

Pandemic Preparedness of Private Retail Pharmacies in Ghana: Lessons from COVID-19 and Readiness for Disease X

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ABSTRACT

Background: Private retail pharmacies represent a critical but underutilized frontline resource in pandemic prevention and response, particularly in low- and middle-income countries. Despite their strategic importance, evidence from both high-income and LMICs reveals persistent and systemic gaps in emergency preparedness among community pharmacies. The spectre of Disease X makes it urgent to evaluate how prepared these facilities are for future health system shocks.

Methods: Adhering to the Standards for Reporting Qualitative Research checklist, this study employed a qualitative design in which data collection was structured deductively around the WHO Health Systems Framework while thematic analysis proceeded inductively from the interview data. Semi-structured, face-to-face interviews were conducted with lead pharmacists from 32 purposively selected private retail pharmacies across the Greater Accra and Central Regions of Ghana. Sampling continued until data saturation was achieved. Data were audio-recorded, transcribed verbatim, and subjected to narrative analysis. Trustworthiness was ensured through dependability, confirmability, reflexivity, and member checking. The WHO Health Systems Framework underpinned both data collection and analysis, with findings mapped onto its six building blocks.

Findings: Findings revealed that prior to COVID-19, the vast majority of pharmacies had no structured emergency preparedness and response plans, and were not familiar with the concept of health system shocks. Their response to the pandemic was therefore largely reactive rather than proactive, driven by government-issued safety protocols rather than facility-level planning. While pharmacies adopted infection prevention and control measures at the height of the pandemic, gaps persisted across the financing, information systems, and governance building blocks. Post-pandemic, most pharmacies reverted to pre-crisis operations, suggesting a pattern of crisis fatigue. Only three pharmacies reported maintaining enhanced preparedness protocols after the pandemic subsided. Critically, 31 out of 32 respondents had no knowledge of Disease X, rendering them unable to plan toward the next potential pandemic.

Conclusion: The findings reveal deep structural and knowledge-based gaps in the pandemic preparedness of private retail pharmacies in Ghana. In the context of global momentum toward strengthening pandemic prevention frameworks, including the adoption of the WHO Pandemic Agreement in May 2025, the pharmacy sector in Ghana requires urgent, systematic capacity building.

Keywords: Disease X, COVID-19, pandemic preparedness, private retail pharmacy, community pharmacy, health system resilience, WHO health systems framework

INTRODUCTION

Private retail pharmacies, widely referred to as community pharmacies, occupy a strategically significant but chronically underutilized position within health systems, particularly in low- and middle-income countries (LMICs) such as Ghana. In settings where formal healthcare infrastructure is overstretched and geographic access to hospitals is limited, community pharmacies frequently serve as the first, and sometimes only, point of healthcare contact for a substantial proportion of the population (Bahlol and Dewey, 2021; Mugo et al., 2021). This reality is amplified by the high prevalence of self-medication in Ghana. A systematic review and meta-

analysis by Opoku et al. (2023) covering 31 studies and 48,553 Ghanaians estimated a pooled self-medication prevalence of 54.0% (95% CI: 43.0% to 66.0%), with private retail pharmacies being the most frequently accessed source of medicines. Given this landscape, community pharmacies are not simply retail outlets. They are de facto primary healthcare nodes, capable of functioning as early warning sentinels and frontline responders in pandemic settings.

The COVID-19 pandemic, which was declared a Public Health Emergency of International Concern (PHEIC) by the WHO in January 2020 and upgraded to a global pandemic in March 2020, exposed both the importance and the unpreparedness of community pharmacies worldwide. In Ghana, which recorded its first confirmed case on 12 March 2020, private retail pharmacies experienced acute shortages of personal protective equipment (PPE), supply chain disruptions, and escalating demand for over-the-counter medication as patients sought to self-diagnose and self-treat COVID-like symptoms (Opoku et al., 2023). Evidence from LMICs further documented that weak regulatory enforcement was allowing non-prescription dispensing of antibiotics in community drug retail outlets even during the pandemic period, compounding risks of antimicrobial resistance (Nortey et al., 2025; Belachew et al., 2021).

The question of future pandemic preparedness has taken on new urgency following the COVID-19 experience. The WHO has identified Disease X as a placeholder designation for an as-yet-unknown pathogen that could cause a serious international epidemic or pandemic, potentially with transmission characteristics and severity exceeding those of COVID-19 (WHO, 2023). Recent outbreaks of mpox, Marburg virus disease, and avian influenza H5N1, alongside the formal adoption of the WHO Pandemic Agreement by 194 Member States at the Seventy-eighth World Health Assembly in May 2025, emphasize that the global health community considers the threat of Disease X neither hypothetical nor distant (Parums, 2025; WHO, 2025). In sub-Saharan Africa, where fewer than one-third of countries operate fully functional Public Health Emergency Operations Centers and health workforce surge capacity remains critically inadequate, the vulnerability to Disease X is particularly acute (Sasie et al., 2026).

