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Digital Health Action Alliance

Wiring the Community Health Worker: A Winning Strategy for NCD Care

INSIGHT REPORT

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Foreword

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Non-communicable diseases (NCDs), especially cardiometabolic diseases such as hypertension and diabetes, are among the most important health challenges and disease burdens of the 21st century. While COVID-19 highlighted the remarkable progress made in generating new vaccines that respond to infectious disease, it also exposed the ongoing vulnerability inherent in chronic disease – as the high underlying prevalence of NCDs led to higher COVID-19 mortality rates.

This prevalence is often attributed to changes in lifestyle, food production, dietary content and multiple other factors. Preventive approaches and policies to improve diets and levels of activity while decreasing risk factors such as obesity are of the utmost importance; but at the same time, the root causes driving the increase in NCDs are unlikely to be reversed quickly. Therefore, improving the capacity of health systems to mitigate the negative impacts of NCDs is of paramount importance – particularly in early diagnosis, effective treatment and sustained management of these diseases.

With this focus in mind, the World Economic Forum and Mercer, alongside key multistakeholder partners, set out to explore new ways of addressing this challenge. The synergy of two principle elements was prioritized in combatting the burden of NCDs:

– Digital innovation – rapid advances in capabilities and accessibility (especially for the developing world) of devices, connectivity and artificial intelligence present an immense opportunity.

– Communities – at the same time as we consider exciting new technology, we must also stay humble and grounded. Health is determined in communities; community health workers (CHWs) have been and will continue to be critically important for improving health throughout populations.

The Digital Health Action Alliance (DHAA) was therefore established by the World Economic Forum as a global platform to promote knowledge, forge partnerships and identify solutions for NCDs via digitally driven and community-based approaches, with its first activity being to conduct key primary research into the potential impact of this powerful combination.

This report serves to validate the initial hypotheses of the DHAA community, and to tee up new potential areas for impact in managing and preventing NCDs – such as employer-based health programmes. This foundational work will be continued and expanded, linking to other important Forum initiatives such as the Digital Healthcare Transformation initiative, the EDISON Alliance and the Healthy Workforces initiative.

Executive summary

Expanding access to care for those with non-communicable diseases is accelerated when technology works with – and for – people.

In an increasingly connected and digital world, technology continues to transform even the most human of interactions, including healthcare. Yet ascertaining how innovation will affect people – and whether that change will be positive for all or just a few – has historically been challenging. Most recently, the rise of artificial intelligence (AI) has generated significant attention and enthusiasm, in part due to its ability to expedite transactional processes and automate mundane tasks. Whether digital transformation and AI will ultimately enhance or detract from health outcomes and social interactions remains to be seen, and the future role of human beings in delivering healthcare is likewise still uncertain. A recent publication from the World Economic Forum outlines several high-potential use cases of AI in healthcare, the barriers to realizing value and the principles for accelerating adoption.[1] What is not in doubt is that the digital revolution in healthcare is well under way.

While new technologies are poised to disrupt people's experience of healthcare, the speed and allocation of the resources for innovation remain unbalanced. The digital health market has received unprecedented levels of funding over the past decade, and many are now asking difficult questions about the use of these funds and whether investment has been prudent, effective or equitably distributed. Global investment in digital health is disparate, and is skewed heavily towards the United States. Yet within the US there are additional disparities; for instance, in the funding of start-ups with female and/or ethnic minority founders.[2,3] To truly improve the state of health around the world, addressing this reality and these imbalances is essential, as is reflection on both the potential and limits of technology to change health outcomes. In judging whether technological innovation will stimulate positive change in healthcare, it matters not only what and how change is implemented but also who is being supported to design and create the transformation.

The World Economic Forum identified a need and an opportunity to focus the narrative on digital health by resituating people at the centre of discussions and outlining some of the key obstacles. This collaborative exercise was the genesis of the Forum's Digital Health Action Alliance. The alliance's ambition is to focus on the opportunity for digital tools to affect chronic condition outcomes, and to do so with an equitable intent. For digital solutions to truly transform healthcare, they must not amplify existing disparities but aim to reduce premature deaths from non-communicable diseases (NCDs) across all populations.

This report is a part of that journey, focusing on the intersection of digital tools and an often overlooked but essential part of the healthcare workforce: community health workers (CHWs, also referred to as agents, navigators, health coaches, health educators, health outreach workers, public health aids, caregivers, etc.). CHWs have a robust track record of championing the health needs of the populations with whom they work, in areas from maternal care through to HIV and COVID-19. They are central figures in the famed Alma-Ata Declaration of 1978 that called for "Health For All" and they are again being recognized as a powerful global movement in the effort to address heath equity and chronic care needs.[4,5] The findings in this report, which include the voices of more than 1,000 CHWs across 28 countries, a review of commercial products and a collection of successful implementations, demonstrate that expanding access to care for NCDs through CHWs is accelerated when technology works for and with people.

Introduction

The need for healthcare workers with the competencies to manage non-communicable diseases is growing, alongside the increasing disease burden.

Some 20 years ago, humanity quietly passed a significant milestone. Due to remarkable advances in the understanding of pathogens and human physiology, and global efforts to distribute vaccines to those who need them, for the first time fewer than 50% of deaths worldwide were caused by communicable diseases. Since 2003, most deaths each year have instead been caused by non-communicable diseases (NCDs) such as heart disease, chronic respiratory diseases, cancer and diabetes. Today, NCDs account for 74% of global deaths per year, or 41 million people, 17.9 million of which are caused by heart disease alone.[6]

Thus, in 2015 the United Nations articulated in Sustainable Development Goal (SDG) 3.4 a global call to action to reduce premature mortality due to NCDs by one-third by 2030. The goal is designed to be met through preventive healthcare and treatment, which will be magnified when coupled with the objective of SDG 3.8, to achieve universal health coverage (UHC). Premature deaths from NCDs are one of the most quantifiable and treatable examples of global health inequity. As defined by SDG 3.4, premature death from an NCD occurs between the ages of 30 and 69 years old, which includes prime working and earning years. Preventing deaths and improving health thus improve economic and social participation in a key population segment.[7] Despite these highlighted threats to lives and economies, the World Health Organization (WHO)'s 2023 SDG report estimates that at the current annual reduction rate, all regions will fail to meet the set global target by 2030.[8]

Prior to the COVID-19 pandemic, trends in deaths from cardiovascular disease were declining in high-income countries as well as in some low- or middle-income countries (LMICs).[9] For instance, in Latin America and Asia, progress in health and towards SDG 3 (Good Health and Well-being) outpaced improvements on other SDGs. However, the COVID-19 pandemic disrupted these advances and dramatically overwhelmed health systems.[10] It has also amplified the vulnerability of people with NCDs, who face higher rates of infection, hospitalization and mortality.[11] Since the pandemic, most LMICs have lost ground in reducing premature mortality and are not on track to meet SDG 3.4,[12] and many higher-income countries are stagnating or even regressing in this area. A study across US counties showed increasing variations in NCD-driven premature mortality, with the highest mortality being 10.4 times greater than the lowest. It was estimated that 23% of this variation was associated with differences in socioeconomic composition.[13]

Despite the severity of the challenge, spending on NCD care has not come close to keeping pace with the growing burden of disease. A review in *The Lancet* estimated that achieving SDG 3.4 requires an additional $18 billion in global spending per year from 2020 to 2030, which, over the same period, would prevent 39 million deaths and generate a net economic benefit of $2.7 trillion.[14] Not making this investment is a missed opportunity as spending on health and particularly NCDs intersects with other key societal goals and economic metrics.

