DIGITAL HEALTH TECHNOLOGIES FOR ANTI-CORRUPTION, TRANSPARENCY AND ACCOUNTABILITY: OPPORTUNITIES AND CHALLENGES FOR ZIMBABWE

Sharon R.T. Chilunjika, Alouis Chilunjika
School of Public Management Governance and Public Policy,
University of Johannesburg, South Africa
Corresponding Email: chilunjikas@staff.msu.ac.zw

Abstract

This paper explores the opportunities of digital health technologies as platforms that can be adopted to foster transparency, accountability and anti-corruption measures in Zimbabwe's public health sector. Corruption in the health domain has severe consequences for quality, access, equity and efficiency of health services, and is a barrier to the attainment of Universal Health Coverage. Digital health technologies that can foster accountability, transparency, detect and prevent corruption are particularly crucial to developing countries were corruption is a huge threat. This paper, being qualitative in its approach relied on an extensive review of scholarly journals, trusted databases, websites, policy documents and newspapers that shed light on digital health technologies and their impact on corruption. The paper establishes that Zimbabwe's public health sector is highly susceptible to corruption due to system complexity, large sums of resources involved, information asymmetry and the nature of the pharmaceutical supply chain. The study found out that digital health technologies can support anti-corruption by impacting citizen scrutiny in a number of ways including reporting on corruption, facilitating citizen participation and promoting accountability and transparency. The technologies reviewed are transparency portals, artificial intelligence, decentralized digital ledgers, and whistleblowing tools. Nevertheless, the study established that these technologies can also usher novel corruption opportunities in the health domain through the dark web and cryptocurrencies. The study concludes with some considerations for policy makers on how technologies can be harnessed to ensure that their benefits are reaped.

*Keywords: **Digital health; transparency, accountability, anti-corruption, health sector, Zimbabwe***

1. INTRODUCTION

The public health domain is a dynamic system made up of intricate interactions between a variety of stakeholders including health care institutions, patients, payers, policy makers and suppliers (Glynn 2022). It is this complexity that makes it susceptible to corruption. Corruption exacerbates inequality as it alters how health resources are distributed, consequently denying marginalized and poor people access to health care (Chilunjika, Chilunjika and Uwizeyimana 2023). This is particularly evident in African countries such as Zimbabwe where corruption has become so institutionalised. Several studies in this region illustrate how the burden of corruption impacts the poor most heavily given their limited ability to meet the demands it imposes on them (Transparency International Zimbabwe 2019; Muchena 2019;Duri 2020;).

A study by Duri (2020) reveals that poor citizens in Sub Saharan Africa are being denied access to health services as informal payments are required for medical care. Further evidence comes from a Transparency International report (2021) which states that corruption in Africa has significant negative effects on health indicators such as maternal mortality and child mortality. The report states that corruption lowers the immunization rate for infants, can avert the delivery of necessary care, particularly for the poor and discourages the use of public health facilities, which leads to thousands of deaths (Transparency International 2021). In Zimbabwe, corruption seems to be now an acceptable way of life (Transparency International Zimbabwe 2019; Chilunjika 2021). The country has been rated as being among the most corrupt in the world and is caught in a corruption persistence trap (Transparency International Zimbabwe 2019).

DIGITAL HEALTH TECHNOLOGIES FOR ANTI-CORRUPTION, TRANSPARENCY AND ACCOUNTABILITY: OPPORTUNITIES AND CHALLENGES FOR ZIMBABWE

Sharon R.T. Chilunjika, Alouis Chilunjika

Over the years a lot of corruption cases have been reported in the media from some key public institutions and sectors including health. Most worrying, the health sector has been tainted with incidents of embezzlement of health funds, bribery, theft of medical supplies, nepotism, absenteeism and corruption in pharmaceutical procurement (Chene 2015; Muchena 2019, Chilunjika *et al*., 2023). A study by Chilunjika et al., (2023) for instance, revealed irregularities in the pharmaceutical procurement processes at NatPharm, (a not for profit pharmaceutical company in Zimbabwe). The study highlighted issues including inflation of prices, distribution of substandard medical products and violation of procurement regulations. Theft of pharmaceuticals and budget leakages are also common practices in Zimbabwe's public health sector. A study by Chene (2015) reported that drugs are stolen every year in public health facilities, exacerbating further challenges of drug shortages. Similarly, a report by the Zimbabwe Human Rights Lawyers in 2011 brought to light that antiretroviral drugs in public health facilities were being diverted to the black market through covert fraud or the use of ghost patients.

Scarcity of public health services, low salaries, staff shortages and inefficiency also create fertile ground for corruption in Zimbabwe's health sector. A study by Choguya (2018) for example, revealed that low salaries among health personnel is resulting in bribery, as a means for health staff to earn a living. The study noted that in some towns and rural areas citizens can be asked for bribes to secure access to care, leading to lower utilisation of care amongst poor and disadvantaged patients. Absenteeism and moonlighting among public health personnel are also prevalent corrupt activities in Zimbabwe (Choguya 2018). These two unethical practises are particularly problematic for health service delivery when health personnel are absent from their public sector positions in order to provide care in the private domain. Commonly cited causes of absenteeism and moonlighting in Zimbabwe include poor salaries, lack of accountability and monitoring systems, and substandard working environments that include weak governance structures (Choruma 2017; Transparency International Zimbabwe 2019; Mangwaya 2021).