Despite the growing literature on pandemic preparedness among hospitals and public sector facilities, private retail pharmacies in LMICs remain understudied. Existing research has predominantly been conducted in high-income settings or has focused on public-sector facilities (Bahlol and Dewey, 2021; Boateng-Osei et al., 2023; Ejimele and Fatusi, 2021). Studies examining preparedness through the lens of the WHO Health Systems Framework, which provides a structured and comprehensive analytical structure covering all critical dimensions of health system function, are particularly scarce. This study addresses that gap directly. By grounding the inquiry in the WHO Health Systems Framework (WHO, 2007), it ensures that preparedness is assessed not only in terms of infection control but across all six building blocks of a functioning health system: service delivery, health workforce, health information systems, essential medicines, health financing, and leadership and governance.

This study therefore sought to (i) examine the pre-COVID-19 pandemic preparedness of private retail pharmacies in the Greater Accra and Central Regions of Ghana; (ii) assess how these pharmacies responded to the COVID-19 pandemic in relation to the WHO Health Systems Framework; (iii) identify lessons learned and post-pandemic interventions instituted; and (iv) evaluate the current level of preparedness of these pharmacies for Disease X. The findings of this study are timely and relevant, offering evidence that can directly inform pharmacy regulation, policy, and continuing professional development in Ghana and across comparable LMICs at a moment when the global health community is actively redrawing the architecture of pandemic preparedness.

Theoretical Framework

This study is grounded in the WHO Health Systems Framework (WHO, 2007), a widely applied conceptual tool for evaluating health system performance and resilience. Developed in response to the global health system strengthening agenda, the framework proposes six interdependent building blocks that collectively determine how well a health system functions: (i) service delivery, which concerns the effective, safe, and quality provision of health interventions to those who need them; (ii) health workforce, which addresses the responsiveness and efficiency of health workers in achieving the best possible outcomes; (iii) health information systems, which ensure the production, analysis, and use of reliable and timely data; (iv) access to essential medicines and medical

products, which concerns equitable and scientifically sound access to needed commodities; (v) health financing, which ensures that adequate funds are raised and that people are protected from the financial consequences of ill health; and (vi) leadership and governance, which involves strategic oversight, regulation, accountability, and coalition building (WHO, 2007; WHO, 2010; Manyazewal, 2017).

The framework has been used in diverse health system contexts, including a multi-country analysis of COVID-19 health system resilience (Arsenault et al., 2022), an assessment of public health facility performance in Ethiopia (Manyazewal, 2017), and an evaluation of disability-inclusive health responses (Kuper et al., 2024). Sagan et al. (2021) further demonstrated its applicability to analyzing governance dimensions of health system resilience during the pandemic. By mapping the preparedness of private retail pharmacies against each of the six building blocks, this study generates a structured and holistic assessment that can identify specific gaps while producing actionable, building-block-specific recommendations. This is a critical advantage over studies that assess preparedness through single dimensions such as infection control alone.

METHODS

Study Design and Setting

This study employed a qualitative research design that combined a deductive, framework-guided approach to data collection with an inductive approach to thematic analysis, consistent with the epistemological requirements of exploring lived experience and contextual understanding in a setting where quantitative data are limited and where the phenomenon of interest is deeply embedded in operational and cultural context. Data collection was deductive in the sense that the interview guide was built directly from the six building blocks of the WHO Health Systems Framework (WHO, 2007). Analysis was inductive in the sense that codes and themes were generated from the content of participant accounts rather than fixed in advance, and were organized within the framework's building blocks only at the interpretation stage. This combination follows a directed approach to qualitative inquiry, in which an existing framework guides data collection while coding and theme development remain open to what participants actually say. The SRQR checklist guided all aspects of study design, conduct, and reporting (O'Brien et al., 2014). The study was conducted in the Greater Accra and Central Regions of Ghana from March to May 2024. These regions were purposively selected because they represent urban and peri-urban pharmacy practice environments, respectively, enabling a degree of contextual contrast while remaining within a geographically manageable scope. The researcher reasoned that differences in population density, client literacy, and proximity to regulatory oversight between these regions could yield contextually distinct preparedness experiences.

Sampling and Participants

Purposive sampling was employed to select 32 private retail pharmacies. The sole inclusion criterion was that each pharmacy must have been in operation prior to the onset of COVID-19 in Ghana in March 2020, ensuring that respondents could meaningfully reflect on pre-pandemic, pandemic-era, and post-pandemic preparedness. Sampling continued iteratively across both regions until data saturation was reached: the point at which no new themes, codes, or conceptual categories emerged from additional interviews (Guest et al., 2006). In-depth interviews were conducted with the lead pharmacist at each facility or, where the lead pharmacist was unavailable, with a senior designated representative with operational authority. Eligible pharmacies were identified from the list of retail pharmacies licensed with the Pharmacy Council of Ghana for the two regions, from which the researcher purposively selected facilities to reflect variation in years of operation, client volume, and urban or peri-urban location. Owners or lead pharmacists were approached in person at their pharmacies, informed about the purpose and requirements of the study, and invited to participate, with a follow-up visit or call arranged for those who needed time to decide. Saturation was assessed on an ongoing basis. After each interview, the researcher reviewed the transcript and updated a running list of codes, comparing newly generated codes against those already identified, and sampling within each region continued until consecutive interviews produced no additional codes or conceptual categories.

