Reach Alliance

Digital Health and Inequality:

Technology's Role in Ghana's Fight against Diabetes and Hypertension

Valerie Maame Abena Ackon, Nana Akua Gyaaba Dickson, Hilary Nana Ama Kwofie, Charlton Mandaza, Theodora Aryee, Disraeli Asante-Darko, Albert Bensusan

ASHESI
Center for Inclusive Growth

The Reach Alliance

The Reach Alliance is a consortium of global universities — with partners in Ghana, South Africa, Mexico, Canada, United States, United Kingdom, Australia, and Singapore — developing the leaders we need to solve urgent local challenges of the hard to reach — those underserved for geographic, administrative, or social reasons. Working in interdisciplinary teams, Reach's globally minded students use rigorous research methods to identify innovative solutions to climate, public health, and economic challenges. The United Nations Sustainable Development Goals (SDGs) provide inspiration and a guiding framework. Research is conducted in collaboration with local communities and with guidance from university faculty members, building capacity and skills among Reach's student researchers.

The power of the Reach Alliance stems from engaging leading universities to unleash actionable research insights for impact. These insights have been published in numerous journals such as *The Lancet* and *BMJ Global Health* and are being used by policymakers and sector leaders, such as the Government of Canada and the *Stanford Social Innovation Review*, to catalyze impact around the world.

The Reach Alliance was created in 2015 by the University of Toronto's Munk School of Global Affairs & Public Policy, in partnership with the Mastercard Center for Inclusive Growth. It is guided by an advisory council of leaders in academia, and in the private, public, and nonprofit sectors who help to drive impact, influence and scale, and support fundraising efforts.

ASHESI · UNIVERSITY OF CAPE TOWN · UCL · THE UNIVERSITY OF MELBOURNE

Tecnológico de Monterrey · HOWARD UNIVERSITY · UNIVERSITY OF OXFORD · SMU Singapore Management University · UNIVERSITY OF TORONTO

Note: Authors are listed alphabetically with the faculty mentor listed last.

Cover photo: A blood pressure monitor and glucometer with readings from a patient (photo by Valerie Ackon)

Acknowledgements

We are sincerely grateful to all those who helped us throughout this research journey. This work would not have been possible without the generous trust and time of the patients, caregivers, and healthcare professionals who shared their experiences with us. We also extend our thanks to the local leaders and community health workers who facilitated access to the field sites that would have otherwise been difficult to reach.

Special appreciation goes to Anowa Quarcoo, our team performance coach, Albert Cofie, a researcher with the STOP NCD project in Ghana, and Sihaam Sayuti, a faculty member at Ashesi University, who provided valuable insight and support.

We also extend heartfelt thanks to everyone who worked behind the scenes, from logistics to keeping morale when the journey felt very long. Your contributions may not have always been visible, but they were deeply felt and appreciated.

Finally, we acknowledge the support of Professor Angela Owusu-Ansah, Provost of Ashesi University, and the Stephen Adei Research Studio, whose resources and backing made this research possible.

This research was vetted by and received approval from the Ethics Review Board at Ashesi University.

Contribution	Contributor
Conception or design of the work	VMAA, NAGD, CM, HNAK, DA, TEA, AB
Data collection	VMAA, NAGD, CM, HNAK, with contributions from DA, TA, and AB
Data coding	VMAA, NAGD, CM, HNAK, with contributions from TA
Data analysis and interpretation	VMAA, NAGD, CM, HNAK, with contributions from DA, AB and TA
Drafting of the case study report	VMAA, NAGD, CM, HNAK, with contributions from DA, AB, and TA
Critical revision of the case study report	VMAA, NAGD, CM, HNAK, with contributions from DA, AB, and TA
Final approval of the version to be submitted	VMAA, NAGD, CM, HNAK, DA, AB, TA

Reach Alliance

Contents

Executive Summary

Ghana, like many low- and middle-income countries, is grappling with a silent but accelerating health crisis: the rise of noncommunicable diseases (NCDs), particularly hypertension and type-2 diabetes. These two conditions, closely linked by shared risk factors such as poor nutrition, physical inactivity, and aging, often go undiagnosed until complications emerge, contributing to preventable deaths, especially in under-resourced and underserved communities.

Although preventable and manageable, hypertension and diabetes remain poorly addressed in many parts of the country. Traditional healthcare systems are stretched thin, and the promise of digital health remains unevenly realized. Although mobile apps, wearables, portable diagnostics, and remote monitoring tools are revolutionizing chronic disease management globally, in Ghana, these innovations are often confined to urban or private settings, leaving rural and hard-to-reach communities behind.

We investigate how technology is currently being used to manage type-2 diabetes and hypertension in Ghana and, crucially, who is being left out. Drawing on a mixed-methods approach that includes interviews, surveys, and desk research, our study explores levels of awareness, accessibility, and actual use of digital health tools in under-resourced communities.

The findings offer a compelling insight: digital health can transform chronic disease care, but only if tools are designed to be inclusive, context-aware, and simple enough to meet people where they are. Equitable deployment of these innovations is not just a technological challenge; it is a public health imperative.

Figure 1. A diabetes and hypertension patient showing some medicines he just received

By highlighting both barriers and opportunities, this work contributes to Ghana's broader ambitions for universal health coverage and supports global goals including SDG 3 (Good Health and Well-being), SDG 9 (Industry, Innovation and Infrastructure), and SDG 10 (Reduced Inequalities). At its heart, the case study raises a provocative question: how can we ensure that the future of health is one everyone can access, regardless of where they live?