Chronic disease is both a cause and consequence of poverty, depriving societies, employers and families of important contributors.[15] Several studies highlight the direct and indirect costs of poor health, including impediments to workforce participation, the burden of caregiving requirements and debt accumulation to cover healthcare costs. With lack of sufficient insurance or social safety nets, households slip into poverty.[16,17]

Moreover, the need for healthcare workers with the competencies to manage NCDs is also growing – yet the WHO projects a shortage of 10 million healthcare workers by 2030.[18] Health systems globally are unprepared to manage the growing disease burden of NCDs, citing a lack of primary-level healthcare professionals as a common limiting factor. For example, the Pan American Health Organization (PAHO) estimates a deficit of 600,000 health workers in the Americas, while there is a shortage of 1 million health workers in Europe.[19,20]

Equally significant and concurrent with this epidemiological shift from infectious disease to chronic disease has been the rapid transformation and adoption of digital technology. Over the same 20 years that has seen growth in NCDs, digital innovation, adoption and access have also grown exponentially. In 2000, less than 7% of the globe was online; now 66% have access and there are more than 7 billion mobile phone users.[21,22,23] The aspiration for digital capabilities and platforms to transform health outcomes is being widely discussed and commitments to use new technologies to strengthen health systems are gaining momentum. In 2020, the WHO adopted its *Global Strategy on Digital Health 2020–2025*, the first strategic objective of which is to promote global collaboration and advance the transfer of knowledge on digital health.[24]

Encouraged by a belief that digital capabilities can stimulate better health outcomes, the World Economic Forum's Centre for Health and Healthcare launched the **Digital Health Action Alliance (DHAA)**, a growing community of organizations representing the healthcare industry, technology companies, civil society organizations, academics and government partners. Together, members of the DHAA set out to understand how digital solutions can best be deployed to reduce the global burden of NCDs effectively and equitably.

1 The power of collective experience

With a focus on systems change, healthcare stakeholders identified benefits as well as threats and barriers to implementing digital solutions to mitigate the global NCD burden.

Through the World Economic Forum's convening platform, the DHAA assembled leaders from diverse backgrounds and geographies who are deeply involved in the effort to combat NCDs. The goal was to identify challenges and opportunities in NCD care and to better understand the current landscape. These stakeholders gathered in the summer of 2022 at the World Economic Forum's New York Office and virtually. More than 100 individuals from 38 organizations across six continents took part.

Participants split into working groups, facilitated by an adaptation of the Health Belief Model (HBM).[25] The HBM is a value-expectancy model, based on the proposition that people change their behaviour only when there are sufficient benefits to doing so after subtracting the costs incurred by the change. The likelihood of the action is determined by the perceived gains in something that a person values. The HBM was adapted to focus on systems change rather than individual behaviour, and questions posed to the stakeholders were specific to identifying threats, benefits and barriers to implementing digital solutions to mitigate the global NCD burden.
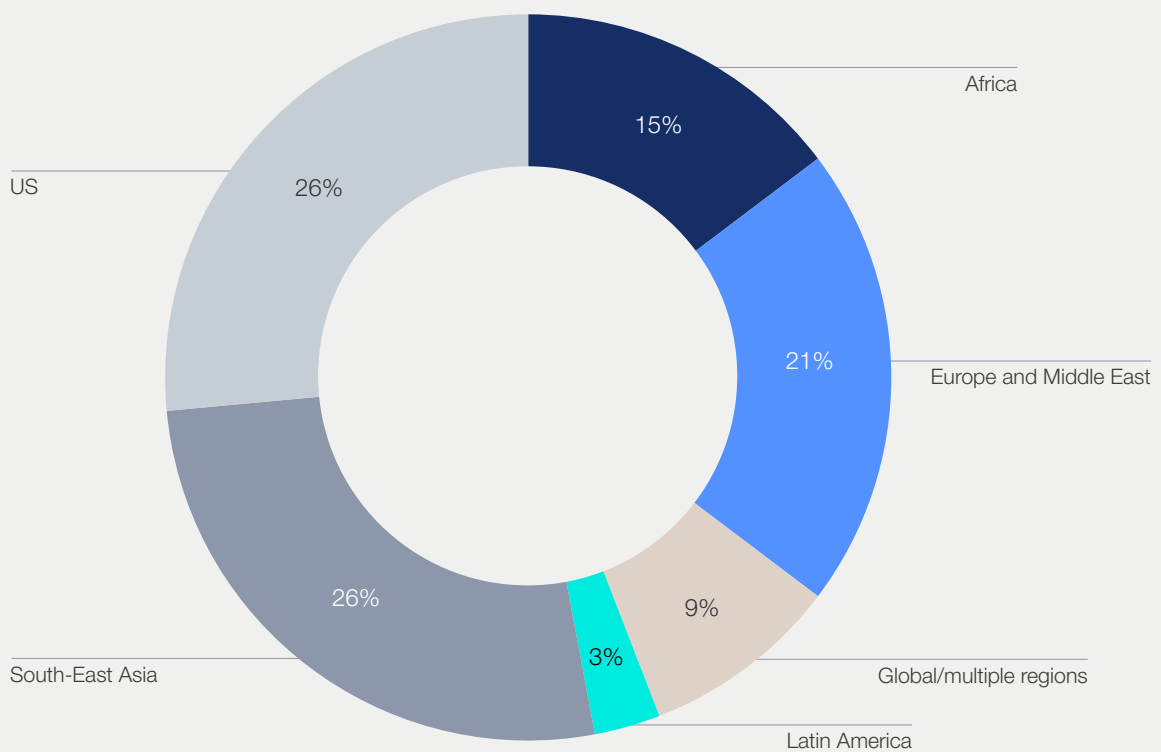
The exercise to identify barriers and accelerators for innovation and adoption led to clear areas of alignment and emerging focal points for further engagement and research. There was wide agreement on the continued need for primary prevention efforts (e.g. intervening to promote healthy lifestyles) to address NCDs before they arise. As the dialogue moved to secondary prevention (e.g. reducing the negative impacts of disease via early detection and action) and the potential of digital platforms and technology to address diagnostic and treatment challenges, one theme was consistent: for successful NCD care, community health workers (CHWs) have great value – and there could be sustainable results from using digital solutions to amplify their success. Extending their skills with digital tools increases CHWs' capacity and deepens their impact. This report sets out to explore the relationship of digital tools and CHWs within the context of NCDs through a series of conversations, case studies and research. The findings reinforce the DHAA's optimism and set out a framework for further research and investment.

1.1 | Digitally enabled community case studies

To understand the current ecosystem, the research team requested members of the DHAA community to provide case studies detailing the implementation of health initiatives using digital capabilities to combat NCDs. The team received 34 case studies that were predominantly coordinated through a mix of public and private mechanisms and, as expected, there was a variety of applications for and approaches to digital tooling in the NCD space.

The case studies were organized by key characteristics, starting with geography. The geographic footprint (Figure 1) is evidence that digital health solutions are no longer reserved for those in "developed" nations, but reflect the growing prevalence of global telecommunications coverage and the ability to extend access to rural communities.