Specifically, poor salaries are the main driver of absenteeism among public health personnel in Zimbabwe, consequently, public health personnel in Zimbabwe choose to engage in private pursuits during working hours as a means to subsidise their low salaries. To tackle corruption in public health domain, digital health technologies have gained popularity in recent years as viable anti-corruption mechanisms. There is a broad consensus among international organizations such as the World Health Organization (WHO) and the United Nations Development Programme UNDP that digital health solutions have the potential to make significant contributions to the fight against corruption (WHO 2019; UNDP 2019). Similarly, studies by Mackey and Nayyar (2017); Baguma *et al*., (2019) and Hausenkamph *et al*., (2022) claim that digital technologies have the potential to reduce corruption by promoting transparency, accountability, opening public health sector data to citizen scrutiny, automating health processes, monitoring health personnel's activities and enabling corruption reporting.

The most commended technologies in the health domain include as mobile-health (m-health) applications, Blockchain, e-procurement, Artificial Intelligence (AI), social media and the internet. These technologies are being adopted and used to facilitate the reporting of corruption, improve access to official health data, monitor the efficiency and integrity of health services, and to make health financial data more transparent (Hausenkamph *et al*., 2022; Chilunjika and Uwizeyimana 2024). Furthermore, these technologies can also support campaigning efforts to help mobilize citizens against corruption. Digital health technologies are thus widely perceived to offer new effective ways for the detection, prevention and prosecution of corruption in the health domain. Whilst the potential benefits of digital technologies in the fight against corruption are clear even for developing countries, the uptake of these technologies in Zimbabwe's public health sector remain limited. Furthermore, since the availability of these technologies does not automatically translate into effective anti-corruption measures there is need to explore what can be done to ensure their usefulness and sustainability given social divides and power relation which often exist in developing countries such as Zimbabwe. It is against this background that this paper seeks to: (1) explore the nature, forms and impact of corruption in Zimbabwe's public health sector (2) review digital health technologies

currently used as anti-corruption tools (3) examine the potential benefits of digital health technologies in preventing corruption in Zimbabwe and (4) discuss ways in which these technologies can be misused for corruption in the health sector.

2. Literature Review
2.1 Digital health defined

The term digital health is used interchangeably with electronic-health (e-health), and is defined by the WHO as the use of Information Communication Technologies for health ICTs (WHO 2004). The WHO (2021) further defines digital health as the cost-effective and secure use of ICTs to support health service delivery and health related fields, including health surveillance, health management, health education, research, and knowledge. This implies that e-health encompasses both clinical and non-clinical facets of the healthcare system. Digital health expands the concept of e-health to include a wide range of smart devices, the internet of things and other advanced digital technologies such Blockchain, Artificial intelligence (AI) and drones (Chilunjika and Chilunjika 2023). In simple terms, e-health covers all aspects of health through the use of ICTs and the internet to provide novel ways to access health information, and to utilise and improve health services that are people centred. For the purposes of this study, digital health is defined as the use of ICTs to support the fight of corruption in the health sector. The value of digital health lies in its ability to modernise public health systems, increase efficiency, improve access health service delivery, improve data collection, and help lower healthcare costs (WHO 2021).

As an additional benefit digital health is expected to reduce corruption, increase transparency and accountability in the management of health systems (WHO 2021; Chilunjika and Chilunjika 2023). Digital health thus, makes health systems more efficient, transparent and responsive to the needs of health consumers. Digital health can also be discussed within the broader theoretical framework of "*mediatization,*" a term denoting to the over transformation of the media environment (Hepp *et al*., 2015). Mediatization is an emerging social process that enables human experience and social exchange to take place wholly or partially through engagement with media technologies which include social media and online platforms (Hepp *et al*., 2015). Through these media platforms, civil society groups and individuals around the globe can raise awareness on health matters and engage in whistle blowing on issues such as corruption. Nonetheless, despite the above mentioned high expectations and benefits of digital health in the fight against corruption, evidence of impact is mixed and limited in developing countries such as Zimbabwe, which warrants further research so as to contribute to evidence based practices for sustainable long term solutions. To the best of our knowledge no study has focused on the correlation between digital health and corruption in Zimbabwe. Thus the aim of this study is to take a step forward and to overcome this shortcoming by empirically assessing the ability of these technologies to mitigate corruption in the public health domain.

2.1 Digital health tool types

In the context of this study digital health technologies are discussed as generally facilitating the processing, transmission and display of health related information through electronic devices. These include mobile phones, computers, ipads, as well as network technology, particularly the internet. Digital health technologies can be classified in a number of ways, however these researchers opted for a categorisation driven by literature discussing digital health technology-corruption linkage. While the list below is not comprehensive, these researchers managed to keep the digital tools largely distinct from each other;

1) Transparency portals, which are digital platforms operated by the state or civil society groups that publish data on the operations of public organizations such as public hospitals and national pharmaceutical companies (Chilunjika *et al*., 2023).
2) Artificial Intelligence technologies such as neural networks, which use algorithms to deduce patterns and relationships from "mountains" of data in order to achieve organizational goals. The ability of AI technology to speedily and economically predict and uncover hidden

DIGITAL HEALTH TECHNOLOGIES FOR ANTI-CORRUPTION, TRANSPARENCY AND ACCOUNTABILITY: OPPORTUNITIES AND CHALLENGES FOR ZIMBABWE

Sharon R.T. Chilunjika, Alouis Chilunjika

relationships make them indispensable in health policy making and implementation such as corruption risk red flagging (Chilunjika *et al*., 2022).