Data Collection

A semi-structured interview guide was developed deductively from the WHO Health Systems Framework (WHO, 2007) and inductively informed by the existing pandemic preparedness literature. The guide comprised six thematic sections, one for each WHO Health Systems Framework building block, with structured questions covering the pre-pandemic, pandemic, and post-pandemic periods in each section, together with open follow-up prompts that allowed participants to raise considerations not anticipated by the framework. This structure meant that data collection was directed by the framework while remaining open to inductive elaboration, and it was this inductive elaboration that formed the basis of the subsequent coding and analysis. The guide was validated by two public health experts for content validity and appropriateness and was subsequently pilot-tested in three private retail pharmacies in the Western Region of Ghana, resulting in minor refinements to question phrasing and sequencing. All interviews were conducted face-to-face. This mode of data collection was selected because it facilitates the observation of non-verbal communicative cues, including body language, facial expressions, and hesitations, which can provide important contextual information beyond verbal responses (Kvale, 2009). The face-to-face format also fostered deeper engagement and more elaborate responses, particularly on sensitive topics such as actual dispensing practices during the pandemic. Each interview lasted between 35 and 60 minutes. With the informed consent of participants, all interviews were audio-recorded using a digital voice recorder and stored securely.

Data Management and Analysis

Audio recordings were transcribed verbatim using Google Voice technology, after which transcripts were manually reviewed and corrected by the researcher for transcription accuracy. Narrative analysis was employed as the primary analytical method, which is appropriate for capturing the sequential and contextually embedded nature of participants' experiences (Riessman, 2008). The analytical process involved a first cycle of open coding to identify initial themes, followed by a second cycle of pattern coding to cluster codes into broader thematic categories anchored to the six building blocks of the WHO Health Systems Framework. The researcher maintained an active reflexive journal throughout data collection and analysis, documenting positional assumptions and analytical decisions to mitigate interpretive bias (Finlay, 2002). Results were reported in alignment with the study's objectives.

Trustworthiness

Trustworthiness was established through four strategies: dependability, whereby an audit trail of methodological decisions was maintained; confirmability, whereby findings were grounded in participant accounts rather than researcher inference; reflexivity, through journal-based self-assessment of positionality; and member checking, whereby interview transcripts were returned to participants for verification of accuracy and contextual fidelity (Lincoln and Guba, 1985).

Researcher Positionality

The researcher is a health systems academic based in a department of health administration and education rather than a practicing community pharmacist, and held no professional or supervisory relationship with any of the participating pharmacies prior to the study. This outsider position was judged to reduce the likelihood that participants would shape their responses around a perceived professional evaluator, while also meaning that some operational details of day-to-day pharmacy practice had to be actively probed for during interviews rather than assumed. The reflexive journal described under Trustworthiness was used throughout data collection and analysis to record these assumptions and to monitor their influence on question framing, probing, and interpretation.

Ethical Considerations

Ethical approval was obtained from the relevant Ethics Review Board. Participation was voluntary and each participant provided written informed consent prior to their interview. Participants were assured of the right to

withdraw at any stage without consequence. All identifying information was replaced with pseudonyms to protect anonymity. Data were stored on a password-protected device accessible only to the researcher.

Findings

Demographic Characteristics of Respondents

A total of 32 private retail pharmacies participated in this study, with interviews conducted across the Greater Accra (n = 21; 65.6%) and Central (n = 11; 34.4%) Regions. Demographic characteristics of respondents are presented in Table 1. The majority of pharmacies (n = 15; 46.9%) had been in operation for over 15 years, suggesting considerable institutional experience, while only five facilities (15.6%) had been operating for fewer than ten years. The average daily client load ranged from 10 to over 50 clients, with the modal category being 20 to 30 clients per day (n = 13; 40.6%), indicating that these pharmacies collectively served a substantial volume of community health seekers. Regarding pharmacist qualifications, the majority held either a BPharm (n = 13; 40.6%) or PharmD (n = 8; 25.0%) degree; one respondent held a PhD in Health Services Management rather than pharmacy. In Ghana, the BPharm has been phased out and replaced by the PharmD as the entry-level pharmacy qualification, meaning the workforce in this study reflects a generational transition in professional training.

Table 1. Demographic Characteristics of Respondent Pharmacies and Their Lead Pharmacists

Demographic Characteristic	Frequency (n)	Percentage (%)
Geographical Location		
Greater Accra Region	21	65.6
Central Region	11	34.4
Total	32	100.0
Period of Operation		
Above 15 years	15	46.9
10 to 15 years	12	37.5
4 to 10 years	5	15.6
Total	32	100.0
Average Daily Client Load		
40 to 50 clients	4	12.5
30 to 40 clients	6	18.8
20 to 30 clients	13	40.6
10 to 20 clients	9	28.1
Total	32	100.0
Highest Qualification of Lead Pharmacist		

Doctor of Philosophy (PhD)	1	3.1
Masters degree	10	31.3
Bachelor of Pharmacy (BPharm)	13	40.6
Doctor of Pharmacy (PharmD)	8	25.0
Total	32	100.0

Note. GAR = Greater Accra Region; CR = Central Region; BPharm = Bachelor of Pharmacy; PharmD = Doctor of Pharmacy. The PhD holder's doctoral qualification was in Health Services Management, not pharmacy.