FIGURE 1 | Case studies by geographic footprint

- Africa 15%
- Europe and Middle East 21%
- Global/multiple regions 9%
- Latin America 3%
- South-East Asia 26%
- US 26%

Source: DHAA case studies

The research team then mapped each case study by the domain in which it applies digital technology and suggested the following macro categories:

1. **Patient care and delivery:** Includes telemedicine, education, payment models, screening, etc.

2. **Provider task extension:** Specifically targets healthcare workers as the end user, with interventions on training, electronic health record management, etc.

3. **Systems strengthening:** Provides high-level insights, such as predictive modelling, health management dashboards, supply-chain forecasting, etc.

4. **Research and development:** Includes clinical trials and experimental design.

Some individual case studies use digital capabilities across more than one category. For example, a programme might use a mix of smart medical devices and apps to promote the interrelated tasks of patient screening, education and electronic health record collection.

As shown in Figure 2, the majority of case studies (67%) involved at least one element of enhancing patient care and the delivery of health services. Only 16% of the case studies reflected what the research team identifies as "provider task extension", which encompasses the training of front-line providers such as CHWs and the simplifying of their tasks (e.g. management of health records).

FIGURE 2 | **Case studies by category of intervention**
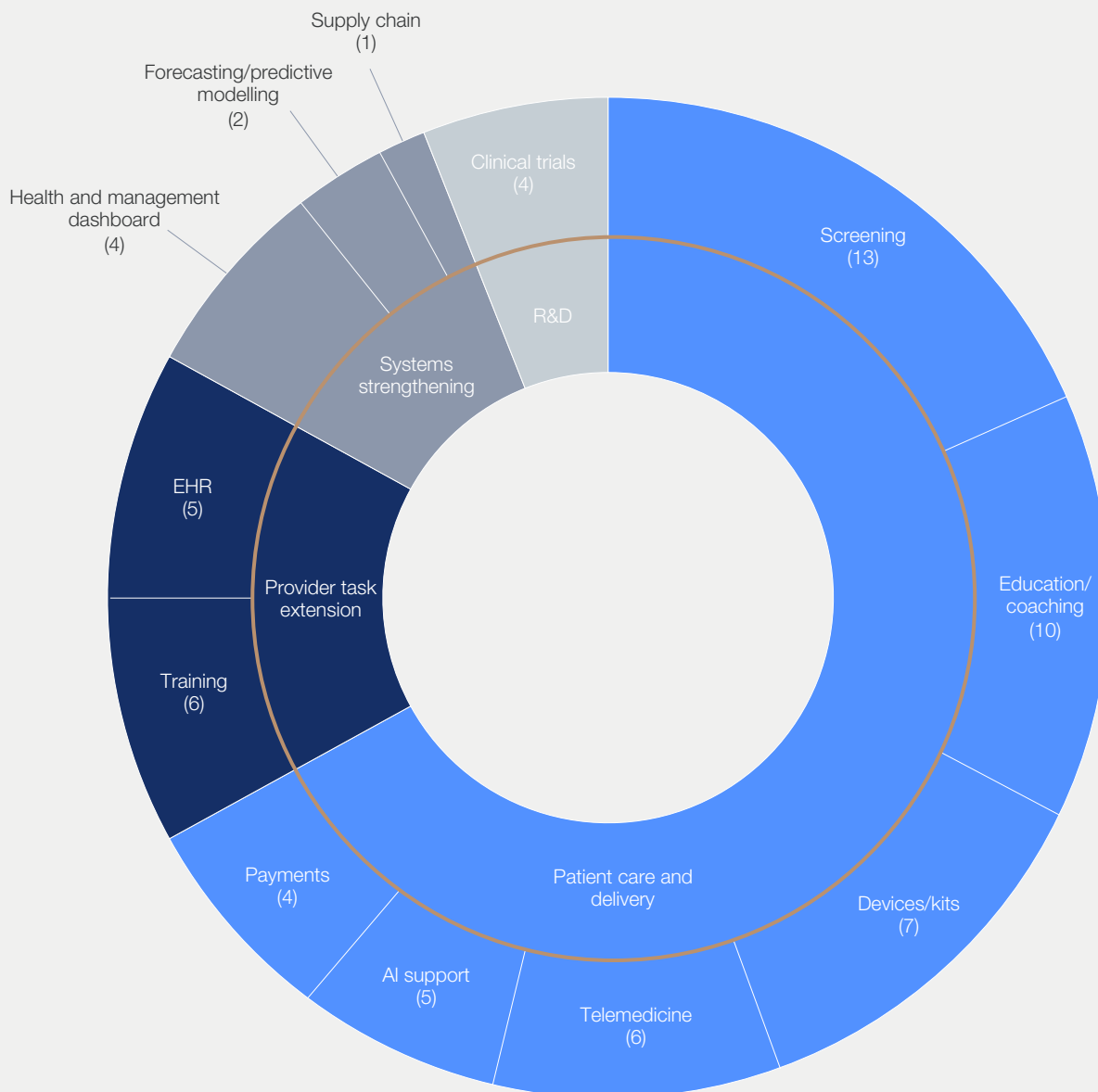
Source: DHAA case studies

Best practices gleaned from the review help to substantiate and contextualize the view that improving the prevention and management of NCDs with digital platforms is well under way in diverse settings. Key lessons from the reviewed case studies include:

– The trust and social capital that CHWs establish with their clients is enhanced by digital technology, which also facilitates wider access.

– "Offline first" is a critical capability and key to expanding existing delivery systems, especially in areas with limited reception or connectivity.

– Technology can improve the efficiency of tasks such as collection of electronic health records (EHR) – but more promising is the enablement of task-shifting and task-enhancing capabilities.

To that end, this section of the report highlights three illustrative case studies selected due to: a) their geographic representation; b) their reported impact; and c) their specific focus on using CHWs.

CASE STUDY 1
Dell Technologies Digital LifeCare

"Enrolment at scale"

Digital LifeCare is an open-source digital healthcare platform created to help the Indian government address the rising burden of NCDs at population scale. It is a future-ready technology platform into which healthcare systems can be integrated digitally, enabling continuity of care for patients. It equips India's front-line healthcare workers with an easy-to-use and easy-to-carry tool that is the first point in creating electronic healthcare records.

The platform is now integrated with India's National Digital Health Infrastructure ABHA (Ayushman Bharat Health Account) to create unique health identifiers (IDs) for citizens.

This digitally verifiable ID facilitates a comprehensive and integrated individual health record, which can be used for informed decision-making and improved health management.

In 2023, the programme saw a 94% increase in enrolments compared to the previous year, resulting in a cumulative total of 238 million individuals enrolled. Dell's partner, Tata Trusts, has helped train more than 110,000 healthcare professionals.

Digital LifeCare received the Digital Healthcare Platform of the Year Award in The Economic Times (of India) Healthcare Awards in 2022. The award honours the ground-breaking contributions of leaders and innovators from various areas of the healthcare sector.

Source: [26,27]

CASE STUDY 2
Blueprint for Success

"Health-system strengthening"

This initiative by Takeda Pharmaceuticals, Amref Health Africa and local stakeholders provides a comprehensive framework that other parties may replicate in seeking to address NCD prevalence and quantify the success of health-system strengthening efforts.

Implemented from 2019 to 2023, the pilot programme sought to strengthen local healthcare systems in Kenya's Meru County to improve the management of diabetes, hypertension and cancer. CHWs were an integral part of the programme's strategy, with 1,244 people receiving training on NCD screening and management. The programme further used CHWs' data collection capabilities through the Mobile Jamii Afya Link (M-Jali) tool. More than 150,000 people were screened at the community level, allowing for improved NCD surveillance and data-driven policy decisions.