Global Context: The Rising Prevalence of Noncommunicable Diseases

Noncommunicable diseases (NCDs) have quietly become the world's biggest killers, representing a major and growing threat to public health systems. In 2021 alone, NCDs were responsible for over 43 million deaths: three-quarters of all non-pandemic-related deaths worldwide. Among these, 18 million were considered premature, affecting people under the age of 70. The burden falls heavily on low- and middle-

income countries (LMICs), where 82 per cent of such premature deaths occur. In many of these settings, access to timely care and long-term disease management is often limited.[1]

Ghana and the NCD Challenge

Ghana is no exception to this global trend. In the 1990s, NCDs accounted for just 27.8 per cent of all deaths in the country while infectious diseases were responsible for a much higher 67.4 per cent of all deaths.[2] Today, NCDs account for an estimated 43 per cent of deaths in the country, with hypertension (HT) and type-2 diabetes (T2D) emerging as two of the most pressing concerns.[3] These two connected conditions share multiple risk factors such as poor diets, physical inactivity, obesity, and aging. They also tend to occur together, each being a risk factor for the other, creating a dangerous cycle of comorbidity that significantly increases the risk of severe complications.

The economic impact of NCDs on Ghanaian households is substantial. Studies indicate that families affected by both hypertension and type-2 diabetes can spend up to 94 per cent of their healthcare-related costs on disease management alone, with lower socioeconomic groups bearing a disproportionately heavier burden than those with higher incomes.[4] Such high health expenditures push families deeper into poverty when economic constraints further limit access to care.

To complicate matters, Ghana's current healthcare delivery model remains largely oriented toward acute care and infectious disease management, with limited support for NCDs and other chronic conditions. Many health facilities lack standardized protocols for NCD care, and the implementation of the WHO Package of Essential Noncommunicable Disease Interventions (WHO-PEN) for primary healthcare has been minimal across the country. Although the Ghana Health Service has outlined a policy for increasing the adoption of digital health, it remains a challenge because there is limited infrastructure to support digital health solutions, and there is also a low uptake of such solutions.

Delayed or inadequate care significantly increases the risk of developing life-threatening complications, creating a vicious cycle where preventable conditions become major causes of morbidity and mortality.

While HT and T2DM are largely preventable and manageable through lifestyle modifications, medication adherence, and regular monitoring, they are frequently diagnosed late or improperly managed, especially in resource-constrained settings. This delayed or inadequate care significantly increases the risk of developing life-threatening complications, creating a vicious cycle where preventable conditions become major causes of morbidity and mortality.

1 "Noncommunicable Diseases: Mortality," World Health Organization, December 2024.

2 Irenius Konkor and Vincent Kuuire, "Epidemiologic Transition and the Double Burden of Disease in Ghana: What Do We Know at the Neighbourhood Level?" *PLOS ONE* 18, no. 2 (2023): e0281639.

3 "Beating Noncommunicable Diseases Through Primary Healthcare," World Health Organization, Regional Office for Africa, 16 December 2022.

4 Samuel Amon, Moses Aikins, Hassan Haghparast-Bidgoli, et al., "Household Economic Burden of Type-2 Diabetes and Hypertension Comorbidity Care in Urban-poor Ghana: A Mixed Methods Study," *BMC Health Services Research* 24, no. 1 (2024): 1028.

Our Study: Technology's Potential in Healthcare

Technology offers a promising pathway for transforming healthcare delivery and addressing many of the systemic challenges facing Ghana's health system. Tools such as portable diagnostic devices, mobile health applications, electronic health records, and remote patient-monitoring platforms have revolutionized how patients manage their conditions and how healthcare providers deliver care. These tools support earlier diagnosis, improved treatment adherence, and ongoing disease monitoring, while easing pressure on overburdened health systems.

Given the growing burden of NCDs in Ghana, exploring how technology is — or isn't — being adopted to manage hypertension (HT) and type-2 diabetes (T2DM) is both timely and critical. Understanding this intersection could uncover opportunities to scale life-saving interventions and ultimately reduce preventable deaths. However, the adoption and integration of such technology for the management of HT and T2DM in the country remains limited and uneven. While some urban areas and private healthcare facilities have begun implementing electronic health records and basic mobile health interventions, the majority of the population, particularly those in rural and underserved communities, have limited exposure or access to these innovations. Existing digital health initiatives often remain small-scale pilot projects that struggle to achieve sustainability and integration with the broader healthcare system.

We therefore sought to understand how technology is currently being used to support the long-term management of hypertension and type-2 diabetes in Ghana, and to identify gaps, challenges, and opportunities for more effective digital health interventions. In this study, we focus on Ghana's hard-to-reach communities, which face unique and compounded barriers to being aware of, accessing, and using health technology for the management of HT and T2DM.

The Hard-to-Reach

For our purposes here, we define "hard-to-reach" communities using a multidimensional lens. The Ghana Statistical Service (GSS) defines multidimensional poverty as the "many overlapping deprivations that people living in poverty experience," using 12 nonmonetary indicators across three dimensions: education, health, and living standards.[5] Building on this framework, we define "hard to reach" as encompassing individuals and communities who are not only multidimensionally poor, but who also face additional structural or spatial barriers such as geographic isolation and poor mobile and internet connectivity. These compounding barriers reduce access to both traditional health services and emerging health technologies and make them a critical focus for any efforts aimed at equitable health improvement.

Health Technology's Barriers and Opportunities

We thus seek to investigate the landscape of health technology use for HT and T2DM management in Ghana, with a particular focus on understanding the barriers and opportunities that exist within hard-to-reach communities. In doing so, we aim to contribute to a more inclusive, data-informed, and equity-driven response to Ghana's growing NCD burden, supporting national

5 Francis Bright Mensah, John Foster Agyaho, Raymond Elikplim Kofinti, and Joshua Sebu, "Multidimensional Poverty — Ghana," Ghana Statistical Service Report, June 2020.

Figure 2. Community clinic in Cape Coast

goals for universal health coverage while advancing global efforts toward achieving UN Sustainability Goals 3 (Good Health and Well-being), 9 (Industry, Innovation, and Infrastructure), and 10 (Reduced Inequalities).

Research Approach

We used a mixed-methods approach for both quantitative and qualitative insights. The research design was specifically chosen to capture the different experiences related to hypertension and type-2 diabetes management, and to enrich statistical patterns with the lived experiences of individuals navigating these conditions, as well as healthcare professionals' perspectives.