3) Anti-corruption crowdsourcing platforms which allow citizens to report corruption cases through the internet or mobile phones. These platforms are mainly established to enable a large number of citizens to conveniently share cases of corruption 24/7(Kuriyam *et al*., 2011).

4) Digital decentralized databases such as Blockchain represent a distributed and immutable repository maintained by a peer to peer network where all users hold a copy of all the transactions and information entered into it (Ndayizigamiye and Dube 2019). The use of Blockchain technology in the public health sector has two main advantages;

- Transparency- all authorised users can access, trace and verify data as public records.
- Veracity- there is guarantee that data are complete, accurate and secure.

5) Digital services in the public health sector are a sub-form of electronic government (e-government), that involves the use of electronic tools such as digital data management systems or web based devices to deliver public health services to patients (Kuriyam *et al*., 2011).

2.3 The nature and forms of corruption in the health sector

Corruption is known as a multi-dimensional bane, perpetuated by numerous factors in society, and is a problem within health systems globally (Chilunjika 2021). There is no universally accepted definition of corruption, due to its multi-faceted nature, thus it is defined in numerous ways. Commonly, corruption is defined as the abuse of entrusted authority for private benefit (Wolfe and Gurgen 2000; Tinarwo *et al*., 2019; Glynn 2022). Furthermore, corruption ranges from grand corruption to petty or low level corruption (Tinarwo *et al*., 2019). For the purposes of this study corruption is defined simply as the misuse of authority in the health sector for private gain. This definition describes corruption within a bureaucratic context, and can be conceptualized using the principal-agent problem, with the public being principals and public health officials being agents that act on the citizens' behalf. In this case, public health officials are in possession of asymmetric data and have discretion on the allocation of resources, which potentially opens avenues for corruption.

Accordingly, measures to combat corruption in the framework of the principal-agent model generally, centre on reducing discretionary power of public officials and establishing accountability and effective oversight systems (Hussman 2011). Most of the digital health technologies that this study examines fall into this category as they aim to reduce the incidence of corruption by improving oversight and accountability in the health domain. Numerous factors have been put forward by scholars which make the health sector susceptible to corruption. These include the large sums of resources sources at the disposal of actors, system complexity, information asymmetry and the complex nature of the pharmaceutical supply chain (Chene 2015; Transparency International Zimbabwe 2019; Glynn 2022). These factors open systematic opportunities for various forms of heath corruption including theft and diversion of resources, bribery, improper financial relationships and the infiltration of counterfeit pharmaceutical products.

The huge amounts of resources channelled into the health domain globally and at national level for instance, are an attractive target for abuse, corruption and illicit gain. It is estimated that annually global spending on health exceeds USD 7.5 trillion, consequently such huge figures offer lucrative opportunities for theft and misuse of funds (Chilunjika *et al*., 2023). Furthermore, the health domain is plagued by high information irregularities. Chene (2015) notes that in some African countries health data is not equally available to all stakeholders, making it difficult to fully monitor the actions of different health players, hold them accountable and detect corruption. For example, countries without well-established public finance management systems, where paper based financial recording is predominant, health managers may manipulate financial records for private gain. This kind of corruption has been recorded in African countries such as Uganda, Nigeria and Zimbabwe (Chene 2015; Hsiao *et al*., 2019). The large number of actors involved in the health sector also worsen the chances for corrupt behaviour. Wouters (2018) highlights that the complex relationships between

health providers, health consumers, policy makers and medical suppliers makes it difficult to detect conflicts of interest that can result to policy distortions and unethical conduct. Particularly, these relationships foster situations where individuals are motivated by financial gain over the well-being of the society. Other potential manifestations of improper relationships in the public health domain, include deregulation of the sector to benefit specific interest groups, individuals or organizations, influence over health related guidelines or recommendations (Glynn 2022). The complex nature of the pharmaceutical supply chain also allows for corruption globally. Improper relationships between pharmaceutical companies, their agents, frontline practitioners in hospitals and members of selection committees in the procurement chain for instance, can result in the infiltration of counterfeit and sub-standard pharmaceuticals.

This is supported by the WHO (2017) which notes that corruption in the pharmaceutical chain has led to the circulation of substandard or falsified drugs. It is estimated that twenty percent of malaria medications, seventeen percent of antibiotics and nine percent of anaesthetics circulated globally are substandard (WHO 2017). These statistics indicate the prevalence of corruption in the pharmaceutical chain and how no one is immune to this endemic. While, these issues were reported in numerous countries of all income levels, the challenge is particularly severe in Sub Saharan Africa, which represented forty-two percent of the total reports (WHO 2019). Studies by Egharevba and Atikinson (2016); and Onwujekwe et al., (2020) also bring to light how many foreign and local pharmaceutical companies in developing countries such as Nigeria and Ghana pay bribes to have their pharmaceutical products deceitfully approved a situation which undermines the health of citizens, as some of these products can become fatal.