The pilot broadened efforts on cancer prevention and treatment, aiming to establish Kenya as a centre of excellence in oncology. The model has since been expanded to target NCDs in four other African countries.

The detailed project framework includes specific activities and metrics for success through strategies to: 1) address community awareness; 2) engage in multifaceted health-system strengthening; 3) increase patient screening, diagnosis, treatment and retention; 4) improve supply chains; and 5) explore alternative price schemes.

Source: [28,29,30]

# Padayon

"Task-shifting and offline first"

Medtronic LABS and reach52 partnered with municipal health providers in rural Philippines to pilot a new digital health model for diabetes and hypertension management in low-resource settings. The positive outcomes of this public–private partnership evidence the successful combination of "offline-first" technology and community involvement in addressing access barriers to health services and improving health outcomes for patients with NCDs in LMICs.

Screened rural inhabitants were enrolled in a 12-week treatment programme that offered in-person and virtual health coaching, blood pressure and blood sugar monitoring and delivery of prescribed medicines, all facilitated through a single-subscription digital platform.

Source: [32]

This integrated health solution was largely managed by CHWs equipped as "agents" with the offline-first mHealth app. Community agents coordinated the collection and distribution of prescribed medicines, reinforced in-person coaching, entered blood pressure and random blood sugar readings into the app and were compensated via commissions on the processing and delivery of medicine orders.

As a result of the pilot programme, 89% of enrollees had their systolic and diastolic blood pressure under control by the final readings, compared to 60% at the start of the programme. Furthermore, the "task-shifting" model of using local, existing human capital vs. more credentialled[31] health workers was noted as advancing the aims of United Nations SDG 8 (to promote inclusive and sustainable economic growth) as well as the health-oriented SDG 3.
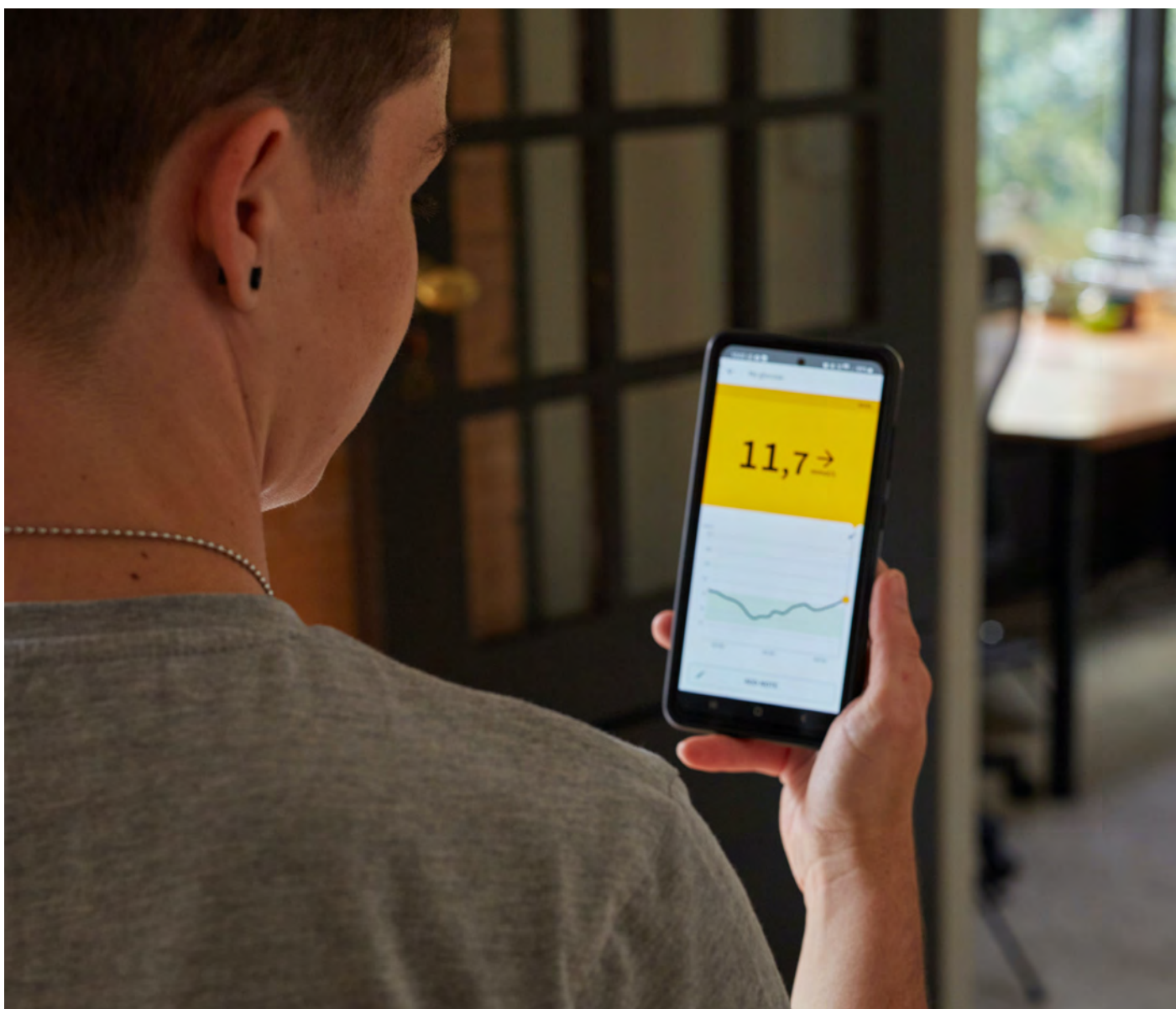
2 | Investing in community health workers

The most successful CHWs are those who are adequately trained, have clear roles and responsibilities, and are formally paid.

2.1 | Guidelines and models for implementation

As recognition grows that CHWs play a key role in achieving universal health coverage, the level of institutionalized support for CHW initiatives – including training and supervision, accreditation, compensation, integration with formal health systems and funding – is increasing, albeit with significant variation across and within countries. For CHWs to be optimally effective they need commensurate endorsement and support. A study from 2021 estimates a $5.4 billion annual funding gap for at-scale CHW programmes in sub-Saharan Africa alone.[33] In Africa, a large majority of CHWs work as unsalaried or minimally compensated volunteers.[34]

The WHO underscored this need in its 2018 guidelines on optimizing CHW programmes. Its guidelines provide a blueprint for national governments and global partners to deploy and professionalize CHWs, recognizing that the most successful CHWs are those who are adequately trained, have clear roles and responsibilities, and are paid for their work.[35] The WHO also reinforces the importance of country-level adaptation and contextualization. It recommends that training and accreditation programmes should be customized to reflect the tasks CHWs in that country are expected to perform, and that incentive structures should be culturally relevant.

MODEL 1 | The Brazilian model

Brazil's CHW programme is often cited as a model for other countries looking to scale and institutionalize their CHW workforce. In Brazil, CHWs (*agentes comunitários de saúde*) are salaried professionals who are fully integrated into the public health system, working regularly with multidisciplinary family health teams to promote and deliver primary care.

CHWs are recruited from their own communities and must complete at least 40 hours of initial training prior to practising. Their formal employment with the state affords them strong legal protections, including a minimum wage, additional compensation if exposed to hazardous working conditions and the right to form a union.