Study Settings and Site Selection

The research was conducted across four regions of Ghana: Greater Accra, Western, Central, and Ashanti regions, with fieldwork taking place in the suburbs of Accra, Takoradi, Cape Coast, and Kumasi. We selected these regions because our research highlighted them as having the highest prevalence of hypertension and type-2 diabetes nationwide.[6] Within each region, we focused on areas that aligned with our definition of hard to reach, prioritizing peri-urban areas (i.e., the "outskirts" or areas surrounding cities) and smaller market communities. This approach allowed us to capture and appreciate different geographic, socioeconomic, and cultural contexts, while centring the experiences of populations most likely to be underserved.

Qualitative Data Collection and Analysis

To move beyond the numbers and statistics, we turned to semi-structured, in-depth interviews to fully understand the realities of people's experiences within the communities. Over several weeks, our research team visited different study sites: the Dome Market in Accra, the Sekondi Market in Takoradi, then to community clinics in Cape Coast, and finally to Kumasi's neighbourhood health posts and

6 Mariana Cook-Huynh, Daniel Ansong, Rachel Christine Steckelberg, et al., "Prevalence of Hypertension and Diabetes Mellitus in Adults from a Rural Community in Ghana," *Ethnicity and Disease* 22, no. 3 (2012): 347–52.

Table 1. Key to healthcare-respondent codes, interview locations, and roles

Participant code	Location	Current role in Ghanaian healthcare system
R1	Accra	Administrative staff at the Ghana Medical Association and medical practitioner
R2 & R3	Accra	Medical doctor in a tertiary hospital
R4	Accra	Principal nursing officer in a teaching hospital
R5 to R8	Takoradi	Principal nursing officer in a teaching hospital
R9 to R11	Cape Coast	Principal nursing officer in a teaching hospital
R12	Cape Coast	Emergency medical officer in a teaching hospital
R13 & R14	Cape Coast	Nursing official in a teaching hospital
R15 & R16	Cape Coast	Administrative staff in a tertiary hospital

Table 2. Key to patient-respondent codes with diabetes or hypertension

Participant code	Location	Condition
P1 to P3	Dome Market, Accra	Diabetes
P4 to P6	Dome Market, Accra	Hypertension
P7 & P8	Dome Market, Accra	Both diabetes & hypertension
P9 to P11	Sekondi Market, Takoradi	Diabetes
P12 to P14	Sekondi Market, Takoradi	Hypertension
P15 & P16	Sekondi Market, Takoradi	Both diabetes & hypertension
P17 to P19	Cape Coast	Diabetes
P20 to P22	Cape Coast	Hypertension
P23 & P24	Cape Coast	Both diabetes & hypertension
P25 to P27	Kumasi	Diabetes
P28 to P30	Kumasi	Hypertension
P31 & P32	Kumasi	Both diabetes & hypertension

surrounding communities. At each location, we invited both patients living with hypertension and/or diabetes, caretakers of such patients (who acted as proxies), and healthcare professionals to share their perspectives on awareness of, access to, and use of digital health technology for managing HT and T2DM.

Sampling strategy. We used purposive sampling to identify individuals whose experiences could provide deep insights into the challenges and opportunities connected to digital health technologies for NCD management. This was complemented by convenience sampling when impromptu opportunities arose, such as when market vendors paused between serving their customers.

Interview process. In total, we conducted between 10 and 15 interviews at each site (48 interviews total), allowing conversations to unfold naturally in participants' preferred languages, primarily Twi and Fante. We obtained consent from participants, and the interviews were recorded and labelled by a number, the location, and type of person interviewed (i.e., patient with diabetes, patient with hypertension, dual-diagnosis patient, healthcare professional). Interviews were semi-structured, covering topics including:

- current diabetes and hypertension management practices,
- awareness and experience with health technology,
- barriers to accessing healthcare and technology, and

Table 3. Key to patient-respondent codes with diabetes or hypertension

Thematic phase	Purpose	Field application
Familiarization	Immerse in data to understand depth and breadth of content	Each transcript was read three times by at least two team members who noted key phrases and their first impressions.
Generating initial codes	Identify meaningful features across the entire data set	Passages related to technology, cost, or cultural beliefs were highlighted in the margins of printed transcripts.
Searching for themes	Collate codes into broader patterns	Related codes, such as mentions of device cost or concerns about complexity, were grouped under provisional themes "affordability" and "ease of use."
Reviewing themes	Ensure themes accurately reflect the data	We held weekly coding workshops to compare examples under each theme and to refine boundaries or merge overlapping themes.
Defining and naming themes	Articulate the essence of each theme	Clear definitions (for example, "cultural resistance" or "information channels") were drafted and vetted by the whole team.
Producing the report	Weave themes into a coherent narrative	Themes were interwoven into participant stories, ensuring that each quotation retained its original context and emotion.

Table 4. Themes, codes, and supporting quotes from interviews

Theme	Code	Supporting quote	UTAUT construct
Enhancing technological awareness	AWARE_TECH	P18: "I had never heard of such a device before, only the clinic ever checked my sugar for me."	Performance expectancy & facilitating conditions
Addressing financial accessibility	COST_BARRIER	P2 & P6: "It's expensive; I'd rather spend my money on food for the family than on batteries and strips."	Facilitating conditions
Building competence through hands-on training	TRAINING_NEED	P21: "I held the glucometer in my hand but didn't dare press any buttons — what if I break it?"	Effort expectancy
Integrating cultural contexts into care	CULTURAL_BARRIER	P32 & R9: "Some say the more you check your blood, the more you invite sickness into your body."	Social influence
Institutionalizing patient education in routine practice	HEALTH_SYS_ROLE	R10: "When nurses take five minutes to show you how it works, you feel confident, but it hardly ever happens."	Facilitating conditions
Leveraging community networks for knowledge dissemination	INFO_SOURCE	P13: "I heard about the monitor from my neighbour. If she hadn't told me, I'd never have known it exists."	Social influence

- preferences for future digital health interventions.