Pre-COVID-19 Pandemic Preparedness

Findings from the interviews revealed that the overwhelming majority of pharmacies (31 of 32) had no structured emergency preparedness and response plan prior to the emergence of COVID-19. Respondents consistently reported that the concept of health system shocks was not part of their operational consciousness and that the perceived remoteness of such events from their local context precluded proactive planning.

Respondent 15 (R15GAR) stated: *"Before the year 2020, the facility was not in any way prepared for health system shocks as things of that nature were even hardly thought of, neither was there an emergency preparedness plan because it had been so long since the happenstance of such things in the world."*

Similarly, Respondent 23 (R23CR) noted: *"To be very honest, we were not prepared for COVID-19. We did not think a disease of this nature could even occur. Especially in Ghana, things like this do not happen often, so it would not even occur to you to develop an emergency preparedness plan for a disease like this."*

Despite this absence of formal planning, some pharmacies had incidentally established internal operational systems for managing day-to-day workplace contingencies. These systems, while not designed for pandemic scenarios, provided a minimal degree of functional readiness. As Respondent 6 (R6CR) explained: *"Even though there were no preparedness for health system shocks by the facility, there were systems that were implemented for other reasons within the facility before the onset of COVID-19. So when COVID-19 hit, these systems turned out to be just what may be needed."* These improvised measures were mapped onto the WHO Health Systems Framework building blocks and are presented in Table 2. Notably, no respondent reported any pre-existing measures relating to leadership and governance, health financing, or health information systems, representing the most critical structural gaps in pre-pandemic readiness.

Table 2. Pre-COVID-19 Internal Operational Measures Among Study Pharmacies, Mapped to WHO Health Systems Building Blocks

Specific Measure	WHO Health System Building Block	Representative Quote	Respondent
Maintaining minimum of two staff on duty plus on-call backup	Health Workforce	"We had a minimum of 2 working staff in the facility which ensured not more than two persons in the pharmacy per shift; in addition, we always had an additional staff on standby."	R2GAR; R30CR
Conscious stocking of essential and community-specific medicines	Access to Essential Medicines	"We always made conscious effort to stock the medications on our essential drug list and made it a point not to run out of commonly prescribed medications."	R5CR; R23CR

Use of face masks (mainly due to dusty environments) and hand sanitisers	Service Delivery / Infection Prevention	"Infection prevention measures such as wearing of nose masks were in place, mostly because the pharmacy is located adjacent to an untarred road."	R12GAR; R32GAR
No measures identified	Leadership and Governance; Health Financing; Health Information Systems	No respondent reported any pre-existing measures related to these three building blocks.	All

Note. PPE = Personal Protective Equipment. All measures were incidental to daily operations, not designed as pandemic preparedness strategies. Responses mapped by the researcher to building blocks following narrative analysis.

Response to the COVID-19 Pandemic

Consistent with their pre-pandemic unpreparedness, the pharmacies' response to COVID-19 was described by respondents as predominantly reactive. The emergence of the pandemic caught facilities off guard, and responses were largely dictated by government and Ministry of Health-issued safety protocols rather than facility-level emergency plans.

Respondent 14 (R14GAR) recounted: *"Even when we started hearing news of this COVID-19 disease in the news, we did not think it would get to Ghana. We thought it was going to remain in the Western world and just die off. As a result, we could not be proactive in dealing with the pandemic. It took us by surprise, so I think we were largely reactive, especially at the early stages."*

The infection prevention and control measures adopted in response to the pandemic protocols included social distancing through physical barricades within pharmacy spaces, provision of veronica buckets and hand sanitizers, disinfection of door handles and surfaces, and mandatory mask wearing for staff. These measures reflect compliance with service delivery and infection control requirements but did not extend to the other building blocks. Respondent 25 (R25GAR) noted: *"During the pandemic, we handled the situation by adhering to the safety protocol we were given. A barricade was made inside the pharmacy to ensure a safe distance between the patients and the customers."*

A notable finding was that all 32 respondents denied selling over-the-counter medications to patients presenting with COVID-like symptoms without first conducting a structured symptom inquiry. Pharmacists reported probing for hallmark symptoms including loss of smell and taste, fever, cough, and recent travel history, and referring suspected cases to the nearest hospital. While this self-reported behavior is laudable, it is in tension with documented anecdotal evidence from Ghana and broader LMIC literature suggesting widespread over-the-counter sales during the pandemic (Opoku et al., 2023; Nortey et al., 2025). The possibility of social desirability bias in responses to this particular question cannot be excluded and is acknowledged as a limitation.