The Brazilian model is successful, in part, because CHWs are positioned at the forefront of the public primary care system and their value is widely recognized both socially and legally. Nevertheless, CHWs in Brazil face challenges common to the CHW workforce more broadly. Their ability to serve as a trusted bridge between the community and the health system is constrained if access to supplies and resources is otherwise limited.

Source: [36,37,38]

MODEL 2 | Training CHWs in high-income countries (HICs)

High-income countries such as the United States, Canada and Australia have also deployed CHWs in various capacities with generally positive outcomes. In the US, federally qualified health centers (FQHCs) are required by law to provide primary care to medically underserved communities and rely on front-line workers such as CHWs to provide community-based care.

Moreover, the US Department of Health and Human Services (HHS) is channelling $226.5 million in allocated funding to launch the Community Health Worker Training Program. Through this programme, HHS plans to train 13,000 CHWs, increasing access to care, improving public health emergency response and addressing the public health needs of underserved communities. The CHWs will be trained in various health services including COVID-19 care; mental health and substance use disorder prevention, treatment and recovery services; and chronic disease care.

Source: [39,40]

MODEL 3 | CHW professionalization in Kenya

Kenya's Community Health Strategy (2020–2025) aims to fully integrate 100,000 CHWs into the formal health system and transition them from volunteers to compensated roles.

Recognizing that the success of community health interventions often depends on a motivated workforce, the Kenyan government has committed to offering CHWs a regular stipend and coverage in the National Health Insurance Fund (NHIF). Allocation of more resources towards CHW programmes is encouraged at the county level, with county governments contributing KSH 2,500 ($16.50) monthly for each CHW stipend to be matched by funding from the national government.

CHWs' scope of work will be increased to position them not only as health workers, but as social agents involved in educational outreach and public works. These complementary roles will be funded through blended public-sector wages and performance-based compensation strategies. Finally, the initiative seeks to restructure the allocation of international funding, particularly global fund grants, which are often siloed into disease-specific interventions, to incorporate significant resources for strengthening community health systems.

Source: [41,42]

2.2 | Training, credentialling and compensation

While the WHO's guidelines were a significant endorsement and pathway for the CHW workforce on a global scale, country-level adoption remains limited and variable. A recent review of 24 studies in eight countries on CHWs' roles in the European Union identified high regional variability in training, ranging from two days to nine months.[43] There can also be heightened fragmentation within a single country context; in Uganda, for example, more than 22 different organizations are responsible for training CHWs.[44] The WHO guidelines were validated in a cross-sectional study by TB REACH, which operates in more than 30 countries. It should be noted that CHWs engaged in delivering tuberculosis care participate in a wide scope of activities beyond health education and screening, from case identification and sputum collection to laboratory support and directly observed treatment. The TB REACH programme, established to foster innovation, reviewed different CHW engagement and performance models with active case finding as the primary outcome. Its conclusions merit further attention:

> ❝ In line with WHO guidelines, our findings emphasize that successful implementation approaches provide CHWs with comprehensive training, continuous supervision, fair compensation, and are integrated within the existing primary healthcare system.

In addition, it found some suggestion that community-based learning was superior to classroom learning and, although e-learning was a small proportion of this, it was associated with cost savings.[45]

Funding for CHW programmes in LMICs have largely been sourced from the public sector, composed of both international donations and government funding. The US Agency for International Development estimated the breakdown for public funding of CHW programmes in sub-Saharan Africa to be 60% donations and 40% government investment.[46] Only a fraction of total CHW funding goes towards NCD-focused programmes.[47] However the success of CHWs as front-line public health resources has caught the attention of both public and private funders, including state-based insurance companies. In the US, nine states have authorized funding for coverage by CHW services and four more plan to do so.[48] These commitments change the primary funding model from volunteering or grants-based and begin to formally integrate CHW care into billable time for those certified or credentialled to deliver the services.

The credentialling or certification of CHWs remains a topic of some debate.[49] Credentialling or certification necessitates agreement on standards regarding competency and scope of services. A study in the United States found that states in which credentialling of CHWs was used resulted in higher wages for the CHWs; however, where it was used, the issue of pay gaps between male and female workers, as well as between white and Black CHWs, persisted.[50] Another study from the Agency for HealthCare Quality and Research found little evidence of improved outcomes in asthma when credentialling was used, though the authors acknowledged the sparseness of the literature.[51] It may be inevitable that credentialling of CHWs will be a criterion for defining compensation as CHWs transition from volunteering into a more professional and task-driven role. Further research will be needed to understand what is gained and what can be lost in this transition.

The large number of existing studies has focused on the successful impact of CHWs across a wide array of public health needs, including maternal child health and infectious diseases such as malaria, TB, HIV and now COVID-19. As NCD prevalence continues to increase, CHWs are also having an impact in these chronic areas. Thus, new research will have to investigate the relationship between outcomes and a continuum of professionalization efforts, from training and certification to credentialling and licensing. Identifying best practices within geographic and diagnostic contexts will be especially critical if task extension and scope of services for CHWs is to continue expanding beyond health education and screening to newer areas of impact such as point-of-care testing and the treatment and management of both infectious and chronic disease.

3 Investing in digital health

With a growing user base and sizeable investment, there is value for CHWs in using digital health tools – including in commercial and employer-based settings.

Policy leads and public health advocates have identified the value of digital health tools for decades, encouraging their use and championing the results. In 2005, the World Health Assembly called on member states to create digital health strategies, while the World Bank has invested almost $4 billion over the past decade in digital health, spanning health information systems, digital governance, identification systems and infrastructure.[52] In 2021, the WHO published the *Global Strategy on Digital Health*, which laid out a set of objectives to advance digital health systems. Proposed actions in the strategy aim to cultivate a people-centred health system, foster training of the healthcare workforce and shift to community-based models.[53]

Several studies outline the benefits, challenges and potential strategies for the implementation of digital health solutions specific to LMICs.[54,55] In the light of recent advances, governments and international bodies are turning their attention towards digital health and are establishing strategies for transformation. The WHO's *Global Strategy on Digital Health 2020–2025* recommends the development of sustainable funding models to support the deployment of digital health solutions.[56]