Finally, at country level, health sectors are often fragmented, complex and with different sub-systems catering to the health needs of different populations. For example, most countries' health systems involve a combination of public, private and non for profit health providers. Wouters, (2018) is of the view that, the manifold logics of these subsystems and the diverse legitimate and illegitimate interests of the various actors involved provide opportunities for corruption, mismanagement and unethical behaviour. The examples discussed in this section demonstrate that corruption is a global challenge, with a heterogeneous presentation. Similarly, the motivations underlying corruption in the health sector vary nation by nations. None the less the is a general consensus among scholars and international organizations involved in the fight against corruption that digital health technologies can help detect and reduce this scourge in the health domain

3. METHODOLOGY

The paper employs a qualitative methodology where a review and analysis of purposefully selected secondary data sources on digital health technologies and corruption in the public health sector was conducted. Qualitative research, focuses on understanding a specific phenomenon of social life, is differentiated by its procedures, which (most of the time) supply words instead of statistical information for assessment, as emphasised by Hennik et al., 2012 in Mapuvire et al., 2022). An internet search of research papers, newspaper articles, books and reports was done from online academic data repositories such as Google scholar, Science direct, Semantic Scholar, JSTOR, Google Books, Scopus and Google Trends. Whilst the use of documentary review in a study like this is prudent, caution should be taken by authors to not simply "lift" words and passages from available literature that they use in their research. Rather, they established the meanings of the information and its contribution to the issues being explored. Furthermore, the authors looked at the authenticity, credibility, accuracy and representativeness of digital health technologies and corruption documents that were selected. The data collected from all these sources were analysed using thematic analysis and qualitative content analysis.

4. RESULTS AND FINDINGS
4.1 Impact of corruption on health system performance in Zimbabwe

The impact of corruption on citizens' health may not always be clear and direct, but they are present nonetheless and can damage health systems and adversely affect the health of a society or

DIGITAL HEALTH TECHNOLOGIES FOR ANTI-CORRUPTION, TRANSPARENCY AND ACCOUNTABILITY: OPPORTUNITIES AND CHALLENGES FOR ZIMBABWE

Sharon R.T. Chilunjika, Alouis Chilunjika

country in numerous ways. Literature reviewed show that corruption has dire consequences on the three key dimensions of health system performance, which are quality, access and efficiency. The impact of corruption on these three dimensions in Zimbabwe's public health sector is briefly discussed below:

Access: refers to the extent to which health care consumers are able to get medical services they need when they need it (Gulliford *et al*., 2002). This study found out that access to healthcare services in Zimbabwe is being seriously hampered by theft of medicines for resale and pocketing of health funds and user fees. Embezzlement and theft of health funds occurs at all levels of Zimbabwe's public health sector and a number of these cases have been reported over the years. At government level for instance, former minister of health Dr Obadial Moyo was fired following his involvement in the embezzlement of USD 60 million meant for COVID-19 supplies (Mututwa and Ufuoma 2022). At provider level, a government audit in 2019 discovered the embezzlement of over two million USD at Beitbridge Rural District Hospital (Muchena 2019). These cases are just a few examples of how health resources in Zimbabwe are lost to theft and embezzlement which in turn hampers access to care.

Another barrier to health care access in Zimbabwe is absenteeism of medical staff in public hospitals. A study by Mangwaya (2021) for example, reported that 86% of the study respondents had visited public hospitals where health personnel were absent. This situation often occurs because clinicians are working other jobs in the private sector, so when there are dually scheduled, the public sector suffers. The study further highlighted that higher rates of absenteeism are being witnessed for qualified personnel such as doctors and pharmacists, which in the end impedes access to specialized and quality care. Bribery is also found to have negative correlation with health access in Zimbabwe. A study by Muchena (2019) found that demands for brides in exchange for health services that citizens are entitled to receive for free such as consultation for pregnant women and children under five, discourage the use of public health services. Moreover, it is alleged that in rural Zimbabwe, the more the remote the area, the greater the size of the bribe (Muchena 2019). What this entails is that the demand for bribes can increase the cost of treatment for disadvantaged patients in remote and hard to reach areas, limiting their access to care.

Quality: describes the extent to which the right health care is delivered in the right way (Muzvidziwa-Chilunjika and Chilunjika 2021). According to Sakarombe *et al*., (2023) corruption in the health sector is one of the main barriers to delivering quality health services. Similarly, this study found out that the provision of quality health services and distribution of pharmaceutical products in Zimbabwe's public health sector is being severely compromised by corruption. Sakarombe *et al*., (2023) notes that in some public hospitals good quality medicines maybe unavailable due to pharmaceutical theft, porous procurement systems or extortion. The proliferation of substandard pharmaceuticals however, lead to severe illness and death, as well as to the spread of drug resistant viral strains within the country. It was also established that unethical conduct in Zimbabwe's public health domain also lead to kickback-driven referrals and unnecessary procedures which may promote poor service delivery (Choguya 2018). Low salaries for instance, are creating an incentivised environment for doctors to carry out unnecessary tests and procedures for private gain. Doctors take advantage of their high social standing in society and recommend patients to their private practices for unnecessary procedures and tests. Similarly, a report by the World Health Organization (2015) reported that in developing countries Zimbabwe included caesarean procedures are often performed unnecessarily and are linked to negative health outcomes for women and their infants. In some extreme cases health personnel may even charge patients for fake surgeries and non-performed medical tests, which again can be classified as poor service delivery (World Health Organization 2015).