Lessons Learned and Post-Pandemic Interventions

All 32 respondents reported that COVID-19 had generated significant learning. The dominant lessons articulated centered on the unpredictability of health system shocks, the importance of maintaining safety protocols at all times, the need to educate the public on health matters, and the value of staying updated with global disease trends. These themes align with findings from Watson et al. (2019), Buheji and Buheji (2020), and the International Pharmaceutical Federation (FIP, 2020), all of whom identified adaptability, real-time information use, and community health education as hallmarks of resilient pharmacy responses to public health emergencies. As Respondent 11 (R11GAR) reflected: *"Anything can happen in the health system at any time, so proper measures must be put in place to ensure readiness in case of any future pandemics or epidemics. The pandemic has taught me to ensure the availability of personal protection equipment always, as the future is uncertain."*

Despite this expressed awareness, the post-pandemic operational reality of most pharmacies told a different story. Twenty-nine of the 32 pharmacies reported reverting to pre-pandemic operational norms once the immediate threat subsided, discontinuing practices such as social distancing and masking. Respondent 10 (R10CR) acknowledged: *"To be honest, we sometimes even forget to sanitize our hands in between patients, and for wearing of face masks, we do not do it as much anymore."* This pattern of post-crisis reversion is well-documented in the global literature and has been attributed to pandemic fatigue, financial and logistical constraints, and a diminishing sense of threat once case counts decline (WHO, 2020; Latonen et al., 2024).

Only three pharmacies (R3GAR, R13GAR, R16CR) reported maintaining or institutionalising enhanced preparedness measures after the pandemic declined. Their post-pandemic interventions, mapped against the WHO Health Systems Framework, are presented in Table 3. Importantly, even these more proactive pharmacies had no provisions within their post-pandemic protocols for health financing or health information systems, the two building blocks most critical for sustained long-term resilience.

Table 3. Post-Pandemic Preparedness Interventions Among the Three Proactive Pharmacies, Mapped to WHO Health Systems Building Blocks

WHO Building Block	Representative Quote	Respondent	Gap / Omission
Leadership and Governance	"Management continues to update staff on disease trends globally and in Ghana and has made provisions for PPE when a disease outbreak occurs."	R3GAR; R13GAR	None noted
Service Delivery	"For patients who present with cold symptoms, we continue to probe for other symptoms and refer them for further tests where necessary."	R16CR	None noted
Health Workforce	"Staff have been trained on the importance of social distancing. They maintain a safe distance for clients, especially those coughing."	R16CR	None noted
Access to Essential Medicines	"We ensured availability of essential drugs always, including vitamin C and broad-spectrum antibiotics since the next infectious disease is uncertain."	R3GAR; R16CR	None noted
Health Financing; Health Information Systems	No interventions reported under these building blocks by any of the three pharmacies.	None	Critical gaps: no financial contingency planning; no digital health or data reporting systems

Note. Only 3 of 32 pharmacies (9.4%) reported maintaining structured post-pandemic preparedness interventions. Gaps in health financing and health information systems were consistent across all three facilities.

Preparedness for Disease X

The final and arguably most consequential finding of this study concerns the pharmacies' preparedness for Disease X. When questioned about the concept, 31 of the 32 respondents (96.9%) indicated no prior knowledge of Disease X. Many initially assumed it was an actual, already-circulating disease.

Respondent 7 (R7GAR) asked: *"Disease X? What disease is that?"* Respondent 32 (R32CR) similarly enquired: *"I have never heard about that disease before. Is it in Ghana or a western country thing?"*

Respondent 12 (R12GAR) attributed the knowledge gap to systemic failure in health communication: *"I do not know what disease that is. Maybe the government has not educated us on it."* This attribution is significant because it points to a structural gap in health literacy dissemination at the pharmacy level, rather than individual knowledge failure alone.

The single exception was Respondent 18 (R18GAR), a pharmacist who had learned about Disease X through informal channels and conducted independent online research. As she explained: *"I heard about it from a friend and I went online to read about it. I realized it is not any disease in particular. It is just an unknown infectious disease that could break out anytime and could be very deadly."* Motivated by this understanding, she had developed a facility-level emergency preparedness and response plan that incorporated four of the six WHO Health Systems building blocks. Details of this plan are presented in Table 4. However, critical gaps remained: no plans existed for service delivery adaptation, health workforce training and surge capacity, health financing contingencies, or health communication strategies. This finding suggests that even among pharmacists who understand the concept of Disease X, translating awareness into comprehensive, building-block-spanning preparedness remains a significant challenge.

Table 4. Disease X Emergency Preparedness Plan of the Single Pharmacy (R18GAR) with Prior Knowledge of Disease X, Mapped to WHO Health Systems Building Blocks

WHO Building Block	Specific Measure	Representative Quote	Gap
Leadership and Governance	Monitoring disease trends; cooperation with regulatory bodies	"Management stays updated with disease trends and cooperates with regulatory authorities to implement recommended disease management practices."	None noted
Access to Essential Medicines	Stocking with attention to expiry dates; aligning stock to disease and weather trends	"The facility stocks essential medicines in adequate quantities that will not expire should a pandemic break out and there is a close-down."	None noted
Health Information Systems	Mobile health technology: WhatsApp prescriptions and phone consultations	"Patients can send prescriptions via WhatsApp or phone call and the medicines will be delivered to their homes."	None noted
Infection Prevention and Control	Continuous stocking of disinfectant wipes, sanitisers; hand hygiene protocols	"The pharmacy is stocking disinfectant wipes for cleaning surfaces and hands, as well as sanitisers even though COVID-19 seems over."	None noted
Service Delivery; Health Workforce; Health Financing; Health Communication	Not addressed in the plan	No provisions reported for these four building blocks despite their critical importance in pandemic response.	Critical gaps across four building blocks

Note. This was the only pharmacy out of 32 (3.1%) with any documented preparedness strategy for Disease X. Four of the six WHO Health Systems building blocks remained unaddressed in the plan.