Meanwhile, private investment in digital health technology for commercial use has been extensive. Global private investment in all sectors of digital health was boosted by the increased adoption of remote healthcare services during the COVID-19 pandemic. However, this investment has been geographically concentrated; in 2022, US-based companies received 68% ($17.7 billion) of the $25.9 billion total investment in global digital health solutions, compared to 5% for African, Latin American, Canadian and Australian-based companies combined.[57] The pandemic also surfaced concerns about the veracity of information and use of health data, underscoring the need for governance in health systems and bringing discussions on the role of trust in digital platforms into the wider social dialogue.[58]
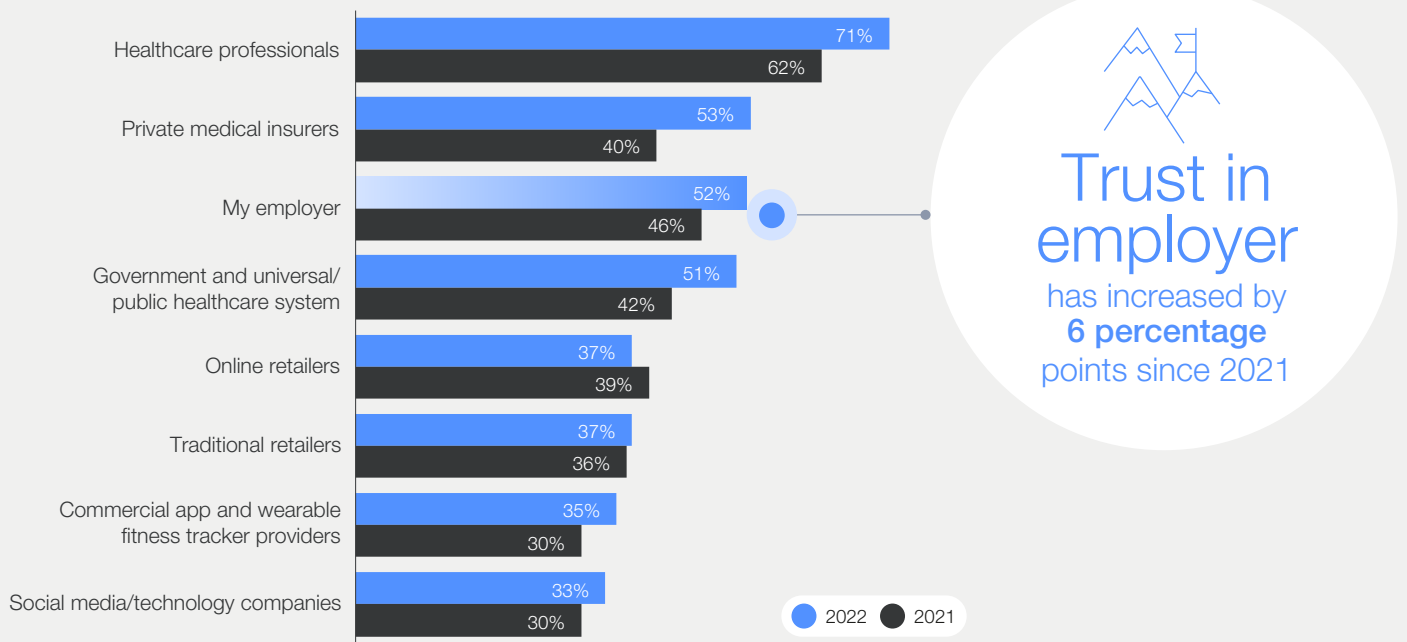
Commercial models aimed at group buyers such as employers are generally focused on developed markets and often target individual employee or consumer behaviour. Employees across the globe appear to be open to employer participation in health support. Mercer's 2023 *Health on Demand* study surveyed more than 17,000 employees in 16 countries and noted wide acceptance on the part of

employees towards a future of employer-supported digital healthcare (Figure 3).[59] During the COVID-19 pandemic, both employers and CHWs ranked very high on trust parameters for delivery of health solutions and information.[60,61] The role of CHWs in workplaces has been established, particularly for work populations that are seasonal and marginalized.[62,63] As acceptance of CHWs increases and new payment models are defined, expansion into new settings is emerging.[64]

FIGURE 3 | **Half of employees trust their employers to deliver high-quality, convenient, affordable and secure personal health solutions**

How much trust or distrust do you have in the following sources to deliver personal health solutions that are of high quality, convenient, affordable and secure?
(a great deal or a fair amount of trust)

Source	2022	2021
Healthcare professionals	71%	62%
Private medical insurers	53%	40%
My employer	52%	46%
Government and universal/public healthcare system	51%	42%
Online retailers	37%	39%
Traditional retailers	37%	36%
Commercial app and wearable fitness tracker providers	35%	30%
Social media/technology companies	33%	30%

Trust in employer has increased by **6 percentage** points since 2021

● 2022 ● 2021

Note: N=14,405 surveyed employees

Source: [65]

3.1 | Review of commercial digital health solutions

Nearly 7.5 billion people have mobile phones and the vast majority of those are smartphones.[66] Given that there is both a growing user base and sizeable investment in digital health funding, the opportunity for CHWs to use digital health tools and the value of doing so seem evident. Yet can commercial tools complement the delivery of care and position CHWs at the centre of the health delivery system?

In late 2022, the research team for this paper sent a survey to a group of commercial digital health suppliers to explore and compare commercial models designed specifically to help close gaps in NCD prevention, diagnosis and treatment. Participating suppliers reported service offerings in five key countries – the United States (56%), India (42%), the United Kingdom (28%), Kenya (25%) and the Philippines (25%). Offerings were focused on four NCD categories – cardiovascular and diabetes (47%), cardiovascular only (36%), diabetes only (8%), and other (8%). The survey results identified the following themes:

Of the surveyed digital health suppliers, three out of four designed their tool as a direct-to-patient model. However, with appropriate training, the solutions could pivot and complement a direct-to-health-provider model, where CHWs or patient advocates become the end user of the tool.

FIGURE 4

Without training on how to use the solution, who is the solution primarily designed for (e.g. end user)?

	# of solutions	% of solutions
Patient	27	75%
Health navigator, community health worker, occupational health clinic team	16	44%
Family member or other caregiver	14	39%
Patient advocate	7	19%
Certified doctors/nurses	7	19%
Outpatient clinic staff	5	14%

Note: total may equal more than 100% as survey respondents were directed to select all options that applied to their solutions

Source: DHAA Survey

FIGURE 5

With training on how to use the solution, it can be used by:

	# of solutions	% of solutions
Health navigator, community health worker, occupational health clinic team	10	28%
Certified doctors/nurses	10	28%
Outpatient clinic staff	9	25%
Patient advocate	8	22%
Family member or other caregiver	7	19%
Patient	3	8%

Source: DHAA Survey

The focus is on educating patients on their health status and how to self-manage NCDs by addressing lifestyle behaviours relating to factors such as diet, level of physical activity and body weight. Biometric data such as blood pressure, glucose readings and physical activity are user-reported and/or integrated with a device. Two-thirds of the digital health tools stratify risk and, based on risk levels, steer patients towards digital content; for instance, health education through online learning modules and content libraries (61%), personalized notifications and reminders (26%) and algorithmic chatbot coaching (9%).

On aggregate, the surveyed commercial entities reported improved health outcomes such as a reduction in HbA1C of 1.4–1.9%, weight loss of 5–6%, and Hg systolic blood pressure reduction of 8 mm Hg–13 mmHg systolic after 12 months of patient engagement on the platform.

Commercial digital health tools are also being designed with health providers as the primary end users. Six out of 10 digital health tools captured by the survey monitor gaps in care and notify the patient's health provider when there is a gap in care. Others send alert messages to designated contacts such as caregivers (20%), and many provide access to online chat or social support groups (19%).