Efficiency: in health system performance refers to doing things in the most economical way. There is evidence to suggest that corruption has enormous effects on the efficiency of the public health sector in Zimbabwe, in particular the availability and use of limited resources (Marisa 2022). In Zimbabwe an estimated 2 billion USD is lost to corruption and fraud, meaning key sectors such as health are left chronically underfunded (Marisa 2022). Consequently, the end result is decay of health

infrastructure, equipment and high morbidity and mortality rates. In addition, corruption and lack of transparency also affect drug pricing in Zimbabwe. In their study Mututwa and Ufuoma (2022) brings to light how corrupt conduct affects drug pricing in Zimbabwe. The authors gave an example of how Drax International, a company awarded a tender to supply COVID-19 medical supplies by NATPHARM through nepotism and bribery inflated prices to maximise their profits. The study notes that the company won a tender to supply 5040 units of N95 masks at a unit Cost of US\$ 28 per unit, 15 000 COVID-19 test kits, at a unit price of US\$34 and 3740 protective clothing units, at a unit cost of US \$90, respectively. However, it was established, the masks costed an average US\$5 per unit, or less, with suppliers in Dubai, where Drax was registered while protective clothing units cost US\$30 (Mututwa and Ufuoma 2022). These corrupt tendencies result in crucial pharmaceuticals and medical supplies becoming more expensive and unaffordable to many ordinary Zimbabweans, consequently affecting the attainment of Universal Health Coverage and Sustainable Development Goal 3.

4.2 Possible benefits of digital health technologies as anti-corruption tools in Zimbabwe's public health sector.

In this section the researchers shift their discussion to the possible benefits of adopting and implementing digital health technologies in the fight against corruption in Zimbabwe's public health sector. These benefits include;

Increased transparency and accountability

This study revealed that digital health technologies have the potential to improve transparency in Zimbabwe's public health institutions. For the purposes of this study, transparency refers to the public availability of usable health related information. Transparency in the health domain can be discussed in two main dimensions; upward transparency which allows the government and health managers to observe the conduct or results produced by subordinates (Ndayizigamiye and Dube 2019), and downward transparency which allows citizens to observe conduct or results of public official (Rispe *et al.*, 2015). There is evidence to suggest that digital health technologies can aid in the enforcement of both upward and downward transparency. Firstly, technologies such as Blockchain enabled systems, social media and e-procurement platforms can help to detect and prevent corruption, through downward transparency, where public sector activities are made public to citizens (Kuriyan *et al.*, 2011; Ndayizigamiye and Dube 2019). It was noted that information produced by the aforementioned technologies has the potential to bring to light patterns and outliers which may expose embezzlement of funds, manipulation and falsification of data, tender manipulation and kickbacks which happen during procurement processes.

In light of this, downward transparency can thus be understood as public hospitals in Zimbabwe making health information publicly available through digital technologies, so that their decisions and actions are visible to the principals (citizens, government officers and other non-state actors) who can in turn hold them accountable. Downward transparency in the public health sector enabled by digital technologies can provide the public for example with information on cases of corruption. The firing of the former health minister Obiadah Moyo after his involvement in an embezzlement scandal is one notable example of how digital technologies (social media) to be precise was pivotal in exposing COVID-19 corruption in Zimbabwe. Digital technologies also have the potential to foster upward transparency in Zimbabwe's public health sector, for example through information flows from the citizens to the government. Public health managers can receive citizen feedback on public health personnel's performance, for instance through online portals and websites. Such feedback loops create complaint avenues that can lead to detection, prevention and punishment of corrupt behaviour within public health hospitals.

Automation of key administrative processes

Automation of administrative tasks is also a potential benefit of digital health technologies in the fight against corruption in developing countries such as Zimbabwe (Kuriyan *et al.*, 2011) Traditional financial management, human resource management and pharmaceutical procurement in Zimbabwe's public health sector involve a lot of manual processing thus, information from these activities is easy to tamper with which may result corruption. The adoption Blockchain systems in

DIGITAL HEALTH TECHNOLOGIES FOR ANTI-CORRUPTION, TRANSPARENCY AND ACCOUNTABILITY: OPPORTUNITIES AND CHALLENGES FOR ZIMBABWE

Sharon R.T. Chilunjika, Alouis Chilunjika

financial management for instance can help provide effective data traceability and auditability as the technology's immutable nature makes it difficult to alter or remove evidence of corruption. Moreover, this study also found out that technologies can aid in the fight against corruption by automating payment methods to reduce interactions between office holders and patients that can create opportunities for the development of corrupt networks (Rispe *et al*., 2018). The use of mobile payment platforms when paying hospital bills for instance, can increase the transparency and efficiency of financial management processes at public hospitals in Zimbabwe as transactions done using these platforms can easily be monitored. Similarly, Baguma *et al*., (2019) notes that mobile money platforms offer a great deal of security when it comes to financial management in the public health sector. This is because the use these platforms minimise the handling of cash, which in turn fosters accountability and reduces theft of health funds. The effectiveness of such systems in the public health domain have been noted in developing countries such as Tanzania and Kenya who are using the M-PESA mobile money service (Meeseen 2018). The successful implementation of such platforms in these developing countries could suggest that if adopted in Zimbabwe the same positive results may be yielded.