DISCUSSION

This study examined the pandemic preparedness of private retail pharmacies in Ghana before, during, and after COVID-19, as well as their readiness for Disease X, using the WHO Health Systems Framework as an analytical

lens. The findings illuminate a pattern of structural unpreparedness that transcends individual knowledge gaps and reflects deeper systemic weaknesses in how private retail pharmacies are integrated into Ghana's emergency preparedness architecture. The discussion below synthesizes these findings in relation to current literature, organized around the four study objectives.

Pre-Pandemic Preparedness: Structural Absence of Emergency Planning

The near-universal absence of emergency preparedness and response plans among the study pharmacies is consistent with evidence from comparable settings. Bahlol and Dewey (2021), in a study conducted across multiple countries, found that most community pharmacies had not developed pandemic preparedness plans prior to COVID-19, citing gaps in PPE supply, contactless payment infrastructure, and reporting protocols. Similarly, Boateng-Osei et al. (2023) found weak emergency preparedness capacity in a Ghanaian university hospital, and Ejimele and Fatusi (2021) documented the absence of structured emergency plans in most Nigerian hospitals. The current findings therefore confirm that unpreparedness is not specific to private pharmacies but reflects a pervasive systemic failure across LMICs at the primary and community healthcare level.

The absence of preparedness measures across the leadership and governance, health financing, and health information systems building blocks is particularly concerning. Manyazewal (2017) demonstrated that health system resilience initiatives must address all six building blocks comprehensively, not selectively. The finding that improvised, operationally motivated measures covered only health workforce and some aspects of service delivery and essential medicines suggests that private retail pharmacies in Ghana are operating with a truncated and fragmented conception of health system readiness. Sagan et al. (2021) argued that governance, above all other building blocks, determines the coherence and sustainability of health system responses to shocks. The total absence of governance-level preparedness among study pharmacies underscores a critical structural vulnerability.

Pandemic Response: Reactive Adaptation and the Compliance Gap

The predominantly reactive nature of the pharmacies' COVID-19 response reinforces what Binagwaho et al. (2022) identify as the defining weakness of poorly resilient health systems: the inability to anticipate and absorb shocks, as opposed to merely reacting to them. Forsgren et al. (2022), in a scoping review of health system resilience strategies across 43 studies, emphasised that proactive anticipation is a necessary precondition for adaptive capacity. The pharmacies in this study were unable to exercise anticipatory capacity because they lacked both the informational infrastructure to detect early warning signals and the governance structures to act on them.

The pharmacies' infection prevention and control responses during the pandemic were broadly consistent with international guidance. Novak et al. (2021), in a comparative study of pharmacists' COVID-19 work practices, found that pharmacists who adhered to structured infection control protocols demonstrated significantly lower infection rates among staff. Goff et al. (2020) similarly confirmed that pharmacies which implemented rigorous safety protocols maintained service continuity while protecting their workforce. However, the finding in the current study that compliance was driven by externally communicated government protocols rather than internal planning reflects an important distinction: reactive compliance versus proactive resilience. While the former may be sufficient in a well-managed pandemic with a responsive government, it is deeply insufficient in the face of a rapidly evolving Disease X where government guidance may lag behind community-level transmission.

The tension between self-reported adherence to dispensing protocols and documented anecdotal evidence of over-the-counter antibiotic sales during COVID-19 in Ghana is worth examining carefully. Nortey et al. (2025), in a recent qualitative study of antibiotic dispensing in Ghanaian community pharmacies, found that economic incentives, weak regulatory enforcement, and customer pressure routinely resulted in non-prescription antibiotic sales. Opoku et al. (2023) similarly documented high self-medication prevalence during the pandemic. Social desirability bias likely inflated favourable responses in the current study on this particular issue, a limitation shared by other self-reported pharmacy practice research (Bahlol et al., 2022).

Post-Pandemic Reversion: Crisis Fatigue and the Sustainability Challenge

The finding that 29 of 32 pharmacies reverted to pre-pandemic operational norms after the acute COVID-19 threat subsided is consistent with a broader global pattern documented in the literature. The WHO (2020) has described pandemic fatigue, characterized by declining motivation to follow protective behaviours over time, as a significant driver of protocol abandonment among frontline health workers, while Latonen et al. (2024) attributed reversion in community pharmacies to the financial and logistical constraints of sustaining enhanced crisis protocols. A parallel decline in perceived threat as case counts fall has similarly been documented as a trigger for reduced vigilance (WHO, 2020). The current findings suggest that without structural reinforcement, institutional memory of pandemic lessons dissipates rapidly, leaving pharmacies in a state of renewed vulnerability.

The three pharmacies that maintained post-pandemic preparedness protocols represent a small but instructive exception. Their inclusion of leadership and governance measures, such as regular disease trend briefings and PPE provision plans, aligns with evidence from Yang et al. (2024), who found that crisis leadership behaviors including clear communication and accountability were associated with better staff outcomes and sustained responsiveness beyond the acute crisis period. However, even these pharmacies omitted health financing and health information systems from their post-pandemic plans, confirming that the six building blocks are not equally intuitive or accessible to pharmacy practitioners without structured support.