With training or small adaptations, these solutions can easily assist CHWs and provide them with health education, risk stratification and patient-tracking features to increase health awareness and engagement in their communities.
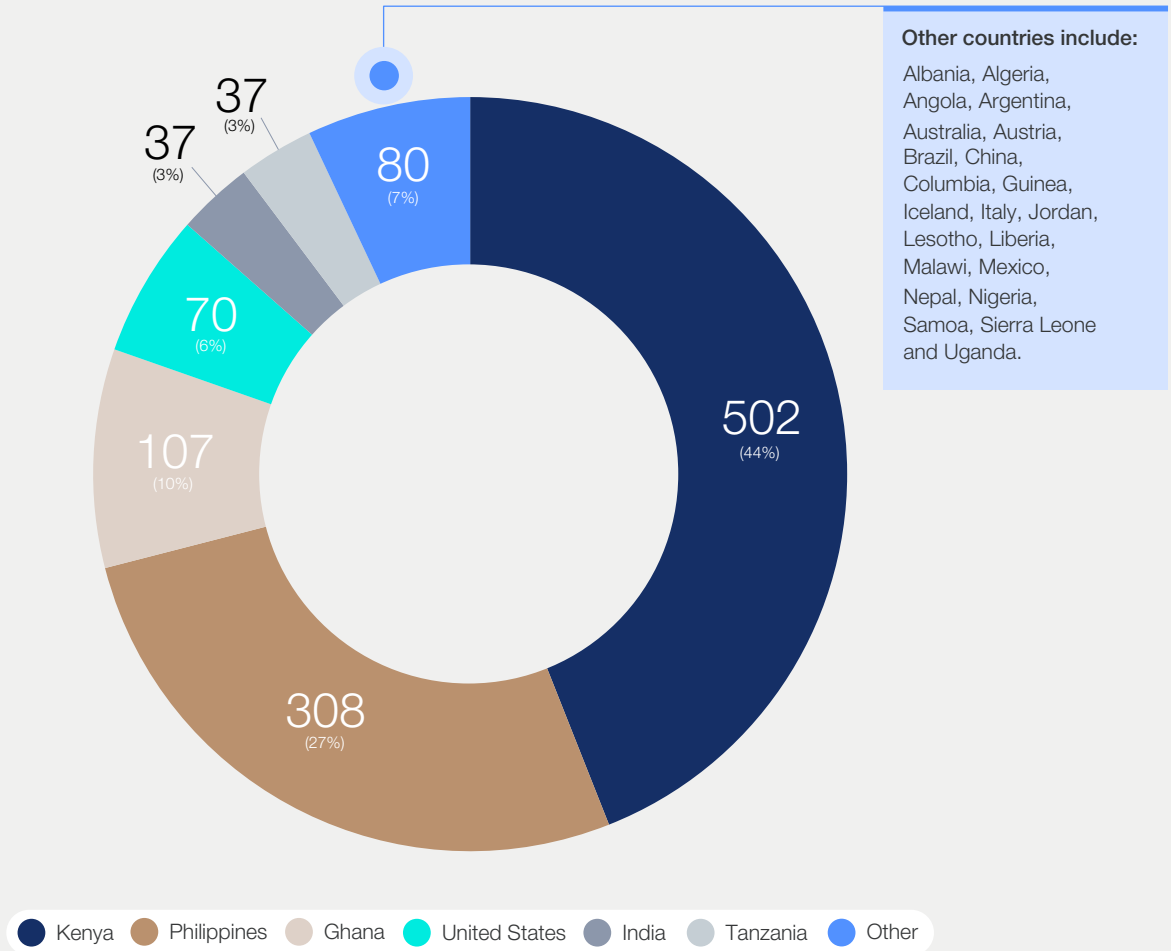
4 Voices from the front line

Surveyed CHWs already use and find value in digital tools: they are early adopters and optimistic about digital health.

Many studies involving the implementation of digital capabilities in CHW settings identify improvements across a set of dimensions: enhancement in CHW training, adherence to quality standards, reduction in delayed visits and increasing feelings of CHW self-efficacy.[67,68] But there is still some debate over acceptance rates and the use of digital tools for CHWs in varied settings.[69]

The research team wanted to hear from CHWs working on the front line about their level of acceptance and views on these tools. The team surveyed 1,141 CHWs from across the globe to understand the nature of their work with respect to NCDs and digital uptake, as well as to validate the barriers initially identified by DHAA stakeholders.

FIGURE 6 | **Nationality of CHWs**

Other countries include:

Albania, Algeria, Angola, Argentina, Australia, Austria, Brazil, China, Columbia, Guinea, Iceland, Italy, Jordan, Lesotho, Liberia, Malawi, Mexico, Nepal, Nigeria, Samoa, Sierra Leone and Uganda.

502 (44%)

308 (27%)

107 (10%)

70 (6%)

37 (3%)

37 (3%)

80 (7%)

● Kenya ● Philippines ● Ghana ● United States ● India ● Tanzania ● Other
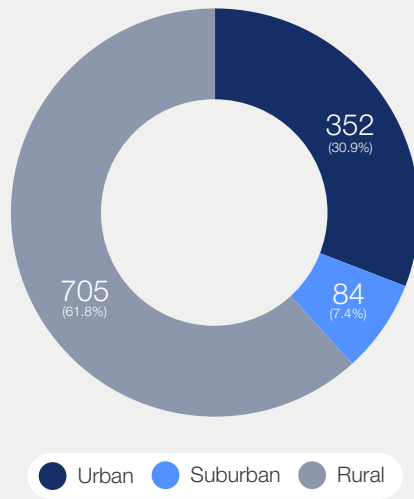
Source: DHAA Survey

The majority of CHWs in the research sample were women (78.4%), while the highest concentration were aged 35–44 years (31.1%). CHWs primarily worked in rural settings (61.8%) with a tenure of more than five years (60.5%); 80.2% of the sample currently used digital devices and tools for their work and, of those, the majority used a mobile device/smartphone (74.8%). Some 77% of the sample had received training in NCD care. Other most-reported trainings included health education methods (69.3%), sanitation and hygiene promotion and education (65.3%) and data collection (56.5%).
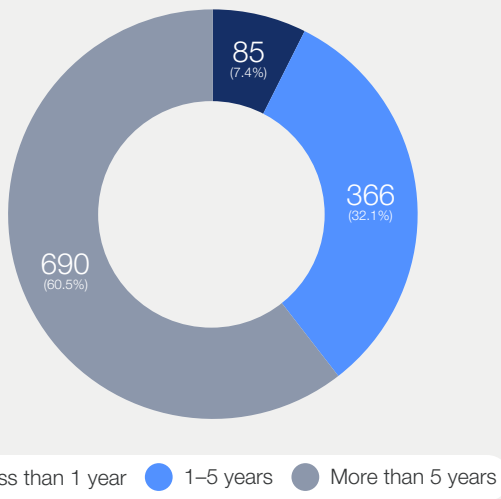
Overall, the sample was either very optimistic (55.3%) or optimistic (28.8%) that digital health can have a positive impact on the community. CHWs identified themselves as often being one of the first people to try new technology and devices (74.5%) compared to waiting for others to try (20.8%) or being the last person to try (4.6%) new technology and devices.
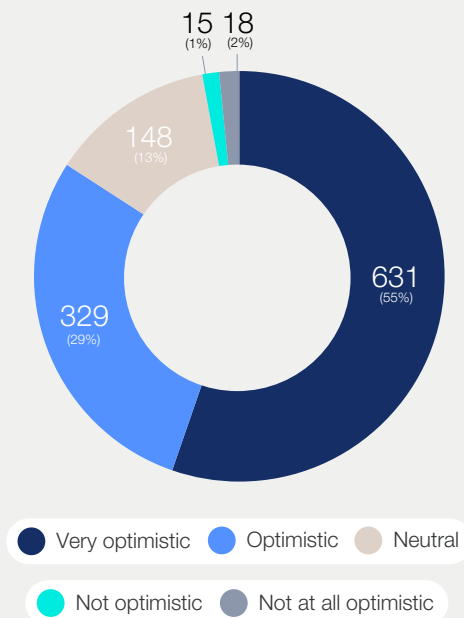
FIGURE 7 | **Geographic representation of CHWs**

