialty clinics Hospital Emergency and urgent care service NGO and humanitarian action Other (specify: _____)
A3.	What are the main WhatsApp uses in your initiative? (Select the top 3)	Telehealth/ Telemedicine Healthcare Related Communications with patients (e.g., medication reminders, appointment scheduling) Health Education Data Collection and Reporting Health Surveillance Communication and Coordination with Fieldworkers Management and Administration Peer-to-peer Consulting/ case discussion Other (specify: _____)
	(Optional) How would you describe the initiative in 2-3 sentences?	

A4.	Who uses WhatsApp in this *use case*? (select all that apply)	Patients/Community Members Healthcare Providers Community Health Workers Health Administrators/Managers Field Researchers Data collectors Staff/Outreach teams Other (specify): _____
A5.	How long have your initiative been using WhatsApp?	Less than 6 months Between 6 and 12 months Between 1 and 3 years Between 4 to 10 years More than 10 years I don't have this information
A6.	How many people, on average, interact on WhatsApp per month in this initiative?	0-10 persons per month 11-50 persons per month 51-100 persons per month 101-500 persons per month 501-1,000 persons per month more than 1,000 persons per month more than 10,000 persons per month I don't have this information
A7.	What types of WhatsApp chats are most used in your use case? (Select all that apply)	One-to-One (1-1) Chats Group Chats Broadcast Lists Not sure Other (specify: _____)
A8.	What type of data are usually sent on WhatsApp? (Select all that apply)	Text messages Voice messages Photos Videos Files Links Not sure Other (specify: _____)
	SECTION B: YOUR OPINION 4 questions about your perspective on the use of	

	WhatsApp in this use case	
B9.	In your perspective, what are the main reasons to adopt WhatsApp in this use case? (Select at maximum 3 options)	Leadership asked us to use it Familiarity among users Available on mobile devices Low cost/no cost of implementation Low Internet data usage Real-time engagement Support multimedia (images, videos, voice messages) Lack of access to other digital alternatives Other (specify: _____) Not sure
A10.	How comfortable do you feel in your relationship with technology in general?	Very Comfortable Comfortable Neutral Uncomfortable Very Uncomfortable
A11.	How satisfied are you with the overall use of WhatsApp in this use case?	Very Satisfied Satisfied Neutral Dissatisfied Very Dissatisfied
A12.	Do you/your organization have any specific concerns or worries about using WhatsApp? (Select 3 at maximum)	Usability and Ease of Use Challenges. Cost or Price. Mixing personal and professional life Internet Connectivity Issues. Privacy Concerns Regarding Patient Data. Regulatory Compliance. Access to Cellphones by Target Population. Integration with Existing Systems. Mental Health Effects in Users Potential for Misuse or Abuse. None. Not sure. Other (specify): _____
	SECTION C: TECHNICAL ASPECTS	

A13.	Does the leadership officially recognize WhatsApp, or is its use informal/undisclosed?	Officially Recognized. Informal, Widely Acknowledged. Informal, but not Discussed Openly. I don't have this information Other
A14.	Is any patient data being transmitted on WhatsApp? (images, healthcare information, etc)	Yes, usually with identifiers (name, government ID, health system ID, etc) Yes, usually anonymized. Yes, sometimes with identifiers, sometimes anonymized. No. Other (specify: _____) Not sure.
A15.	Is the data/information transmitted on WhatsApp saved in another place that is not WhatsApp?	No. Yes, some of them are saved digitally (e.g., external drive, spreadsheet, medical record, etc). Yes, some of them are stored physically (e.g., paper printout or transcription). Yes, some of them are stored physically, and some digitally Other (specify: _____)
A16.	Are there any other apps or digital tools used in conjunction with WhatsApp for health-related activities?	No. Yes, we regularly use Microsoft Office Suite (Word, Excel, PowerPoint) or similar. Yes, we have developed a custom application for our health activities Yes, we use another third-party application (free or paid). Not sure Other
A17.	Do you have access to an IT support team or person?	Yes, every time that I need. Yes, sometimes when I need. Yes, but I never needed No. Not sure.
A18.	Have you utilized any WhatsApp-related products or services for this use case? Select all that apply	WhatsApp Business Account WhatsApp Chatbots/Scripts WhatsApp APIs (e.g., Twilio) or Business solutions (e.g., CRM, Payment services, analytic tools, etc.)

		None I don’t have this information. Other (specify: _____)
A19.	What actions does your organization take to ensure the security and anonymization of data shared/collected on WhatsApp? (Select all that apply.)	Employee Training on Data Security Compliance with Data Privacy Regulations (e.g., GDPR, LGPD, HIPAA) Anonymization of Sensitive Data Regular Data Backups Data Access Control Policies Deleting chats and data from mobile devices None Not sure Other (specify: _____)

SECTION B: ADDITIONAL OPTIONAL QUESTIONS

	"Thank you for dedicating your time to contribute to this research! If you know other professionals who have used WhatsApp in healthcare contexts, you can send them this link so they can also contribute: "Hello! I have just completed a quick survey about the use of WhatsApp in healthcare contexts. If you can collaborate, please access it here: <link>"	
B1	Please provide any additional comments, concerns, challenges, suggestions, insights, and/or opinions. (Optional)	_____