Our bilingual team members translated and transcribed all recordings into English, with careful attention to preserving the cultural nuance and authentic voice of each participant, while drawing key themes and insights.

Data Analysis

Guided by Braun and Clarke's six-step framework, we began work on the qualitative strand by immersing ourselves in field notes and interview transcripts.[7] The interview transcripts were generated manually because most of the interviews were conducted in the local dialects (Twi and Fante). Transcription was completed in Microsoft Word, followed by open coding without preconceived labels: codes were iteratively refined and compiled into a comprehensive codebook. During theme development, codes reflecting mentions of knowledge or lack of knowledge regarding devices (e.g., glucometers, blood pressure monitors) were grouped under "awareness of technology," while remarks about the cost or financial barriers formed the "cost and affordability" theme. Themes such as "cultural and belief barriers" and "healthcare system's role" emerged similarly, capturing local belief systems and institutional influences.

7 Virginia Braun and Victoria Clarke, "Using Thematic Analysis in Psychology," *Qualitative Research in Psychology* 3, no. 2 (2006): 77–101.

Figure 3. Team member Hilary interviewing a patient during a health-screening program

To further ground our analysis, we applied the Unified Theory of Acceptance and Use of Technology (UTAUT) as a guiding framework for interpreting emerging themes related to the adoption and use of digital health tools. Developed by Venkatesh and coauthors, UTAUT synthesizes multiple models of technology acceptance and identifies four key determinants of user behaviour:

- performance expectancy (belief that the technology will help),
- effort expectancy (ease of use),
- social influence (the degree to which others encourage its use), and
- facilitating conditions (availability of resources and infrastructure).[8]

UTAUT helped us interpret both the enabling and constraining factors influencing digital health engagement in hard-to-reach Ghanaian communities. For example, participants' perceptions of whether glucometers or mobile apps would actually improve health outcomes reflected performance expectancy, while concerns about cost, electricity access, or smartphone literacy aligned with facilitating conditions. Mentions of support (or discouragement) from family, peers, or healthcare workers were read through the lens of social influence, and usability concerns (especially among older adults) spoke directly to effort expectancy.

Rather than applying UTAUT rigidly, we used it flexibly to structure our interpretation of qualitative insights, ensuring that emergent themes remained grounded in participants' lived realities while being mapped onto a broader, widely recognized framework for technology adoption.

Quantitative Data Collection and Analysis

We also designed a structured survey to gather broader insights into the levels of awareness, access to, and use of health technologies for the management of hypertension and type-2 diabetes. The survey was administered both in person and online, with the use of Microsoft forms across our selected study sites. It focused on patients, patient proxies (e.g., family members directly involved in the care of patients), and healthcare professionals. Generally, respondents were first asked about their demographic background, including age, gender, education, income, and their relationship to the person living with hypertension or type-2 diabetes (for proxy respondents).

In total, we received 392 valid survey responses, with 349 for patients and proxies and 43 for healthcare professionals. This met the required sample size, according to the Krejcie and

8 Viswanath Venkatesh, Michael Morris, Gordon Davis, and Fred Davis, "User Acceptance of Information Technology: Toward a Unified View," *MIS Quarterly* 27, no. 3 (2003): 425–78.

Table 5. Sociodemographic characteristics of the study sample

Sociodemographic characteristics		Total (%)
Age	18–24	8 (2.3%)
	25–34	5 (1.4%)
	35–44	68 (19.5%)
	45–54	111 (31.8%)
	55+	157 (45.0%)
Gender	Male	120 (34.4%)
	Female	227 (65.0%)
	Prefer not to say	2 (0.6%)
Education	No formal education	83 (23.8%)
	Primary school level	60 (17.2%)
	Junior high (BECE) level	60 (17.2%)
	Senior high (WASSCE) level	98 (28.1%)
	Undergraduate	37 (10.6%)
	Master's	11 (3.2%)
Monthly income[10]	GHS 0–500 (USD 0–49)	94 (26.9%)
	GHS 501–800 (USD 49–78)	61 (17.5%)
	GHS 801–1,200 (USD 79–118)	91 (26.1%)
	GHS 1,201–3,000 (USD 118–294)	76 (21.8%)
	GHS 3,000+ (USD 295+)	27 (7.7%)

Morgan table.[9] We categorized the responses into two categories: healthcare professionals and patients. This allowed us to compare technology and their perspectives across those providing care and those receiving it.

Data Analysis

Our analysis of the collected data began with descriptive statistics to summarize demographic data and highlight common trends in technology use and accessibility.

For the patient surveys, we considered four main socio-demographic factors: age, gender, education, and income.

To further explore associations between our key variables, we used chi-squared tests of independence. These tests helped us examine, for instance, whether awareness of digital health tools varied significantly by education level, or whether income influenced technology ownership. We also tested variables such as gender, age group, and involvement in managing a chronic condition to identify statistically significant relationships.

9 Robert V. Krejcie and Daryle W. Morgan, "Determining Sample Size for Research Activities, *Educational and Psychological Measurement* 30, no. 3 (1970): 607–610.

10 At the time of writing (June 2025), 1 USD was equivalent to GHS 10.20. All conversions in this report use this rate and are rounded to the nearest dollar.

Table 6. Chi-square tests of demographic and usage variables for self-monitoring technologies

Variable 1	Variable 2	x^2	p-value	df
Education	Awareness	21.967	0.0379	12
Income	Ownership	12.443	0.0143	4
Education	Ownership	26.488	0.0002	6
Education	Interest in learning more	30.268	0.0025	12
Income	Ease of access	44.465	0.0002	16
Gender	Ownership	8.363	0.0391	3
Gender	Use	0.809	0.6673	2
Age	Ownership	2.619	0.6235	4
Age	Use	2.027	0.7308	4
Awareness	Use	1.477	0.2243	1
Ownership	Use	0.000	1.0000	0

Among the variables we examined, several demonstrated robust, statistically significant associations with technology ownership, interest, and perceived ease of access (see Table 6). Respondents with more years of formal schooling were much more likely to own a home monitoring device and to express interest in learning how to use it. Similarly, participants in higher income brackets consistently reported that obtaining a glucometer or blood-pressure monitor was easier for them. We also found a modest gender difference in device ownership, with men slightly more likely than women to possess these tools. Taken together, these results indicate that education and financial means, and to a lesser degree gender, are the strongest predictors of both interest in and ownership of self-monitoring technology.