The automation of procurement systems can also be ideal in reducing corruption in Zimbabwe's health supply chain system. Studies by Chilunjika *et al*., (2023) and Chilunjika and Uwizeyimana (2024) brought to light that the pharmaceutical supply chain in Zimbabwe is soiled by numerous loopholes where procurement officials can forge documents or alter evidence of corruption. These studies suggest that adopting e-procurement can help to curtail uncontrolled adjustments to the country's pharmaceutical supply chain data. Moreover, e-procurement systems create access to shared information and integrate merchant catalogues with contract management, to ensure that every order for health services and goods is placed with the best vendor at the best price, while avoiding the risk of rogue spending or invoicing fraud (Mackey and Nayyar 2017). All these benefits emanate from the creation of digitalised workflows which help remove bottlenecks, unnecessary human error and minimise fraud.

Additionally, the study found out that automation of HRM systems can help reduce unethical conduct in Zimbabwe's public health sector. A study by Gweshe *et al*., (2022) highlighted that the efficiency of Zimbabwe's public health sector HRM practices is affected by corrupt public officials and human resource managers who abuse systems for private gain. There is evidence in literature to suggest that the adoption of AI enabled HRM systems in the recruitment process can reduce bias and unethical conduct (Vrontis *et al*., 2022; Gweshe *et al*., 2022). Furthermore, AI enabled HRM systems can also offer a more unbiased approach to performance management through the use of data driven by algorithms. This is in line with Vrontis *et al*., (2022) who notes that AI enabled performance management systems help to lessen bias in performance management as they are more accurate and offer comprehensive approaches to staff performance evaluation. Through the use of AI, HR managers in Zimbabwe's public health sector can thus make performance management decisions based on corroborated evidence.

Other expected anti-corruption benefits associated with digital health technologies in Zimbabwe public sector include:

- eliminating intermediaries that often expedite bribery.
- reducing bureaucratic red-tape in the public health sector as a measure to remove potential entry points for corruption.
- Providing a wide range of online platforms for the public to report and mobilise against corruption.
- Receiving feedback and reports from patients to frequently track satisfaction, identify challenges and improve the quality of health services.

4.3 Digital health technologies and corruption: a negative side

Although this is not the main objective of this study, the researchers further investigated the negative effect of digital health technologies in fight against corruption in Zimbabwe's public health

sector. Scholars such as Kossow and Dykes (2018) underline the notion that digital technologies may reduce or increase corruption depending on the type of intervention and context. Similarly, a report by the World Bank (2016) denotes that the power of digital technologies to improve public service delivery by enhancing transparency and accountability significantly varies by the type of service and activity, and their amenability to improve through these technologies. Literature reviewed shows that technologies can have a corruption enhancing effect as their use in the public health domain can introduce novel opportunities for covering unethical conduct of any form (Baguna *et al*., 2019; Hsiao *et al*., 2019). Technologies may also present advanced layers of complexity making it easier for public official to hide corruption. Data security, sharing, privacy and storage issues can also emanate from the use of digital technologies in the health domain, particularly in developing countries such as Zimbabwe were the implementation of these technologies in still in its infancy stages. Around the globe there have been tremendous efforts to breach online health data including patient information, insurance data and clinical trials (Kossow and Dykes 2018).

Developing countries that lack advanced software, skills and infrastructure to protect online health information, are particularly vulnerable to hacking and manipulation which affects patient satisfaction with the use of these technologies (Furusa and Coleman 2018). Furthermore, the use of technologies in developing countries, can also lay the foundation of vulnerability for hacking and manipulation at a spectrum simply not possible in traditional paper-based systems. Technologies may also shift corruption to other areas of public health activities that are not yet automated, consequently resulting in more corruption. Additionally, digital technologies may also flourish a global web of corruption, making law enforcement that in mainly country bound ineffective. In line with this, Hsiao *et al*., (2019) note that digital technologies the internet in particular, may enable bribery markets and the exchange of illegal goods and services to operate more efficiently through what is commonly known as online black market or dark net and the introduction of cryptocurrencies.

The adoption and use digital technologies in the health sector, particularly in developing countries may also concentrate novel system-wide corruption opportunities in the few hands of those who possess advanced technological skills (Baguna *et al*., 2019). Furthermore, increased transparency brought by digital technologies can also facilitate corrupt behaviour for instance, in public pharmaceutical procurement by aiding bidders to more efficiently identify which officials to bribe (Wolfe and Gurgen 2000). Literature reviewed also brought to light that virtual activism especially in developing countries may give citizens the impression that they are taking action against corruption, while the online activity does not translate into significant impact (Kossow and Dykes 2018) In addition, digital tools such as social media also carry the risk that misleading and confusing information might be spread, leading to unnecessary public outrage (Furusa and Coleman 2018). In sum, the reviewed literature points at both positive and negative impacts of digital technology on corruption in the public health sector depending on how impact mechanisms interact with contextual factors.