Disease X Preparedness: A Knowledge and Systems Failure

The finding that 96.9% of respondents had no knowledge of Disease X is arguably the most alarming result of this study. It points to a fundamental failure in translating WHO risk communication into actionable awareness at the community pharmacy level in Ghana. The WHO has maintained Disease X on its Research and Development Blueprint priority list since 2018, and the concept has gained renewed prominence following the COVID-19 pandemic and through initiatives such as WHO's Preparedness and Resilience for Emerging Threats (PRET) Programme, launched in 2023 (WHO, 2023). The adoption of the WHO Pandemic Agreement in May 2025, which includes provisions for emergency global health workforces, pathogen access and benefit sharing, and equitable access to medical countermeasures, further signals global recognition of the inevitability of Disease X-type events (Parums, 2025; WHO, 2025).

It is important to distinguish two related but analytically separate findings of this study. The first is that 31 of 32 respondents had not previously encountered the specific WHO terminology Disease X. The second is the substantive question of whether these pharmacies possess the underlying capacity, in the form of stocking practices, communication channels, staffing flexibility, and governance routines, to respond to an unknown future pathogen regardless of what it is called. Unfamiliarity with a specific label does not by itself establish a complete absence of underlying preparedness capacity, and the two findings should not be treated as equivalent. In this study, however, the two findings converge rather than diverge. When preparedness capacity was examined directly, as in the mapping of post-pandemic interventions in Table 3 and the single documented Disease X plan in Table 4, the same structural gaps in health financing, health information systems, and in most cases health workforce and service delivery planning were evident regardless of whether the pharmacy had heard of the term. The low awareness finding and the low preparedness-capacity finding are therefore mutually reinforcing rather than redundant, and the terminology gap is best read as one indicator of a broader deficit in structured engagement with pandemic risk information, not as the sole basis for concluding that these pharmacies are unprepared. In this global context, the near-total absence of Disease X awareness among Ghanaian private retail pharmacists represents a critical vulnerability. The literature on pandemic preparedness knowledge gaps among health workers offers a relevant parallel: Bhagavathula et al. (2020), in an early COVID-19 study among healthcare workers, found that knowledge deficits translated directly into preparedness failures and suboptimal infection control practices. Hatem et al. (2023) similarly demonstrated that community pharmacies with inadequate pandemic preparedness experienced significant service continuity challenges, including widespread medication shortages, that exacerbated community health risks during COVID-19. If private retail pharmacies in Ghana remain uninformed about Disease X, they will be unable to contribute to early detection, community health communication, or initial case management when the next pandemic emerges, greatly undermining their potential as a frontline resilience resource.

The one pharmacy that had developed a Disease X preparedness plan demonstrates that awareness is a prerequisite for action. However, the incompleteness of even this plan, which omitted service delivery adaptation, workforce surge planning, health financing, and health communication, underscores that individual initiative without structured regulatory and institutional support is insufficient for comprehensive preparedness. Comprehensive pandemic preparedness, as conceptualized in the WHO Pandemic Agreement (2025) and articulated in the WHO Health Systems Framework (WHO, 2007), requires all six building blocks to be simultaneously addressed and mutually reinforcing.

Implications for Policy and Practice

The cumulative weight of this study's findings points to three priority areas for policy and practice. First, there is an urgent need for standardized, building-block-specific emergency preparedness guidelines tailored to private retail pharmacies in Ghana. These guidelines should be developed by the pharmacy regulatory authority in collaboration with the Ministry of Health and the WHO, and compliance should be a condition of facility licensing and renewal. The guidelines must explicitly address all six building blocks, with particular attention to health financing, governance, and health information systems, which were consistently absent from pharmacy preparedness efforts. Second, Disease X must be integrated into pharmacy continuing professional development (CPD) programs and entry-level training curricula. Community pharmacists are at the frontline of public health communication; they can only fulfil this role effectively if they are literate in emerging health threats. Third, the pharmacy regulatory framework must evolve to include preparedness verification mechanisms, for example through periodic facility inspections that assess emergency plan currency and comprehensiveness. The WHO Pandemic Agreement (2025), to which Ghana is a signatory, creates an international accountability framework that can be leveraged to drive domestic regulatory reforms.

CONCLUSION

This study provides the first qualitative, theory-grounded evidence on the pandemic preparedness of private retail pharmacies in Ghana, assessed through the WHO Health Systems Framework. It reveals a pattern of structural unpreparedness that existed before COVID-19, persisted reactively through the pandemic, reverted to pre-crisis norms in its aftermath, and remains dangerously inadequate in relation to Disease X. The knowledge gap on Disease X among 96.9% of respondents is a stark finding that demands immediate, sustained, and systematically delivered redress.

At a moment when the global community has adopted a historic Pandemic Agreement to prevent and mitigate the next health emergency, the findings of this study offer a ground-level corrective: pandemic preparedness cannot be achieved at the international level alone. It must be built at the facility level, one pharmacy at a time, supported by regulatory mandates, educational investment, and governance accountability. Private retail pharmacies in Ghana have the potential to be a powerful asset in the national pandemic response architecture. Realizing that potential requires treating preparedness not as a voluntary aspiration but as a professional and regulatory imperative.