By contrast, age group, experience helping others manage their condition, and general awareness of the devices did not significantly affect ownership or use once education and income were taken into account. These findings suggest that neither life stage nor informal caregiving experience alone drives technology uptake. Instead, an individual's level of education and their economic capacity determine whether they move from mere awareness to actual acquisition and use of these health tools.

Key Findings on Awareness, Access, and Use of Digital Health Tools

After our analysis, we synthesized both our quantitative and qualitative findings to discover emerging insights related

Figure 4. Team member Nana Akua interacting with a nurse during data collection

to our four core research objectives: (1) assessing awareness of technologies used for managing for type-2 diabetes and hypertension, (2) cataloguing current usage and accessibility, (3) identifying enabling and inhibiting factors for adoption, and (4) determining effective integration strategies.

Awareness of Existing Technology

Qualitative perspective. Across all four urban centres, Accra, Kumasi, Cape Coast, and Sekondi, interviewees overwhelmingly reported little to no prior exposure to self-monitoring devices such as glucometers and blood pressure cuffs. One interviewee (P22) said, "I had never heard of any" (AWARE_TECH), underscoring a foundational gap in even basic knowledge. P4 described clinic-bound framing, noting that "you only see these things in hospitals," which reinforces the idea that monitoring is exclusively a professional, not personal, activity.

These narratives suggest that before any intervention can induce meaningful behaviour change, a concerted education effort must first establish what these technologies are, why they matter, and how they can empower individuals to manage their own health.

Quantitative findings. Our survey data indicate that 89.7 per cent of respondents could name at least one self-monitoring technology when prompted with a brief description. However, when asked unprompted whether they had ever heard of a glucometer or home blood pressure monitor, only 34.2 per cent answered affirmatively. This discrepancy between prompted recall and spontaneous awareness highlights superficial familiarity without substantive understanding.

We also tested whether simply having heard of self-monitoring tools relates to using them. When we compared answers to "Have you heard of any technology that helps manage your condition?" with answers to "Have you ever used any of these technologies to help others?" as Table 6 indicated, we found no significant link (x^2 (1) = 1.48, p = 0.2243). In other words, simply hearing about glucometers or blood-pressure monitors did not make people more likely to have tried them. This tells us that awareness efforts must go beyond talking about these tools and include hands-on demonstrations if we want people to move from passive recognition to giving them a try.

Accessibility of Technology

Qualitative perspectives. Even among the minority who had heard of home monitoring devices, few knew where to purchase them. Respondents frequently remarked, "We don't even see them around, usually only in the clinics," underscoring a physical and logistical barrier to acquisition (ACCESS_TECH). In markets such as Dome and Sekondi,

people identified pharmacies as the primary points of service, yet our interviewees reported that these outlets often charge "prohibitive" mark-ups. The uneven distribution of medical technology across community settings therefore compounds the awareness deficit, leaving potential users unable to act even if they wish to.

Quantitative findings. According to the survey, only 26.1 per cent of households reported owning a glucometer or blood pressure monitor. Among those who did not own a device, 68.4 per cent cited "don't know where to buy" as the main reason, while 54.9 per cent pointed to "too expensive."

People with more years of formal schooling were much more likely to own a home monitoring device and those in higher income brackets were more likely to say it was easy to obtain one. We also found that men were slightly more likely than women to have these tools in their homes. This suggests that efforts to distribute and finance self-monitoring tools should pay special attention to people with less schooling and lower earnings — and women — to close these gaps.

Adoption Enablers and Barriers

Qualitative perspectives. When prompted on their willingness to adopt self-monitoring, participants expressed a mixture of curiosity and apathy. Some voiced eagerness, "I'm willing to learn so I can use it," while others defaulted to existing habits, noting that they were "accustomed to going to the pharmacy" for checks and felt no compelling incentive to purchase personal devices (ADOPT_USE). This ambivalence reveals that, beyond awareness and access, entrenched routines and perceived convenience of professional settings continue to dissuade household adoption.

The key thematic barriers are as follows:

Figure 5. Cape Coast community clinic

- *Cost and Affordability*

Cost emerged as a consistent deterrent. Interviewees candidly stated, "It's expensive, and I don't have the money for it," highlighting how device price tags place self-monitoring out of reach for many (COST_BARRIER). Even modestly priced glucometers or blood pressure monitors represent significant expenditures compared to competing household needs. Without subsidy programs or tiered pricing models, financial barriers will persist as one of the most formidable obstacles to broader uptake.

- *Training and Ease of Use*

Beyond purchase hurdles, several participants confessed to trepidation about operating unfamiliar equipment: "Even the sight of the

machine scares me," and "When I was able to buy it, they'd show me how to use it," indicating that hands-on orientation is critical (TRAINING_NEED). While some clinics offer demonstrations, they are sporadic and seldom integrated into routine care. Without structured training sessions — ideally delivered in local dialects — people's fear and uncertainty will undermine both initial adoption and sustained use.

- *Cultural and Belief Barriers*

One commonly held cultural view is the idea that frequent health checks can bring misfortune or "invite" illness. As one respondent noted, "There's the fear … that the more you check, you're asking for it." This belief reflects a broader sentiment that "what you don't know won't hurt you," leading many to avoid health screenings or regular monitoring out of fear, superstition, or emotional self-protection. Unfortunately, this avoidance contributes to delayed diagnosis and worsens health outcomes.

On the religious front, some beliefs can complicate disease recognition and management. Many participants expressed a strong confidence in divine protection and faith-based healing, where many participants expressed how "my body is protected by God — no disease can enter it" and "there is no way I can have such illness." Some participants associated self-monitoring (such as using a glucometer or checking blood pressure) with a lack of faith, worrying that seeking medical solutions implies spiritual weakness or disbelief in divine healing. Individuals who adopt regular self-care routines may even face subtle stigma, as though their vigilance is a sign of dwindling faith in divine power and healing.