5. CONCLUSION AND RECOMMENDATIONS

The purpose of the study was to explore the potential benefits of digital health technologies in the fight against corruption in Zimbabwe's public health sector. It began with a conceptual analysis of corruption and digital technologies which aided in understanding the dimensions of corruption, its impact on the public health sector and the various technologies that are being harnessed to fight corruption in the health domain. The study found out that corrupt activities including embezzlement and theft of funds, bribery and absenteeism prevalent in Zimbabwe's public sector have dire consequences for quality, access and efficiency of health services, undermining the well-being of ordinary Zimbabweans who depend on the public health sector. It was established that digital technologies such as AI, Blockchain, the internet, e-procurement and social media have the potential to increase transparency, accountability and reduce corruption in the public health sector.

The study finding show that the underlying features of these technologies hold significant promise to reduce corruption as demonstrated by the development of enhanced security features that help curtail fraud, manipulation of data, theft and embezzlement of health resources. However, while

DIGITAL HEALTH TECHNOLOGIES FOR ANTI-CORRUPTION, TRANSPARENCY AND ACCOUNTABILITY: OPPORTUNITIES AND CHALLENGES FOR ZIMBABWE

Sharon R.T. Chilunjika, Alouis Chilunjika

it is clear that the aforementioned technologies are crucial tools in the fight against corruption, the study brought to light that these technologies can also be manipulated to increase corruption in the public health sector. In light of this there is need for digital technology- enabled reforms that are in tandem with socio-economic context in which they are to be implemented. Moreover, there is need for health policy makers to clarify the impact mechanism which underpin the expected anti-corruption impact. Lastly the study recommends the government and health policy makers in Zimbabwe to invest in the adoption of digital health technologies as they present benefits in the fight corruption.

REFERENCES

Baguma, R., Mutungi, F. and Janowski, T. 2019. *Towards digital anti-corruption typology for public service delivery*. ACM International Conference Proceeding Series: 484–494.

Chilunjika, S.R.T and Uwizeyimana, D.E. 2024. Blockchain Technology for Health Information Management: A case of Zimbabwe. *Insights into Regional Development*, 6(1):59-73. http://doi.org/10.9770/IRD.2024.6.1(5).

Chilunjika, S.R.T., Chilunjika, A., & Uwizeyimana, D.E. 2023. Implementing e-procurement at Zimbabwe' National Pharmaceutical Company (NATPHAM): Challenges and Prospects. *JeDEM- Journal of E-Democracy and Open Government*, 15(1):124-143. https://doi.org/10.29379/jedem.v15i1.761.

Chilunjika, S.R.T. & Chilunjika, A. 2023. Embracing e-health systems in managing the COVID-19 Pandemic in Sub Saharan Africa. *Social Sciences and Humanities Open*, 8(2023):1-8. 100556. https//doi.org/10.1016.j.ssaho.2023.100556.

Chilunjika, A., Intauno, K., & Chilunjika, S.R.T. 2022. Artificial intelligence and public sector human resource management in South Africa: Opportunities, challenges and prospects. *SA Journal of Human Resource Management/SA Tydskrif vir Menslikehulpbronbestuur*,20(0), a1972. https://doi. org/10.4102/sajhrm.v20i0.19.

Chilunjika, A. 2021. Revamping the Zimbabwe Anti-Corruption Commission. *African Journal of Business and Economic Research*, 16 (2): 311-327.

Choguya, N.Z. 2018. Corruption in health service delivery: The case of maternal health in rural Zimbabwe. *In Review of Human Factor Studies*, 24 (1), pp 81 – 104

Choruma, A.2017. *Corruption stalls Zimbabwe's economic agenda*, Financial Gazette, June 30

Egharevba, E & Atikinson, J. (2016). The role of corruption and unethical behaviour in precluding the placement of industry sponsored clinical trials in Sub Saharan Africa: Stakeholder views. *Contemporary Clinical Trials Communication*, 3 (1), 102-110.

Furusa, S.S. & Coleman, A., (2018). Factors Influencing E-health Implementation by Medical Doctors in Public Hospitals in Zimbabwe. *South Africa Journal of Information Management*,12 (2), 928-94.

Glynn E. H. (2022). Corruption in the health sector: A problem in need of a systems-thinking approach. *Frontiers in public health*, 10, 910073. https://doi.org/10.3389/fpubh.2022.910073.

Gweshe, G.T., Pedzisai, P., Nkala, B., & Chiware, M. 2022. *Digitalisation of human resources and process necessary for public sector transformation in Zimbabwe* in Chiware, Nkala, Chirisa eds, Transformational human resources management in Zimbabwe: Solutions for the public sector in the 21st Century, Springer Nature, Singapore Pte Ltd.

Gulliford, M., Figueroa-Munoz, J., Morgan, M., Hughes, D., Gibson, B., Beech, R., & Hudson, M. (2002). What does 'access to health care' mean?. *Journal of health services research & policy*, 7(3), 186–188. https://doi.org/10.1258/135581902760082517.

Hausenkamph, D.S., Cuadrado, D.C., Aarvik, P. and Kirta, M. 2022. *Anti—corruption, transparency and accountability in health information system*. Available at https://www.u4.no/publications/anti-corruption-transparency-and-accountability-in-health-management-information-systems.pdf Accessed on 21 March 2024.