- Urban: 352 (30.9%)
- Suburban: 84 (7.4%)
- Rural: 705 (61.8%)

Source: DHAA Survey

FIGURE 8 | **Tenure of CHWs**

- Less than 1 year: 85 (7.4%)
- 1–5 years: 366 (32.1%)
- More than 5 years: 690 (60.5%)

Source: DHAA Survey

FIGURE 9 | **Optimism that digital health can positively affect the community**

- Very optimistic: 631 (55%)
- Optimistic: 329 (29%)
- Neutral: 148 (13%)
- Not optimistic: 15 (1%)
- Not at all optimistic: 18 (2%)

Source: DHAA Survey

CHWs were also asked about the barriers that individuals in their communities faced when accessing digital health. The most reported barriers were limited or no internet connectivity (60.4%), cost of internet services (52.6%), cost of mobile phone services (47.9%) and cost of phone/device (40.1%). At lower levels, CHWs also identified limited experience with technology/not knowing how to use technology (34.7%), preference for traditional face-to-face interaction (25.8%) and distrust in technology (8.3%) as barriers to digital access for people in their community. However, CHWs in the research sample believed that digital tools would help them have more impact specifically with improved and faster data collection (85.1%), easy access to health education (73.9%) and more frequent contact with community members without travel (53.0%).

FIGURE 10 | **Barriers to digital access for individuals in your community**

Number of community health workers endorsing barrier
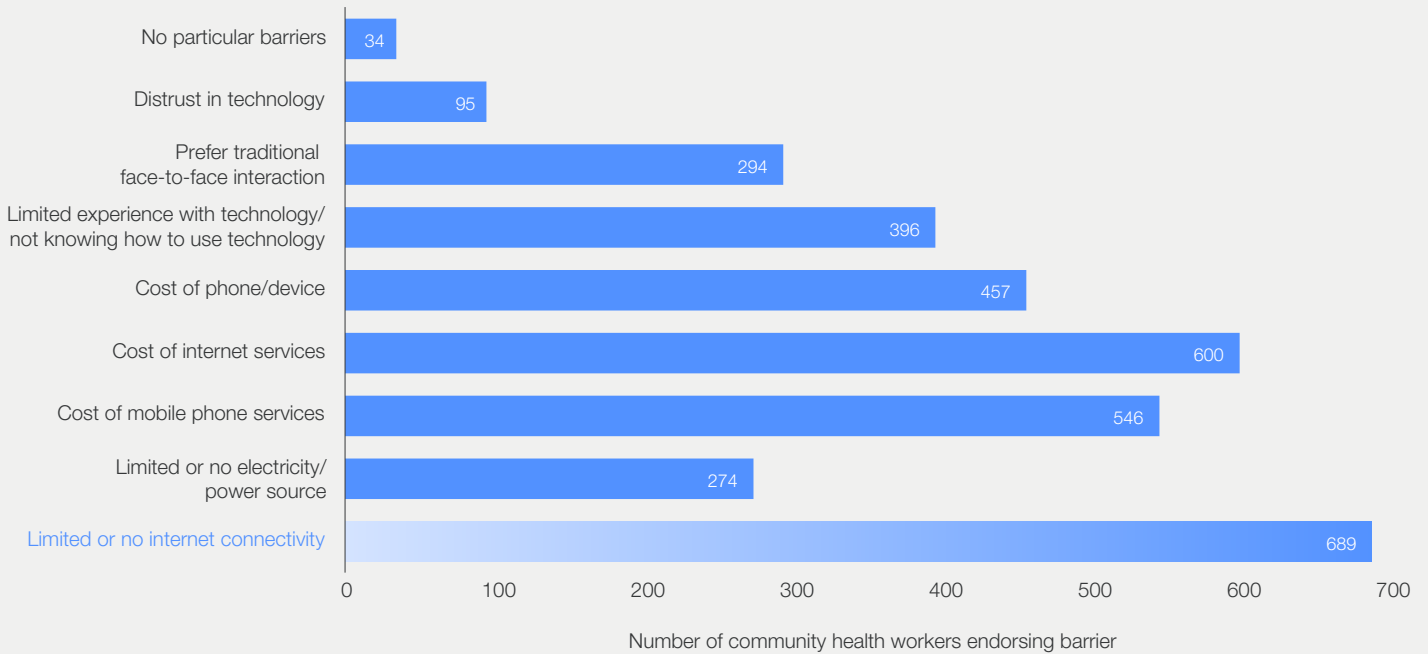
Source: DHAA Survey

CHWs in the sample were already using and found value in digital health to support their work. They were optimistic about the future of digital health and were early adopters of new technology. The barriers identified by the DHAA were confirmed by the CHWs, but did not negatively influence CHWs' perception of the potential for digital health to have an impact on their community. CHWs endorsed digital health's potential to add value to their communities through specific activities. These results validated the research team's understanding of CHWs as catalysts in the acceptance and use of digital health in communities affected by NCDs, especially rural communities.

Further analyses from this data are currently under peer review in an open-access journal. These findings will be shared when published.

Conclusion

The consensus is clear: digital health tools placed in the hands of CHWs are an effective force in combatting NCDs.

NCDs such as diabetes and hypertension account for 74% of all deaths across the globe: 15 million of these deaths occur before the age of 70 and are considered premature. These are prime years of life, which include working, earning, community and familial contributions. Preventing death and improving health thus improve economic and social participation in a key population segment.

Prior to the COVID-19 pandemic, trends in deaths due to NCDs were dropping in high-income countries as well as in some LMICs in Latin American and Asia.[70] However, with the disruption of COVID-19, the momentum to invest and develop sustainable infrastructure to manage and treat NCDs has stalled. And the continued shortage of healthcare workers is also a considerable challenge in the fight against premature death due to NCDs.

The Digital Health Action Alliance was formed with the aspiration that digital health tools can and should play a role in addressing these challenges. And the consensus is increasingly clear that these digital health tools placed in the hands of CHWs can be an extremely effective force in combatting NCDs.

Digital health solutions were once considered appropriate only for those in "developed" nations, but this is no longer the case. Internet access and mobile phone ownership are increasingly ubiquitous in every corner of the world, and even in areas without constant connectivity, clever "offline-first" solutions have emerged to bring digital tools to remote communities. Furthermore, CHWs in both high-income and low-income countries are already engaging with digital health and appreciate digital health innovation as a reliable path to enhancing impact in their communities.

With the synthesis of this knowledge, the DHAA community and its partners are promoting five calls to action:

1 Credential

Credentialling is a path to formalized acknowledgment of CHWs as key stakeholders in health-system strengthening. It is one path to wider integration and compensation, while maintaining continued emphasis on lived experience, social connection and in-the-field training.

2 Compensate

CHWs deserve to be paid for their considerable contributions. Continued research is needed to understand models that compensate them fairly while continuing to enhance their skills and social impact.

3 Construct

Build and extend capabilities and improve the quality of CHWs' impact with a digital toolkit that aims to go beyond data collection and move to digital diagnostics, point-of-care testing and low-cost and easily distributed treatment options.

4 Consider

Private and public investors should keep this vital workforce in mind when developing solutions and products that target the management of chronic disease, particularly considering the impact of social determinants of health on outcomes.

5 Collaborate

Employers and other private-sector players have a role in enhancing community health and NCD management through coverage sponsorship, on-site services and collaboration with existing and emerging models that use CHWs. Further work is warranted to understand how to deploy effective programmes with CHWs in workforce settings.

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