- *Healthcare System's Role*

Interviewees acknowledged that clinics and pharmacies hold untapped potential as catalysts for technology diffusion. Comments such as "Clinics could be more intentional with announcing the existence of these technologies" and praise for nurses who "take their time to explain things you don't understand" illustrate both the system's latent capacity and missed opportunities (HEALTH_SYS_ROLE). Proactive provider outreach — ranging from device demonstrations during routine check-ups to community-based screening events — could leverage existing trust in health institutions to normalize home-monitoring practices.

Quantitative findings. Survey data reveal that 61.3 per cent of respondents earn ≤ GHC 1,200 (equivalent to about USD 117) per month, a bracket in which the combined cost of a glucometer, test strips, and batteries represents a sizable share of disposable income.

Participants who reported higher answers to "What is your level of education" were also much more likely to answer *Yes* to "Would you be interested in learning more about these technologies?" By contrast, when asked about actual device use, neither gender nor age made a difference, with both showing no significant effect. These results suggest that while formal education strongly predicts curiosity and willingness to engage, factors such as cultural attitudes, personal confidence, and hands-on training are what ultimately influence whether people move from interest to actual use.

Recommendations to Improve Tech Use

Qualitative perspectives. Few participants described established self-monitoring habits; instead, many reported episodic or clinic-bound practices: "I've been given a chart, so I go to the pharmacy to check my blood pressure," and "They check it only in the mornings" (ROUTINE_INTEGRATION). Embedding technology use into daily life requires more than device distribution; it calls for behavioural reinforcement strategies — such as SMS reminders and

Figure 6. Participants and healthcare professionals at a health screening

once-weekly community check-ins — that convert sporadic use into habitual routines.

Finally, participants suggested actionable strategies to bridge existing gaps. Proposals included using "radios, and community and market leaders to spread awareness" and "making it affordable would help" (IMPROVE_TECH_USE). These grassroots suggestions align closely with broader best practices in global health promotion: tailored messaging through trusted community figures, coupled with financial interventions like voucher schemes or micro-financing for device purchase. Collectively, these insights chart a path toward interventions that are culturally resonant, economically feasible, and systemically supported.

Participants depended on informal networks and mass media for health information: "My friend owns one and advised that I buy one," and suggestions like "Maybe through sharing the word about it on radio or TV stations" point to the centrality of peer and broadcast channels in shaping perceptions (INFO_SOURCE). Harnessing these channels — through market leader endorsements, radio spots in Twi and Fante, and testimonial vignettes — could amplify awareness efforts far beyond clinic walls.

Additional Themes

Trust in health institutions. Interviewees repeatedly contrasted personal use with clinic-based measurement, expressing deference to professionals. Trust emerges as a double-edged sword: it can discourage self-monitoring but also, if leveraged, can accelerate acceptance when providers actively endorse and demonstrate devices.

Cultural resonance. Cultural narratives around illness and spiritual beliefs must be navigated sensitively. Collaborating with faith leaders who endorse self-care as responsible stewardship can reframe monitoring practices as culturally consonant rather than taboo.

Economic viability. In these regions, cost remains the most salient barrier. Proposed financial models include voucher schemes, micro-credit for device purchase, and tiered pricing. Any scale-up plan must integrate robust cost–benefit messaging to show long-term savings from avoiding health complications.

Four Areas to Strengthen Self-Monitoring

Our mixed-methods findings converge to highlight four critical areas for strengthening self-monitoring of hypertension and type-2 diabetes in Ghana's hard-to-reach communities: building genuine awareness,

improving affordability and access, fostering user confidence, and embedding technology into daily life. Grounded in both local voices and survey evidence, our discussion reframes each area in light of the country's broader diabetes and hypertension burden and health-technology landscape.

Enhancing Technological Awareness

In a setting where HT and T2DM now account for 43 per cent of national deaths, yet most people "have never seen [a glucometer] outside the clinic," basic awareness is the first hurdle. Our interviews in market hubs such as Dome and Sekondi revealed that hearing about a device once does little to change behaviour. Table 6 shows that mere recognition ("Have you heard of any technology…?") bears no link to actual use, underscoring the superficiality of prompt-based familiarity. To move beyond this, awareness campaigns must meet people where they live and trade — market durbars (lively community events held in a marketplace), church gatherings, and local radio dramas in Twi and Fante can plant durable mental anchors. Real-time demonstrations and testimonies from trusted peers will transform devices from abstract concepts into tangible solutions

Addressing Financial Accessibility

Even when awareness exists, price remains an obstacle. Households facing catastrophic expenditures — spending up to 94 per cent of their health budget on NCD care — cannot absorb high device costs or recurring strip and battery purchases. Our survey confirm that education and income strongly predict both ownership and perceived ease of access. Voucher schemes, micro-financing partnerships with NGOs, and tiered pricing models co-designed with community health centres can lighten this burden and enable families to plan realistically for maintening a device over time.

Building Competence Through Hands-on Training

In interviews we repeatedly heard about lack of confidence in operating a glucometer or cuff: "I held the glucometer but didn't dare press any buttons." This fear cuts across age, gender, and caregiving roles, none of which predict usage in our chi-square tests. In other words, it's technical skill, not demographics, that limits adoption. Integrating "device days" into existing outreach, with bilingual printed guides and on-site coaching by community health workers, would transform an intimidating tool into an empowering ally. Embedding short tutorials in routine clinic interactions will also normalize self-checks and reinforce competence over time.

Integrating Cultural Contexts into Care

Cultural and religious beliefs both hinder and enable self-monitoring. Ghanaian type-2 diabetes patients often rely on "religious capital," that is, prayer, spiritual support, and church participation to cope with illness and self-care.[11] While some pastors warn that frequent checks "invite illness," others frame self-care as stewardship of one's body, a message that resonates with spiritual values. Collaborating with faith leaders to co-create sermon inserts and workshop modules can reframe self-monitoring as an act of responsible care. Similarly, leveraging informal networks — market leaders, neighbours, and radio personalities — would amplify authentic voices and overcome people's distrust of clinical authority.