Limitations

This study has several limitations that should be considered when interpreting its findings. First, the study was conducted in two of Ghana's sixteen regions, which limits the generalizability of findings to other regional and rural contexts where pharmacy infrastructure, regulatory oversight, and disease exposure may differ substantially. Second, as noted in the discussion, social desirability bias may have inflated favorable self-reports, particularly regarding adherence to dispensing protocols during the pandemic. The use of face-to-face interviews, while methodologically advantageous in many respects, may have exacerbated this bias by increasing participants' awareness of being evaluated. Third, the cross-sectional nature of the study provides a single-point-in-time snapshot of preparedness; the rapidly evolving context of pandemic preparedness means that findings may require updating as new guidance and experience accumulate. A longitudinal design would offer greater insight into whether preparedness changes are sustained over time. Fourth, the exclusion of public-sector pharmacies and other health facility types means that the findings are specific to the private retail context and do not allow for comparative analysis with the public pharmacy sector. Fifth, the study relied exclusively on

self-reported interview accounts and did not triangulate these accounts with pharmacy records, documented emergency preparedness plans, regulatory inspection reports, or direct observation of facility practices. Such triangulation was beyond the scope of the present qualitative design but would strengthen confidence in self-reported preparedness claims in future work. Relatedly, preparedness in this study was assessed through open-ended qualitative accounts rather than through a standardized or validated preparedness assessment instrument, so the findings describe the character and content of preparedness gaps without providing a scored or benchmarked measure that could be compared across facilities or against other settings.

RECOMMENDATIONS

Based on the findings and their discussion, the following recommendations are advanced. For pharmacy regulatory authorities: standardized, building-block-specific emergency preparedness guidelines for private retail pharmacies should be developed and enforced, with compliance verified through periodic facility inspections and tied to facility licensing. This recommendation is feasible within existing regulatory structures because the Pharmacy Council of Ghana already conducts periodic facility inspections and controls annual licence renewal, so preparedness compliance could be added as an additional inspection domain rather than requiring a new inspection system. Suggested monitoring indicators include the proportion of inspected pharmacies with a written and dated emergency preparedness plan, the proportion of plans addressing all six WHO Health Systems Framework building blocks, and the proportion of plans updated within the preceding two years. For the Ministry of Health and Ghana Health Service: a sustained, multi-channel national health communication campaign on Disease X should be mounted, integrating community pharmacy networks as both targets and dissemination channels. Implementation would be strengthened by routing the campaign through structures the Ministry of Health and Ghana Health Service already operate, including district health promotion units and the risk communication function of the national public health emergency management structure, with pharmacy associations serving as both a distribution channel for materials and a feedback route for questions raised by clients. Progress could be monitored through periodic surveys of pharmacist and client awareness of Disease X and related emerging threat concepts, tracked before and after campaign activities. For pharmacy professional bodies and training institutions: Disease X preparedness and pandemic health systems literacy should be formally integrated into pharmacy entry-level curricula and continuing professional development frameworks. The Pharmacy Council of Ghana and the Pharmaceutical Society of Ghana already hold authority over entry-level curricula and continuing professional development points, so this recommendation would not require a new institutional mandate, only the addition of a pandemic and emerging threats module to existing accreditation and continuing professional development requirements. A monitoring indicator would be the proportion of registered pharmacists completing this module within a defined renewal cycle. For researchers: future studies should extend this inquiry to other regions of Ghana, include public pharmacies and other primary healthcare facilities for comparative analysis, and adopt longitudinal designs to assess preparedness trajectory over time. Future studies should also incorporate a validated quantitative preparedness assessment instrument and triangulate self-reported data with facility records and direct observation, so that the descriptive richness of qualitative accounts is complemented by an objective and comparable measure of preparedness. Across all four recommendations, coordination responsibility should rest with the Pharmacy Council of Ghana, given its existing licensing and inspection authority over private retail pharmacies, working alongside the Ministry of Health, Ghana Health Service, and the pharmacy professional bodies named above.

Declarations

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The author declares no conflicts of interest.

Author Statement

Lawrencia Aggrey-Bluwey: Conceptualization; Methodology; Investigation; Formal analysis; Data curation; Validation; Writing - Original Draft; Writing - Review & Editing; Project administration.

Ethical Approval:

Ethical approval was obtained from the Ethics Review Board of the University of Education, Winneba, prior to the commencement of data collection. Ethics approval number is UEWC/26.

Data Availability Statement

The datasets generated and analyzed during the current study are not publicly available because they consist of qualitative interview transcripts that contain potentially identifiable and sensitive participant information. Participants consented to take part in the study with the understanding that their identities and responses would remain confidential. Public deposition of the data could therefore compromise participant privacy and violate the conditions of ethical approval.

De-identified excerpts of the interview data that support the findings are included within the manuscript. Additional de-identified data may be made available from the corresponding author upon reasonable request, subject to approval by the Ethics Review Board of the University of Education, Winneba, and in accordance with institutional policies governing the protection of research participants.

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