Hepp, A., Hjarvard, S., & Lundby, K. 2015. Mediatization: Theorizing the interplay between media, culture and society. *Media Culture & Society*, 18, 1–11. https://doi.org/10.1177/0163443715573835

Hussman, J. 2011. *Addressing corruption in the health sector: securing equitable access to healthcare for everyone*. U4. Anti-corruption Resource Center. Available at https://www.u4/no/publications/adressing-corruption-in-the-health sector-securing-eq uitable-access-to-health-care-for-everyone-pdf. Accessed on 20 March 2024.

Hsiao A, Vogt V and Quentin W. 2019. Effect of corruption on perceived difficulties in healthcare access in sub-Saharan Africa. *PLoS ONE.* 14:e0220583. doi: 10.1371/journal.pone.0220583

Hennik, M., Hutter, I., & Biley, A. 2012. *Qualitative research methods*. Sage publication Ltd.

Kuriyan, R., Bailur, S., Gigler, B.S., & Park, K.R. (2011). Technologies for transparency and accountability. Implications for ICT Policy and Implementation, 1–6

Mackey, T.K. & Nayyar, G. 2017. A review of existing and emerging digital technologies to combat the global trade in fake medicines, Expert Opinion on Drug Safety, 16:5, 587-602, DOI: 10.1080/14740338.2017.1313227

Mapuvire, D.H., Chilunjika, S.R.T. & Mutasa, F. 2022. *The health and safety perspectives in the Zimbabwe public sector*, in Chiware, Nkala, Chirisa eds, Transformational human resources management in Zimbabwe: Solutions for the public sector in the 21st Century, Springer Nature, Singapore Pte Ltd.

Mangwaya M. 2021. *Health workers shunning public practice*. Available at https://www.newsday.co.zw/slider/article/33012/health-workers-shunning-public-practice Accessed on 1 February 2024.

Marisa J. 2022. *Zimbabwe health system grapples with corruption*. Available at https://www.newsday.co.zw/thestandard/health-amp-fitness/article/200000644/health-talk-zim-health-system-grapples-with-corruption#google_vignette. Accessed on 2 February 2024

Muchena, R.I. 2019. *An Exploration of corruption in the health sector: A case of Zimbabwe*. Masters in Public Administration Thesis, Stellenbosch University: Cape Town.

Muzvidziwa-Chilunjika, S.R.T. & Chilunjika, A. 2021. Dynamics surrounding the implementation of the Primary Health Care (PHC) Approach in Zimbabwe's Rural Areas: The Case of Mt Darwin District. *International Journal of Clinical Inventions and Medical Sciences*, 3(1): 1-17.

Ndayizigamiye, P. & Dube, S. 2019. *Potential adoption of blockchain technology to enhance transparency and accountability in the public healthcare system in South Africa*, in Proceedings of the 2019 International Multidisciplinary Information Technology and Engineering Conference (IMITEC), IEEEXplore, Emerald Resort & Casino, Vanderbijlpark, Gauteng, November 21-22, 2019. https://doi.org/10.1109/IMITEC45504.2019.9015920

Onwujekwe, O., Agwu, P., Odii, A., Orjiakoe, C., Obodoechi, D., Nwokolo, C., Roy, P., Hutchinson, E., Mckee, M. & Balabanova, D. 2020. *Corruption in the procurement of pharma ceuticals in Anglophone Sub Saharan Africa: A scoping literature review*. Working paper 028. Anti corruption Evidence. ACE SOAS. Consurtium.

Laetitia C Rispe, L.C., de Jager, P., & Fonn, S. 2015. "Exploring corruption in the South African health sector." *Health Policy and Planning*, doi: 10.1093/heapol/czv047.

Tinarwo, J., Mzizi, V., Uwizeyimana, D & Zimano F. R. 2019. *The relationship between corruption and economic development: Lessons from Zimbabwe's Public Enterprises*. Conference Proceedings: Social Sciences Research Society. pp. 90-100

Transparency International. 2019. *The Ignored Pandemic*. Available @ http://ti-health.org/content/the-ignored-pandemic/. Accessed 20 February 2024.

Transparency International Zimbabwe. 2019. *Gender and Corruption in Zimbabwe*. Available at http://www.tizim.org/published-reports/ Accessed 1 March 2024.

Sakarombe, E., Mutema, E.P., Muzvidziwa-Chilunjika, S.R.T. and Mufema-Mapuvire, D.H., 2023. Service delivery and corruption in local authorities in Zimbabwe: A reflection of Chitungwiza municipality (2018-2023). *International Journal of Judicial Law*.

DIGITAL HEALTH TECHNOLOGIES FOR ANTI-CORRUPTION, TRANSPARENCY AND ACCOUNTABILITY: OPPORTUNITIES AND CHALLENGES FOR ZIMBABWE

Sharon R.T. Chilunjika, Alouis Chilunjika

Vrontis, D., Christofi, M., Pereira, V., Tarba, S., Makrides, A., & Trichina, E. 2021. Artificial intelligence, robotics, advanced technologies and human resource management: a systematic review. *The International Journal of Human Resource Management*, 1(1)-30.

Wolfe, T. and Gurgen, E. 2000. *Improving Governance and Fighting Corruption in the Baltic and CIS Countries: The Role of the IMF*. Washington D.C.: World Bank Group.