11 Kwadwo Ameyaw Korsah, "The Use of Religious Capital As a Coping Strategy in Self-care by Type 2 Diabetes Patients in a Ghanaian Hospital," *Journal of Religion and Health* 62, no. 6 (2022): 4399–4416.

Institutionalizing Patient Education in Routine Practice

Our interviewees' narratives praise nurses who take extra time to demonstrate device use but lament that such moments are rare. To scale this goodwill, every primary-care nurse should be equipped with a portable demonstration kit and brief scripts to guide five-minute tutorials during each patient visit. Standardizing these "nurse-led monitoring modules" within Ghana's WHO-PEN rollout can ensure that education is woven into the fabric of chronic-care protocols rather than delivered ad hoc.

Leveraging Community Networks for Knowledge Dissemination

Finally, embedding self-monitoring into daily life requires sustained reinforcement through channels people already trust. A multi-pronged campaign — peer ambassadors in women's groups, story-driven radio vignettes, and short video clips in clinic waiting areas — can keep the conversation alive between visits. By centring participant voices in each message, we honour the authentic experiences that our qualitative work unearthed and ensure interventions resonate with real hopes, fears, and routines.

Embedding self-monitoring into daily life requires sustained reinforcement through channels people already trust.

Study Limitations

Sampling Scope and Generalizability

Our reliance on purposive and convenience sampling in peri-urban market communities allowed us to engage deeply with "hard-to-reach" urban populations — those who often fall through the cracks of mainstream health interventions. By focusing on bustling commercial hubs in Accra, Sekondi, Cape Coast, and Kumasi, we captured rich, context-specific insights into awareness, access, and use of self-monitoring technologies. Yet this very strength also constrains our ability to generalize findings beyond similar settings. Communities in fully rural or remote locales might face entirely different logistical and cultural barriers — lengthy travel distances without reliable transport, absence of any nearby clinics or pharmacies, and more pronounced digital divides — that our data do not encompass. Therefore, caution is needed when extrapolating these results to Ghana's hinterlands or to other LMIC contexts with distinct geographic or infrastructural challenges.

Language Translation and Nuance Preservation

Conducting interviews in Twi and Fante was essential for eliciting candid, nuanced accounts that might otherwise have been lost in English-only exchanges. Our bilingual research assistants worked diligently to translate recordings into English transcripts, striving to retain local idioms, tonal inflexions, and culturally embedded metaphors. Nevertheless, any translation process introduces the risk of subtle meaning shifts. Idiomatic expressions, such as beliefs that "checking invites the illness," carry layered connotations that may not map perfectly into direct English equivalents. Despite iterative back-translation checks and audio audits, some of this layered cultural resonance may have faded in the final transcripts, potentially influencing how we identified and presented themes.

Analytical Framework and Researcher Reflexivity

We adopted an open-coding process without a predetermined codebook to remain responsive to emergent patterns in our data. While

this inductive stance enabled us to capture unexpected themes — such as the central role of faith-based narratives — it also increased the possibility of researcher bias. Team members' own experiences, assumptions about health technology, or familiarity with local contexts might have influenced which excerpts were highlighted and how codes were grouped. To mitigate this, we held weekly coding workshops where multiple analysts reviewed excerpts blind to each other's labels, debated code definitions, and reconciled discrepancies. However, we also recognize that no amount of discussion can entirely eliminate subjective influence; the final thematic structure remains a co-constructed product of both participant voices and researcher interpretation.

Temporal Constraints of Cross-Sectional Design

Our survey was administered once in a six-week window, providing a valuable snapshot of awareness, ownership, and attitudes toward self-monitoring devices at that specific moment. However, NCD management is inherently dynamic: a patient's confidence with a glucometer may grow over months of regular use, or financial shocks might force people to abandon their device. Without longitudinal data — repeat surveys or panel interviews — we cannot trace how individual behaviours, community norms, or supply-chain factors evolve over time. Consequently, our recommendations for training modules, subsidy schemes, or community outreach remain grounded in the present reality.

Lessons Learned

Value of Cultural and Linguistic Fluency

Having research team members who speak Twi and Fante fluently — and who understood the subtleties of local belief systems — transformed our engagement with participants. When we approached a shopkeeper in Dome Market, she smiled and launched into her story in Twi, describing both her gratitude for free screenings and her hesitation to use a device alone. In such moments, the absence of a linguistic or cultural intermediary fostered deeper trust, richer anecdotes, and more candid reflections on topics like religious taboos and financial sacrifices. Future projects should prioritize assembling similarly fluent teams, recognizing that language competence is not merely a technical asset but a gateway to authenticity and rapport.

Strategic Engagement with Community Gatekeepers

Early in the fieldwork, we learned that formal permission alone — signed letters from district health offices — did not guarantee participation. Instead, invitations endorsed by market leaders, faith-group coordinators, and clinic managers proved crucial. These gatekeepers offered logistical support (securing quiet interview spaces), vouched for our research legitimacy, and sometimes even joined interviews to signal collective investment. By contrast, attempts to recruit participants solely through flyers or clinic posters yielded minimal uptake. This lesson underscores the importance of mapping local power dynamics and forging genuine partnerships with community champions as an entry point for both recruitment and sustained intervention efforts.

Adaptive Sampling and Methodological Flexibility

Our original plan to conduct exactly ten interviews per site quickly bumped against on-the-ground realities: some days, market noise made audio recording impossible; on others, rain storms at Kumasi's neighbourhood posts forced us to relocate meetings indoors. We responded by blending purposive sampling

— targeting diverse patient and provider profiles — with opportunistic, convenience-based interviews when unplanned moments arose, such as a nurse stepping aside after a busy clinic session. This methodological flexibility enabled us to maximize data collection within fixed time frames but also required constant recalibration of daily goals and careful tracking of participant characteristics to ensure breadth and balance.

Importance of Iterative Team Reflexivity

While open coding allowed themes to emerge organically, it also demanded rigorous reflexivity to check personal biases. Weekly workshops in which different team members re-examined transcripts fostered healthy debate over code definitions, theme boundaries, and exemplar quotations. These sessions not only refined our codebook — merging overlapping themes like "cost barrier" and "affordability concerns" under a unified heading — but also surfaced power differentials within the research team itself. Junior members, unfamiliar with local norms, initially hesitated to challenge senior colleagues' interpretations; structured turns in leading discussions helped democratize the analytic process and keep participant voices at the centre.

Balancing Depth with Breadth

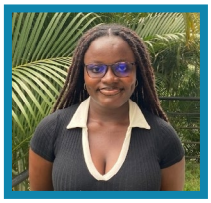
Finally, our concurrent mixed-methods design offered complementary strengths: rich qualitative narratives and broad quantitative patterns. Yet integrating these streams in real time proved challenging — qualitative interviews sometimes flagged new issues after surveys were finalized, and survey findings occasionally prompted fresh interpretation of interview data. Allocating extra hours for cross-team synchronizing meetings and maintaining a shared online dashboard of emerging insights proved indispensable. Still, this balance remains an art as much as a science, requiring deliberate coordination, clear communication channels, and a mutual commitment to letting each method inform the other.

Recommendations for Future Work

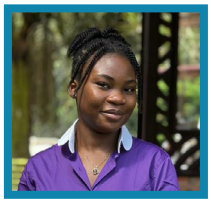
To enhance future studies and interventions, we recommend establishing partnerships with community health centres and local NGOs to subsidize device costs and coordinate hands-on training sessions. Leveraging trusted information channels — market durbars, radio broadcasts, and faith-based gatherings — can raise awareness and normalize self-monitoring behaviours. Embedding digital literacy modules into existing primary healthcare curricula will address fears surrounding device use, while incorporating mobile health check-ins via SMS can reinforce routine integration. Methodologically, expanding sampling to rural contexts and employing longitudinal survey designs would capture evolving attitudes and adoption trajectories, providing richer data for policy planning.

Language competence is not merely a technical asset but a gateway to authenticity and rapport.

Research Team



Valerie Maame Abena Ackon majored in computer engineering at Ashesi University, where she explored her interests in the intersection of hardware and software. She loves to learn about the application of technology in the healthcare sector, and how innovative solutions can be developed to improve the quality of people's lives. She hopes to be instrumental in shaping equitable healthcare systems across Africa through scalable, technology-driven solutions.



Nana Akua Gyaaba Dickson is a business administration graduate with a keen interest in data analytics and research. Passionate about using data to drive meaningful change, she is particularly invested in projects that address critical healthcare challenges. Beyond her academic and professional pursuits, Nana Akua is deeply committed to community service and believes in giving back through impactful initiatives. She aims to blend her analytical skills with a strong sense of social responsibility to contribute to lasting change in healthcare and beyond.

Hilary Nana Ama Kwofie is a final-year business administration student at Ashesi University. Through academic work, research internships, and volunteer projects, she has acquired skills in primary data collection, thematic analysis, survey design, and data analysis. Motivated to become a data analyst, she takes every opportunity to apply and refine her skills while contributing to impactful, community-driven research.

Charlton Mandaza is a recent graduate of Ashesi University where he majored in mechanical engineering. He is passionate about building solutions at the intersection of health, energy, and equity, especially expanding access to clean, sustainable energy. This has led to him working on creating clean cooking technologies, such as developing hydrogen-based energy solutions to reduce reliance on solid fuels and combat indoor air pollution. Whether through research, engineering, or community engagement, he is dedicated to creating scalable, context-driven solutions that improve lives and foster long-term sustainability.

Theodora Aryee has a BSc, MPhil, and PhD, all in accounting. She is passionate about research making an impact on society, in particular sustainability, not-for-profit governance, professional identity, and change management. She considers the Reach Alliance a fine platform to support emerging scholars and bring change to hard-to-reach communities through their research. She believes that anything worth doing is worth doing well.

Disraeli Asante-Darko is an associate professor with over a decade of experience in teaching and research. He currently serves as the director of the Ashesi MBA program. His expertise lies in supply chain management, sustainable development, and procurement strategy. He has published extensively in top-tier academic journals and is a recognized thought leader in operations and sustainable supply chain management. Disraeli integrates practical problem solving and innovative approaches into his teaching, making significant contributions to both academia and industry.

Albert Bensusan is a lecturer at Ashesi University, with a passion for ensuring industry and academic collaboration. His experience working with last-mile communities and the businesses that support them has driven his research interest in problem solving, innovation, and entrepreneurship. He supports communities' aspirations for growth through innovation grounded in human-centred research. He joined the Reach Alliance to drive similar research. He aims to do this by supporting students to put people at the centre of research and ensuring actionable insights from their research findings.

ASHESI

Ashesi University's mission is to propel an African renaissance by educating ethical, entrepreneurial leaders. Located in Ghana, this private, nonprofit university combines a rigorous multidisciplinary core with degree programs in Computer Science, Business Administration, Management Information Systems, and Engineering. A student-led honour code, integrated community service, diverse internships, and real-world projects prepare students to develop innovative solutions for the challenges facing their individual communities, countries, and the continent at large.
www.ashesi.edu.gh

Center for
Inclusive Growth

The Center for Inclusive Growth advances equitable and sustainable economic growth and financial inclusion around the world. The Center leverages the company's core assets and competencies, including data insights, expertise, and technology, while administering the philanthropic Mastercard Impact Fund, to produce independent research, scale global programs, and empower a community of thinkers, leaders, and doers on the front lines of inclusive growth.
mastercardcenter.org

Reach Alliance

Published by the Reach Alliance, October 2025
Munk School of Global Affairs & Public Policy | University of Toronto

reachalliance.org | @ReachAllianceTO TheReachAlliance